

Product Summary

| Device | $V_{(BR)DSS}$ | $R_{DS(on) \max}$ | I_D $T_A = +25^\circ C$ |
|--------|---------------|---------------------------------|------------------------------|
| Q2 | 60V | 55m Ω @ $V_{GS} = 10V$ | 4.7A |
| Q1 | -60V | 105m Ω @ $V_{GS} = -10V$ | -3.9A |

Description

This new generation MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

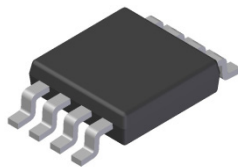
- DC-DC Converters
- Power Management Functions
- Backlighting

Features and Benefits

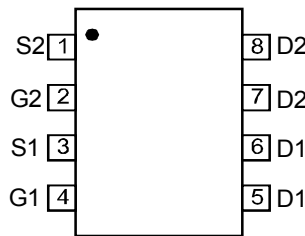
- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

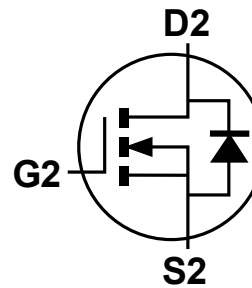
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish annealed over Copper leadframe Solderable per MIL-STD-202, Method 208
- Weight: 0.074 grams (approximate)



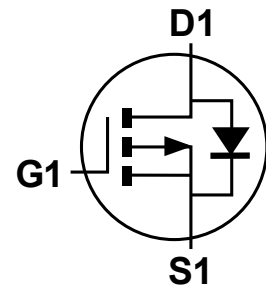
Top View



TOP VIEW
Internal Schematic



N-Channel MOSFET



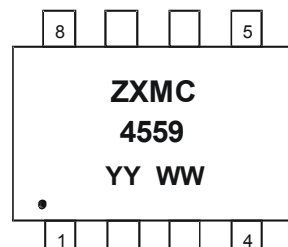
P-Channel MOSFET

Ordering Information (Note 4)

| Part Number | Compliance | Case | Packaging |
|---------------|------------|------|-------------------|
| ZXMC4559DN8TA | Standard | SO-8 | 500/Tape & Reel |
| ZXMC4559DN8TC | Standard | SO-8 | 2,500/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



