

ZXMC4559DN8

COMPLEMENTARY 60V ENHANCEMENT MODE MOSFET

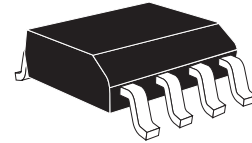
SUMMARY

N-Channel $V_{(BR)DSS} = 60V$; $R_{DS(ON)} = 0.055\Omega$; $I_D = 4.7A$

P-Channel $V_{(BR)DSS} = -60V$; $R_{DS(ON)} = 0.105\Omega$; $I_D = -3.9A$

DESCRIPTION

This new generation of TRENCH MOSFETs from Zetex utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed. This makes them ideal for high efficiency, low voltage, power management applications.



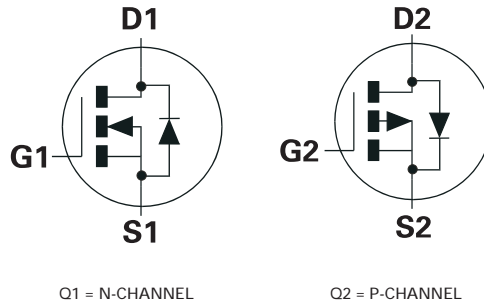
SO8

FEATURES

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- Low profile SOIC package

APPLICATIONS

- Motor Drive
- LCD backlighting



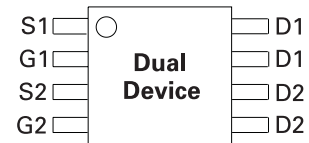
ORDERING INFORMATION

| DEVICE | REEL | TAPE WIDTH | QUANTITY PER REEL |
|---------------|------|------------|-------------------|
| ZXMC4559DN8TA | 7" | 12mm | 500 units |
| ZXMC4559DN8TC | 13" | 12mm | 2500 units |

DEVICE MARKING

- ZXMC
4559

PINOUT



Top view

ZXMC4559DN8

ABSOLUTE MAXIMUM RATINGS.

| PARAMETER | SYMBOL | N-Channel | P-Channel | UNIT |
|--|----------------|-------------|-----------|----------------|
| Drain-Source Voltage | V_{DSS} | 60 | -60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | ± 20 | V |
| Continuous Drain Current @ $V_{GS}=10V$; $T_A=25^\circ C$ (b) (d) | I_D | 4.7 | -3.9 | A |
| | | 3.7 | -2.8 | A |
| | | 3.6 | -2.6 | A |
| Pulsed Drain Current (c) | I_{DM} | 22.2 | -18.3 | A |
| Continuous Source Current (Body Diode) (b) | I_S | 3.4 | -3.2 | A |
| Pulsed Source Current (Body Diode)(c) | I_{SM} | 22.2 | -18.3 | A |
| Power Dissipation at $T_A=25^\circ C$ (a) (d) | P_D | 1.25 | | W |
| Linear Derating Factor | | 10 | | mW/ $^\circ C$ |
| Power Dissipation at $T_A=25^\circ C$ (a) (e) | P_D | 1.8 | | W |
| Linear Derating Factor | | 14 | | mW/ $^\circ C$ |
| Power Dissipation at $T_A=25^\circ C$ (b) (d) | P_D | 2.1 | | W |
| Linear Derating Factor | | 17 | | mW/ $^\circ C$ |
| Operating and Storage Temperature Range | $T_J; T_{stg}$ | -55 to +150 | | $^\circ C$ |

