



# Quad SPST CMOS Analog Switches

DG202/DG212

## General Description

The DG202/DG212 are normally open, quad single-pole single-throw (SPST) analog switches. These CMOS switches can be continuously operated with power supplies ranging from  $\pm 4.5V$  to  $\pm 18V$ . Maxim guarantees that these switches will not latch up if the power supplies are disconnected with input signals still connected.

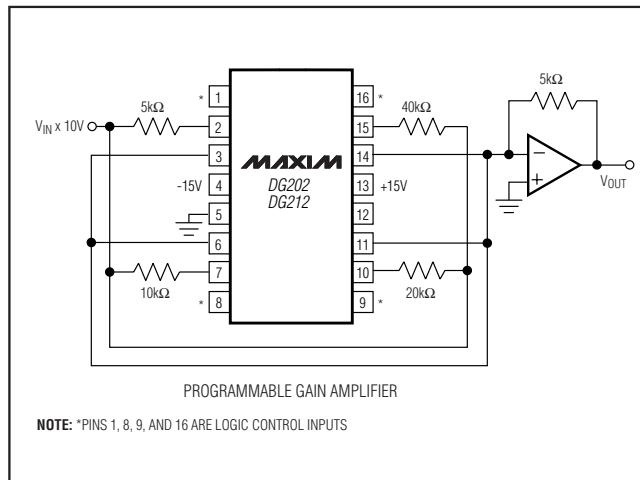
The DG202/DG212 are similar to the DG201/DG211 except for inverted control inputs. All devices have guaranteed break-before-make switching, as well as essentially constant on-resistance over the analog signal range. All switches conduct current in either direction and add no offset to the output signal.

Compared to the original manufacturer's products, Maxim's DG202/DG212 consume very little power, making them better suited for portable applications. Maxim has also eliminated the need for the third logic power supply ( $V_L$ ) that is required for the operation of the original manufacturer's DG212 without sacrificing compatibility.

## Applications

- Analog Multiplexers
- Programmable Gain Amplifiers
- Communications Systems
- Sample/Holds
- Automatic Test Equipment
- PBX, PABX

## Typical Operating Circuit



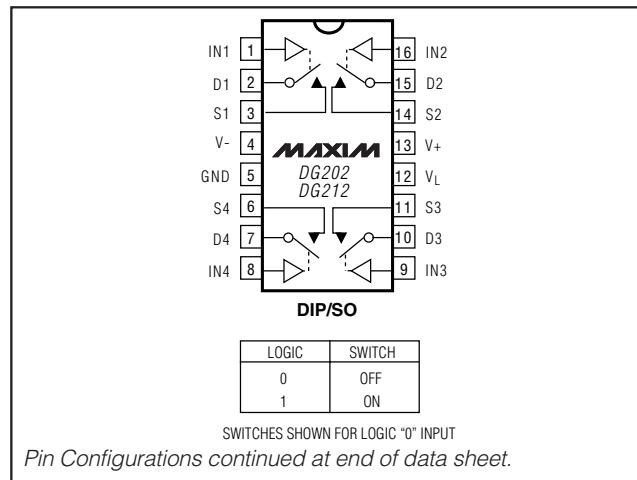
## Features

- ◆ Guaranteed  $\pm 4.5V$  to  $\pm 18V$  Operation
- ◆ No  $V_L$  Supply Required
- ◆ Nonlatching with Supplies Turned Off and Input Signals Present
- ◆ CMOS and TTL Logic Compatible
- ◆ Monolithic, Low-Power CMOS Design

## Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
<b>DG202CUE</b>	0°C to +70°C	16 TSSOP
DG202CSE	0°C to +70°C	16 SO
DG202CJ	0°C to +70°C	16 Plastic DIP
DG202C/D	0°C to +70°C	Dice
DG202AEGE	-40°C to +85°C	16 QFN (5mm x 5mm)
DG202AEUE	-40°C to +85°C	16 TSSOP
DG202ADY	-40°C to +85°C	16 SO
DG202ADJ	-40°C to +85°C	16 Plastic DIP
DG202AK	-55°C to +125°C	16 CERDIP
<b>DG212CUE</b>	0°C to +70°C	16 TSSOP
DG212CSE	0°C to +70°C	16 SO
DG212CJ	0°C to +70°C	16 Plastic DIP
DG212C/D	0°C to +70°C	Dice
DG212EGE	-40°C to +85°C	16 QFN (5mm x 5mm)
DG212EUE	-40°C to +85°C	16 TSSOP
DG212DY	-40°C to +85°C	16 SO
DG212DJ	-40°C to +85°C	16 Plastic DIP
DG212ETE	-40°C to +85°C	16 Thin QFN

## Pin Configurations



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## ABSOLUTE MAXIMUM RATINGS (DG212)

V+ to V-	44V
V <sub>IN</sub> to Ground	V-, V+
V <sub>L</sub> to Ground	-0.3V, 25V
V <sub>S</sub> or V <sub>D</sub> to V+	0, -40V
V <sub>S</sub> or V <sub>D</sub> to V-	0, 40V
V+ to Ground	.25V
V- to Ground	-25V
Current, Any Terminal Except S or D	.30mA
Continuous Current, S or D	.20mA
Peak Current, S or D (pulsed at 1ms 10% duty cycle max)	.70mA
Storage Temperature Range	-65°C to +125°C

**Note 1:** Device mounted with all leads soldered to PC board.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS (DG212)

