

# 64-pin CK505 Compatible Clock w/Fully Integrated Voltage Regulator + Integrated Series Resistor

**9LRS3165B**
**Recommended Application:**

CK505 compatible clock with fully integrated voltage regulator and internal series resistor on differential outputs

**Output Features:**

- 2 - CPU differential low power push-pull pairs
- 9 - SRC differential low power push-pull pairs
- 1 - CPU/SRC selectable differential low power push-pull pair
- 1 - SRC/DOT selectable differential low power push-pull pair
- 5 - PCI, 33MHz
- 1 - PCI\_F, 33MHz free running
- 1 - USB, 48MHz
- 1 - REF, 14.318MHz

**Key Specifications:**

- CPU outputs cycle-cycle jitter < 85ps
- SRC output cycle-cycle jitter < 125ps
- PCI outputs cycle-cycle jitter < 250ps
- +/- 100ppm frequency accuracy on CPU & SRC clocks

**Features/Benefits:**

- Does not require external pass transistor for voltage regulator
- Integrated 33ohm series resistors on differential outputs,  $Z_0=50\Omega$
- Supports spread spectrum modulation, default is 0.5% down spread
- Uses external 14.318MHz crystal, external crystal load caps are required for frequency tuning
- Selectable between one SRC differential push-pull pair and two single-ended outputs
- Meets PCIEX Gen2 specification on dedicated SRC outputs. Muxed SRC outputs meet PCIEX Gen1 specification, except SRC1.
- Single-ended programmable slew rate control for RFI reduction
- Meets PCIEX <85ps cycle-to-cycle jitter for SRC[11:1]

**Pin Configuration**

|                         |    |    |                    |
|-------------------------|----|----|--------------------|
| PCI0/CR#_A              | 1  | 64 | SCLK               |
| VDDPCI                  | 2  | 63 | SDATA              |
| PCI1/CR#_B              | 3  | 62 | REF/FSLC/TEST_SEL  |
| PCI2/TME                | 4  | 61 | VDDREF             |
| PCI3                    | 5  | 60 | X1                 |
| PCI4/27_SEL             | 6  | 59 | X2                 |
| PCI5_F/ITP_EN           | 7  | 58 | GNDREF             |
| GNDPCI                  | 8  | 57 | FSLB/TEST_MODE     |
| VDD48                   | 9  | 56 | CK_PWRGD/PD#       |
| USB48M/FSLA             | 10 | 55 | VDDCPU             |
| GND48                   | 11 | 54 | CPUT_LR0           |
| VDDI/O96MHz             | 12 | 53 | CPUC_LR0           |
| DOT96T/SRCT_LR0         | 13 | 52 | GNDCPU             |
| DOT96C/SRCC_LR0         | 14 | 51 | CPUT_F_LR1         |
| GND                     | 15 | 50 | CPUC_F_LR1         |
| VDD                     | 16 | 49 | VDDCPU_IO          |
| 27FIX/LCDT/SRCT_LR1/SE1 | 17 | 48 | NC                 |
| 27SS/LCDC/SRCC_LR1/SE2  | 18 | 47 | CPUT_ITP_LR2/SRCT8 |
| GND                     | 19 | 46 | CPUC_ITP_LR2/SRCC8 |
| VDDPLL3I/O              | 20 | 45 | VDDSRCI/O          |
| SRCT_LR2/SATACLKT       | 21 | 44 | SRCT_LR7/CR#_F     |
| SRCC_LR2/SATACLKC       | 22 | 43 | SRCC_LR7/CR#_E     |
| GNDSRC                  | 23 | 42 | GNDSRC             |
| SRCT_LR3/CR#_C          | 24 | 41 | SRCT_LR6           |
| SRCC_LR3/CR#_D          | 25 | 40 | SRCC_LR6           |
| VDDSRCI/O               | 26 | 39 | VDDSRC             |
| SRCT_LR4                | 27 | 38 | PCL_STOP#          |
| SRCC_LR4                | 28 | 37 | CPU_STOP#          |
| GNDSRC                  | 29 | 36 | VDDSRCI/O          |
| SRCT_LR9                | 30 | 35 | SRCC_LR10          |
| SRCC_LR9                | 31 | 34 | SRCT_LR10          |
| SRCC_LR11/CR#_G         | 32 | 33 | SRCT_LR11/CR#_H    |

**64-TSSOP**
**Table 1: CPU Frequency Select Table**

| FS <sub>L</sub> C <sup>2</sup><br>B0b7 | FS <sub>L</sub> B <sup>1</sup><br>B0b6 | FS <sub>L</sub> A <sup>1</sup><br>B0b5 | CPU<br>MHz | SRC<br>MHz | PCI<br>MHz | REF<br>MHz | USB<br>MHz | DOT<br>MHz |
|--|--|--|------------|------------|------------|------------|------------|------------|
| 0                                      | 0                                      | 0                                      | 266.66     | 100.00     | 33.33      | 14.318     | 48.00      | 96.00      |
| 0                                      | 0                                      | 1                                      | 133.33     |            |            |            |            |            |
| 0                                      | 1                                      | 0                                      | 200.00     |            |            |            |            |            |
| 0                                      | 1                                      | 1                                      | 166.66     |            |            |            |            |            |
| 1                                      | 0                                      | 0                                      | 333.33     |            |            |            |            |            |
| 1                                      | 0                                      | 1                                      | 100.00     |            |            |            |            |            |
| 1                                      | 1                                      | 0                                      | 400.00     |            |            |            |            |            |
| 1                                      | 1                                      | 1                                      | Reserved   |            |            |            |            |            |

1. FS<sub>L</sub>A and FS<sub>L</sub>B are low-threshold inputs. Please see V<sub>IL,FS</sub> and V<sub>IH,FS</sub> specifications in the Input/Supply/Common Output Parameters Table for correct values. Also refer to the Test Clarification Table.

2. FS<sub>L</sub>C is a three-level input. Please see the V<sub>IL,FS</sub> and V<sub>IH,FS</sub> specifications in the Input/Supply/Common Output Parameters Table for correct values.

## TSSOP Pin Description

| Pin# | Pin Name        | Type | DESCRIPTION   |
|------|-----------------|------|---|
| 1    | PCI0/CR#_A      | I/O  | 3.3V PCI clock output or Clock Request control A for either SRC0 or SRC2 pair<br>The power-up default is PCI0 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 0 of SMBus address space . After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_A_EN bit located in byte 5 of SMBUs address space.<br>Byte 5, bit 7<br>0 = PCI0 enabled (default)<br>1 = CR#_A enabled.<br>Byte 5, bit 6 controls whether CR#_A controls SRC0 or SRC2 pair<br>Byte 5, bit 6<br>0 = CR#_A controls SRC0 pair (default),<br>1 = CR#_A controls SRC2 pair |
| 2    | VDDPCI          | PWR  | Power supply pin for the PCI outputs, 3.3V nominal  |
| 3    | PCI1/CR#_B      | I/O  | 3.3V PCI clock output/Clock Request control B for either SRC1 or SRC4 pair<br>The power-up default is PCI1 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 1 of SMBus address space . After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_B_EN bit located in byte 5 of SMBUs address space.<br>Byte 5, bit 5<br>0 = PCI1 enabled (default)<br>1 = CR#_B enabled.<br>Byte 5, bit 4 controls whether CR#_B controls SRC1 or SRC4 pair<br>Byte 5, bit 4<br>0 = CR#_B controls SRC1 pair (default)<br>1 = CR#_B controls SRC4 pair     |
| 4    | PCI2/TME        | I/O  | 3.3V PCI clock output / Trusted Mode Enable (TME) Latched Input. This pin is sampled on power-up as follows<br>0 = Overclocking of CPU and SRC Allowed<br>1 = Overclocking of CPU and SRC NOT allowed<br>After being sampled on power-up, this pin becomes a 3.3V PCI Output  |
| 5    | PCI3            | OUT  | 3.3V PCI clock output.  |
| 6    | PCI4/27_SEL     | I/O  | 3.3V PCI clock output / 27MH mode select for pin17, 18 strap. On powerup, the logic value on this pin determines the power-up default of DOT_96/SRC0 and 27MHz/SRC1 output and the function table for the pin17 and pin18.  |
| 7    | PCI5_F/ITP_EN   | I/O  | Free running PCI clock output and ITP/SRC8 enable strap. This output is not affected by the state of the PCI_STOP# pin. On powerup, the state of this pin determines whether pins 46 and 47 are an ITP or SRC pair.<br>0 =SRC8/SRC8#<br>1 = ITP/ITP#  |
| 8    | GNDPCI          | PWR  | Ground for PCI clocks.  |
| 9    | VDD48           | PWR  | Power supply for USB clock, nominal 3.3V.   |
| 10   | USB48M/FSLA     | I/O  | Fixed 48MHz USB clock output. 3.3V / 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for V <sub>il_FS</sub> and V <sub>ih_FS</sub> values.   |
| 11   | GND48           | PWR  | Ground pin for the 48MHz outputs.   |
| 12   | VDDI/O96MHz     | PWR  | 1.05V to 3.3V from external power supply  |
| 13   | DOT96T/SRCT_LR0 | OUT  | True clock of SRC or DOT96. The power-up default function depends on 27_Select,1= SRC0, 0=DOT96   |
| 14   | DOT96C/SRCC_LR0 | OUT  | Complement clock of SRC or DOT96. The power-up default function depends on 27_Select,1= SRC0, 0=DOT96   |
| 15   | GND             | PWR  | Ground pin for the DOT96 clocks.  |
| 16   | VDD             | PWR  | Power supply for SRC / SE1 and SE2 clocks, 3.3V nominal.  |

## TSSOP Pin Description (Continued)

| PIN # | PIN NAME                | TYPE | DESCRIPTION   |
|-------|-------------------------|------|---|
| 17    | 27FIX/LCDT/SRCT_LR1/SE1 | OUT  | Single-ended 3.3V 27MHz fix clock output / True clock of differential SRC1 or LCD clock pair / Single ended 3.3V peripheral clock output. The default output selection is determined by the SEL_27 default latch value. See below:<br><b>27_SEL=0:</b> LCD100 with -0.5% down spread is selected as default. LCD100 spread percentage can be adjusted OR output can be changed to SRC or 3.3V single-ended peripheral clock output via SMBUS B1b[4:1].<br><b>27_SEL=1:</b> Single-ended 27FIX output is selected.   |
| 18    | 27SS/LCDC/SRCC_LR1/SE2  | OUT  | Single-ended 3.3V 27MHz fix clock output / Complementary clock of differential SRC1 or LCD clock pair / Single ended 3.3V peripheral clock output. The default output selection is determined by the SEL_27 default latch value. See below:<br><b>27_SEL=0:</b> LCD100 with -0.5% down spread is selected as default. LCD100 spread percentage can be adjusted OR output can be changed to SRC or 3.3V single-ended peripheral clock output via SMBUS B1b[4:1].<br><b>27_SEL=1:</b> Single-ended 27SS output is selected with -0.5% down spread as default. Spread percentage can be adjusted via SMBUS B1b[4:1].   |
| 19    | GND                     | PWR  | Ground pin for SRC / SE1 and SE2 clocks, PLL3.  |
| 20    | VDDPLL3/O               | PWR  | 1.05V to 3.3V from external power supply  |
| 21    | SRCT_LR2/SATACLKT       | OUT  | True clock of differential SRC/SATA clock pair.   |
| 22    | SRCC_LR2/SATACLKC       | OUT  | Complement clock of differential SRC/SATA clock pair.   |
| 23    | GNDSRC                  | PWR  | Ground pin for SRC clocks.  |
| 24    | SRCT_LR3/CR#_C          | I/O  | True clock of differential SRC clock pair/ Clock Request control C for either SRC0 or SRC2 pair<br>The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space. After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_C_EN bit located in byte 5 of SMBUS address space.<br>Byte 5, bit 3<br>0 = SRC3 enabled (default)<br>1 = CR#_C enabled.<br>Byte 5, bit 2 controls whether CR#_C controls SRC0 or SRC2 pair<br>Byte 5, bit 2<br>0 = CR#_C controls SRC0 pair (default),<br>1 = CR#_C controls SRC2 pair          |
| 25    | SRCC_LR3/CR#_D          | I/O  | Complementary clock of differential SRC clock pair/ Clock Request control D for either SRC1 or SRC4 pair<br>The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space. After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_D_EN bit located in byte 5 of SMBUS address space.<br>Byte 5, bit 1<br>0 = SRC3 enabled (default)<br>1 = CR#_D enabled.<br>Byte 5, bit 0 controls whether CR#_D controls SRC1 or SRC4 pair<br>Byte 5, bit 0<br>0 = CR#_D controls SRC1 pair (default),<br>1 = CR#_D controls SRC4 pair |
| 26    | VDDSRC/O                | PWR  | 1.05V to 3.3V from external power supply  |
| 27    | SRCT_LR4                | I/O  | True clock of differential SRC clock pair 4   |
| 28    | SRCC_LR4                | I/O  | Complement clock of differential SRC clock pair 4   |
| 29    | GNDSRC                  | PWR  | Ground pin for SRC clocks.  |
| 30    | SRCT_LR9                | OUT  | True clock of differential SRC clock pair.  |
| 31    | SRCC_LR9                | OUT  | Complement clock of differential SRC clock pair.  |
| 32    | SRCC_LR11/CR#_G         | I/O  | SRC11 complement /Clock Request control for SRC9 pair<br>The power-up default is SRC11#, but this pin may also be used as a Clock Request control of SRC9 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 7 of SMBUS configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC9 pair using byte 6, bit 5 of SMBUS configuration space<br>Byte 6, bit 5<br>0 = SRC11# enabled (default)<br>1 = CR#_G controls SRC9   |