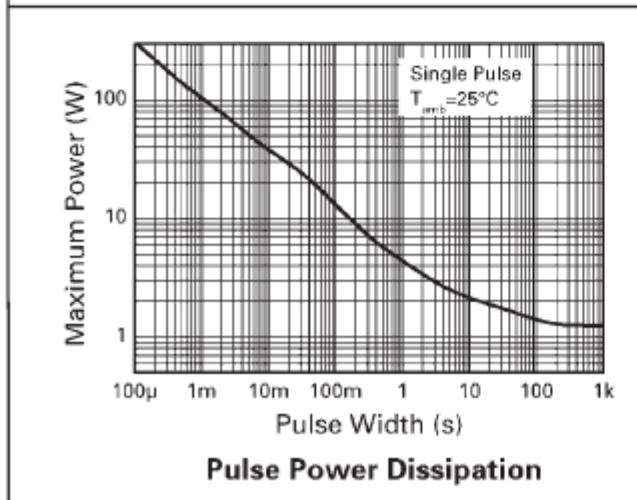
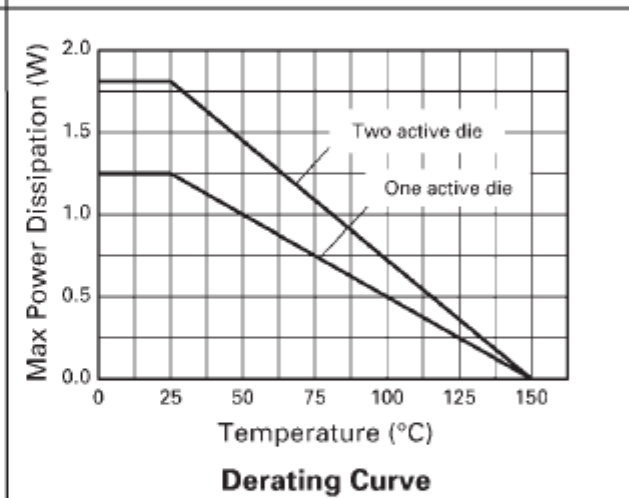
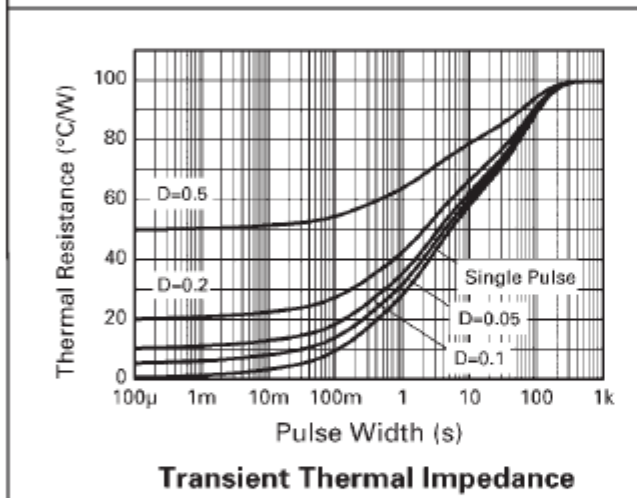
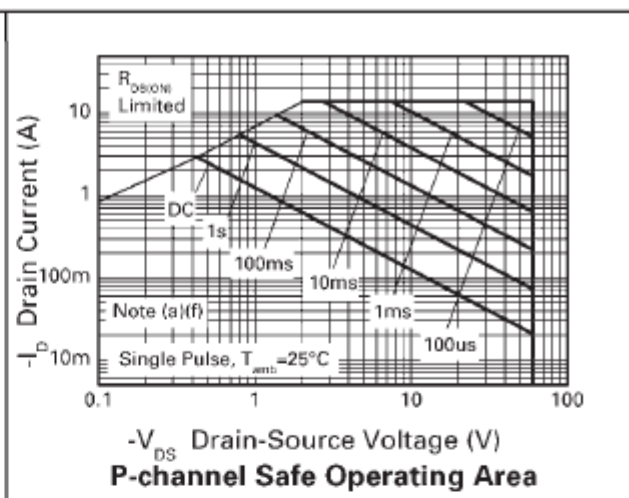
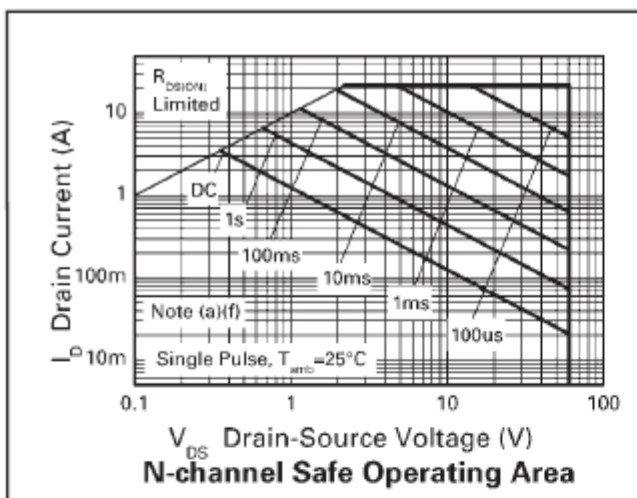
ZXMC4559 = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 14 = 2014)
 WW = Week (01 - 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value_Q2 | Value_Q1 | Units | |
|-------------------------------------------------------------------|-------------------------|----------------|----------|-------|---|
| Drain-Source Voltage | V _{DSS} | 60 | -60 | V | |
| Gate-Source Voltage | V _{GSS} | ±20 | ±20 | V | |
| Continuous Drain Current V _{GS} = 10V | SteadyState (Note 5) | I _D | 3.6 | -2.6 | A |
| | t<10s (Note 6) | I _D | 4.7 | -3.9 | A |
| Maximum Body Diode Forward Current at t<10s (Note 6) | I _S | 3.4 | -3.2 | A | |
| Pulsed Drain Current (300µs pulse, duty cycle = 2%) | I _{DM} | 22.2 | -18.3 | A | |
| Pulsed Source Current (Body Diode) (300µs pulse, duty cycle = 2%) | I _{SM} | 22.2 | -18.3 | A | |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Units |
|--------------------------------------------------|-----------------------------------|-------------|-------|
| Power Dissipation | P _D | 1.25 | W |
| Linear Derating Factor (Note 5) | | 10 | mW/°C |
| Power Dissipation | P _D | 2.1 | W |
| Linear Derating Factor (Note 6) | | 17 | mW/°C |
| Thermal Resistance, Junction to Ambient (Note 5) | R _{θJA} | 100 | °C/W |
| Thermal Resistance, Junction to Ambient (Note 6) | R _{θJA} | 58 | |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |



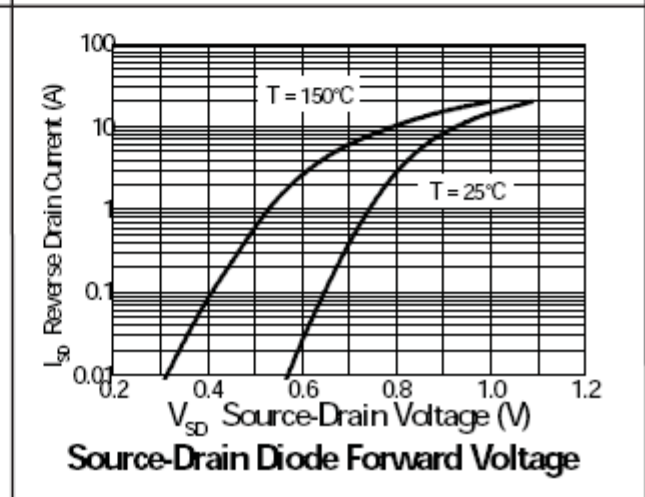
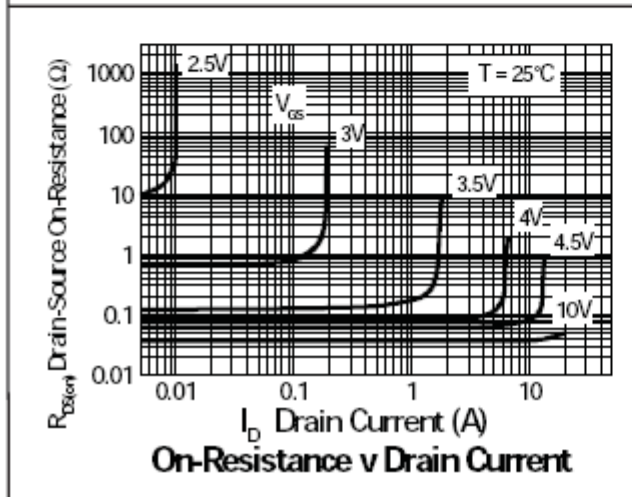
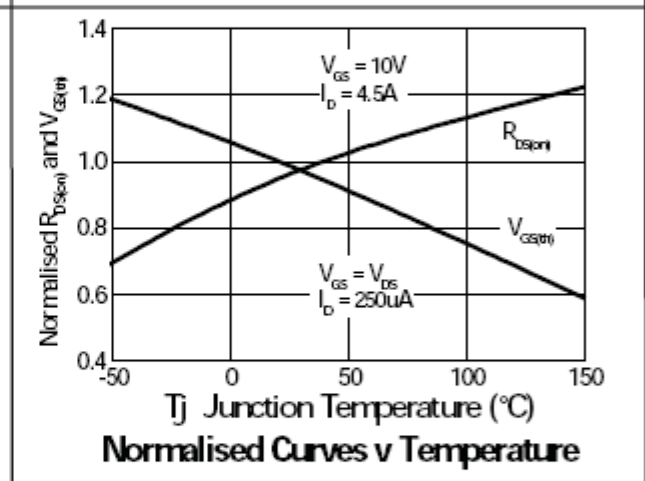
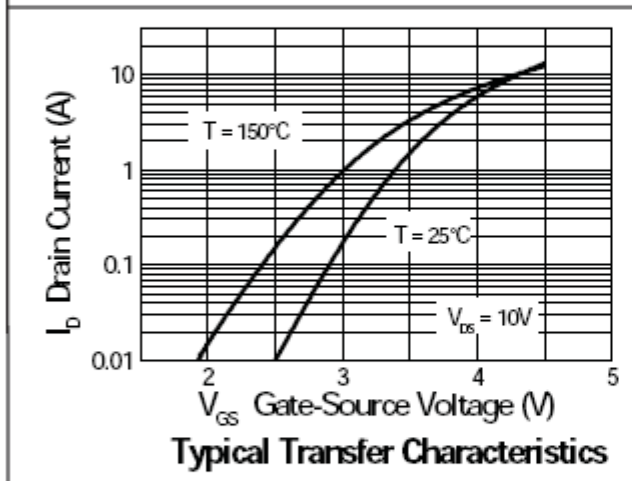
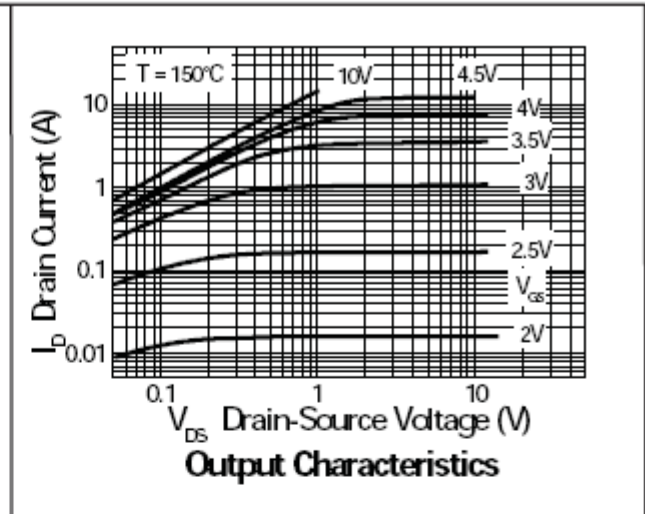
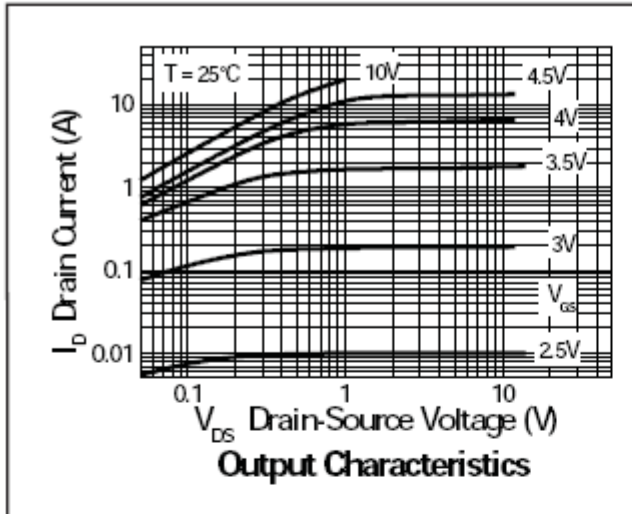
Electrical Characteristics N-Channel Q2 (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--------------------------------------------|---------------------|-----|------|------|------|----------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 60 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 1.0 | μA | V _{DS} = 60V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 1.0 | — | — | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | — | 55 | mΩ | V _{GS} = 10V, I _D = 4.5A |
| | | — | — | 75 | | V _{GS} = 4.5V, I _D = 4.0A |
| Diode Forward Voltage | V _{SD} | — | 0.85 | 1.2 | V | V _{GS} = 0V, I _S = 5.5A |
| Forward Transconductance | g _{fs} | — | 10.2 | — | S | V _{DS} = 15V, I _D = 4.5A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 1063 | — | pF | V _{DS} = 30V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 104 | — | | |
| Reverse Transfer Capacitance | C _{rss} | — | 64 | — | | |
| Total Gate Charge (V _{GS} = 5.0V) | Q _g | — | 11 | — | nC | V _{DS} = 30V, I _D = 4.5A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 20.4 | — | | |
| Gate-Source Charge | Q _{gs} | — | 4.1 | — | | |
| Gate-Drain Charge | Q _{gd} | — | 5.1 | — | | |
| Turn-On Delay Time | t _{D(on)} | — | 3.5 | — | nS | V _{DD} = 30V, I _D = 1.0A V _{GS} = 10V, R _G = 6.0Ω |
| Turn-On Rise Time | t _r | — | 4.1 | — | | |
| Turn-Off Delay Time | t _{D(off)} | — | 26.2 | — | | |
| Turn-Off Fall Time | t _f | — | 10.6 | — | | |
| Body Diode Reverse Recovery Time | t _{rr} | — | 22 | — | nS | I _F = 2.2A, di/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{rr} | — | 21.4 | — | nC | I _F = 2.2A, di/dt = 100A/μs |