(V+ = +15V, V- = -15V, GND = 0, T<sub>A</sub> = +25°C, unless otherwise noted.) (For more information on TYP values see Note 2.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>SWITCH</b>						
Analog Signal Range	V <sub>ANALOG</sub>		-15	+15		V
Drain-Source ON-Resistance	R <sub>DS</sub> (ON)	V <sub>D</sub> = ±10V, V <sub>IN</sub> = 2.4V, I <sub>S</sub> = 1mA	115	175		Ω
Source OFF-Leakage Current	I <sub>S</sub> (OFF)	V <sub>IN</sub> = 0.8V	0.01	5.0		nA
		V <sub>S</sub> = 14V, V <sub>D</sub> = -14V V <sub>S</sub> = -14V, V <sub>D</sub> = 14V	-5.0	-0.02		
Drain OFF-Leakage Current	I <sub>D</sub> (OFF)	V <sub>IN</sub> = 0.8V	0.01	5.0		nA
		V <sub>S</sub> = 14V, V <sub>D</sub> = -14V V <sub>S</sub> = -14V, V <sub>D</sub> = 14V	-5.0	-0.02		
Drain ON-Leakage Current (Note 3)	I <sub>D</sub> (ON)	V <sub>S</sub> = V <sub>D</sub> = 14V, V <sub>IN</sub> = 2.4V	0.1	5.0		
		V <sub>S</sub> = V <sub>D</sub> = -14V, V <sub>IN</sub> = 2.4V	-5.0	-0.15		
<b>INPUT</b>						
Input Current with Input Voltage High	I <sub>INH</sub>	V <sub>IN</sub> = 2.4V	-1.0	-0.0004		μA
		V <sub>IN</sub> = 15V	0.003	1.0		
Input Current with Input Voltage Low	I <sub>INL</sub>	V <sub>IN</sub> = 0	-1.0	-0.0004		
<b>DYNAMIC</b>						
Turn-ON Time	t <sub>ON</sub>	See Switching Time Test Circuit V <sub>S</sub> = 2V, R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 35pF	460	1000		ns
Turn-OFF Time	t <sub>OFF1</sub>		360	500		
	t <sub>OFF2</sub>		450			
Source OFF-Capacitance	C <sub>S</sub> (OFF)	V <sub>S</sub> = 0, V <sub>IN</sub> = 0, f = 1MHz	5			pF
Drain OFF-Capacitance	C <sub>D</sub> (OFF)	V <sub>D</sub> = 0, V <sub>IN</sub> = 0, f = 1MHz	5			
Channel ON-Capacitance	C <sub>D</sub> + S (ON)	V <sub>D</sub> = V <sub>S</sub> = 0, V <sub>IN</sub> = 5V, f = 1MHz	16			
OFF-Isolation (Note 4)	OIRR	V <sub>IN</sub> = 0, R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 15pF, V <sub>S</sub> = 1VRMS, f = 100kHz	70			dB
Crosstalk (Channel to Channel)	CCRR		90			

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## ELECTRICAL CHARACTERISTICS (DG212) (continued)

(V<sub>+</sub> = +15V, V<sub>-</sub> = -15V, GND = 0, T<sub>A</sub> = +25°C, unless otherwise noted.) (For more information on TYP values see Note 2.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>SUPPLY</b>						
Positive Supply Current	I <sub>+</sub>	V <sub>IN</sub> = 0 and 2.4V (all)	0.02	0.4	mA	
Negative Supply Current	I <sub>-</sub>		0.01	0.4		
Logic Supply Current	I <sub>L</sub>		0	0		
Power-Supply Range for Continous Operation	V <sub>OP</sub>		±4.5		±18.0	V

**Note 2:** Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

**Note 3:** I<sub>D(ON)</sub> is leakage from driver into "ON" switch.

**Note 4:** OFF-Isolation = 20 log V<sub>S</sub>/V<sub>D</sub>, V<sub>S</sub> = input to OFF switch, V<sub>D</sub> = output.

## ABSOLUTE MAXIMUM RATINGS (DG202)

Voltages Reference to V-

V <sub>+</sub> .....	44V
GND.....	25V
Digital Inputs (Note 1), V <sub>S</sub> , V <sub>D</sub> .....	-2V to (V <sub>+</sub> + 2V) or 20mA, whichever occurs first
Current, Any Terminal Except S or D.....	30mA
Continuous Current, S or D.....	20mA
Peak Current, S or D (pulsed at 1ms 10% duty cycle max).....	70mA

Operating Temperature Range

DG202C .....	0°C to +70°C
DG202D/E .....	-40°C to +85°C
DG202A .....	-55°C to +125°C

Storage Temperature Range.....-65°C to +150°C

Power Dissipation (Note 2)

16-Pin Plastic Dip (derate 10.5mW/°C above +70°C) .....	842mW
16-Pin SO (derate 8.7mW/°C above +70°C) .....	696mW
16-Pin TSSOP (derate 9.4mW/°C above +70°C) .....	755mW
16-Pin QFN (5 x 5) (derate 19.2mW/°C above +70°C) .....	1538mW
16-Pin CERDIP (derate 10.0mW/°C above +70°C) .....	800mW

**Note 1:** Signals on S<sub>\_</sub>, D<sub>\_</sub>, or IN<sub>\_</sub> exceeding V<sub>+</sub> or V<sub>-</sub> on Maxim's DG202 will be clamped by internal diodes, and are also internally current limited to 25mA.

**Note 2:** Device mounted with all leads soldered to PC board.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS (DG202)

(V<sub>+</sub> = +15V, V<sub>-</sub> = -15V, GND = 0, T<sub>A</sub> = +25°C, unless otherwise noted.) (For more information on TYP values see Note 3.)