## TSSOP Pin Description (Continued)

| PIN # | PIN NAME           | TYPE | DESCRIPTION   |
|-------|--------------------|------|---|
| 33    | SRCT_LR11/CR#_H    | I/O  | SRC11 true or Clock Request control H for SRC10 pair<br>The power-up default is SRC11, but this pin may also be used as a Clock Request control of SRC10 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 7 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC10 pair using byte 6, bit 4 of SMBus configuration space<br>Byte 6, bit 4<br>0 = SRC11 enabled (default)<br>1= CR#_H controls SRC10. |
| 34    | SRCT_LR10          | OUT  | True clock of differential SRC clock pair.  |
| 35    | SRCC_LR10          | OUT  | Complement clock of differential SRC clock pair.  |
| 36    | VDDSRCI/O          | PWR  | 1.05V to 3.3V from external power supply  |
| 37    | CPU_STOP#          | IN   | Stops all CPU Clocks, except those set to be free running clocks. In AMT mode 3 bits are shifted in from the ICH to set the FSC, FSB, FSA values  |
| 38    | PCI_STOP#          | IN   | Stops all PCI Clocks, except those set to be free running clocks. In AMT mode 3 bits are shifted in from the ICH to set the FSC, FSB, FSA values  |
| 39    | VDDSRC             | PWR  | VDD pin for SRC Pre-drivers. 3.3V nominal   |
| 40    | SRCC_LR6           | OUT  | Complement clock of low power differential SRC clock pair.  |
| 41    | SRCT_LR6           | OUT  | True clock of low power differential SRC clock pair.  |
| 42    | GNDSRC             | PWR  | Ground for SRC clocks   |
| 43    | SRCC_LR7/CR#_E     | I/O  | SRC7 complement or Clock Request control E for SRC6 pair<br>The power-up default is SRC7#, but this pin may also be used as a Clock Request control of SRC6 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space . After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC6 pair using byte 6, bit 7 of SMBus configuration space<br>Byte 6, bit 7<br>0 = SRC7# enabled (default)<br>1= CR#_E controls SRC6. |
| 44    | SRCT_LR7/CR#_F     | I/O  | SRC7 true or Clock Request control 8 for SRC8 pair<br>The power-up default is SRC7, but this pin may also be used as a Clock Request control of SRC8 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC8 pair using byte 6, bit 6 of SMBus configuration space<br>Byte 6, bit 6<br>0 = SRC7# enabled (default)<br>1 = CR#_F controls SRC8.         |
| 45    | VDDSRCI/O          | PWR  | 1.05V to 3.3V from external power supply  |
| 46    | CPUC_ITP_LR2/SRCC8 | OUT  | Complement clock of low power differential CPU2/Complement clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 7, PCIF5/ITP_EN on powerup. The function is as follows:<br>Pin 7 latched input Value<br>0 = SRC8#<br>1 = ITP#   |
| 47    | CPUT_ITP_LR2/SRCT8 | OUT  | True clock of low power differential CPU2/True clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 7, PCIF5/ITP_EN on powerup. The function is as follows:<br>Pin 7 latched input Value<br>0 = SRC8<br>1 = ITP   |
| 48    | NC                 | N/A  | No Connect  |
| 49    | VDDCPU_IO          | PWR  | 1.05V to 3.3V from external power supply  |
| 50    | CPUC_F_LR1         | OUT  | Complement clock of low power differential CPU clock pair. This clock will be free-running during iAMT.   |
| 51    | CPUT_F_LR1         | OUT  | True clock of low power differential CPU clock pair. This clock will be free-running during iAMT.   |
| 52    | GNDCPU             | PWR  | Ground Pin for CPU Outputs  |
| 53    | CPUC_LR0           | OUT  | Complement clock of low power differential CPU clock pair.  |
| 54    | CPUT_LR0           | OUT  | True clock of low power differential CPU clock pair.  |
| 55    | VDDCPU             | PWR  | Power Supply 3.3V nominal.  |
| 56    | CK_PWRGD/PD#       | IN   | Notifies CK505 to sample latched inputs, or iAMT entry/exit, or PWRDWN# mode  |
| 57    | FSLB/TEST_MODE     | IN   | 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for Vil_FS and Vih_FS values. TEST_MODE is a real time input to select between Hi-Z and REF/N divider mode while in test mode. Refer to Test Clarification Table.  |
| 58    | GNDREF             | PWR  | Ground pin for crystal oscillator circuit   |
| 59    | X2                 | OUT  | Crystal output, nominally 14.318MHz.  |
| 60    | X1                 | IN   | Crystal input, Nominally 14.318MHz.   |
| 61    | VDDREF             | PWR  | Power pin for the REF outputs, 3.3V nominal.  |
| 62    | REF/FSLC/TEST_SEL  | I/O  | 3.3V 14.318MHz reference clock/3.3V tolerant low threshold input for CPU frequency selection. Refer to input electrical characteristics for Vil_FS and Vih_FS values/<br>TEST_SEL: 3-level latched input to enable test mode. Refer to Test Clarification Table.  |
| 63    | SDATA              | I/O  | Data pin for SMBus circuitry, 5V tolerant.  |
| 64    | SCLK               | IN   | Clock pin of SMBus circuitry, 5V tolerant.  |



## MLF Pin Description

| Pin# | Pin Name          | TYPE | DESCRIPTION   |
|------|-------------------|------|---|
| 1    | GNDREF            | PWR  | Ground pin for crystal oscillator circuit   |
| 2    | X2                | OUT  | Crystal output, nominally 14.318MHz.  |
| 3    | X1                | IN   | Crystal input, Nominally 14.318MHz.   |
| 4    | VDDREF            | PWR  | Power pin for the REF outputs, 3.3V nominal.  |
| 5    | REF/FSLC/TEST_SEL | I/O  | 3.3V 14.318MHz reference clock/3.3V tolerant low threshold input for CPU frequency selection. Refer to input electrical characteristics for $V_{il\_FS}$ and $V_{ih\_FS}$ values/TEST_SEL: 3-level latched input to enable test mode. Refer to Test Clarification Table.  |
| 6    | SDATA             | I/O  | Data pin for SMBus circuitry, 5V tolerant.  |
| 7    | SCLK              | IN   | Clock pin of SMBus circuitry, 5V tolerant.  |
| 8    | PCI0/CR#_A        | I/O  | 3.3V PCI clock output or Clock Request control A for either SRC0 or SRC2 pair<br>The power-up default is PCI0 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 0 of SMBus address space . After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_A_EN bit located in byte 5 of SMBUs address space.<br>Byte 5, bit 7<br>0 = PCI0 enabled (default)<br>1 = CR#_A enabled.<br>Byte 5, bit 6 controls whether CR#_A controls SRC0 or SRC2 pair<br>Byte 5, bit 6<br>0 = CR#_A controls SRC0 pair (default),<br>1 = CR#_A controls SRC2 pair |
| 9    | VDDPCI            | PWR  | Power supply pin for the PCI outputs, 3.3V nominal  |
| 10   | PCI1/CR#_B        | I/O  | 3.3V PCI clock output/Clock Request control B for either SRC1 or SRC4 pair<br>The power-up default is PCI1 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the PCI output must first be disabled in byte 2, bit 1 of SMBus address space . After the PCI output is disabled (high-Z), the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_B_EN bit located in byte 5 of SMBUs address space.<br>Byte 5, bit 5<br>0 = PCI1 enabled (default)<br>1 = CR#_B enabled.<br>Byte 5, bit 4 controls whether CR#_B controls SRC1 or SRC4 pair<br>Byte 5, bit 4<br>0 = CR#_B controls SRC1 pair (default)<br>1 = CR#_B controls SRC4 pair     |
| 11   | PCI2/TME          | I/O  | 3.3V PCI clock output / Trusted Mode Enable (TME) Latched Input. This pin is sampled on power-up as follows<br>0 = Overclocking of CPU and SRC Allowed<br>1 = Overclocking of CPU and SRC NOT allowed<br>After being sampled on power-up, this pin becomes a 3.3V PCI Output  |
| 12   | PCI3              | OUT  | 3.3V PCI clock output.  |
| 13   | PCI4/27_SEL       | I/O  | 3.3V PCI clock output / 27MH mode select for pin24, 25 strap. On powerup, the logic value on this pin determines the power-up default of DOT_96/SRC0 and 27MHz/SRC1 output and the function table for the pin24 and pin25.  |
| 14   | PCI5_F/ITP_EN     | I/O  | Free running PCI clock output and ITP/SRC8 enable strap. This output is not affected by the state of the PCI_STOP# pin. On powerup, the state of this pin determines whether pins 53 and 54 are an ITP or SRC pair.<br>0 = SRC8/SRC8#<br>1 = ITP/ITP#   |
| 15   | GNDPCI            | PWR  | Ground for PCI clocks.  |
| 16   | VDD48             | PWR  | Power supply for USB clock, nominal 3.3V.   |
| 17   | USB48M/FSLA       | I/O  | Fixed 48MHz USB clock output. 3.3V./ 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for $V_{il\_FS}$ and $V_{ih\_FS}$ values.   |
| 18   | GND48             | PWR  | Ground pin for the 48MHz outputs.   |
| 19   | VDDI/O96MHz       | PWR  | 1.05V to 3.3V from external power supply  |
| 20   | DOT96T/SRCT_LR0   | OUT  | True clock of SRC or DOT96. The power-up default function depends on 27_Select, 1= SRC0, 0=DOT96  |
| 21   | DOT96C/SRCC_LR0   | OUT  | Complement clock of SRC or DOT96. The power-up default function depends on 27_Select, 1= SRC0, 0=DOT96  |
| 22   | GND               | PWR  | Ground pin for the DOT96 clocks.  |
| 23   | VDD               | PWR  | Power supply for SRC / SE1 and SE2 clocks, 3.3V nominal.  |

## MLF Pin Description (Continued)

| PIN # | PIN NAME                | TYPE | DESCRIPTION  |
|-------|-------------------------|------|--|
| 24    | 27FIX/LCDT/SRCT_LR1/SE1 | OUT  | Single-ended 3.3V 27MHz fix clock output / True clock of differential SRC1 or LCD clock pair / Single ended 3.3V peripheral clock output. The default output selection is determined by the SEL_27 default latch value. See below:<br><b>27_SEL=0:</b> LCD100 with -0.5% down spread is selected as default. LCD100 spread percentage can be adjusted OR output can be changed to SRC or 3.3V single-ended peripheral clock output via SMBUS B1b[4:1].<br><b>27_SEL=1:</b> Single-ended 27FIX output is selected.  |
| 25    | 27SS/LCDC/SRCC_LR1/SE2  | OUT  | Single-ended 3.3V 27MHz fix clock output / Complementary clock of differential SRC1 or LCD clock pair / Single ended 3.3V peripheral clock output. The default output selection is determined by the SEL_27 default latch value. See below:<br><b>27_SEL=0:</b> LCD100 with -0.5% down spread is selected as default. LCD100 spread percentage can be adjusted OR output can be changed to SRC or 3.3V single-ended peripheral clock output via SMBUS B1b[4:1].<br><b>27_SEL=1:</b> Single-ended 27SS output is selected with -0.5% down spread as default. Spread percentage can be adjusted via SMBUS B1b[4:1].  |
| 26    | GND                     | PWR  | Ground pin for SRC / SE1 and SE2 clocks, PLL3.   |
| 27    | VDDPLL3/I/O             | PWR  | 1.05V to 3.3V from external power supply   |
| 28    | SRCT_LR2/SATACLKT       | OUT  | True clock of differential SRC/SATA clock pair.  |
| 29    | SRCC_LR2/SATACLKC       | OUT  | Complement clock of differential SRC/SATA clock pair.  |
| 30    | GNDSRC                  | PWR  | Ground pin for SRC clocks.   |
| 31    | SRCT_LR3/CR#_C          | I/O  | True clock of differential SRC clock pair/ Clock Request control C for either SRC0 or SRC2 pair<br>The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 0 or SRC pair 2 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space . After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 2 or pair 0 using the CR#_C_EN bit located in byte 5 of SMBUS address space.<br>Byte 5, bit 3<br>0 = SRC3 enabled (default)<br>1= CR#_C enabled.<br>Byte 5, bit 2 controls whether CR#_C controls SRC0 or SRC2 pair<br>Byte 5, bit 2<br>0 = CR#_C controls SRC0 pair (default),<br>1= CR#_C controls SRC2 pair          |
| 32    | SRCC_LR3/CR#_D          | I/O  | Complementary clock of differential SRC clock pair/ Clock Request control D for either SRC1 or SRC4 pair<br>The power-up default is SRCCLK3 output, but this pin may also be used as a Clock Request control of SRC pair 1 or SRC pair 4 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC3 output must first be disabled in byte 4, bit 7 of SMBus address space . After the SRC3 output is disabled, the pin can then be set to serve as a Clock Request pin for either SRC pair 1 or pair 4 using the CR#_D_EN bit located in byte 5 of SMBUS address space.<br>Byte 5, bit 1<br>0 = SRC3 enabled (default)<br>1= CR#_D enabled.<br>Byte 5, bit 0 controls whether CR#_D controls SRC1 or SRC4 pair<br>Byte 5, bit 0<br>0 = CR#_D controls SRC1 pair (default),<br>1= CR#_D controls SRC4 pair |
| 33    | VDDSRCI/O               | PWR  | 1.05V to 3.3V from external power supply   |
| 34    | SRCT_LR4                | I/O  | True clock of differential SRC clock pair 4  |
| 35    | SRCC_LR4                | I/O  | Complement clock of differential SRC clock pair 4  |
| 36    | GNDSRC                  | PWR  | Ground pin for SRC clocks.   |
| 37    | SRCT_LR9                | OUT  | True clock of differential SRC clock pair.   |
| 38    | SRCC_LR9                | OUT  | Complement clock of differential SRC clock pair.   |
| 39    | SRCC_LR11/CR#_G         | I/O  | SRC11 complement /Clock Request control for SRC9 pair<br>The power-up default is SRC11#, but this pin may also be used as a Clock Request control of SRC9 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 7 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC9 pair using byte 6, bit 5 of SMBus configuration space<br>Byte 6, bit 5<br>0 = SRC11# enabled (default)<br>1= CR#_G controls SRC9   |