THERMAL RESISTANCE

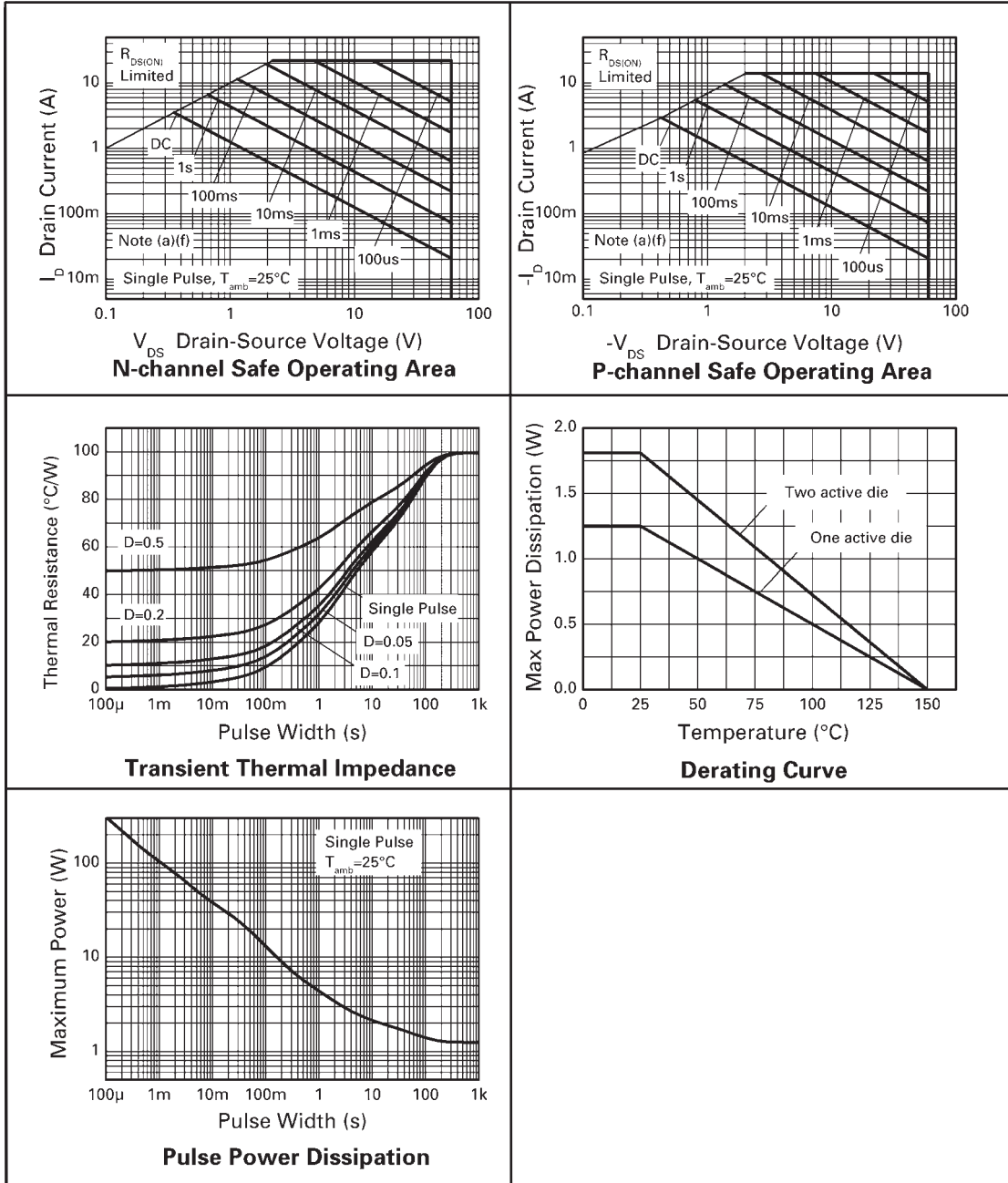
| PARAMETER | SYMBOL | VALUE | UNIT |
|-----------------------------|-----------------|-------|--------------|
| Junction to Ambient (a) (d) | $R_{\theta JA}$ | 100 | $^\circ C/W$ |
| Junction to Ambient (b) (e) | $R_{\theta JA}$ | 69 | $^\circ C/W$ |
| Junction to Ambient (b) (d) | $R_{\theta JA}$ | 58 | $^\circ C/W$ |

Notes

- (a) For a dual device surface mounted on 25mm x 25mm FR4 PCB with coverage of single sided 1oz copper in still air conditions.
- (b) For a dual device surface mounted on FR4 PCB measured at $t \leq 10$ sec.
- (c) Repetitive rating 25mm x 25mm FR4 PCB, $D=0.02$ pulse width=300 μs - pulse width limited by maximum junction temperature.
- (d) For a device with one active die.
- (e) For device with 2 active die running at equal power.