PARAMETER	SYMBOL	CONDITIONS	DG202A			DG202C, D, E			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
<b>SWITCH</b>									
Analog Signal Range	V <sub>ANALOG</sub>		-15	15	-15	15			V
Drain-Source ON Resistance	R <sub>D(S)</sub>	V <sub>D</sub> = ±10V, V <sub>IN</sub> = 2.4V, I <sub>S</sub> = 1mA	115	175	115	200			Ω
Source OFF-Leakage Current	I <sub>S(OFF)</sub>	V <sub>IN</sub> = 0.8V	V <sub>S</sub> = 14V, V <sub>D</sub> = -14V	0.01	1.0	0.01	5.0		nA
			V <sub>S</sub> = -14V, V <sub>D</sub> = 14V	-1.0	-0.02	-1.0	-0.02		
Drain OFF-Leakage Current	I <sub>D(OFF)</sub>	V <sub>IN</sub> = 0.8V	V <sub>S</sub> = 14V, V <sub>D</sub> = -14V	0.01	1.0	0.01	5.0		
			V <sub>S</sub> = -14V, V <sub>D</sub> = 14V	-1.0	-0.02	-1.0	-0.02		
Drain ON-Leakage Current (Note 4)	I <sub>D(ON)</sub>	V <sub>IN</sub> = 2.4V	V <sub>S</sub> = -14V	0.1	1.0	0.1	1.0		
			V <sub>S</sub> = 14V	-1.0		-5.0			

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## ELECTRICAL CHARACTERISTICS (DG202) (continued)

(V<sub>+</sub> = +15V, V<sub>-</sub> = -15V, GND = 0, T<sub>A</sub> = +25°C, unless otherwise noted.) (For more information on TYP values see Note 3.)

PARAMETER	SYMBOL	CONDITIONS	DG202A			DG202C, D, E			UNITS					
			MIN	TYP	MAX	MIN	TYP	MAX						
<b>INPUT</b>														
Input Current with Input Voltage High	I <sub>INH</sub>	V <sub>IN</sub> = 2.4V	-1.0 -0.0004			-1.0 -0.0004			μA					
		V <sub>IN</sub> = 15V	0.003 1.0			0.003 1.0								
Input Current with Input Voltage Low	I <sub>INL</sub>	V <sub>IN</sub> = 0	-1.0 -0.0004			-1.0 -0.0004								
<b>DYNAMIC</b>														
Turn-ON Time	t <sub>ON</sub>	See Figure 1 Switching Time Test Circuit	480 600		480 600		ns							
Turn-OFF Time	t <sub>OFF1</sub>		370 450		370 450									
Charge Injection	Q	C <sub>L</sub> = 1000pF, V <sub>GEN</sub> = 0, R <sub>GEN</sub> = 0	20			20			pC					
Source OFF-Capacitance	C <sub>S</sub> (OFF)	V <sub>S</sub> = 0, V <sub>IN</sub> = 0	f = 140kHz	5		5		pF						
Drain OFF-Capacitance	C <sub>D</sub> (OFF)	5		5										
Channel ON-Capacitance	C <sub>D</sub> (ON) + C <sub>S</sub> (ON)	V <sub>D</sub> = V <sub>S</sub> = 0, V <sub>IN</sub> = 5V		16		16								
OFF-Isolation		V <sub>IN</sub> = 0, Z <sub>L</sub> = 75Ω	70			70			dB					
Crosstalk (Channel to Channel)		V <sub>S</sub> = 2.0V, f = 100kHz	90			90								
<b>SUPPLY</b>														
Positive Supply Current	I <sub>+</sub>	All channels ON or OFF	0.02 0.1		0.02 0.1		mA							
Negative Supply Current	I <sub>-</sub>	All channels ON or OFF	-0.1 -0.01		-0.1 -0.01									
Power-Supply Range for Continuous Operation	V <sub>OP</sub>		±4.5		±18		±4.5	±18.0	V					

**Note 3:** Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

**Note 4:** I<sub>d</sub> (ON) is leakage from driver into "ON" switch.

# Quad SPST CMOS Analog Switches

## ELECTRICAL CHARACTERISTICS (DG202)

( $V_+ = +15V$ ,  $V_- = -15V$ , GND = 0,  $T_A = \text{full operating temperature range}$ , unless otherwise noted.) (For more information on TYP values see Note 3.)

PARAMETER	SYMBOL	CONDITIONS	DG202A			DG202C, D, E			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
<b>SWITCH</b>									
Analog Signal Range	$V_{\text{ANALOG}}$		-15	+15	-15	+15			V
Drain-Source ON Resistance (Note 5)	$R_{DS(\text{ON})}$	$V_D = \pm 10V$ , $V_{IN} = 2.4V$ , $I_S = 1mA$		250		250			$\Omega$
Source OFF-Leakage Current	$I_S(\text{OFF})$	$V_{IN} = 0.8V$	$V_S = 14V$ , $V_D = -14V$	100		100			nA
			$V_S = -14V$ , $V_D = 14V$	-100		-100			
Drain OFF-Leakage Current	$I_D(\text{OFF})$	$V_{IN} = 0.8V$	$V_S = 14V$ , $V_D = -14V$	100		100			
			$V_S = -14V$ , $V_D = 14V$	-100		-100			
Drain ON-Leakage Current (Note 6)	$I_D(\text{ON})$	$V_{IN} = 2.4V$	$V_S = -14V$		200		200		
			$V_D = 14V$	-200		-200			
<b>INPUT</b>									
Input Current with Input Voltage High	$I_{INH}$	$V_{IN} = 2.4V$		-1.0		-1.0			$\mu A$
		$V_{IN} = 15V$			1.0		1.0		
Input Current with Input Voltage Low	$I_{INL}$	$V_{IN} = 0$		-1.0		-1.0			

**Note 5:** Electrical characteristics, such as On-Resistance, will change when power supplies other than  $\pm 15V$ , are used.

**Note 6:**  $I_D(\text{ON})$  is leakage from driver into "ON" switch.

## Pin Description

PIN		NAME	FUNCTION
DIP/SO/TSSOP	QFN/TQFN		
1, 16, 9, 8	15, 14, 7, 6	IN1-IN4	Input
2, 15, 10, 7	16, 13, 8, 5	D1-D4	Analog Switch Drain Terminal
3, 14, 11, 6	1, 12, 9, 4	S1-S4	Analog Switch Source Terminal
4	2	$V_-$	Negative-Supply Voltage Input
5	3	GND	Ground
12	10	N.C.	No Connection
13	11	$V_+$	Positive-Supply Voltage Input—Connected to Substrate
—	EP	EP	Exposed Pad. Connect exposed pad to $V_+$ or leave EP unconnected.