## MLF Pin Description (Continued)

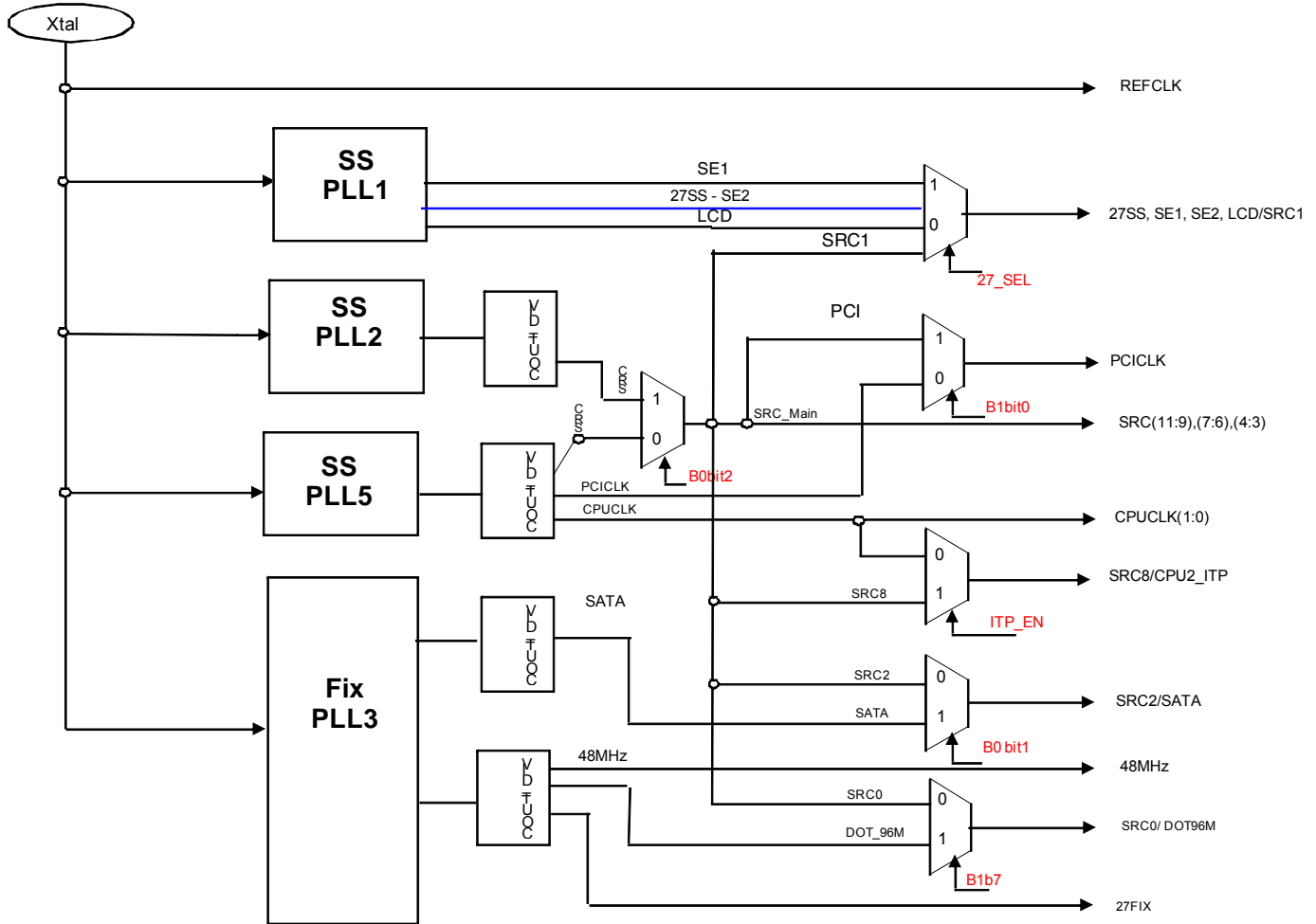
| PIN # | PIN NAME           | TYPE | DESCRIPTION  |
|-------|--------------------|------|--|
| 40    | SRCT_LR11/CR#_H    | I/O  | SRC11 true or Clock Request control H for SRC10 pair<br>The power-up default is SRC11, but this pin may also be used as a Clock Request control of SRC10 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC11 output pair must first be disabled in byte 3, bit 7 of SMBus configuration space After the SRC11 output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC10 pair using byte 6, bit 4 of SMBus configuration space<br>Byte 6, bit 4<br>0 = SRC11 enabled (default)<br>1 = CR#_H controls SRC10. |
| 41    | SRCT_LR10          | OUT  | True clock of differential SRC clock pair.   |
| 42    | SRCC_LR10          | OUT  | Complement clock of differential SRC clock pair.   |
| 43    | VDDSRC/I/O         | PWR  | 1.05V to 3.3V from external power supply   |
| 44    | CPU_STOP#          | IN   | Stops all CPU Clocks, except those set to be free running clocks. In AMT mode 3 bits are shifted in from the ICH to set the FSC, FSB, FSA values   |
| 45    | PCI_STOP#          | IN   | Stops all PCI Clocks, except those set to be free running clocks. In AMT mode 3 bits are shifted in from the ICH to set the FSC, FSB, FSA values   |
| 46    | VDDSRC             | PWR  | VDD pin for SRC Pre-drivers, 3.3V nominal  |
| 47    | SRCC_LR6           | OUT  | Complement clock of low power differential SRC clock pair.   |
| 48    | SRCT_LR6           | OUT  | True clock of low power differential SRC clock pair.   |
| 49    | GNDSRC             | PWR  | Ground for SRC clocks  |
| 50    | SRCC_LR7/CR#_E     | I/O  | SRC7 complement or Clock Request control E for SRC6 pair<br>The power-up default is SRC7#, but this pin may also be used as a Clock Request control of SRC6 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space . After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC6 pair using byte 6, bit 7 of SMBus configuration space<br>Byte 6, bit 7<br>0 = SRC7# enabled (default)<br>1 = CR#_E controls SRC6. |
| 51    | SRCT_LR7/CR#_F     | I/O  | SRC7 true or Clock Request control 8 for SRC8 pair<br>The power-up default is SRC7, but this pin may also be used as a Clock Request control of SRC8 via SMBus. Before configuring this pin as a Clock Request Pin, the SRC7 output pair must first be disabled in byte 3, bit 3 of SMBus configuration space After the SRC output is disabled (high-Z), the pin can then be set to serve as a Clock Request for SRC8 pair using byte 6, bit 6 of SMBus configuration space<br>Byte 6, bit 6<br>0 = SRC7# enabled (default)<br>1 = CR#_F controls SRC8.          |
| 52    | VDDSRC/I/O         | PWR  | 1.05V to 3.3V from external power supply   |
| 53    | CPUC_ITP_LR2/SRCC8 | OUT  | Complement clock of low power differential CPU2/Complement clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 14, PCIF5/ITP_EN on powerup. The function is as follows:<br>Pin 14 latched input Value<br>0 = SRC8#<br>1 = ITP#  |
| 54    | CPUT_ITP_LR2/SRCT8 | OUT  | True clock of low power differential CPU2/True clock of differential SRC pair. The function of this pin is determined by the latched input value on pin 14, PCIF5/ITP_EN on powerup. The function is as follows:<br>Pin 14 latched input Value<br>0 = SRC8<br>1 = ITP  |
| 55    | NC                 | N/A  | No Connect   |
| 56    | VDDCPU_IO          | PWR  | 1.05V to 3.3V from external power supply   |
| 57    | CPUC_F_LR1         | OUT  | Complement clock of low power differential CPU clock pair. This clock will be free-running during iAMT.  |
| 58    | CPUT_F_LR1         | OUT  | True clock of low power differential CPU clock pair. This clock will be free-running during iAMT.  |
| 59    | GNDCPU             | PWR  | Ground Pin for CPU Outputs   |
| 60    | CPUC_LR0           | OUT  | Complement clock of low power differential CPU clock pair.   |
| 61    | CPUT_LR0           | OUT  | True clock of low power differential CPU clock pair.   |
| 62    | VDDCPU             | PWR  | Power Supply 3.3V nominal.   |
| 63    | CK_PWRGD/PD#       | IN   | Notifies CK505 to sample latched inputs, or iAMT entry/exit, or PWRDWN# mode   |
| 64    | FSLB/TEST_MODE     | IN   | 3.3V tolerant input for CPU frequency selection. Refer to input electrical characteristics for ViL_FS and ViH_FS values. TEST_MODE is a real time input to select between Hi-Z and REF/N divider mode while in test mode. Refer to Test Clarification Table.   |



### General Description

ICS9LRS3165B follows Intel CK505 Yellow Cover specification. This clock synthesizer provides a single chip solution for Intel processors and Intel based systems. ICS9LRS3165B is driven with a 14.318MHz crystal. It also provides a tight ppm accuracy output for Serial ATA and PCI-Express support.

### Block Diagram



### Power Groups

| TSSOP Pin Number |       | Description   |
|------------------|-------|---|
| VDD              | GND   |   |
| 2                | 8     | PCICLK  |
| 9                | 11    | USB 48 & Core, FIX PLL Analog/Digital                               |
| 12               | 15    | DOT96 Output  |
| 16               | 19    | 27FIX, 27SS, LCD, SE Outputs & Core, 27SS/LCD/SE PLL Analog/Digital |
| 20               | 19    | SRC1 Output   |
| 26,36,45         | 29,42 | All SRC Outputs except SRC1   |
| 39               | 23    | SATA Output, FIX PLL Analog/Digital                                 |
| 39               | 29,42 | SRC Outputs, CPU/PCIEX PLL Analog/Digital                           |
| 49               | 52    | CPU Outputs   |
| 55               | 52    | CPU Outputs & Core  |
| 61               | 58    | Crystal, REF Output & Core  |

| MLF Pin Number |       | Description   |
|----------------|-------|---|
| VDD            | GND   |   |
| 9              | 15    | PCICLK  |
| 16             | 18    | USB 48 & Core, FIX PLL Analog/Digital                               |
| 19             | 22    | DOT96 Output  |
| 23             | 26    | 27FIX, 27SS, LCD, SE Outputs & Core, 27SS/LCD/SE PLL Analog/Digital |
| 27             | 26    | SRC1 Output   |
| 33,43,52       | 36,49 | All SRC Outputs except SRC1   |
| 46             | 30    | SATA Output, FIX PLL Analog/Digital                                 |
| 46             | 36,49 | SRC Outputs, CPU/PCIEX PLL Analog/Digital                           |
| 56             | 59    | CPU Outputs   |
| 62             | 59    | CPU Outputs & Core  |
| 4              | 1     | Crystal, REF Output & Core  |

## Absolute Maximum Ratings

| PARAMETER              | SYMBOL            | CONDITIONS                          | MIN       | MAX | UNITS | Notes |
|------------------------|-------------------|-------------------------------------|-----------|-----|-------|-------|
| Maximum Supply Voltage | VDDxxx            | Supply Voltage                      |           | 4.6 | V     | 1,7   |
| Maximum Supply Voltage | VDDxxx_IO         | Low-Voltage Differential I/O Supply |           | 3.8 | V     | 1,7   |
| Maximum Input Voltage  | V <sub>IH</sub>   | 3.3V LVCMOS Inputs                  |           | 4.6 | V     | 1,7,8 |
| Minimum Input Voltage  | V <sub>IL</sub>   | Any Input                           | GND - 0.5 |     | V     | 1,7   |
| Storage Temperature    | T <sub>s</sub>    | -                                   | -65       | 150 | °C    | 1,7   |
| Case Temperature       | T <sub>case</sub> |                                     |           | 115 | °C    | 1     |
| Input ESD protection   | ESD prot          | Human Body Model                    | 2000      |     | V     | 1,7   |

## Electrical Characteristics - Input/Supply/Common Output Parameters

| PARAMETER                                    | SYMBOL                  | CONDITIONS   | MIN                   | TYPICAL | MAX                   | UNITS | Notes |
|--|-------------------------|--|-----------------------|---------|-----------------------|-------|-------|
| Ambient Operating Temp                       | T <sub>ambient</sub>    | -  | 0                     |         | 70                    | °C    | 1     |
| Supply Voltage                               | VDDxxx                  | Supply Voltage   | 3.135                 |         | 3.465                 | V     | 1     |
| Supply Voltage                               | VDDxxx_IO               | Low-Voltage Differential I/O Supply  | 1                     |         | 3.465                 | V     | 1     |
| Input High Voltage                           | V <sub>IHSE</sub>       | Single-ended inputs  | 2                     |         | V <sub>DD</sub> + 0.3 | V     | 1     |
| Input Low Voltage                            | V <sub>ILSE</sub>       | Single-ended inputs  | V <sub>SS</sub> - 0.3 |         | 0.8                   | V     | 1     |
| Input Leakage Current                        | I <sub>IN</sub>         | V <sub>IN</sub> = V <sub>DD</sub> , V <sub>IN</sub> = GND  | -5                    |         | 5                     | uA    | 1     |
| Input Leakage Current                        | I <sub>INRES</sub>      | Inputs with pull or pull down resistors<br>V <sub>IN</sub> = V <sub>DD</sub> , V <sub>IN</sub> = GND | -200                  |         | 200                   | uA    | 1     |
| Output High Voltage                          | V <sub>OHSE</sub>       | Single-ended outputs, I <sub>OH</sub> = -1mA   | 2.4                   |         |                       | V     | 1     |
| Output Low Voltage                           | V <sub>OLSE</sub>       | Single-ended outputs, I <sub>OL</sub> = 1 mA   |                       |         | 0.4                   | V     | 1     |
| Output High Voltage                          | V <sub>OHDIF</sub>      | Differential Outputs, I <sub>OH</sub> = TBD mA   | 0.7                   |         | 0.9                   | V     | 1     |
| Output Low Voltage                           | V <sub>OLDIF</sub>      | Differential Outputs, I <sub>OL</sub> = TBD mA   |                       |         | 0.4                   | V     | 1     |
| Low Threshold Input-High Voltage (Test Mode) | V <sub>IH_FS_TEST</sub> | 3.3 V +/-5%  | 2                     |         | V <sub>DD</sub> + 0.3 | V     | 1     |
| Low Threshold Input-High Voltage             | V <sub>IH_FS</sub>      | 3.3 V +/-5%  | 0.7                   |         | 1.5                   | V     | 1     |
| Low Threshold Input-Low Voltage              | V <sub>IL_FS</sub>      | 3.3 V +/-5%  | V <sub>SS</sub> - 0.3 |         | 0.35                  | V     | 1     |
| Operating Supply Current                     | I <sub>DD_DEFAULT</sub> | 3.3V supply, PLL1,2 off  |                       | 95      | 250                   | mA    | 1     |
|  | I <sub>DD_PLL3DIF</sub> | 3.3V supply, PLL1,2 Differential Out   |                       | 106     | 250                   | mA    | 1     |
|  | I <sub>DD_PLL3SE</sub>  | 3.3V supply, PLL1,2 Single-ended Out   |                       | 101     | 250                   | mA    | 1     |
|  | I <sub>DD_IO</sub>      | 0.8V supply, Differential IO current, all outputs enabled  | 25                    | 32      | 80                    | mA    | 1     |
| Power Down Current                           | I <sub>DD_PD3.3</sub>   | 3.3V supply, Power Down Mode   |                       | 26      | 30                    | mA    | 1     |
|  | I <sub>DD_PDIO</sub>    | 0.8V IO supply, Power Down Mode  |                       | 0.23    | 0.5                   | mA    | 1     |
| iAMT Mode Current                            | I <sub>DD_iAMT3.3</sub> | 3.3V supply, iAMT Mode   |                       | 47      | 80                    | mA    | 1     |
|  | I <sub>DD_iAMT0.8</sub> | 0.8V IO supply, iAMT Mode  |                       | 5       | 10                    | mA    | 1     |
| Input Frequency                              | F <sub>i</sub>          | V <sub>DD</sub> = 3.3 V  |                       |         | 14.318                | MHz   | 2     |
| Pin Inductance                               | L <sub>pin</sub>        |  |                       |         | 7                     | nH    | 1     |
| Input Capacitance                            | C <sub>IN</sub>         | Logic Inputs   | 1.5                   |         | 5                     | pF    | 1     |
|  | C <sub>OUT</sub>        | Output pin capacitance   |                       |         | 6                     | pF    | 1     |
|  | C <sub>INX</sub>        | X1 & X2 pins   |                       |         | 5                     | pF    | 1     |
| Spread Spectrum Modulation Frequency         | f <sub>SSMOD</sub>      | Triangular Modulation  | 30                    |         | 33                    | kHz   | 1     |