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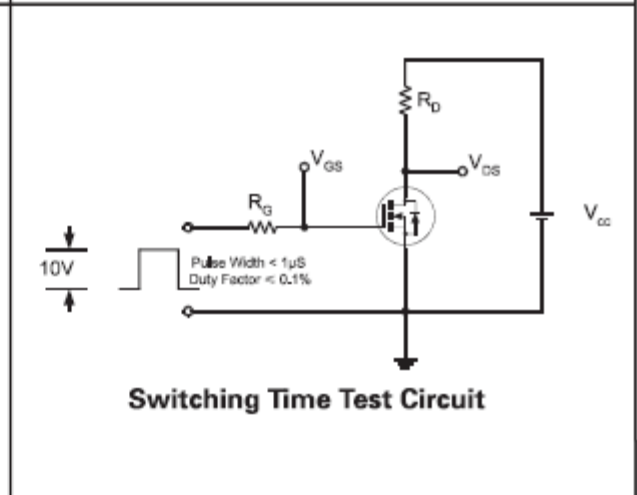
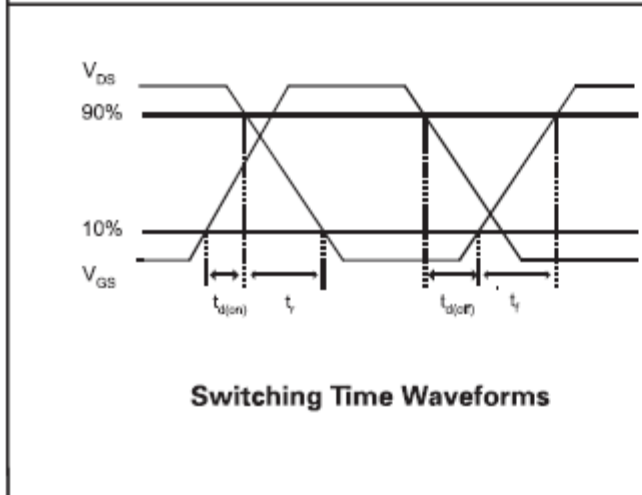
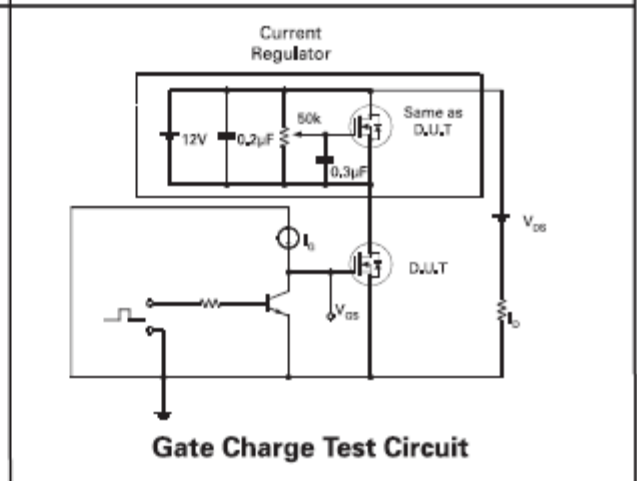
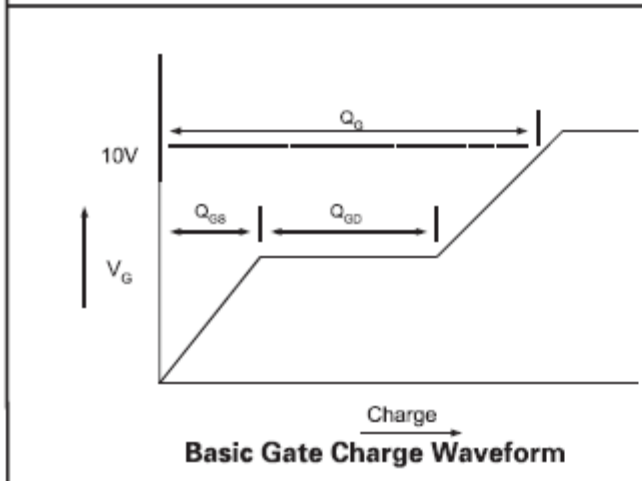
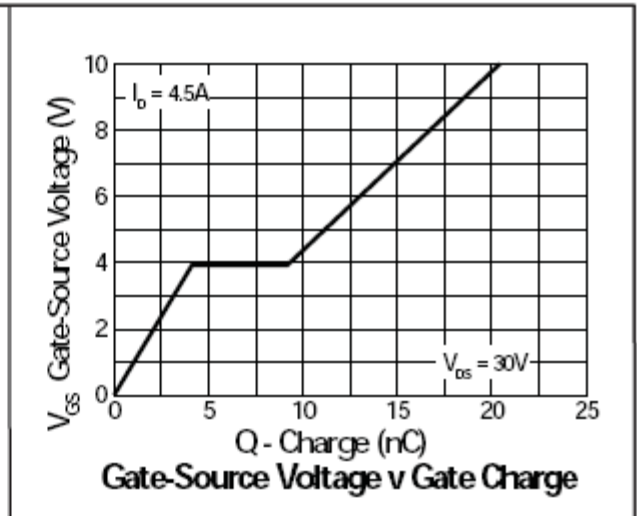
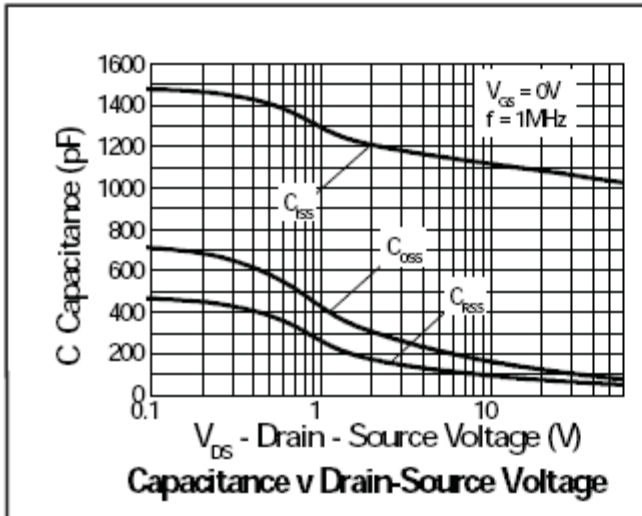
N-Channel Typical Characteristics