## Switching Time Test Circuit

Switch output waveform shown for  $V_S = \text{constant}$  with logic input waveform as shown. Note that  $V_S$  may be +ve or -ve as per switching times test circuit.  $V_O$  is the steady state output with switch on. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.

## Protecting Against Fault Conditions

Fault conditions occur when power supplies are turned off when input signals are still present, or when overvoltages occur at the inputs during normal operation. In either case, source-to-body diodes can be forward biased and conduct current from the signal source. If

# Quad SPST CMOS Analog Switches

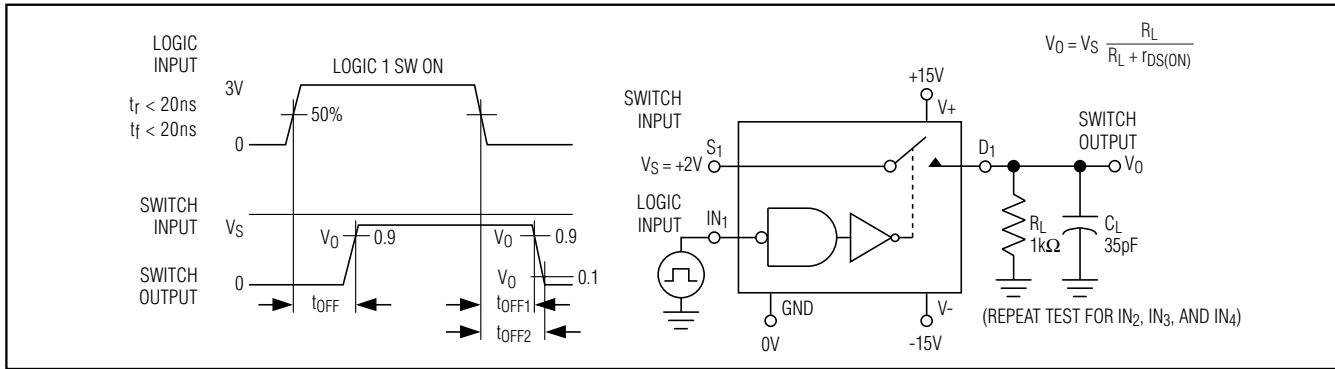


Figure 1. Switching Time

## Typical R<sub>DSON</sub> vs. Power Supplies for Maxim's DG202, and DG212

POWER SUPPLIES	R <sub>DSON</sub> AT ANALOG SIGNAL LEVEL					
	-5V	+5V	-10V	+10V	-15V	+15V
±5V	350Ω	380Ω	—	—	—	—
±10V	—	—	165Ω	250Ω	—	—
±15V	—	—	125Ω	160Ω	135Ω	155Ω

this current is required to be kept to low ( $\mu$ A) levels then the addition of external protection diodes is recommended.

To provide protection for overvoltages up to 20V above the supplies, a 1N4001 or 1N914 type diode should be placed in series with the positive and negative supplies as shown in Figure 2. The addition of these diodes will reduce the analog signal range to 1V below the positive supply and 1V above the negative supply.

## Pin Configurations (continued)

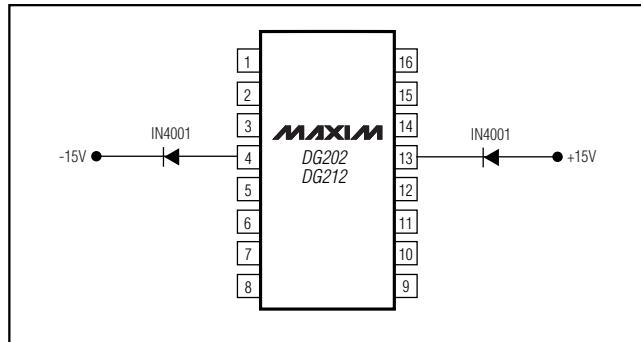
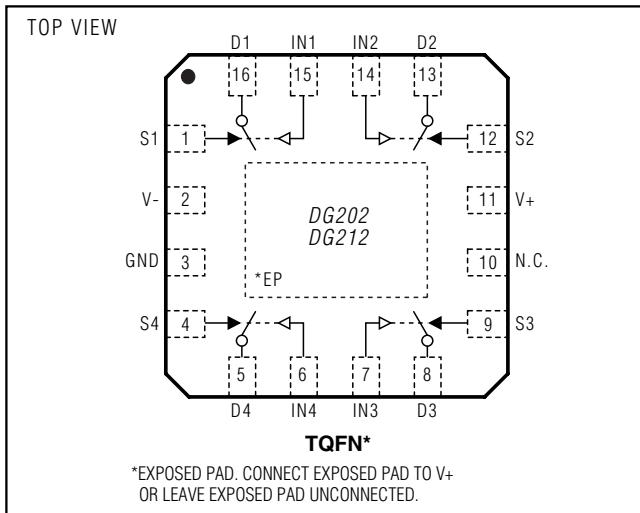


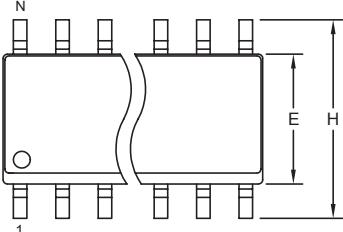
Figure 2. Protection against Fault Conditions

# Quad SPST CMOS Analog Switches

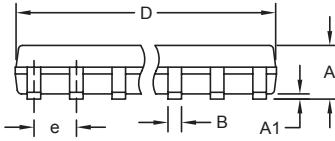
## Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)

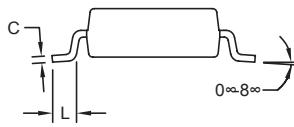
SOICN EPS



**TOP VIEW**



**FRONT VIEW**



**SIDE VIEW**

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
e	0.050 BSC		1.27 BSC	
E	0.150	0.157	3.80	4.00
H	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27

VARIATIONS:

DIM	INCHES		MILLIMETERS		N	MS012
	MIN	MAX	MIN	MAX		
D	0.189	0.197	4.80	5.00	8	AA
D	0.337	0.344	8.55	8.75	14	AB
D	0.386	0.394	9.80	10.00	16	AC

NOTES:

1. D&E DO NOT INCLUDE MOLD FLASH.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED 0.15mm (.006").
3. LEADS TO BE COPLANAR WITHIN 0.10mm (.004").
4. CONTROLLING DIMENSION: MILLIMETERS.
5. MEETS JEDEC MS012.
6. N = NUMBER OF PINS.