**Electrical Characteristics - SMBus Interface**

| PARAMETER   | SYMBOL             | CONDITIONS  | MIN | MAX  | UNITS | Notes |
|---|--------------------|---|-----|------|-------|-------|
| SMBus Voltage   | $V_{DD}$           |   | 2.7 | 5.5  | V     | 1     |
| Low-level Output Voltage                                | $V_{OL\text{SMB}}$ | @ $I_{PULLUP}$                                      |     | 0.4  | V     | 1     |
| Current sinking at<br>$V_{OL\text{SMB}} = 0.4\text{ V}$ | $I_{PULLUP}$       | SMB Data Pin  | 4   |      | mA    | 1     |
| SCLK/SDATA<br>Clock/Data Rise Time                      | $T_{RI2C}$         | (Max $V_{IL} - 0.15$ ) to<br>(Min $V_{IH} + 0.15$ ) |     | 1000 | ns    | 1     |
| SCLK/SDATA<br>Clock/Data Fall Time                      | $T_{FI2C}$         | (Min $V_{IH} + 0.15$ ) to<br>(Max $V_{IL} - 0.15$ ) |     | 300  | ns    | 1     |
| Maximum SMBus Operating<br>Frequency                    | $F_{SMBUS}$        | Block Mode  |     | 100  | kHz   | 1     |

**AC Electrical Characteristics - Low Power Differential Outputs**

| PARAMETER                            | SYMBOL               | CONDITIONS               | MIN       | MAX  | UNITS | NOTES |
|--------------------------------------|----------------------|--------------------------|-----------|------|-------|-------|
| Rising Edge Slew Rate                | $t_{SLR}$            | Differential Measurement | 2.5       | 8    | V/ns  | 1,2   |
| Falling Edge Slew Rate               | $t_{FLR}$            | Differential Measurement | 2.5       | 8    | V/ns  | 1,2   |
| Slew Rate Variation                  | $t_{SLVAR}$          | Single-ended Measurement |           | 20   | %     | 1     |
| Maximum Output Voltage               | $V_{HIGH}$           | Includes overshoot       |           | 1150 | mV    | 1     |
| Minimum Output Voltage               | $V_{LOW}$            | Includes undershoot      | -300      |      | mV    | 1     |
| Differential Voltage Swing           | $V_{SWING}$          | Differential Measurement | 300       |      | mV    | 1     |
| Crossing Point Voltage               | $V_{XABS}$           | Single-ended Measurement | 300       | 550  | mV    | 1,3,4 |
| Crossing Point Variation             | $V_{XABS\text{VAR}}$ | Single-ended Measurement |           | 140  | mV    | 1,3,5 |
| Duty Cycle                           | $D_{CYC}$            | Differential Measurement | 45        | 55   | %     | 1     |
| CPU Jitter - Cycle to Cycle          | $CPUJ_{C2C}$         | Differential Measurement |           | 85   | ps    | 1     |
| SRC0 Jitter - Cycle to Cycle         | $SRCJ_{C2C}$         | Differential Measurement |           | 125  | ps    | 1     |
| SRC[11:1] Jitter - Cycle to<br>Cycle | $SRCJ_{C2C}$         | Differential Measurement |           | 85   | ps    | 1     |
| SATA Jitter - Cycle to Cycle         | $SATAJ_{C2C}$        | Differential Measurement |           | 125  | ps    | 1     |
| DOT Jitter - Cycle to Cycle          | $DOTJ_{C2C}$         | Differential Measurement |           | 250  | ps    | 1     |
| CPU[1:0] Skew                        | $CPU_{SKEW10}$       | Differential Measurement |           | 100  | ps    | 1     |
| CPU[2:ITP:0] Skew                    | $CPU_{SKEW20}$       | Differential Measurement |           | 150  | ps    | 1     |
| SRC[11,7,4,2,0] Skew                 | $SRC_{SKEW}$         | Differential Measurement | 0 nominal |      | ps    | 1     |
| SRC[10,9,8,6,3] Skew                 | $SRC_{SKEW}$         | Differential Measurement |           | 3    | ns    | 1     |

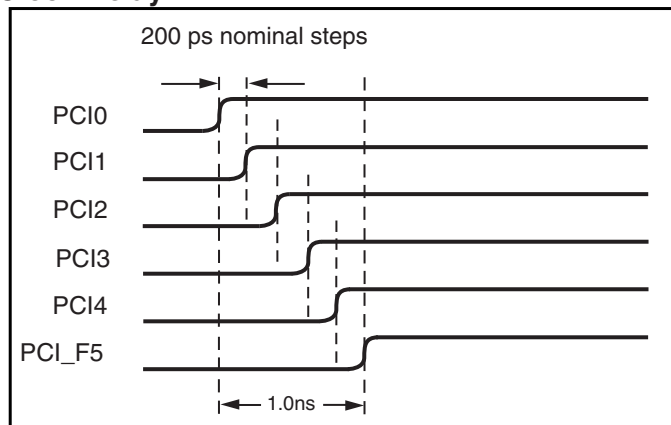
\*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, Rs= 0Ω, CL = 2pF

**AC Electrical Characteristics - Input/Common Parameters**

| PARAMETER         | SYMBOL      | CONDITIONS   | MIN | MAX | UNITS | Notes |
|-------------------|-------------|--|-----|-----|-------|-------|
| Clk Stabilization | $T_{STAB}$  | From VDD Power-Up or de-assertion of PD# to 1st clock    |     | 1.8 | ms    | 1     |
| Tdrive_SRC        | $T_{DRSRC}$ | SRC output enable after<br>PCI_STOP# de-assertion        |     | 15  | ns    | 1     |
| Tdrive_PD#        | $T_{DRPD}$  | Differential output enable after<br>PD# de-assertion     |     | 300 | us    | 1     |
| Tdrive_CPU        | $T_{DRSRC}$ | CPU output enable after<br>CPU_STOP# de-assertion        |     | 10  | ns    | 1     |
| Tfall_PD#         | $T_{FALL}$  | Fall/rise time of PD#, PCI_STOP#<br>and CPU_STOP# inputs |     | 5   | ns    | 1     |
| Trise_PD#         | $T_{RISE}$  |  |     | 5   | ns    | 1     |

**Electrical Characteristics - PCICLK/PCICLK\_F**

| PARAMETER                 | SYMBOL        | CONDITIONS                     | MIN         | MAX      | UNITS | NOTES |
|---------------------------|---------------|--------------------------------|-------------|----------|-------|-------|
| Long Accuracy             | ppm           | see Tperiod min-max values     | -300        | 300      | ppm   | 1,6   |
| Clock period              | $T_{period}$  | 33.33MHz output nominal        | 29.99100    | 30.00900 | ns    | 6     |
|                           |               | 33.33MHz output spread         |             | 30.15980 | ns    | 6     |
| Absolute min/max period   | $T_{abs}$     | 33.33MHz output nominal/spread | 29.49100    | 30.65980 | ns    | 6     |
| Output High Voltage       | $V_{OH}$      | $I_{OH} = -1$ mA               | 2.4         |          | V     | 1     |
| Output Low Voltage        | $V_{OL}$      | $I_{OL} = 1$ mA                |             | 0.4      | V     | 1     |
| Output High Current       | $I_{OH}$      | $V_{OH} @ MIN = 1.0$ V         | -33         |          | mA    | 1     |
|                           |               | $V_{OH} @ MAX = 3.135$ V       |             | -33      | mA    | 1     |
| Output Low Current        | $I_{OL}$      | $V_{OL} @ MIN = 1.95$ V        | 30          |          | mA    | 1     |
|                           |               | $V_{OL} @ MAX = 0.4$ V         |             | 38       | mA    | 1     |
| Rising Edge Slew Rate     | $t_{SLR}$     | Measured from 0.8 to 2.0 V     | 1           | 4        | V/ns  | 1     |
| Falling Edge Slew Rate    | $t_{FLR}$     | Measured from 2.0 to 0.8 V     | 1           | 4        | V/ns  | 1     |
| Duty Cycle                | $d_{T1}$      | $V_T = 1.5$ V                  | 45          | 55       | %     | 1     |
| Skew                      | $t_{skew}$    | $V_T = 1.5$ V                  |             | 250      | ps    | 1     |
| Intentional PCI-PCI delay | $t_{delay}$   | $V_T = 1.5$ V                  | 200 nominal |          | ps    | 1,9   |
| Jitter, Cycle to cycle    | $t_{jyc-cyc}$ | $V_T = 1.5$ V                  |             | 500      | ps    | 1     |

**Intentional PCI Clock to Clock Delay****Electrical Characteristics - USB48MHz**

| PARAMETER               | SYMBOL        | CONDITIONS                 | MIN      | MAX      | UNITS | NOTES |
|-------------------------|---------------|----------------------------|----------|----------|-------|-------|
| Long Accuracy           | ppm           | see Tperiod min-max values | -100     | 100      | ppm   | 1,6   |
| Clock period            | $T_{period}$  | 48.00MHz output nominal    | 20.83125 | 20.83542 | ns    | 6     |
| Absolute min/max period | $T_{abs}$     | 48.00MHz output nominal    | 20.48130 | 21.18540 | ns    | 6     |
| Output High Voltage     | $V_{OH}$      | $I_{OH} = -1$ mA           | 2.4      |          | V     | 1     |
| Output Low Voltage      | $V_{OL}$      | $I_{OL} = 1$ mA            |          | 0.4      | V     | 1     |
| Output High Current     | $I_{OH}$      | $V_{OH} @ MIN = 1.0$ V     | -29      |          | mA    | 1     |
|                         |               | $V_{OH} @ MAX = 3.135$ V   |          | -23      | mA    | 1     |
| Output Low Current      | $I_{OL}$      | $V_{OL} @ MIN = 1.95$ V    | 29       |          | mA    | 1     |
|                         |               | $V_{OL} @ MAX = 0.4$ V     |          | 27       | mA    | 1     |
| Rising Edge Slew Rate   | $t_{SLR}$     | Measured from 0.8 to 2.0 V | 1        | 2        | V/ns  | 1     |
| Falling Edge Slew Rate  | $t_{FLR}$     | Measured from 2.0 to 0.8 V | 1        | 2        | V/ns  | 1     |
| Duty Cycle              | $d_{T1}$      | $V_T = 1.5$ V              | 45       | 55       | %     | 1     |
| Jitter, Cycle to cycle  | $t_{jyc-cyc}$ | $V_T = 1.5$ V              |          | 350      | ps    | 1     |

**Electrical Characteristics - 27MHz\_Spread / 27MHz\_NonSpread**

| PARAMETER           | SYMBOL        | CONDITIONS                                       | MIN     | TYP | MAX     | UNITS | Notes |
|---------------------|---------------|--|---------|-----|---------|-------|-------|
| Long Accuracy       | ppm           | see Tperiod min-max values                       | -50     |     | 50      | ppm   | 1,6   |
|                     |               |  | -15     |     | 15      |       | 6     |
| Clock period        | $T_{period}$  | 27.000MHz output nominal                         | 37.0365 |     | 37.0376 | ns    | 6     |
| Output High Voltage | $V_{OH}$      | $I_{OH} = -1 \text{ mA}$                         | 2.4     |     |         | V     | 1     |
| Output Low Voltage  | $V_{OL}$      | $I_{OL} = 1 \text{ mA}$                          |         |     | 0.55    | V     | 1     |
| Output High Current | $I_{OH}$      | $V_{OH} @ \text{MIN} = 1.0 \text{ V}$            | -29     |     |         | mA    | 1     |
|                     |               | $V_{OH} @ \text{MAX} = 3.135 \text{ V}$          |         |     | -23     | mA    | 1     |
| Output Low Current  | $I_{OL}$      | $V_{OL} @ \text{MIN} = 1.95 \text{ V}$           | 29      |     |         | mA    | 1     |
|                     |               | $V_{OL} @ \text{MAX} = 0.4 \text{ V}$            |         |     | 27      | mA    | 1     |
| Edge Rate           | $t_{slew/f}$  | Rising/Falling edge rate                         | 1       |     | 4       | V/ns  | 1     |
| Rise Time           | $t_{r1}$      | $V_{OL} = 0.4 \text{ V}, V_{OH} = 2.4 \text{ V}$ | 0.5     |     | 2       | ns    | 1     |
| Fall Time           | $t_{f1}$      | $V_{OH} = 2.4 \text{ V}, V_{OL} = 0.4 \text{ V}$ | 0.5     |     | 2       | ns    | 1     |
| Duty Cycle          | $d_{11}$      | $V_T = 1.5 \text{ V}$                            | 45      |     | 55      | %     | 1     |
| Jitter              | $t_{tj}$      | Long Term (10us), $V_T = 1.5 \text{ V}$          |         |     | 800     | ps    | 1     |
|                     | $t_{pk-pk}$   | $V_T = 1.5 \text{ V}$                            | -200    |     | 200     | ps    | 1     |
|                     | $t_{cyc-cyc}$ | $V_T = 1.5 \text{ V}$                            |         |     | 200     | ps    | 1     |

**Electrical Characteristics - REF-14.318MHz**

| PARAMETER               | SYMBOL        | CONDITIONS  | MIN     | MAX      | UNITS | Notes |
|-------------------------|---------------|---|---------|----------|-------|-------|
| Long Accuracy           | ppm           | see Tperiod min-max values  | -300    | 300      | ppm   | 1,6   |
| Clock period            | $T_{period}$  | 14.318MHz output nominal  | 69.8203 | 69.8622  | ns    | 6     |
| Absolute min/max period | $T_{abs}$     | 14.318MHz output nominal  | 69.8203 | 70.86224 | ns    | 6     |
| Output High Voltage     | $V_{OH}$      | $I_{OH} = -1 \text{ mA}$  | 2.4     |          | V     | 1     |
| Output Low Voltage      | $V_{OL}$      | $I_{OL} = 1 \text{ mA}$   |         | 0.4      | V     | 1     |
| Output High Current     | $I_{OH}$      | $V_{OH} @ \text{MIN} = 1.0 \text{ V},$<br>$V_{OH} @ \text{MAX} = 3.135 \text{ V}$ | -33     | -33      | mA    | 1     |
| Output Low Current      | $I_{OL}$      | $V_{OL} @ \text{MIN} = 1.95 \text{ V},$<br>$V_{OL} @ \text{MAX} = 0.4 \text{ V}$  | 30      | 38       | mA    | 1     |
| Rising Edge Slew Rate   | $t_{SLR}$     | Measured from 0.8 to 2.0 V  | 1       | 4        | V/ns  | 1     |
| Falling Edge Slew Rate  | $t_{FLR}$     | Measured from 2.0 to 0.8 V  | 1       | 4        | V/ns  | 1     |
| Duty Cycle              | $d_{11}$      | $V_T = 1.5 \text{ V}$   | 45      | 55       | %     | 1     |
| Jitter                  | $t_{jcy-cyc}$ | $V_T = 1.5 \text{ V}$   |         | 1000     | ps    | 1     |

**Electrical Characteristics - Differential Jitter Parameters**

| PARAMETER     | Symbol           | Conditions                                 | Min | TYP | Max | Units       | Notes |
|---------------|------------------|--|-----|-----|-----|-------------|-------|
| Jitter, Phase | $t_{jphasePLL}$  | PCIe Gen 1                                 |     |     | 86  | ps (p-p)    | 1,11  |
|               | $t_{jphaseLo}$   | PCIe Gen 2<br>10kHz < f < 1.5MHz           |     |     | 3   | ps<br>(RMS) | 1,11  |
|               | $t_{jphaseHigh}$ | PCIe Gen 2<br>1.5MHz < f < Nyquist (50MHz) |     |     | 3.1 | ps<br>(RMS) | 1,11  |

\*TA = 0 - 70°C; Supply Voltage VDD = 3.3 V +/-5%, Rs= 0Ω, CL = 2pF

**Notes on Electrical Characteristics:**

<sup>1</sup>Guaranteed by design and characterization, not 100% tested in production.