ZXMC4559DN8

CHARACTERISTICS



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N-CHANNEL

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated).

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS. |
|--|---------------|------|------|----------------|----------------------|---|
| STATIC | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | 60 | | | V | $I_D=250\mu\text{A}, V_{GS}=0\text{V}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | | | 1.0 | μA | $V_{DS}=60\text{V}, V_{GS}=0\text{V}$ |
| Gate-Body Leakage | I_{GSS} | | | 100 | nA | $V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$ |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | 1.0 | | | V | $I_D=250\mu\text{A}, V_{DS}=V_{GS}$ |
| Static Drain-Source On-State Resistance ⁽¹⁾ | $R_{DS(on)}$ | | | 0.055 0.075 | Ω Ω | $V_{GS}=10\text{V}, I_D=4.5\text{A}$ $V_{GS}=4.5\text{V}, I_D=4.0\text{A}$ |
| Forward Transconductance ^{(1) (3)} | g_{fs} | | 10.2 | | S | $V_{DS}=15\text{V}, I_D=4.5\text{A}$ |
| DYNAMIC ⁽³⁾ | | | | | | |
| Input Capacitance | C_{iss} | | 1063 | | pF | $V_{DS}=30\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}$ |
| Output Capacitance | C_{oss} | | 104 | | pF | |
| Reverse Transfer Capacitance | C_{rss} | | 64 | | pF | |
| SWITCHING ^{(2) (3)} | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | | 3.5 | | ns | $V_{DD}=30\text{V}, I_D=1\text{A}$ $R_G=6.0\Omega, V_{GS}=10\text{V}$ |
| Rise Time | t_r | | 4.1 | | ns | |
| Turn-Off Delay Time | $t_{d(off)}$ | | 26.2 | | ns | |
| Fall Time | t_f | | 10.6 | | ns | |
| Gate Charge | Q_g | | 11.0 | | nC | $V_{DS}=30\text{V}, V_{GS}=5\text{V},$ $I_D=4.5\text{A}$ |
| Total Gate Charge | Q_g | | 20.4 | | nC | $V_{DS}=30\text{V}, V_{GS}=10\text{V},$ $I_D=4.5\text{A}$ |
| Gate-Source Charge | Q_{gs} | | 4.1 | | nC | |
| Gate-Drain Charge | Q_{gd} | | 5.1 | | nC | |
| SOURCE-DRAIN DIODE | | | | | | |
| Diode Forward Voltage ⁽¹⁾ | V_{SD} | | 0.85 | 1.2 | V | $T_J=25^{\circ}\text{C}, I_S=5.5\text{A},$ $V_{GS}=0\text{V}$ |
| Reverse Recovery Time ⁽³⁾ | t_{rr} | | 22 | | ns | $T_J=25^{\circ}\text{C}, I_F=2.2\text{A},$ |
| Reverse Recovery Charge ⁽³⁾ | Q_{rr} | | 21.4 | | nC | $di/dt=100\text{A}/\mu\text{s}$ |

NOTES

- (1) Measured under pulsed conditions. Width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.
 (2) Switching characteristics are independent of operating junction temperature.
 (3) For design aid only, not subject to production testing.