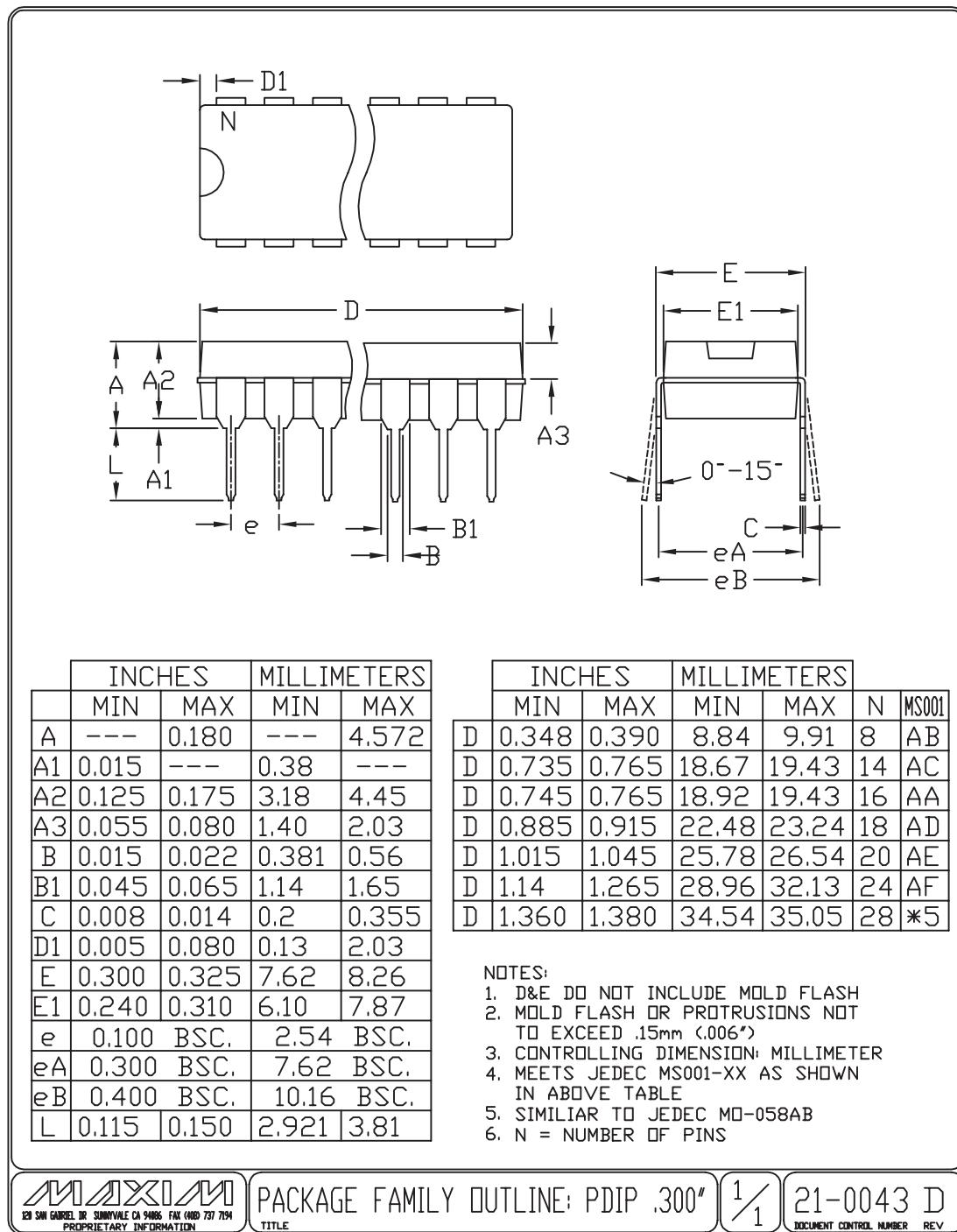
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APPROVAL	DOCUMENT CONTROL NO. 21-0041	REV. <b>B</b> <small>1/1</small>

# Quad SPST CMOS Analog Switches

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)

PDIPN.EPS



PACKAGE FAMILY OUTLINE: PDIP .300"