<sup>2</sup>Slew rate measured through Vswing centered around differential zero

<sup>3</sup>Vxabs is defined as the voltage where CLK = CLK#

<sup>4</sup>Only applies to the differential rising edge (CLK rising and CLK# falling)

<sup>5</sup>Defined as the total variation of all crossing voltages of CLK rising and CLK# falling. Matching applies to rising edge rate of CLK and falling edge of CLK#. It is measured using a +/-75mV window centered on the average cross point where CLK meets CLK#. The average cross point is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations.

<sup>6</sup>All Long Term Accuracy and Clock Period specifications are guaranteed assuming that REFOUT is at 14.31818MHz

<sup>7</sup>Operation under these conditions is neither implied, nor guaranteed.

<sup>8</sup>Maximum input voltage is not to exceed maximum VDD

<sup>9</sup>See PCI Clock-to-Clock Delay Figure

<sup>10</sup>At nominal voltage and temperature



Table 1: CPU Frequency Select Table

| FS <sub>L</sub> C <sup>2</sup><br>B0b7 | FS <sub>L</sub> B <sup>1</sup><br>B0b6 | FS <sub>L</sub> A <sup>1</sup><br>B0b5 | CPU<br>MHz | SRC<br>MHz | PCI<br>MHz | REF<br>MHz | USB<br>MHz | DOT<br>MHz |
|--|--|--|------------|------------|------------|------------|------------|------------|
| 0                                      | 0                                      | 0                                      | 266.66     | 100.00     | 33.33      | 14.318     | 48.00      | 96.00      |
| 0                                      | 0                                      | 1                                      | 133.33     |            |            |            |            |            |
| 0                                      | 1                                      | 0                                      | 200.00     |            |            |            |            |            |
| 0                                      | 1                                      | 1                                      | 166.66     |            |            |            |            |            |
| 1                                      | 0                                      | 0                                      | 333.33     |            |            |            |            |            |
| 1                                      | 0                                      | 1                                      | 100.00     |            |            |            |            |            |
| 1                                      | 1                                      | 0                                      | 400.00     |            |            |            |            |            |
| 1                                      | 1                                      | 1                                      | Reserved   |            |            |            |            |            |

1. FS<sub>L</sub>A and FS<sub>L</sub>B are low-threshold inputs. Please see V<sub>IL\_FS</sub> and V<sub>IH\_FS</sub> specifications in the Input/Supply/Common Output Parameters Table for correct values.

Also refer to the Test Clarification Table.

2. FS<sub>L</sub>C is a three-level input. Please see the V<sub>IL\_FS</sub> and V<sub>IH\_FS</sub> specifications in the Input/Supply/Common Output Parameters Table for correct values.

Table 2: 27FIX/LCDT/SRCT\_LR1/SE1, 27SS/LCDC/SRCC\_LR1/SE2 Configuration

| 27_SEL | B1b4 | B1b3 | B1b2 | B1b1 | 27FIX/LCDT/SRCT_LR1/SE1 | 27SS/LCDC/SRCC_LR1/SE2 | Spread<br>% | Comment                            |
|--------|------|------|------|------|-------------------------|------------------------|-------------|------------------------------------|
|        |      |      |      |      | MHz                     | MHz                    |             |                                    |
| 0      | 0    | 0    | 0    | 0    |                         |                        |             | PLL1 & PLL2 disabled               |
| 0      | 0    | 0    | 0    | 1    | 100.00                  | 100.00                 |             | SRCCLK1 from SRC_MAIN              |
| 0      | 0    | 0    | 1    | 0    | 100.00                  | 100.00                 | -0.50%      | LCDCLK from PLL1                   |
| 0      | 0    | 0    | 1    | 1    | 100.00                  | 100.00                 | -1%         | LCDCLK from PLL1                   |
| 0      | 0    | 1    | 0    | 0    | 100.00                  | 100.00                 | -1.50%      | LCDCLK from PLL1                   |
| 0      | 0    | 1    | 0    | 1    | 100.00                  | 100.00                 | +/-0.25%    | LCDCLK from PLL1                   |
| 0      | 0    | 1    | 1    | 0    | 100.00                  | 100.00                 | +/-0.5%     | LCDCLK from PLL1                   |
| 0      | 0    | 1    | 1    | 1    | N/A                     | N/A                    | N/A         | N/A                                |
| 0      | 1    | 0    | 0    | 0    | 24.576                  | 24.576                 | None        | 24.576Mhz on SE1 and SE2           |
| 0      | 1    | 0    | 0    | 1    | 24.576                  | 98.304                 | None        | 24.576Mhz on SE1, 98.304Mhz on SE2 |
| 0      | 1    | 0    | 1    | 0    | 98.304                  | 98.304                 | None        | 98.304Mhz on SE1 and SE2           |
| 0      | 1    | 0    | 1    | 1    | 27.000                  | 27.000                 | None        | 27Mhz on SE1 and SE2               |
| 0      | 1    | 1    | 0    | 0    | 25.000                  | 25.000                 | None        | 25Mhz on SE1 and SE2               |
| 0      | 1    | 1    | 0    | 1    |                         |                        |             | N/A                                |
| 0      | 1    | 1    | 1    | 0    | N/A                     | N/A                    | N/A         | N/A                                |
| 0      | 1    | 1    | 1    | 1    | N/A                     | N/A                    | N/A         | N/A                                |
| 1      | 0    | 0    | 0    | 0    | N/A                     | N/A                    | N/A         |                                    |
| 1      | 0    | 0    | 0    | 1    | N/A                     | N/A                    | N/A         |                                    |
| 1      | 0    | 0    | 1    | 0    | 27MHz_nonSS             | 27MHz_SS               | -0.5%       |                                    |
| 1      | 0    | 0    | 1    | 1    | 27MHz_nonSS             | 27MHz_SS               | -1%         |                                    |
| 1      | 0    | 1    | 0    | 0    | 27MHz_nonSS             | 27MHz_SS               | -1.5%       |                                    |
| 1      | 0    | 1    | 0    | 1    | 27MHz_nonSS             | 27MHz_SS               | -2%         |                                    |
| 1      | 0    | 1    | 1    | 0    | 27MHz_nonSS             | 27MHz_SS               | -0.75%      |                                    |
| 1      | 0    | 1    | 1    | 1    | 27MHz_nonSS             | 27MHz_SS               | -1.25%      |                                    |
| 1      | 1    | 0    | 0    | 0    | 27MHz_nonSS             | 27MHz_SS               | -1.75%      |                                    |
| 1      | 1    | 0    | 0    | 1    | 27MHz_nonSS             | 27MHz_SS               | +0.5%       |                                    |
| 1      | 1    | 0    | 1    | 0    | 27MHz_nonSS             | 27MHz_SS               | +0.75%      |                                    |
| 1      | 1    | 0    | 1    | 1    | N/A                     | N/A                    |             |                                    |
| 1      | 1    | 1    | 0    | 0    | N/A                     | N/A                    |             |                                    |
| 1      | 1    | 1    | 0    | 1    | N/A                     | N/A                    |             |                                    |
| 1      | 1    | 1    | 1    | 0    | N/A                     | N/A                    |             |                                    |
| 1      | 1    | 1    | 1    | 1    | N/A                     | N/A                    |             |                                    |

Note: Mode 00000 ~ 00110 on Table 2 only applies when SRC\_MAIN source is from PLL5.

**Table 3: IO\_Vout select table**

| B9b2 | B9b1 | B9b0 | IO_Vout |
|------|------|------|---------|
| 0    | 0    | 0    | 0.3V    |
| 0    | 0    | 1    | 0.4V    |
| 0    | 1    | 0    | 0.5V    |
| 0    | 1    | 1    | 0.6V    |
| 1    | 0    | 0    | 0.7V    |
| 1    | 0    | 1    | 0.8V    |
| 1    | 1    | 0    | 0.9V    |
| 1    | 1    | 1    | 1.0V    |

**Table 4: Device ID table**

| B8b7 | B8b6 | B8b5 | B8b4 | Comment      |
|------|------|------|------|--------------|
| 0    | 0    | 0    | 0    | 64 pin MLF   |
| 0    | 0    | 0    | 1    | 64 pin TSSOP |
| 0    | 0    | 1    | 0    | Reserved     |
| 0    | 0    | 1    | 1    | Reserved     |
| 0    | 1    | 0    | 0    | Reserved     |
| 0    | 1    | 0    | 1    | Reserved     |
| 0    | 1    | 1    | 0    | Reserved     |
| 0    | 1    | 1    | 1    | Reserved     |
| 1    | 1    | 0    | 0    | Reserved     |
| 1    | 1    | 0    | 1    | Reserved     |
| 1    | 1    | 1    | 0    | Reserved     |
| 1    | 1    | 1    | 1    | Reserved     |
| 1    | 1    | 0    | 0    | Reserved     |
| 1    | 1    | 0    | 1    | Reserved     |
| 1    | 1    | 1    | 0    | Reserved     |
| 1    | 1    | 1    | 1    | Reserved     |

CPU Power Management Table

| PD# | CPU_STOP# | PCI_STOP# | PEREQ# | SMBus Register OE | CPU0    | CPU0#   | CPU1    | CPU1#   | CPU2    | CPU2#   |
|-----|-----------|-----------|--------|-------------------|---------|---------|---------|---------|---------|---------|
| 1   | 1         | 1         | X      | Enable            | Running | Running | Running | Running | Running | Running |
| 0   | X         | X         | X      | Enable            | Low/20K | Low     | Low/20K | Low     | Low/20K | Low     |
| 1   | 0         | X         | X      | Enable            | High    | Low     | High    | Low     | High    | Low     |
| 1   | X         | X         | X      | Disable           | Low/20K | Low     | Low/20K | Low     | Low/20K | Low     |
| M1  |           |           |        |                   | Low/20K | Low     | Running | Running | Low/20K | Low     |

PCIEX, LCD Power Management Table

| PD# | CPU_STOP# | PCI_STOP# | PEREQ# | SMBus Register OE | PCIeT    | PCIeC   | PCIeT     | PCIeC   | LCD      | LCD #   | LCD       | LCD #   | SATA     | SATA#   | SATA      | SATA#   |
|-----|-----------|-----------|--------|-------------------|----------|---------|-----------|---------|----------|---------|-----------|---------|----------|---------|-----------|---------|
|     |           |           |        |                   | Free-Run |         | Stoppable |         | Free-Run |         | Stoppable |         | Free-Run |         | Stoppable |         |
| 1   | X         | 1         | 0      | Enable            | Running  | Running | Running   | Running | Running  | Running | Running   | Running | Running  | Running | Running   | Running |
| 0   | X         | X         | X      | Enable            | Low/20K  | Low     | Low/20K   | Low     | Low/20K  | Low     | Low/20K   | Low     | Low/20K  | Low     | Low/20K   | Low     |
| 1   | X         | 0         | 0      | Enable            | Running  | Running | High      | Low     | Running  | Running | High      | Low     | Running  | Running | High      | Low     |
| 1   | X         | X         | 1      | Enable            | Running  | Running | Low/20K   | Low     | Running  | Running | Running   | Running | Running  | Running | Running   | Running |
| 1   | X         | X         | X      | Disable           | Low/20K  | Low     | Low/20K   | Low     | Low/20K  | Low     | Low/20K   | Low     | Low/20K  | Low     | Low/20K   | Low     |
| M1  |           |           |        |                   | Low/20K  | Low     | Low/20K   | Low     | Low/20K  | Low     | Low/20K   | Low     | Low/20K  | Low     | Low/20K   | Low     |

DOT, SATA Power Management Table

| PD# | CPU_STOP# | PCI_STOP# | PEREQ# | SMBus Register OE | DOT     | DOT#    |
|-----|-----------|-----------|--------|-------------------|---------|---------|
| 1   | X         | 1         | X      | Enable            | Running | Running |
| 0   | X         | X         | X      | Enable            | Low/20K | Low     |
| 1   | X         | 0         | X      | Enable            | Running | Running |
| 1   | X         | X         | X      | Enable            | Running | Running |
| 1   | X         | X         | X      | Disable           | Low/20K | Low     |
| M1  |           |           |        |                   | Low/20K | Low     |

Single-ended Power Management Table

| PD# | CPU_STOP# | PCI_STOP# | PEREQ# | SMBus Register OE | PCIF/PCI | PCIF/PCI  | USB48   | REF     | 27M     | SE      |
|-----|-----------|-----------|--------|-------------------|----------|-----------|---------|---------|---------|---------|
|     |           |           |        |                   | Free-Run | Stoppable |         |         |         |         |
| 1   | X         | 1         | X      | Enable            | Running  | Running   | Running | Running | Running | Running |
| 0   | X         | X         | X      | Enable            | Low      | Low       | Low     | Low     | Low     | Low     |
| 1   | X         | 0         | X      | Enable            | Running  | Low       | Running | Running | Running | Running |
| 1   | X         | X         | X      | Disable           | Low      | Low       | Low     | Low     | Low     | Low     |
| M1  |           |           |        |                   | Low      | Low       | Low     | Low     | Low     | Low     |