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P-CHANNEL

ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

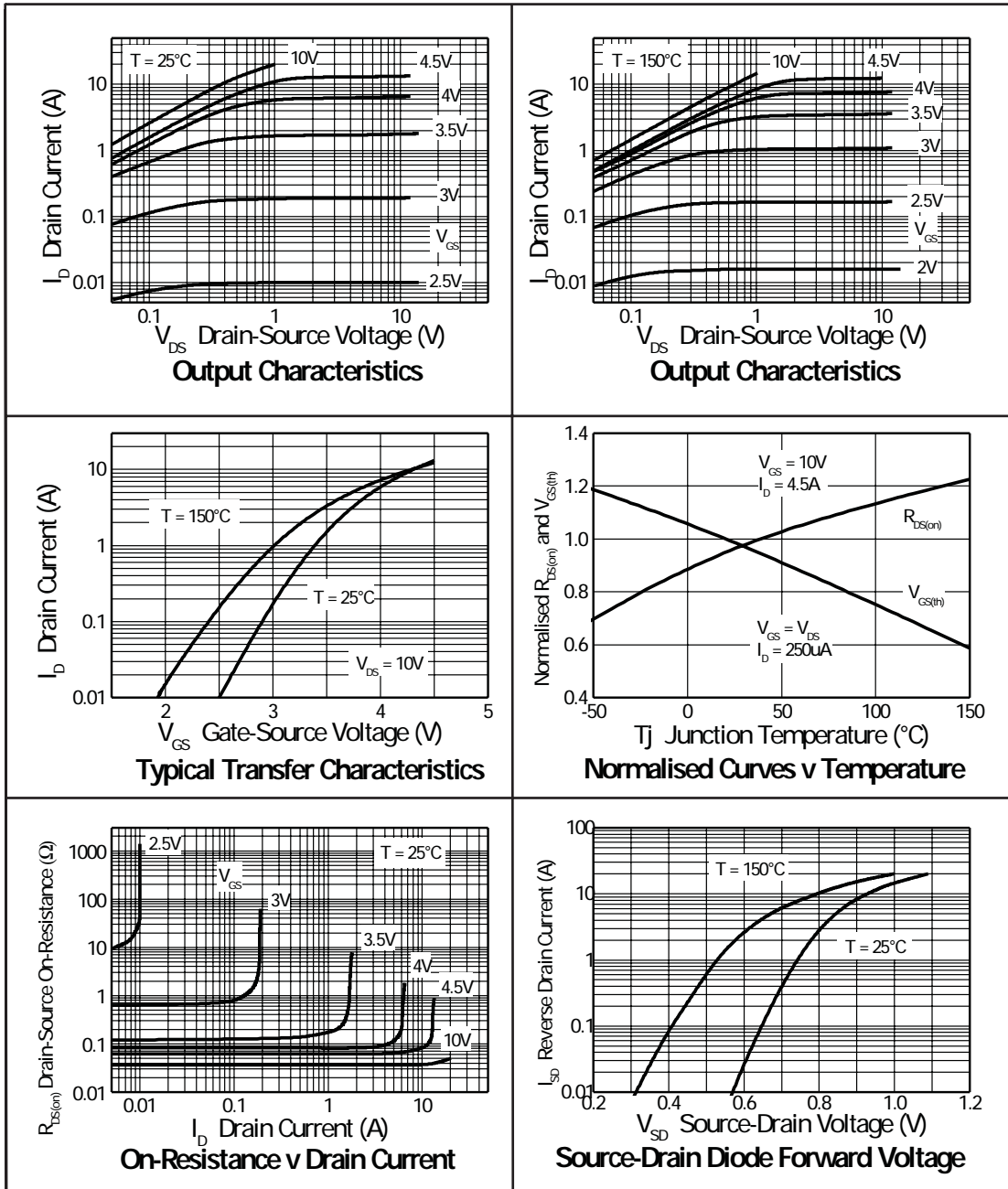
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|--|---------------|------|-------|----------------|----------------------|---|
| STATIC | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | -60 | | | V | $I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | | | -1.0 | μA | $V_{DS} = -60\text{V}$, $V_{GS} = 0\text{V}$ |
| Gate-Body Leakage | I_{GSS} | | | 100 | nA | $V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$ |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | -1.0 | | | V | $I_D = -250\mu\text{A}$, $V_{DS} = V_{GS}$ |
| Static Drain-Source On-State Resistance ⁽¹⁾ | $R_{DS(on)}$ | | | 0.085 0.125 | Ω Ω | $V_{GS} = -10\text{V}$, $I_D = -2.9\text{A}$ $V_{GS} = -4.5\text{V}$, $I_D = -2.4\text{A}$ |
| Forward Transconductance ^{(1) (3)} | g_{fs} | | 7.2 | | S | $V_{DS} = -15\text{V}$, $I_D = -2.9\text{A}$ |
| DYNAMIC ⁽³⁾ | | | | | | |
| Input Capacitance | C_{iss} | | 1021 | | pF | $V_{DS} = -30\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$ |