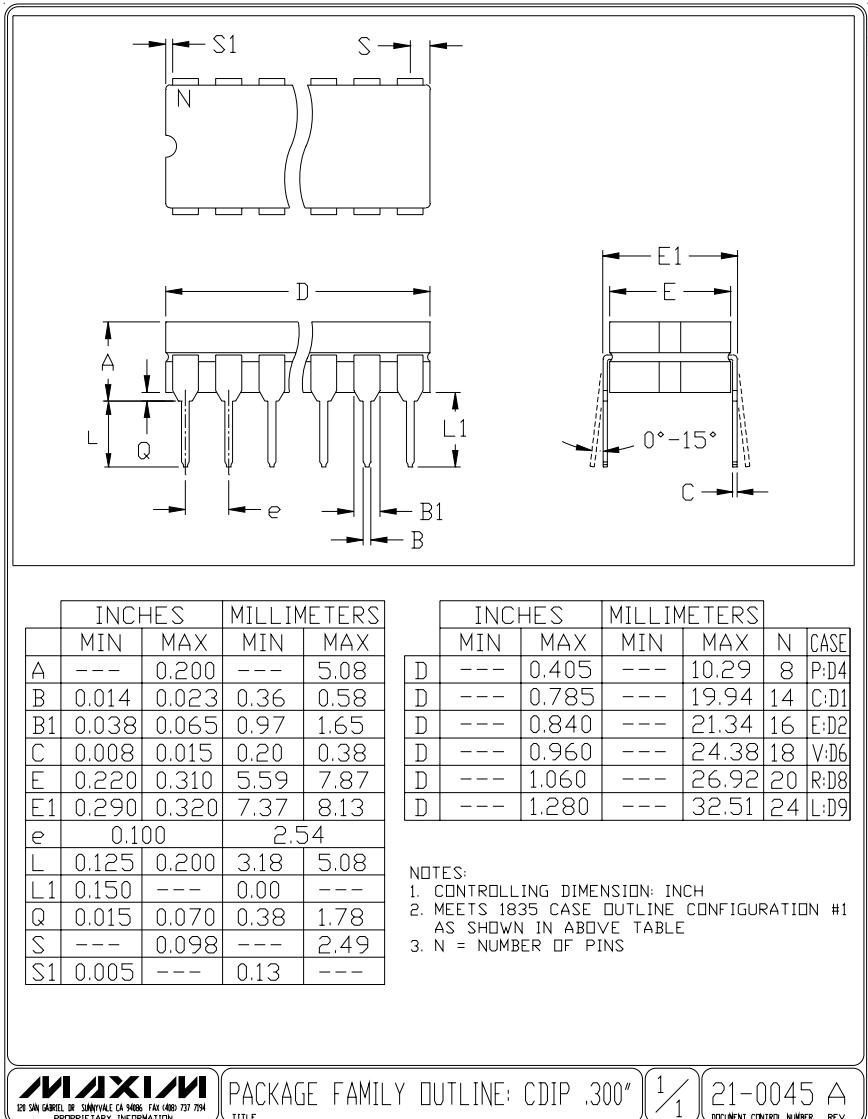
TITLE

21-0043 D  
DOCUMENT CONTROL NUMBER REV

# Quad SPST CMOS Analog Switches

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)



**MAXIM**  
120 SAN GABRIEL DR. Sunnyvale, CA 94086 FAX (408) 737-7949  
Proprietary Information

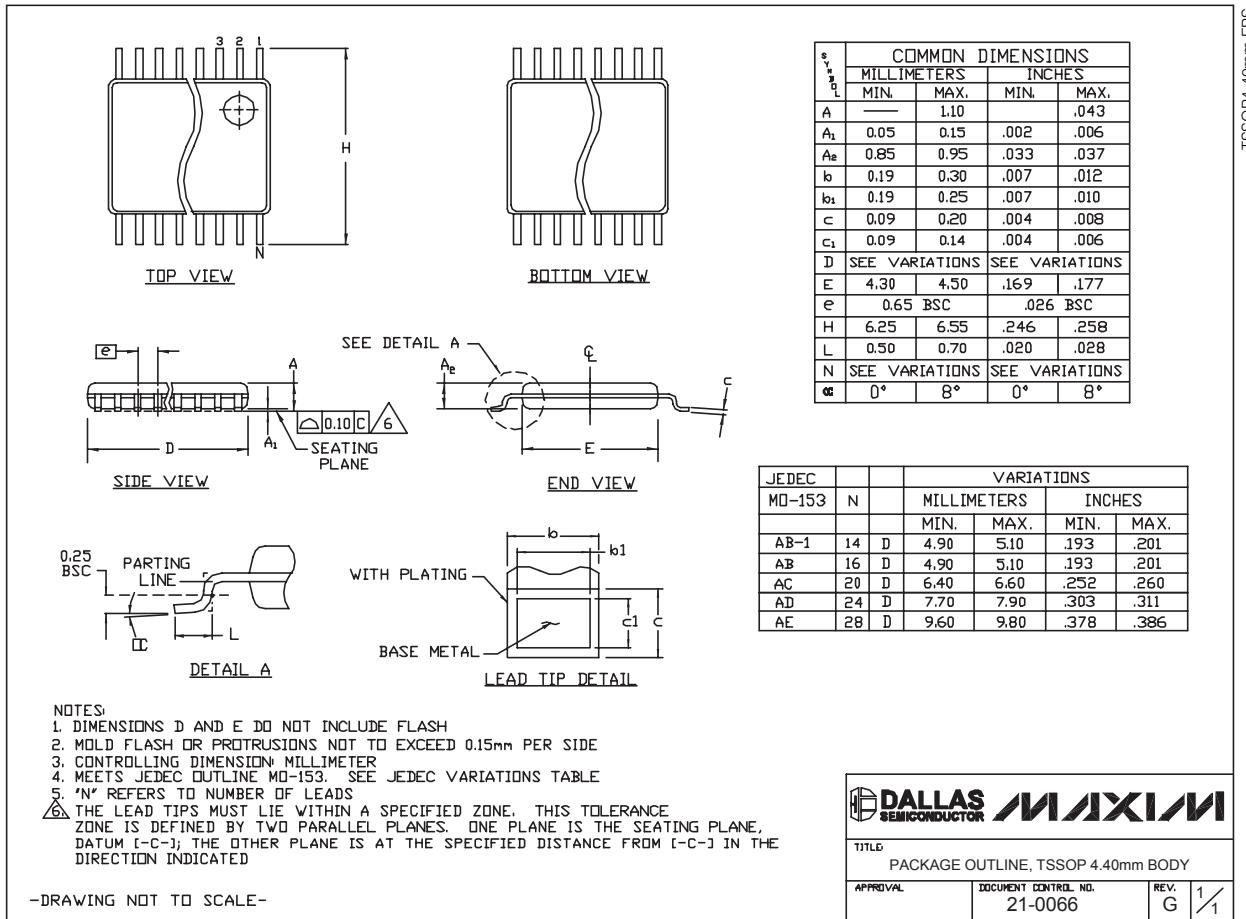
PACKAGE FAMILY OUTLINE: CDIP .300" TITLE

1/1 21-0045 A  
DOCUMENT CONTROL NUMBER REV

# Quad SPST CMOS Analog Switches

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)