## General SMBus serial interface information for the ICS9LRS3165B

### How to Write:

- Controller (host) sends a start bit.
- Controller (host) sends the write address  $D2_{(H)}$
- ICS clock will **acknowledge**
- Controller (host) sends the beginning byte location = N
- ICS clock will **acknowledge**
- Controller (host) sends the data byte count = X
- ICS clock will **acknowledge**
- Controller (host) starts sending **Byte N through Byte N + X - 1**
- ICS clock will **acknowledge** each byte **one at a time**
- Controller (host) sends a Stop bit

### How to Read:

- Controller (host) will send start bit.
- Controller (host) sends the write address  $D2_{(H)}$
- ICS clock will **acknowledge**
- Controller (host) sends the beginning byte location = N
- ICS clock will **acknowledge**
- Controller (host) will send a separate start bit.
- Controller (host) sends the read address  $D3_{(H)}$
- ICS clock will **acknowledge**
- ICS clock will send the data byte count = X
- ICS clock sends **Byte N + X - 1**
- ICS clock sends **Byte 0 through byte X (if  $X_{(H)}$  was written to byte 8).**
- Controller (host) will need to acknowledge each byte
- Controller (host) will send a not acknowledge bit
- Controller (host) will send a stop bit

| Index Block Write Operation |           |                      |
|-----------------------------|-----------|----------------------|
| Controller (Host)           |           | ICS (Slave/Receiver) |
| T                           | starT bit |                      |
| Slave Address $D2_{(H)}$    |           |                      |
| WR                          | WRite     |                      |
|                             |           | ACK                  |
| Beginning Byte = N          |           |                      |
|                             |           | ACK                  |
| Data Byte Count = X         |           |                      |
|                             |           | ACK                  |
| Beginning Byte N            |           | X Byte               |
| ○                           |           |                      |
| ○                           |           |                      |
| ○                           |           |                      |
| ○                           |           |                      |
| Byte N + X - 1              |           |                      |
|                             |           | ACK                  |
| P                           | stoP bit  |                      |

| Index Block Read Operation |                 |                      |
|----------------------------|-----------------|----------------------|
| Controller (Host)          |                 | ICS (Slave/Receiver) |
| T                          | starT bit       |                      |
| Slave Address $D2_{(H)}$   |                 |                      |
| WR                         | WRite           |                      |
|                            |                 | ACK                  |
| Beginning Byte = N         |                 |                      |
|                            |                 | ACK                  |
| RT                         | Repeat starT    |                      |
| Slave Address $D3_{(H)}$   |                 |                      |
| RD                         | ReaD            |                      |
|                            |                 | ACK                  |
|                            |                 | Data Byte Count = X  |
| ACK                        |                 | X Byte               |
| ACK                        |                 |                      |
| ○                          |                 |                      |
| ○                          |                 |                      |
| ○                          |                 |                      |
|                            |                 | Byte N + X - 1       |
| N                          | Not acknowledge |                      |
| P                          | stoP bit        |                      |

**Byte 0 FS Readback & PLL Selection Register**

| Bit | Name         | Description  | Type | 0  | 1                   | Default              |       |
|-----|--------------|--|------|--|---------------------|----------------------|-------|
| 7   | FSLC         | CPU Freq. Sel. Bit (Most Significant)  | R    | See Table 1 : CPU Frequency Select Table |                     | Latch                |       |
| 6   | FSLB         | CPU Freq. Sel. Bit   | R    |  |                     |                      | Latch |
| 5   | FSLA         | CPU Freq. Sel. Bit (Least Significant)   | R    |  |                     |                      | Latch |
| 4   | iAMT_EN      | Set via SMBus or dynamically by CK505 if detects dynamic M1  | R    | Legacy Mode                              | iAMT Enabled        | iAMT power on status |       |
| 3   | Reserved     | Reserved   | RW   |  |                     | 0                    |       |
| 2   | SRC_Main_SEL | Select source for SRC Main   | RW   | SRC Main = PLL5                          | SRC Main = PLL2     | 0                    |       |
| 1   | SATA_SEL     | Select source for SATA clock   | RW   | SATA = SRC_Main                          | SATA = PLL3         | 0                    |       |
| 0   | PD_Restore   | 1 = on Power Down de-assert return to last known state<br>0 = clear all SMBus configurations as if cold power-on and go to latches open state<br>This bit is ignored and treated at '1' if device is in iAMT mode. | RW   | Configuration Not Saved                  | Configuration Saved | 1                    |       |

**Byte 1 PLL1 Quick Config Register**

Note 1 : When 27\_Select pin = 0, B1b7 PWD = 1; When 27\_Select pin = 1, PWD = 0

| Bit | Name         | Description                    | Type | 0   | 1                 | Default |
|-----|--------------|--------------------------------|------|---|-------------------|---------|
| 7   | SRC0_SEL     | Select SRC0 or DOT96           | RW   | SRC0  | DOT96             | Note 1  |
| 6   | PLL5_SSC_SEL | Select 0.5% down or center SSC | RW   | Down spread   | Center spread     | 0       |
| 5   | PLL2_SSC_SEL | Select 0.5% center or down SSC | RW   | Down  | Center            | 0       |
| 4   | PLL1_CF3     | PLL1 Quick Config Bit 3        | RW   | See Table 2: pin 27FIX/LCDT/SRCT_LR1/SE1,<br>27SS/LCDC/SRCC_LR1/SE2 Configuration<br>Only applies if Byte 0, bit 2 = 0. |                   | 0       |
| 3   | PLL1_CF2     | PLL1 Quick Config Bit 2        | RW   |   |                   | 0       |
| 2   | PLL1_CF1     | PLL1 Quick Config Bit 1        | RW   |   |                   | 1       |
| 1   | PLL1_CF0     | PLL1 Quick Config Bit 0        | RW   |   |                   | 0       |
| 0   | PCI_SEL      | PCI_SEL                        | RW   | PCI from PLL5   | PCI from SRC_MAIN | 1       |

**Byte 2 Single Ended Output Enable Register**

| Bit | Name     | Description             | Type | 0               | 1              | Default |
|-----|----------|-------------------------|------|-----------------|----------------|---------|
| 7   | REF_OE   | Output enable for REF   | RW   | Output Disabled | Output Enabled | 1       |
| 6   | USB_OE   | Output enable for USB   | RW   | Output Disabled | Output Enabled | 1       |
| 5   | PCIF5_OE | Output enable for PCIF5 | RW   | Output Disabled | Output Enabled | 1       |
| 4   | PCI4_OE  | Output enable for PCI4  | RW   | Output Disabled | Output Enabled | 1       |
| 3   | PCI3_OE  | Output enable for PCI3  | RW   | Output Disabled | Output Enabled | 1       |
| 2   | PCI2_OE  | Output enable for PCI2  | RW   | Output Disabled | Output Enabled | 1       |
| 1   | PCI1_OE  | Output enable for PCI1  | RW   | Output Disabled | Output Enabled | 1       |
| 0   | PCI0_OE  | Output enable for PCI0  | RW   | Output Disabled | Output Enabled | 1       |

**Byte 3 SRC Output Enable Register**

| Bit | Name        | Description                   | Type | 0               | 1              | Default |
|-----|-------------|-------------------------------|------|-----------------|----------------|---------|
| 7   | SRC11_OE    | Output enable for SRC11       | RW   | Output Disabled | Output Enabled | 1       |
| 6   | SRC10_OE    | Output enable for SRC10       | RW   | Output Disabled | Output Enabled | 1       |
| 5   | SRC9_OE     | Output enable for SRC9        | RW   | Output Disabled | Output Enabled | 1       |
| 4   | SRC8/ITP_OE | Output enable for SRC8 or ITP | RW   | Output Disabled | Output Enabled | 1       |
| 3   | SRC7_OE     | Output enable for SRC7        | RW   | Output Disabled | Output Enabled | 1       |
| 2   | SRC6_OE     | Output enable for SRC6        | RW   | Output Disabled | Output Enabled | 1       |
| 1   | Reserved    | Reserved                      | RW   | -               | -              | 1       |
| 0   | SRC4_OE     | Output enable for SRC4        | RW   | Output Disabled | Output Enabled | 1       |

**Byte 4 SRC/CPU/DOT Output Enable & Spread Spectrum Disable Register**

| Bit | Name          | Description                     | Type | 0               | 1              | Default |
|-----|---------------|---------------------------------|------|-----------------|----------------|---------|
| 7   | SRC3_OE       | Output enable for SRC3          | RW   | Output Disabled | Output Enabled | 1       |
| 6   | SATA/SRC2_OE  | Output enable for SATA/SRC2     | RW   | Output Disabled | Output Enabled | 1       |
| 5   | SRC1_OE       | Output enable for SRC1          | RW   | Output Disabled | Output Enabled | 1       |
| 4   | SRC0/DOT96_OE | Output enable for SRC0/DOT96    | RW   | Output Disabled | Output Enabled | 1       |
| 3   | CPU1_OE       | Output enable for CPU1          | RW   | Output Disabled | Output Enabled | 1       |
| 2   | CPU0_OE       | Output enable for CPU0          | RW   | Output Disabled | Output Enabled | 1       |
| 1   | PLL5_SSC_ON   | Enable PLL5's spread modulation | RW   | Spread Disabled | Spread Enabled | 1       |
| 0   | PLL2_SSC_ON   | Enable PLL2's spread modulation | RW   | Spread Disabled | Spread Enabled | 1       |

**Byte 5 Clock Request Enable/Configuration Register**

| Bit | Name      | Description                               | Type | 0             | 1             | Default |
|-----|-----------|---|------|---------------|---------------|---------|
| 7   | CR#_A_EN  | Enable CR#_A (clk req) for SRC0 or SRC2   | RW   | Disable CR#_A | Enable CR#_A  | 0       |
| 6   | CR#_A_SEL | Sets CR#_A to control either SRC0 or SRC2 | RW   | CR#_A -> SRC0 | CR#_A -> SRC2 | 0       |
| 5   | CR#_B_EN  | Enable CR#_B (clk req) for SRC1 or SRC4   | RW   | Disable CR#_B | Enable CR#_B  | 0       |
| 4   | CR#_B_SEL | Sets CR#_B to control either SRC1 or SRC4 | RW   | CR#_B -> SRC1 | CR#_B -> SRC4 | 0       |
| 3   | CR#_C_EN  | Enable CR#_C (clk req) for SRC0 or SRC2   | RW   | Disable CR#_C | Enable CR#_C  | 0       |
| 2   | CR#_C_SEL | Sets CR#_C to control either SRC0 or SRC2 | RW   | CR#_C -> SRC0 | CR#_C -> SRC2 | 0       |
| 1   | CR#_D_EN  | Enable CR#_D (clk req) for SRC1 or SRC4   | RW   | Disable CR#_D | Enable CR#_D  | 0       |
| 0   | CR#_D_SEL | Sets CR#_D to control either SRC1 or SRC4 | RW   | CR#_D -> SRC1 | CR#_D -> SRC4 | 0       |

**Byte 6 Clock Request Enable/Configuration Register**

| Bit | Name               | Description                              | Type | 0             | 1                              | Default |
|-----|--------------------|--|------|---------------|--------------------------------|---------|
| 7   | CR#_E_EN           | Enable CR#_E (clk req) for SRC6          | RW   | Disable CR#_E | Enable CR#_E                   | 0       |
| 6   | CR#_F_EN           | Enable CR#_F (clk req) for SRC8          | RW   | Disable CR#_F | Enable CR#_F                   | 0       |
| 5   | CR#_G_EN           | Enable CR#_G (clk req) for SRC9          | RW   | Disable CR#_G | Enable CR#_G                   | 0       |
| 4   | CR#_H_EN           | Enable CR#_H (clk req) for SRC10         | RW   | Disable CR#_H | Enable CR#_H                   | 0       |
| 3   | Reserved           | Reserved                                 | RW   | -             | -                              | 0       |
| 2   | Reserved           | Reserved                                 | RW   | -             | -                              | 0       |
| 1   | LCD/SRC1_STP_CTRL* | If set, LCD_SS/SRC1 stops with PCI_STOP# | RW   | Free Running  | Stops with PCI_STOP# assertion | 0       |
| 0   | SRC0_STP_CTRL      | If set, SRC0 stop with PCI_STOP#         | RW   | Free Running  | Stops with PCI_STOP# assertion | 0       |

**Byte 7 Vendor ID/ Revision ID Register**

| Bit | Name            | Description         | Type | 0               | 1 | Default |
|-----|-----------------|---------------------|------|-----------------|---|---------|
| 7   | Rev Code Bit 3  | Revision ID         | R    | Vendor specific |   | 0       |
| 6   | Rev Code Bit 2  |                     | R    |                 |   | 0       |
| 5   | Rev Code Bit 1  |                     | R    |                 |   | 0       |
| 4   | Rev Code Bit 0  |                     | R    |                 |   | 1       |
| 3   | Vendor ID bit 3 | R                   | 0    |                 |   |         |
| 2   | Vendor ID bit 2 | R                   | 0    |                 |   |         |
| 1   | Vendor ID bit 1 | R                   | 0    |                 |   |         |
| 0   | Vendor ID bit 0 | ICS is 0001, binary | R    | 1               |   |         |

**Byte 8 Device ID & Output Enable Register**

| Bit | Name               | Description  | Type | 0                     | 1       | Default (TSSOP) | Default (MLF) |
|-----|--------------------|--|------|-----------------------|---------|-----------------|---------------|
| 7   | Device_ID3         | Table of Device identifier codes, used for differentiating between CK505 package options, etc. | R    | See Device ID Table 4 |         | 0               | 0             |
| 6   | Device_ID2         |  | R    |                       |         | 0               | 0             |
| 5   | Device_ID1         |  | R    |                       |         | 0               | 0             |
| 4   | Device_ID0         |  | R    |                       |         | 1               | 0             |
| 3   | Reserved           | Reserved   | RW   | -                     | -       | 0               | 0             |
| 2   | Reserved           | Reserved   | RW   | -                     | -       | 0               | 0             |
| 1   | 27MHz_nonSS/SE1_OE | Output enable for SE1  | RW   | Disabled              | Enabled | 1               | 1             |
| 0   | 27MHz_SS/SE2_OE    | Output enable for SE2  | RW   | Disabled              | Enabled | 1               | 1             |