| Output Capacitance | C_{oss} | | 83.1 | | pF | |
| Reverse Transfer Capacitance | C_{rss} | | 56.4 | | pF | |
| SWITCHING ^{(2) (3)} | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | | 3.5 | | ns | $V_{DD} = -30\text{V}$, $I_D = -1\text{A}$ $R_G = 6.0\Omega$, $V_{GS} = -10\text{V}$ |
| Rise Time | t_r | | 4.1 | | ns | |
| Turn-Off Delay Time | $t_{d(off)}$ | | 35 | | ns | |
| Fall Time | t_f | | 10 | | ns | |
| Gate Charge | Q_g | | 12.1 | | nC | $V_{DS} = -30\text{V}$, $V_{GS} = -5\text{V}$, $I_D = -2.9\text{A}$ |
| Total Gate Charge | Q_g | | 24.2 | | nC | $V_{DS} = -30\text{V}$, $V_{GS} = -10\text{V}$, $I_D = -2.9\text{A}$ |
| Gate-Source Charge | Q_{gs} | | 2.5 | | nC | |
| Gate-Drain Charge | Q_{gd} | | 3.7 | | nC | |
| SOURCE-DRAIN DIODE | | | | | | |
| Diode Forward Voltage ⁽¹⁾ | V_{SD} | | -0.85 | -0.95 | V | $T_J = 25^{\circ}\text{C}$, $I_S = -3.4\text{A}$, $V_{GS} = 0\text{V}$ |
| Reverse Recovery Time ⁽³⁾ | t_{rr} | | 29.2 | | ns | $T_J = 25^{\circ}\text{C}$, $I_F = -2\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ |
| Reverse Recovery Charge ⁽³⁾ | Q_{rr} | | 39.6 | | nC | |