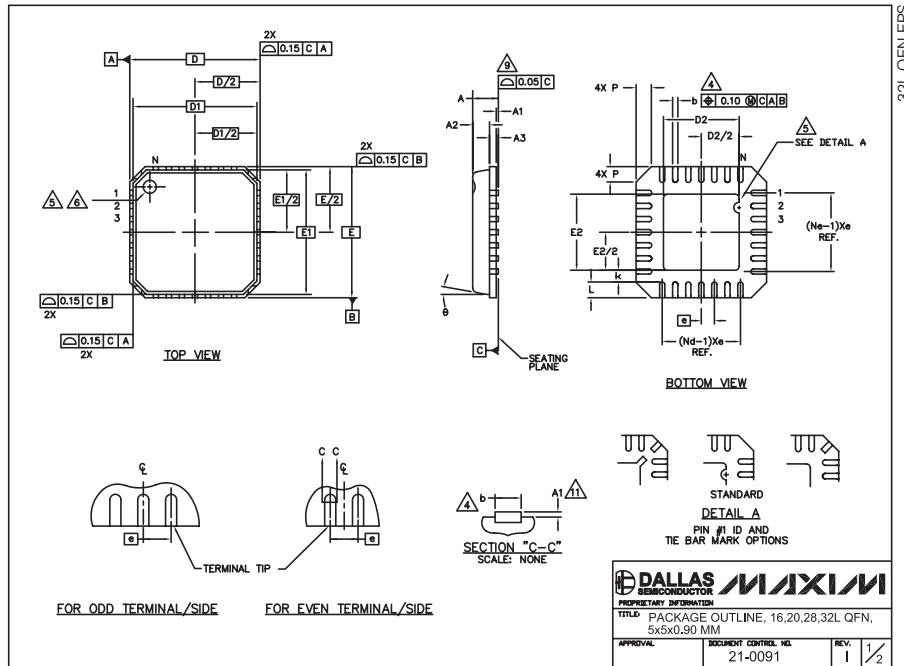


TSSOP4\_40mm.EPS

# Quad SPST CMOS Analog Switches

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)



COMMON DIMENSIONS												
PKG	16L 5x5			20L 5x5			28L 5x5			32L 5x5		
SYMBOL	MIN.	NOM.	MAX.									
A	0.80	0.90	1.00	0.80	0.90	1.00	0.80	0.90	1.00	0.80	0.90	1.00
A1	0.00	0.01	0.05	0.00	0.01	0.05	0.00	0.01	0.05	0.00	0.01	0.05
A2	0.00	0.65	1.00	0.00	0.65	1.00	0.00	0.65	1.00	0.00	0.65	1.00
A3	0.20	REF	0.20	REF	0.20	REF	0.20	REF	0.20	REF	0.20	REF
b	0.28	0.33	0.40	0.23	0.28	0.35	0.18	0.23	0.30	0.18	0.23	0.30
D	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10
D1	4.75	BSC	4.75	BSC	4.75	BSC	4.75	BSC	4.75	BSC	4.75	BSC
E	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10
E1	4.75	BSC	4.75	BSC	4.75	BSC	4.75	BSC	4.75	BSC	4.75	BSC
e	0.80	BSC	0.65	BSC	0.50	BSC	0.50	BSC	0.50	BSC	0.50	BSC
k	0.25	—	—	0.25	—	—	0.25	—	—	0.25	—	—
L	0.35	0.55	0.75	0.35	0.55	0.75	0.35	0.55	0.75	0.30	0.40	0.50
N	16	20	28	20	28	32	20	28	32	20	28	32
ND	4	5	7	5	7	8	5	7	8	5	7	8
NE	4	5	7	5	7	8	5	7	8	5	7	8
P	0.00	0.42	0.60	0.00	0.42	0.60	0.00	0.42	0.60	0.00	0.42	0.60
θ	0°	12°	0°	12°	0°	12°	0°	12°	0°	12°	0°	12°

NOTES:

1. DIE THICKNESS ALLOWABLE IS 0.305mm MAXIMUM (.012 INCHES MAXIMUM)
2. DIMENSIONING & TOLERANCES CONFORM TO ASME Y14.5M - 1994.
3. N IS THE NUMBER OF TERMINALS.
4. Nd IS THE NUMBER OF TERMINALS IN X-DIRECTION & Ne IS THE NUMBER OF TERMINALS IN Y-DIRECTION.
5. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.20 AND 0.25mm FROM TERMINAL TIP.
6. THE PIN #1 IDENTIFIER MUST BE EXISTED ON THE TOP SURFACE OF THE PACKAGE BY USING INDENTATION MARK OR INK/LASER MARKED. DETAILS OF PIN #1 IDENTIFIER IS OPTIONAL BUT MUST BE LOCATED WITHIN ZONE INDICATED.
7. EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.
8. ALL DIMENSIONS ARE IN MILLIMETERS.
9. PACKAGE WARPAGE MAX 0.05mm.
10. APPLIED FOR EXPOSED PAD AND TERMINALS. EXCLUDE EMBEDDED PART OF EXPOSED PAD FROM MEASURING.
11. MEETS JEDEC M022G, EXCEPT DIMENSION "b".
12. APPLIED FOR EXPOSED PAD AND TERMINALS. EXCLUDE EMBEDDED PART OF EXPOSED PAD FROM MEASURING.
13. THIS PACKAGE OUTLINE APPLIES TO ANVIL SINGULATION (STEPPED SIDES).