**Byte 9 Test and Output Control Register**

| Bit | Name             | Description  | Type | 0   | 1                              | Default   |
|-----|------------------|--|------|---|--------------------------------|-----------|
| 7   | PCIF5_STOP_EN    | Allows control of PCIF5 with assertion of PCI_STOP#  | RW   | Free running                                  | Stops with PCI_STOP# assertion | 0         |
| 6   | TME_Readback     | Trusted Mode Enable (TME) strap status               | R    | normal operation                              | no overclocking                | TME latch |
| 5   | Reserved         | Reserved   | RW   | -   | -                              | 1         |
| 4   | Test Mode Select | Allows test select, ignores REF/FSC/TestSel          | RW   | Outputs HI-Z                                  | Outputs = REF/N                | 0         |
| 3   | Test Mode Entry  | Allows entry into test mode, ignores FSB/TestMode    | RW   | Normal operation                              | Test mode                      | 0         |
| 2   | CPU_IO_VOUT2     | CPU IO Output Voltage Select (Most Significant Bit)  | RW   | See Table 3: V_IO Selection (Default is 0.8V) |                                | 1         |
| 1   | CPU_IO_VOUT1     | CPU IO Output Voltage Select                         | RW   |   |                                | 0         |
| 0   | CPU_IO_VOUT0     | CPU IO Output Voltage Select (Least Significant Bit) | RW   |   |                                | 1         |

**Byte 10 Output Control Register**

| Bit | Name                  | Description  | Type | 0                | 1                              | Default      |
|-----|-----------------------|--|------|------------------|--------------------------------|--------------|
| 7   | 27_SEL Latch Readback | Readback of 27_Select latch                        | R    | Dot96/ LCD_SS/SE | SRC0/ 27MHz                    | 27_SEL latch |
| 6   | PCI4_STOP_EN          | Allows control of PCI4 with assertion of PCI_STOP# | RW   | Free running     | Stops with PCI_STOP# assertion | 1            |
| 5   | PCI3_STOP_EN          | Allows control of PCI3 with assertion of PCI_STOP# | RW   | Free running     | Stops with PCI_STOP# assertion | 1            |
| 4   | PCI2_STOP_EN          | Allows control of PCI2 with assertion of PCI_STOP# | RW   | Free running     | Stops with PCI_STOP# assertion | 1            |
| 3   | PCI1_STOP_EN          | Allows control of PCI1 with assertion of PCI_STOP# | RW   | Free running     | Stops with PCI_STOP# assertion | 1            |
| 2   | PCI0_STOP_EN          | Allows control of PCI0 with assertion of PCI_STOP# | RW   | Free running     | Stops with PCI_STOP# assertion | 1            |
| 1   | CPU1 Stop Enable      | Enables control of CPU1 with CPU_STOP#             | RW   | Free Running     | Stoppable                      | 1            |
| 0   | CPU0 Stop Enable      | Enables control of CPU0 with CPU_STOP#             | RW   | Free Running     | Stoppable                      | 1            |



**Byte 11 iAMT/CPU2 Control Register**

| Bit | Name             | Description                            | Type | 0            | 1         | Default |
|-----|------------------|--|------|--------------|-----------|---------|
| 7   | Reserved         | Reserved                               | RW   | -            | -         | 0       |
| 6   | Reserved         | Reserved                               | RW   | -            | -         | 0       |
| 5   | Reserved         | Reserved                               | RW   | -            | -         | 0       |
| 4   | Reserved         | Reserved                               | RW   | -            | -         | 0       |
| 3   | CPU2_AMT_EN      | M1 mode clk enable, only if ITP_EN=1   | RW   | Disable      | Enable    | 0       |
| 2   | CPU1_AMT_EN      | M1 mode clk enable                     | RW   | Disable      | Enable    | 1       |
| 1   | Reserved         | Reserved                               | RW   | -            | -         | 0       |
| 0   | CPU2 Stop Enable | Enables control of CPU2 with CPU_STOP# | RW   | Free Running | Stoppable | 1       |

**Byte 12 Byte Count Register**

| Bit | Name     | Description                                      | Type | 0 | 1 | Default |
|-----|----------|--|------|---|---|---------|
| 7   | Reserved | Reserved   | RW   | - | - | 0       |
| 6   | Reserved | Reserved   | RW   | - | - | 0       |
| 5   | BC5      | Read Back byte count register,<br>max bytes = 32 | RW   | - | - | 0       |
| 4   | BC4      |  | RW   | - | - | 0       |
| 3   | BC3      |  | RW   | - | - | 1       |
| 2   | BC2      |  | RW   | - | - | 1       |
| 1   | BC1      |  | RW   | - | - | 0       |
| 0   | BC0      |  | RW   | - | - | 1       |

**Byte 13 Single Ended Output Slew Rate Control Register**

| Bit | Name     | Description       | RW | 0             | 1             | Default |
|-----|----------|-------------------|----|---------------|---------------|---------|
| 7   | REF      | Slew Rate Control | RW | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 6   | REF      |                   | RW | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 5   | 27M_FIX  | Slew Rate Control | RW | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 4   | 27M_FIX  |                   | RW | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 3   | 27M_SS   | Slew Rate Control | RW | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 2   | 27M_SS   |                   | RW | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 1   | Reserved | Reserved          | RW | -             | -             | 0       |
| 0   | Reserved | Reserved          | RW | -             | -             | 0       |

**Byte 14 Reserved**

| Bit | Name     | Description | Type | 0 | 1 | Default |
|-----|----------|-------------|------|---|---|---------|
| 7   | Reserved | Reserved    | RW   | - | - | X       |
| 6   | Reserved | Reserved    | RW   | - | - | X       |
| 5   | Reserved | Reserved    | RW   | - | - | X       |
| 4   | Reserved | Reserved    | RW   | - | - | X       |
| 3   | Reserved | Reserved    | RW   | - | - | X       |
| 2   | Reserved | Reserved    | RW   | - | - | X       |
| 1   | Reserved | Reserved    | RW   | - | - | X       |
| 0   | Reserved | Reserved    | RW   | - | - | X       |

**Byte 15 Reserved**

| Bit | Name     | Description | Type | 0 | 1 | Default |
|-----|----------|-------------|------|---|---|---------|
| 7   | Reserved | Reserved    | RW   | - | - | X       |
| 6   | Reserved | Reserved    | RW   | - | - | X       |
| 5   | Reserved | Reserved    | RW   | - | - | X       |
| 4   | Reserved | Reserved    | RW   | - | - | X       |
| 3   | Reserved | Reserved    | RW   | - | - | X       |
| 2   | Reserved | Reserved    | RW   | - | - | X       |
| 1   | Reserved | Reserved    | RW   | - | - | X       |
| 0   | Reserved | Reserved    | RW   | - | - | X       |

**Byte 16 Reserved**

| Bit | Name     | Description | Type | 0 | 1 | Default |
|-----|----------|-------------|------|---|---|---------|
| 7   | Reserved | Reserved    | RW   | - | - | X       |
| 6   | Reserved | Reserved    | RW   | - | - | X       |
| 5   | Reserved | Reserved    | RW   | - | - | X       |
| 4   | Reserved | Reserved    | RW   | - | - | X       |
| 3   | Reserved | Reserved    | RW   | - | - | X       |
| 2   | Reserved | Reserved    | RW   | - | - | X       |
| 1   | Reserved | Reserved    | RW   | - | - | X       |
| 0   | Reserved | Reserved    | RW   | - | - | X       |

**Byte 17 SRC Output Control Register**

| Bit | Name               | Description                            | RW | 0            | 1                              | Default |
|-----|--------------------|--|----|--------------|--------------------------------|---------|
| 7   | SATA/SRC2_STP_CTRL | If set, SATA/SRC2 stops with PCI_STOP# | RW | Free Running | Stops with PCI_STOP# assertion | 0       |
| 6   | SRC3_STP_CTRL      | If set, SRC3 stops with PCI_STOP#      | RW | Free Running | Stops with PCI_STOP# assertion | 0       |
| 5   | SRC4_STP_CTRL      | If set, SRC4 stops with PCI_STOP#      | RW | Free Running | Stops with PCI_STOP# assertion | 0       |
| 4   | SRC6_STP_CTRL      | If set, SRC6 stops with PCI_STOP#      | RW | Free Running | Stops with PCI_STOP# assertion | 0       |
| 3   | SRC7_STP_CTRL      | If set, SRC7 stops with PCI_STOP#      | RW | Free Running | Stops with PCI_STOP# assertion | 0       |
| 2   | Reserved           | Reserved                               | RW | -            | -                              | 0       |
| 1   | SRC8_STP_CTRL      | If set, SRC8 stops with PCI_STOP#      | RW | Free Running | Stops with PCI_STOP# assertion | 0       |
| 0   | SRC9_STP_CTRL      | If set, SRC9 stops with PCI_STOP#      | RW | Free Running | Stops with PCI_STOP# assertion | 0       |

**Byte 18 Differential Output Control Register**

| Bit | Name                     | Description  | RW | 0  | 1                              | Default |
|-----|--------------------------|--|----|--|--------------------------------|---------|
| 7   | SRC10_STP_CTRL           | If set, SRC10 stops with PCI_STOP#                                 | RW | Free Running                                     | Stops with PCI_STOP# assertion | 0       |
| 6   | SRC11_STP_CTRL           | If set, SRC11 stops with PCI_STOP#                                 | RW | Free Running                                     | Stops with PCI_STOP# assertion | 0       |
| 5   | SRC/CPUITP_SRC8 IO_VOUT2 | SRC & CPUITP_SRC8 IO Output Voltage Select (Most Significant Bit)  | RW | See Table 3: V_IO Selection<br>(Default is 0.8V) |                                | 1       |
| 4   | SRC/CPUITP_SRC8 IO_VOUT1 | SRC IO & CPUITP_SRC8 Output Voltage Select                         | RW |  |                                | 0       |
| 3   | SRC/CPUITP_SRC8 IO_VOUT0 | SRC & CPUITP_SRC8 IO Output Voltage Select (Least Significant Bit) | RW |  |                                | 1       |
| 2   | SATA/SRC2 IO_VOUT2       | SATA_SRC2 IO Output Voltage Select (Most Significant Bit)          | RW | See Table 3: V_IO Selection<br>(Default is 0.8V) |                                | 1       |
| 1   | SATA/SRC2 IO_VOUT1       | SATA_SRC2 IO Output Voltage Select                                 | RW |  |                                | 0       |
| 0   | SATA/SRC2 IO_VOUT0       | SATA_SRC2 IO Output Voltage Select (Least Significant Bit)         | RW |  |                                | 1       |

**Byte 19 Differential Output Control Register**

| Bit | Name                   | Description   | RW | 0  | 1 | Default |
|-----|------------------------|---|----|--|---|---------|
| 7   | LCD_SS (SRC1) IO_VOUT2 | LCD_SS IO Output Voltage Select (Most Significant Bit)      | RW | See Table 3: V_IO Selection<br>(Default is 0.8V) |   | 1       |
| 6   | LCD_SS (SRC1) IO_VOUT1 | LCD_SS IO Output Voltage Select                             | RW |  |   | 0       |
| 5   | LCD_SS (SRC1) IO_VOUT0 | LCD_SS IO Output Voltage Select (Least Significant Bit)     | RW |  |   | 1       |
| 4   | SRC0/DOT96 IO_VOUT2    | SRC0_DOT96 IO Output Voltage Select (Most Significant Bit)  | RW | See Table 3: V_IO Selection<br>(Default is 0.8V) |   | 1       |
| 3   | SRC0/DOT96 IO_VOUT1    | SRC0_DOT96 IO Output Voltage Select                         | RW |  |   | 0       |
| 2   | SRC0/DOT96 IO_VOUT0    | SRC0_DOT96 IO Output Voltage Select (Least Significant Bit) | RW |  |   | 1       |
| 1   | Reserved               | Reserved  | RW | -  | - | 0       |
| 0   | Reserved               | Reserved  | RW | -  | - | 0       |

**Byte 20 Single Ended Slew Rate Control Register**

| Bit | Name  | Description       | Type | 0             | 1             | Default |
|-----|-------|-------------------|------|---------------|---------------|---------|
| 7   | 48MHz | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 6   | 48MHz |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 5   | PCI5  | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 4   | PCI5  |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 3   | PCI4  | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 2   | PCI4  |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 1   | PCI3  | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 0   | PCI3  |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |

**Byte 21 Single Ended Slew Rate & M/N Enable Control Register**

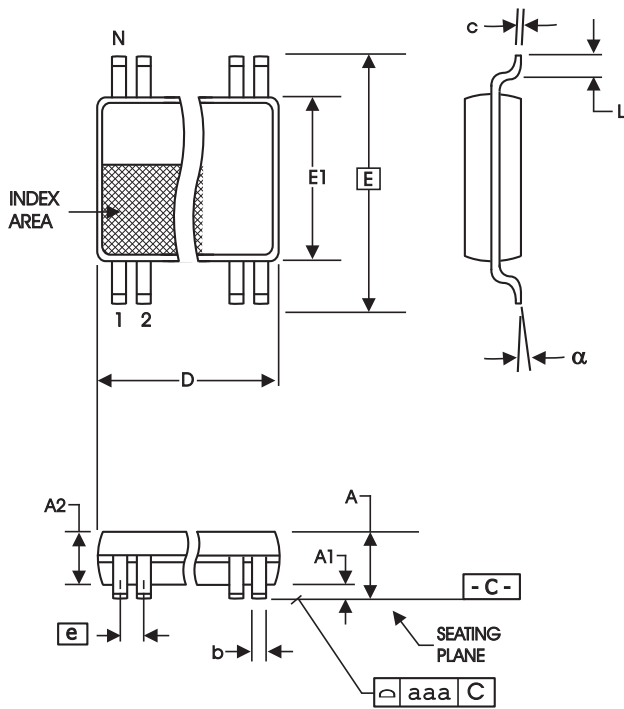
| Bit | Name     | Description       | Type | 0             | 1             | Default |
|-----|----------|-------------------|------|---------------|---------------|---------|
| 7   | PCI2     | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 6   | PCI2     |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 5   | PCI1     | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 4   | PCI1     |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 3   | PCI0     | Slew Rate Control | RW   | 00 = Hi-Z     | 01 = 1.4 V/ns | 0       |
| 2   | PCI0     |                   | RW   | 10 = 2.0 V/ns | 11 = 2.4 V/ns | 1       |
| 1   | Reserved | Reserved          | RW   | -             | -             | 0       |
| 0   | Reserved | Reserved          | RW   | -             | -             | 0       |