NOTES

- (1) Measured under pulsed conditions. Width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.
 (2) Switching characteristics are independent of operating junction temperature.
 (3) For design aid only, not subject to production testing.

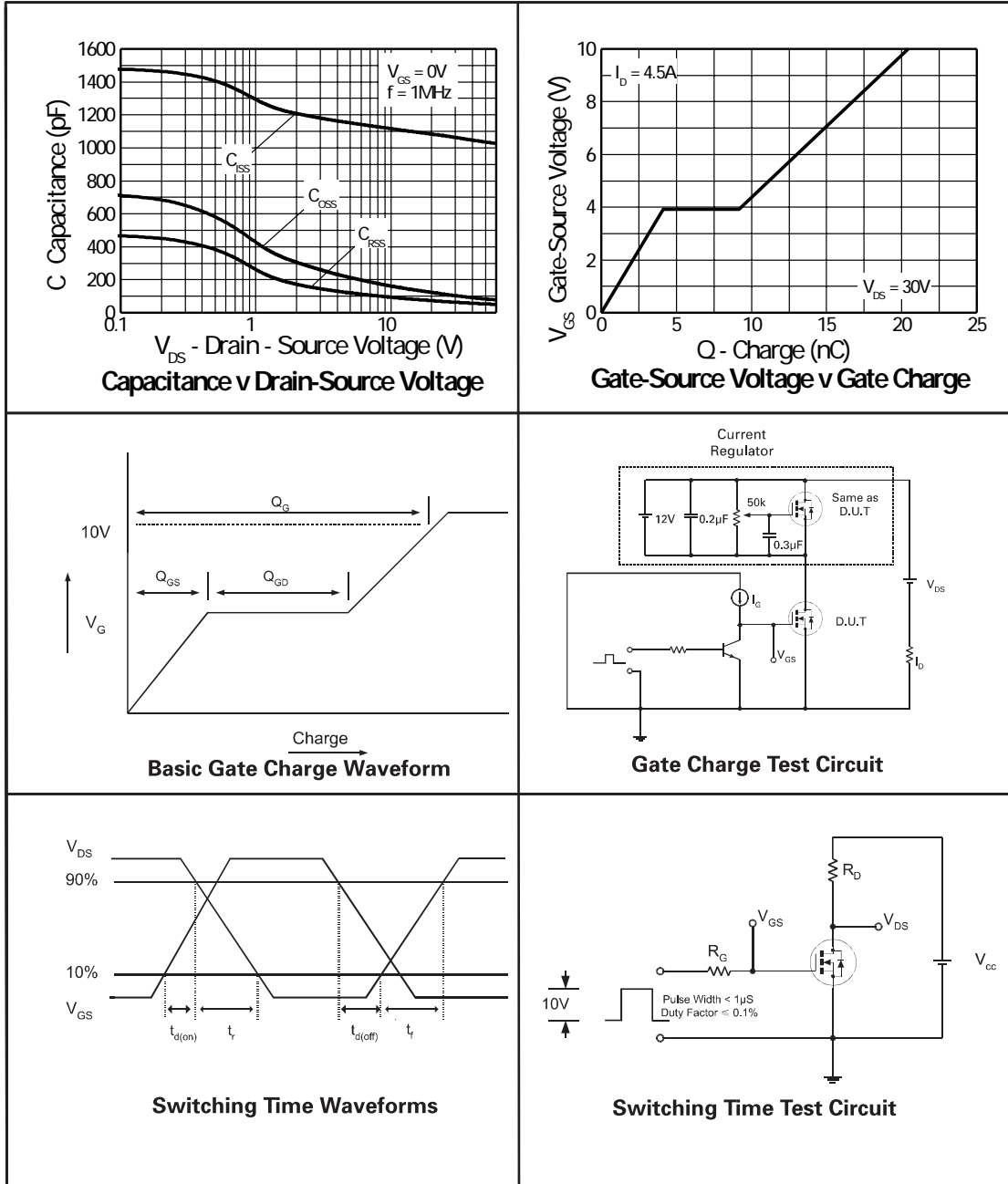
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N-CHANNEL TYPICAL CHARACTERISTICS