EXPOSED PAD VARIATIONS											
PKG	D2		E2								
CODES	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.					
G16S5-3	2.95	3.10	3.25	2.95	3.10	3.25					
G20S5-1	2.55	2.70	2.85	2.55	2.70	2.85					
G20S5-2	2.95	3.10	3.25	2.95	3.10	3.25					
G28S5-1	2.55	2.70	2.85	2.55	2.70	2.85					
G28S5-2	2.95	3.10	3.25	2.95	3.10	3.25					
G32S5-1	2.95	3.10	3.25	2.95	3.10	3.25					

DALLAS MAXIM SEMICONDUCTOR PROPRIETARY INFORMATION

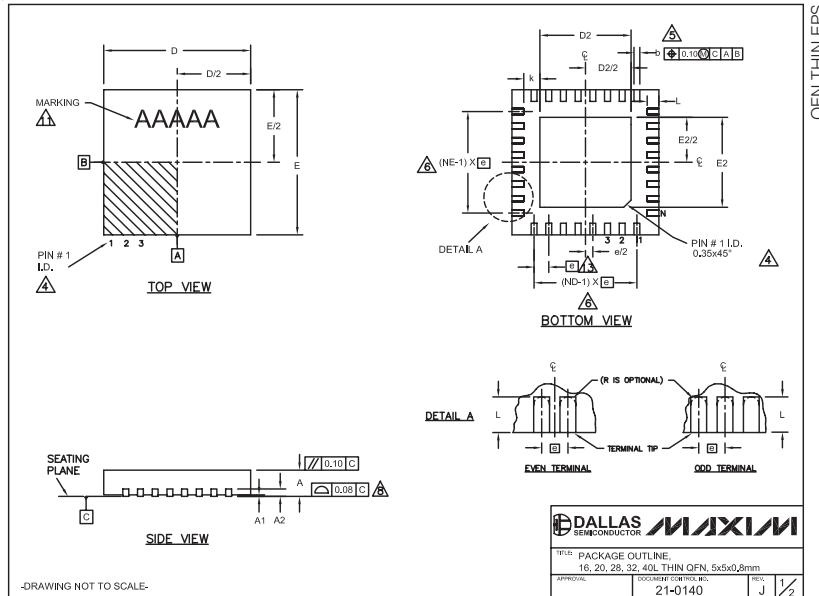
TITLE: PACKAGE OUTLINE, 16,20,28,32L QFN, 5x5x0.90 MM

APPROVAL: DOCUMENT CONTROL NO. 21-0091 REV. 1 1/2

# Quad SPST CMOS Analog Switches

## Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to [www.maxim-ic.com/packages](http://www.maxim-ic.com/packages).)



QFN THIN EPS

COMMON DIMENSIONS										EXPOSED PAD VARIATIONS									
PKG.	16L 5x5	20L 5x5	28L 5x5	32L 5x5	40L 5x5	PKG. CODES	D2	E2											
SYMBOL	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
A	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	
A1	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	
A2	0.20	REF.	0.20	REF.	0.20	REF.	0.20	REF.	0.20	REF.	0.20	REF.	0.20	REF.	0.20	REF.	0.20	REF.	
b	0.25	0.30	0.35	0.30	0.35	0.20	0.25	0.30	0.20	0.25	0.30	0.15	0.20	0.25	0.15	0.20	0.25	0.15	
D	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	
E	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	
e	0.80	BSC.	0.65	BSC.	0.50	BSC.	0.50	BSC.	0.40	BSC.	0.65	BSC.	0.50	BSC.	0.40	BSC.	0.65	BSC.	
k	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-	
L	0.30	0.40	0.50	0.45	0.55	0.65	0.45	0.55	0.65	0.30	0.40	0.50	0.30	0.40	0.50	0.30	0.40	0.50	
N	16			20		28			32			40							
ND	4			5		7			8			10							
NE	4			5		7			8			10							
JEDEC	WHHB			WHHC		WHDH-1			WHDH-2			---							

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.

▲ THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEDEC 95-1 SPP-012. 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.

▲ DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.

▲ ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.

7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.

▲ COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

9. DRAWING CONFORMS TO JEDEC MO220, EXCEPT EXPOSED PAD DIMENSION FOR T2855-3 AND T12855-6.

▲ WARPAGE SHALL NOT EXCEED 0.10 mm.

11. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.

12. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.

▲ LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e",  $\pm 0.05$ .

-DRAWING NOT TO SCALE-

EXPOSED PAD VARIATIONS									
PKG. CODES	D2	E2							
T1655-2	3.00	3.10	3.20	3.00	3.10	3.20			
T1655-3	3.00	3.10	3.20	3.00	3.10	3.20			
T1655N-1	3.00	3.10	3.20	3.00	3.10	3.20			
T2055-3	3.00	3.10	3.20	3.00	3.10	3.20			
T2055-4	3.00	3.10	3.20	3.00	3.10	3.20			
T2055-5	3.15	3.25	3.35	3.15	3.25	3.35			
T2855-3	3.15	3.25	3.35	3.15	3.25	3.35			
T2855-4	2.60	2.70	2.80	2.60	2.70	2.80			
T2855-5	2.60	2.70	2.80	2.60	2.70	2.80			
T2855-6	3.15	3.25	3.35	3.15	3.25	3.35			
T2855-7	2.60	2.70	2.80	2.60	2.70	2.80			
T2855-8	3.15	3.25	3.35	3.15	3.25	3.35			
T2855N-1	3.15	3.25	3.35	3.15	3.25	3.35			
T3255-3	3.00	3.10	3.20	3.00	3.10	3.20			
T3255-4	3.00	3.10	3.20	3.00	3.10	3.20			
T3255-5	3.00	3.10	3.20	3.00	3.10	3.20			
T3255N-1	3.00	3.10	3.20	3.00	3.10	3.20			
T4055-1	3.40	3.50	3.60	3.40	3.50	3.60			
T4055-2	3.40	3.50	3.60	3.40	3.50	3.60			

\*\*SEE COMMON DIMENSIONS TABLE

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.

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▲ DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.

▲ ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.

7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.

▲ COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

9. DRAWING CONFORMS TO JEDEC MO220, EXCEPT EXPOSED PAD DIMENSION FOR T2855-3 AND T12855-6.

▲ WARPAGE SHALL NOT EXCEED 0.10 mm.

11. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.

12. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.

▲ LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e",  $\pm 0.05$ .

-DRAWING NOT TO SCALE-

## Revision History

Pages changed at Rev3: 1–6, 11

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

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