**Test Clarification Table**

| Comments   | HW                          |                              | SW                        |                          | OUTPUT |
|--|-----------------------------|------------------------------|---------------------------|--------------------------|--------|
|  | FSLC/<br>TEST_SEL<br>HW PIN | FSLB/<br>TEST_MODE<br>HW PIN | TEST ENTRY<br>BIT<br>B9b3 | REF/N or<br>HI-Z<br>B9b4 |        |
|  | <2.0V                       | X                            | 0                         | 0                        | NORMAL |
| CK_PWRG=1 w/ TEST_SEL = 1 to enter test mode<br>Cycle power to disable test mode<br>FSLC./TEST_SEL -->3-level latched input<br>If CK_PWRG=1 w/ V>2.0V then use TEST_SEL<br>If CK_PWRG=1 w/ V<2.0V then use FSLC<br>FSLB/TEST_MODE -->low Vth input<br>TEST_MODE is a real time input | >2.0V                       | 0                            | X                         | 0                        | HI-Z   |
|  | >2.0V                       | 0                            | X                         | 1                        | REF/N  |
|  | >2.0V                       | 1                            | X                         | 0                        | REF/N  |
|  | >2.0V                       | 1                            | X                         | 1                        | REF/N  |
| If TEST_SEL HW pin is 0 after CK_PWRG=1,<br>test mode can be invoked through B9b3.<br>If test mode is invoked by B9b3, only B9b4<br>is used to select HI-Z or REF/N<br>FSLB/TEST_Mode pin is not used.<br>Cycle power to disable test mode, one shot control                         | <2.0V                       | X                            | 1                         | 0                        | HI-Z   |
|  | <2.0V                       | X                            | 1                         | 1                        | REF/N  |

B9b3: 1= ENTER TEST MODE, Default = 0 (NORMAL OPERATION)

B9b4: 1= REF/N, Default = 0 (HI-Z)



6.10 mm. Body, 0.50 mm. Pitch TSSOP  
(240 mil) (20 mil)

| SYMBOL | In Millimeters    |      | In Inches         |      |
|--------|-------------------|------|-------------------|------|
|        | COMMON DIMENSIONS |      | COMMON DIMENSIONS |      |
|        | MIN               | MAX  | MIN               | MAX  |
| A      | --                | 1.20 | --                | .047 |
| A1     | 0.05              | 0.15 | .002              | .006 |
| A2     | 0.80              | 1.05 | .032              | .041 |
| b      | 0.17              | 0.27 | .007              | .011 |
| c      | 0.09              | 0.20 | .0035             | .008 |
| D      | SEE VARIATIONS    |      | SEE VARIATIONS    |      |
| E      | 8.10 BASIC        |      | 0.319 BASIC       |      |
| E1     | 6.00              | 6.20 | .236              | .244 |
| e      | 0.50 BASIC        |      | 0.020 BASIC       |      |
| L      | 0.45              | 0.75 | .018              | .030 |
| N      | SEE VARIATIONS    |      | SEE VARIATIONS    |      |
| alpha  | 0°                | 8°   | 0°                | 8°   |
| aaa    | --                | 0.10 | --                | .004 |

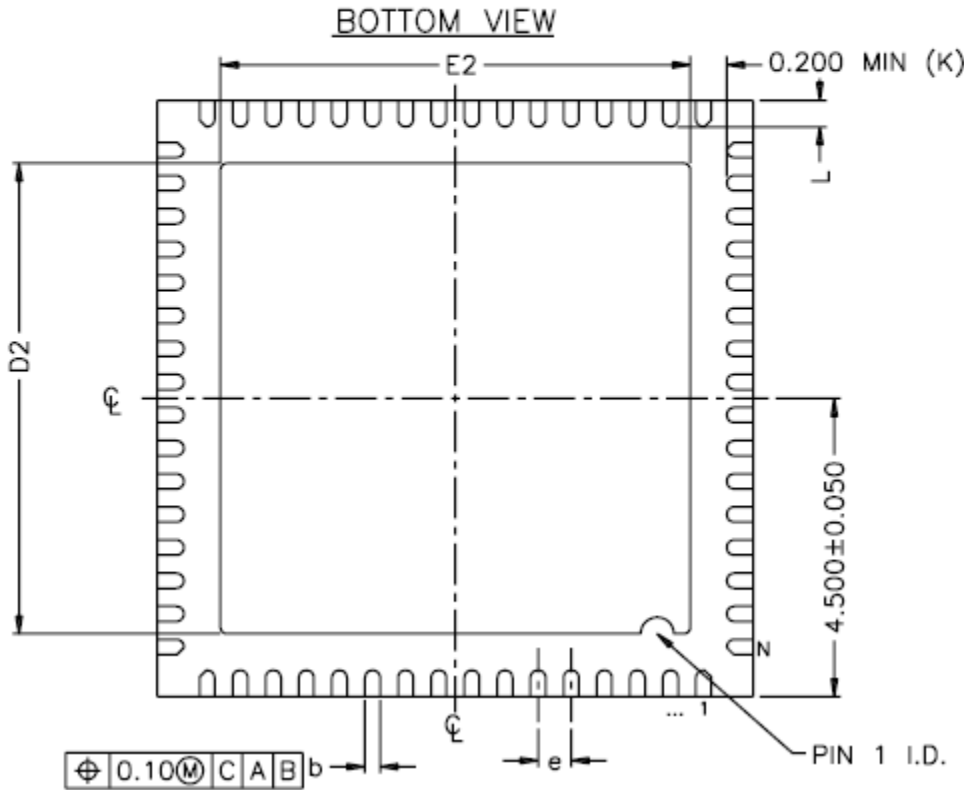
VARIATIONS

| N  | D mm. |       | D (inch) |      |
|----|-------|-------|----------|------|
|    | MIN   | MAX   | MIN      | MAX  |
| 64 | 16.90 | 17.10 | .665     | .673 |

Reference Doc.: JEDEC Publication 95, MO-153

10-0039

MLF Package Drawing and Dimensions



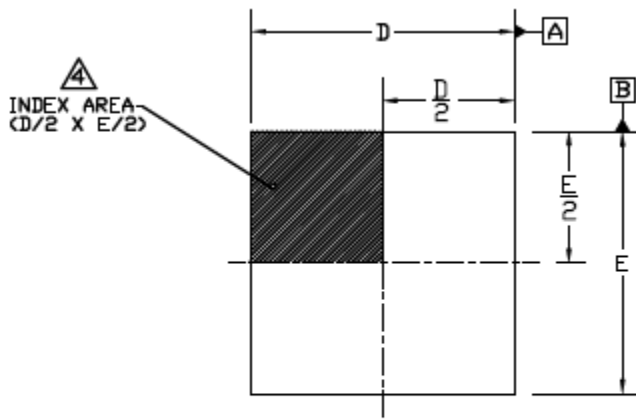
| DIMENSIONS |                    |      |      |
|------------|--------------------|------|------|
| PACKAGE    | 64L 9.0x9.0 - 0.50 |      |      |
| REF.       | MIN.               | NOM. | MAX. |
| A          | 0.80               | 0.90 | 1.00 |
| b          | 0.18               | 0.25 | 0.30 |
| D          | 9.00 BSC           |      |      |
| D2         | 6.0                | 6.15 | 6.25 |
| E          | 9.00 BSC           |      |      |
| E2         | 6.0                | 6.15 | 6.25 |
| e          | 0.50 BSC.          |      |      |
| L          | 0.30               | 0.40 | 0.50 |
| N          | 64                 |      |      |
| ND         | 16                 |      |      |
| NE         | 16                 |      |      |
| k          | 0.20               |      |      |

NOTES:

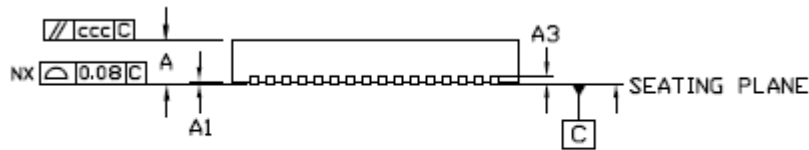
1. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
3. N IS THE TOTAL NUMBER OF TERMINALS.
4. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEDEC PUBLICATION 95 SPP-002. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.
5. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25mm AND 0.30mm FROM TERMINAL TIP.
6. ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.
7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.
8. CORNER LEAD CHAMFERS ARE APPLIED TO MAINTAIN MINIMUM CORNER LEAD SPACING (8 PLACES).

| SYMBOL                          | COMMON DIMENSIONS |           |      | NOTE |
|---------------------------------|-------------------|-----------|------|------|
|                                 | MIN.              | NOM.      | MAX. |      |
| A1                              | 0                 | 0.02      | 0.05 |      |
| A3                              | -                 | 0.20 REF. | -    |      |
| X                               | b/2               | -         | -    |      |
| TOLERANCES OF FORM AND POSITION |                   |           |      |      |
| bbb                             | 0.10              |           |      |      |
| ccc                             | 0.10              |           |      |      |
| ddd                             | 0.05              |           |      |      |

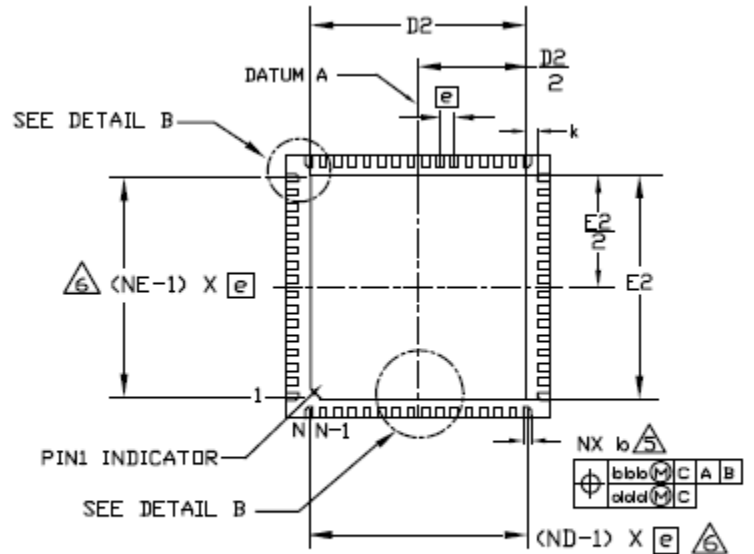
MLF Package Drawing and Dimensions (cont.)



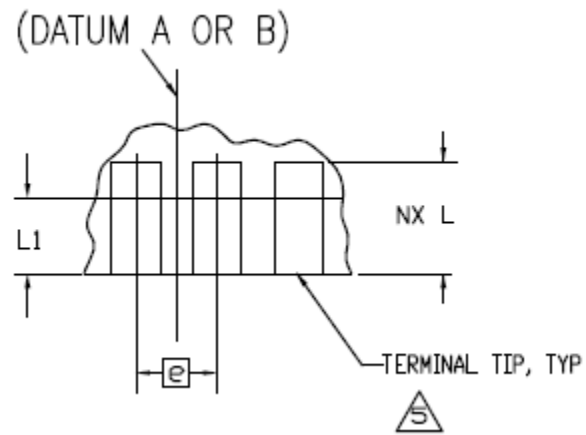
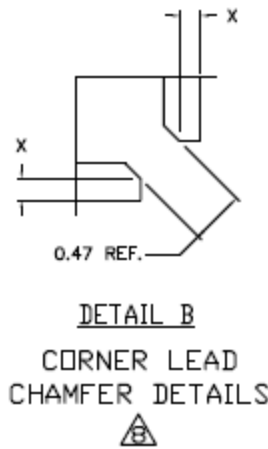
TOP VIEW



SIDE VIEW



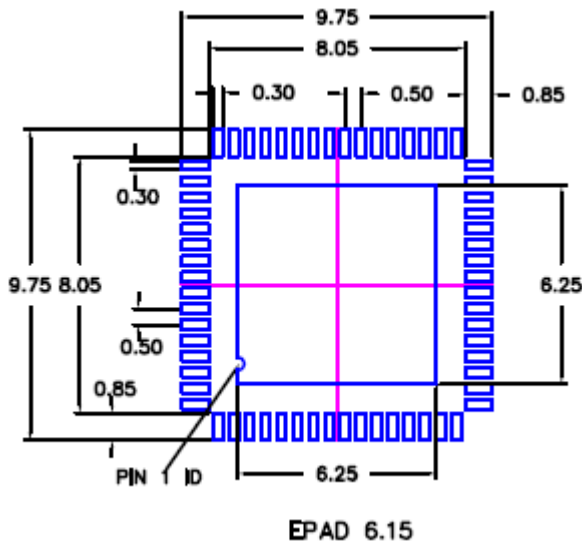
BOTTOM VIEW



DETAIL B



## MLF Package Drawing and Dimensions (cont.)



| SYMBOL | DIMENSION (MM) |      |      | DIMENSION (MIL) |      |      |
|--------|----------------|------|------|-----------------|------|------|
|        | MIN.           | NOM. | MAX. | MIN.            | NOM. | MAX. |
| A      | 0.80           | 0.85 | 1.00 | 31              | 33   | 39   |
| A1     | 0.00           | 0.02 | 0.05 | 0               | 1    | 2    |
| A2     | –              | 0.65 | 1.00 | –               | 26   | 39   |
| A3     | –              | 0.20 | –    | –               | 8    | –    |
| b      | 0.18           | 0.25 | 0.30 | 7               | 10   | 12   |
| D      | 9.00 BSC       |      |      | 354 BSC         |      |      |
| D1     | 8.75 BSC       |      |      | 344 BSC         |      |      |
| D2     | 6.0            | 6.15 | 6.25 | 236             | 242  | 246  |
| E      | 9.00 BSC       |      |      | 354 BSC         |      |      |
| E1     | 8.75 BSC       |      |      | 344 BSC         |      |      |
| E2     | 6.0            | 6.15 | 6.25 | 236             | 242  | 246  |
| e      | 0.50 BSC       |      |      | 20 BSC          |      |      |
| L      | 0.30           | 0.40 | 0.50 | 12              | 16   | 20   |
| θ      | 0°             | –    | 14°  | 0°              | –    | 14°  |

## NOTE :

1. REFER TO JEDEC STD: MO-220.
2. DIMENSION "b" APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15MM AND 0.30MM FROM THE TERMINAL TIP. IF THE TERMINAL HAS OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION B SHOULD NOT BE MEASURED IN THAT RADIUS AREA.

## Ordering Information

| Part/Order Number | Shipping Packaging | Package      | Temperature |
|-------------------|--------------------|--------------|-------------|
| 9LRS3165BKLF      | Trays              | 64-pin MLF   | 0 to +70° C |
| 9LRS3165BKLF      | Tape and Reel      | 64-pin MLF   | 0 to +70° C |
| 9LRS3165BGLF      | Tubes              | 64-pin TSSOP | 0 to +70° C |
| 9LRS3165BGLF      | Tape and Reel      | 64-pin TSSOP | 0 to +70° C |

“LF” suffix to the part number are the Pb-Free configuration and are RoHS compliant.

“B” is the device revision designator (will not correlate with the datasheet revision).

Due to package size constraints, actual top-side marking may differ from the full orderable part number.

**Revision History**

| Rev. | Issue Date | Issuer  | Description  | Page #     |
|------|------------|---------|--|------------|
| A    | 08/21/12   | D. Chan | Move to final.                                     |            |
| B    | 01/06/15   | D. Chan | Changed package drawing from PUNCH to SAWN version | 25, 26, 27 |

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