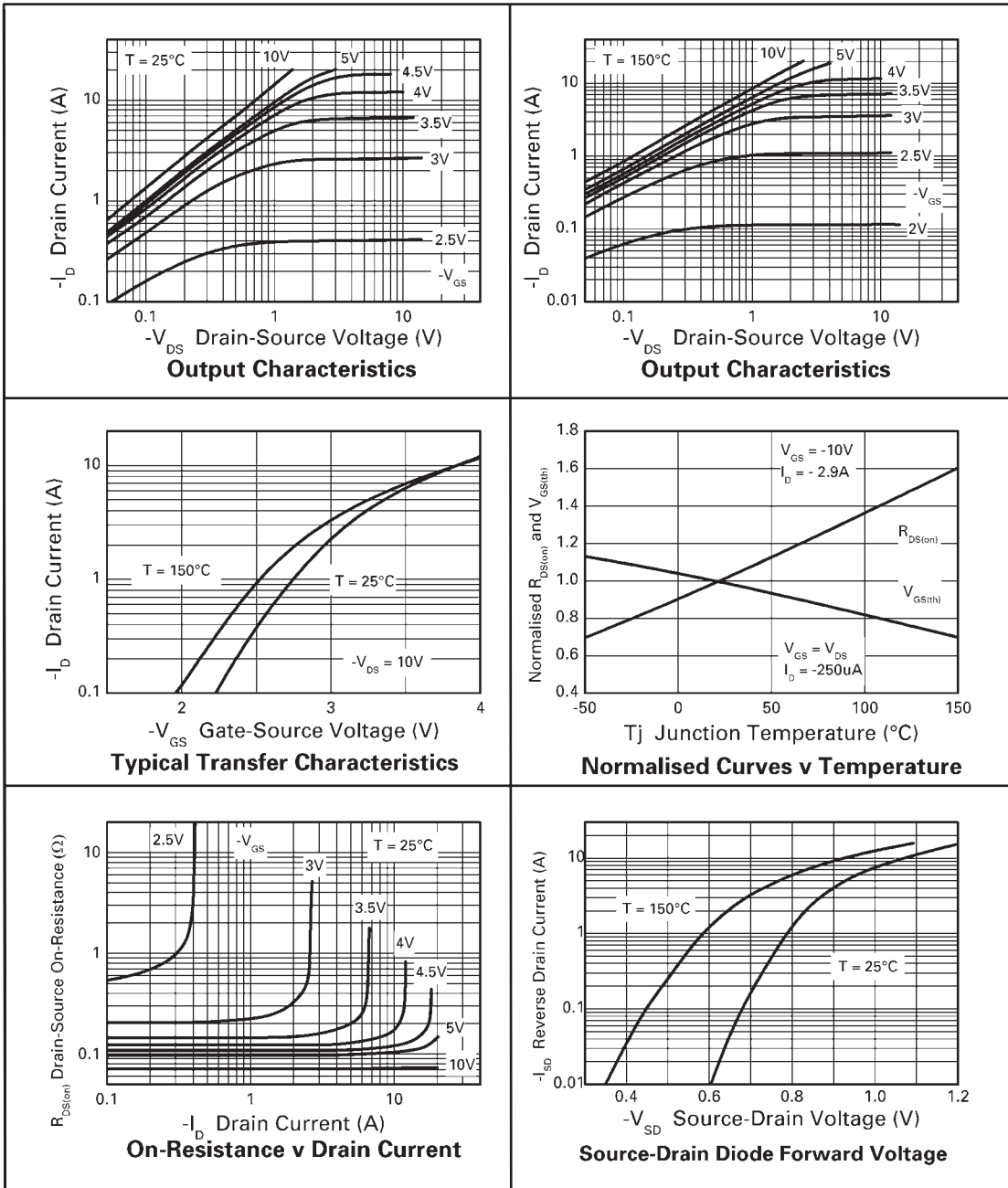
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N-CHANNEL TYPICAL CHARACTERISTICS



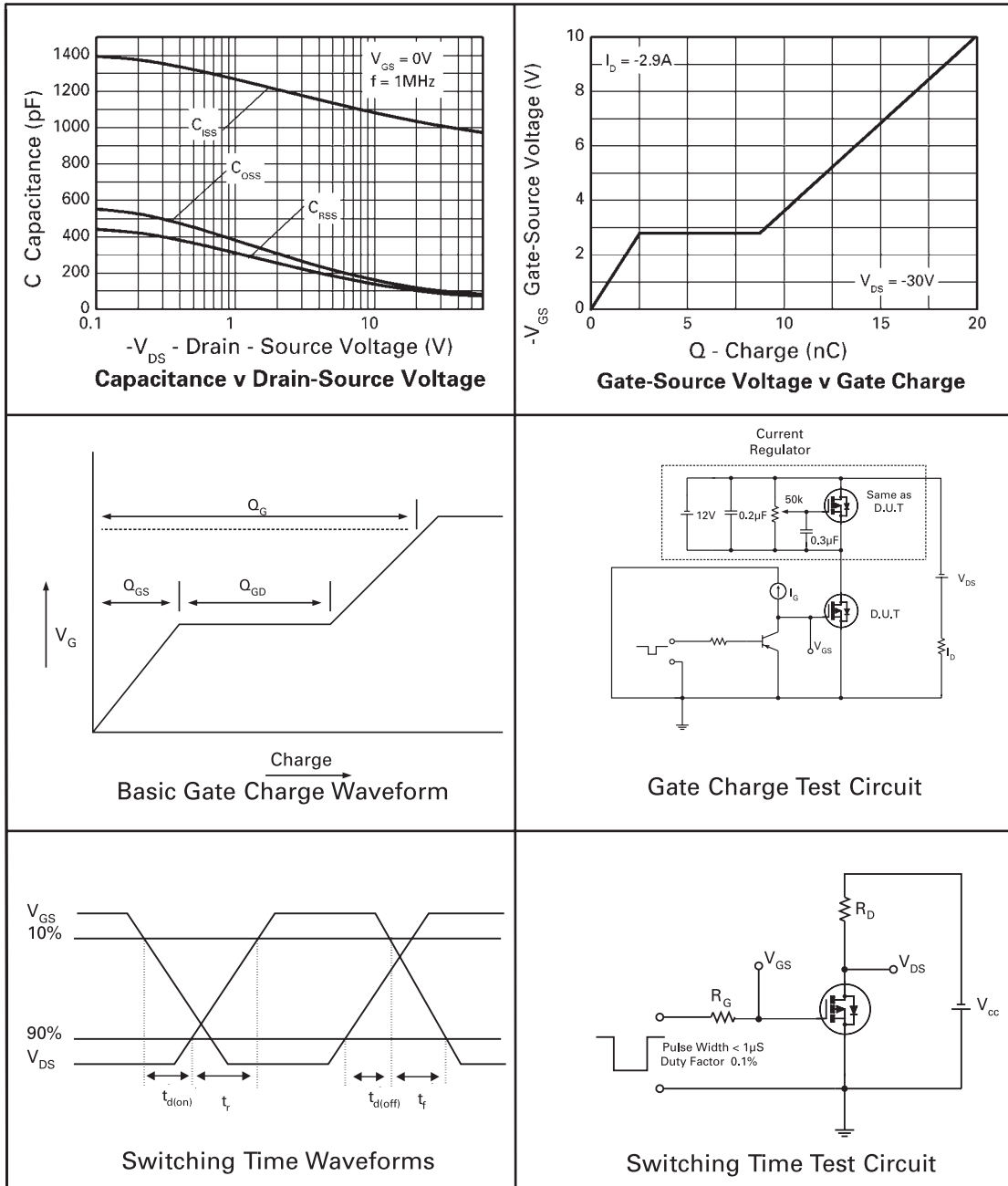
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P-CHANNEL TYPICAL CHARACTERISTICS



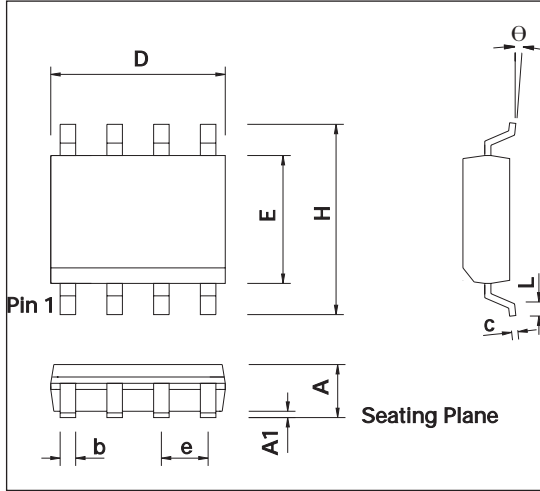
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P-CHANNEL TYPICAL CHARACTERISTICS



ZXMC4559DN8

PACKAGE OUTLINE



CONTROLLING DIMENSIONS ARE IN INCHES
APPROX IN MILLIMETRES

PACKAGE DIMENSIONS

| DIM | INCHES | | MILLIMETRES | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.053 | 0.069 | 1.35 | 1.75 |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 |
| D | 0.189 | 0.197 | 4.80 | 5.00 |
| H | 0.228 | 0.244 | 5.80 | 6.20 |
| E | 0.150 | 0.157 | 3.80 | 4.00 |
| L | 0.016 | 0.050 | 0.40 | 1.27 |
| e | 0.050 BSC | | 1.27 BSC | |
| b | 0.013 | 0.020 | 0.33 | 0.51 |
| c | 0.008 | 0.010 | 0.19 | 0.25 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.010 | 0.020 | 0.25 | 0.50 |

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