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N-Channel Typical Characteristics (cont.)

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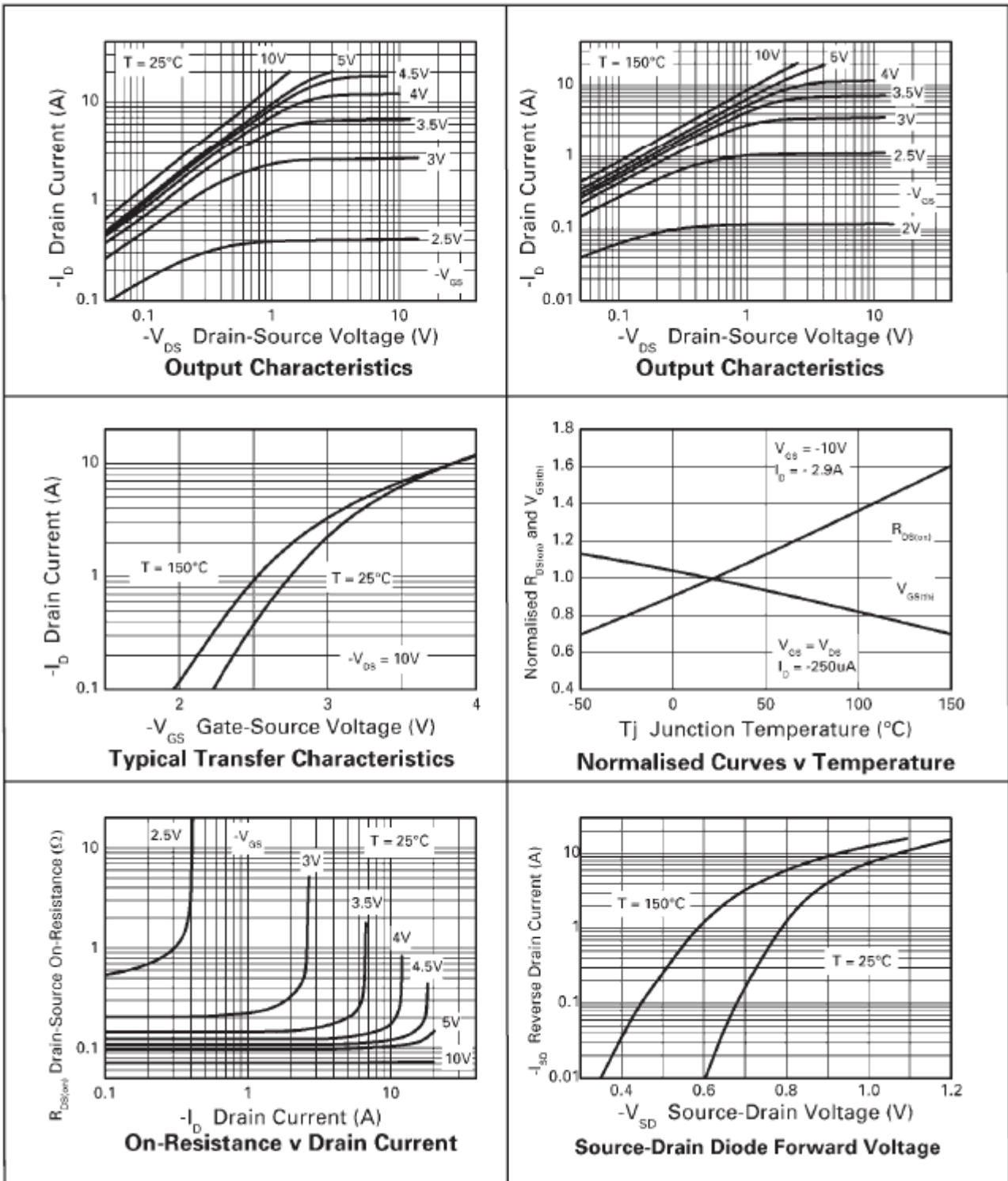
Electrical Characteristics P-Channel Q1 (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---------------------------------------------|---------------------|------|-------|-------|------|-------------------------------------------------------------------------------------------------|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -60 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | -1.0 | μA | V _{DS} = -60V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | -1.0 | — | — | V | V _{DS} = V _{GS} , I _D = -250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | — | 85 | mΩ | V _{GS} = -10V, I _D = -2.9A |
| | | — | — | 125 | | V _{GS} = -4.5V, I _D = -2.4A |
| Diode Forward Voltage | V _{SD} | — | -0.85 | -0.95 | V | V _{GS} = 0V, I _S = -3.4A |
| Forward Transconductance | g _{fs} | — | 7.2 | — | S | V _{DS} = -15V, I _D = -2.9A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iSS} | — | 1021 | — | pF | V _{DS} = -30V, V _{GS} = 0V f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 83.1 | — | | |
| Reverse Transfer Capacitance | C _{rSS} | — | 56.4 | — | | |
| Total Gate Charge (V _{GS} = -5.0V) | Q _g | — | 12.1 | — | nC | V _{DS} = -30V, I _D = -2.9A |
| Total Gate Charge (V _{GS} = -10V) | Q _g | — | 24.2 | — | | |
| Gate-Source Charge | Q _{gs} | — | 2.5 | — | | |
| Gate-Drain Charge | Q _{gd} | — | 3.7 | — | | |
| Turn-On Delay Time | t _{D(on)} | — | 3.5 | — | nS | V _{DD} = -30V, I _D = -1.0A V _{GS} = -10V, R _G = 6.0Ω |
| Turn-On Rise Time | t _r | — | 4.1 | — | | |
| Turn-Off Delay Time | t _{D(off)} | — | 35 | — | | |
| Turn-Off Fall Time | t _f | — | 10 | — | | |
| Body Diode Reverse Recovery Time | t _{rr} | — | 29.2 | — | nS | I _S = -2.0A, dI/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{rr} | — | 39.6 | — | nC | I _S = -2.0A, dI/dt = 100A/μs |

- Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 7. Short duration pulse test used to minimize self-heating effect.
 8. Guaranteed by design. Not subject to product testing.

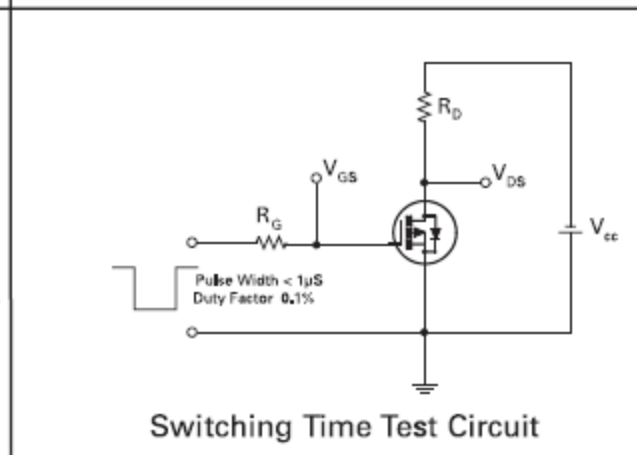
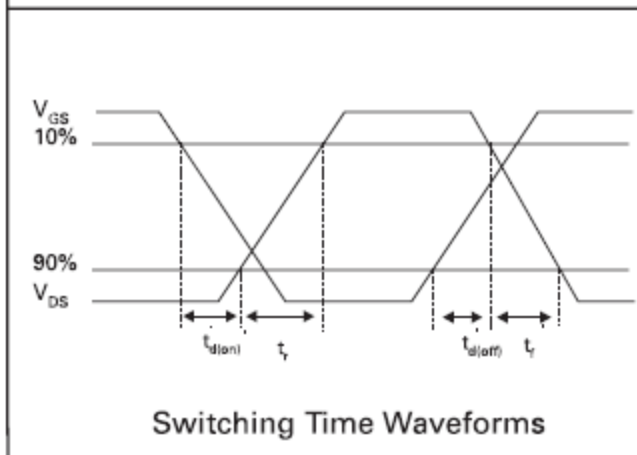
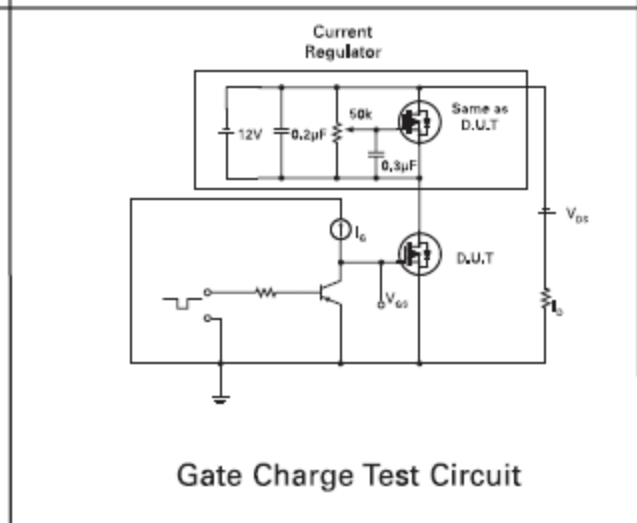
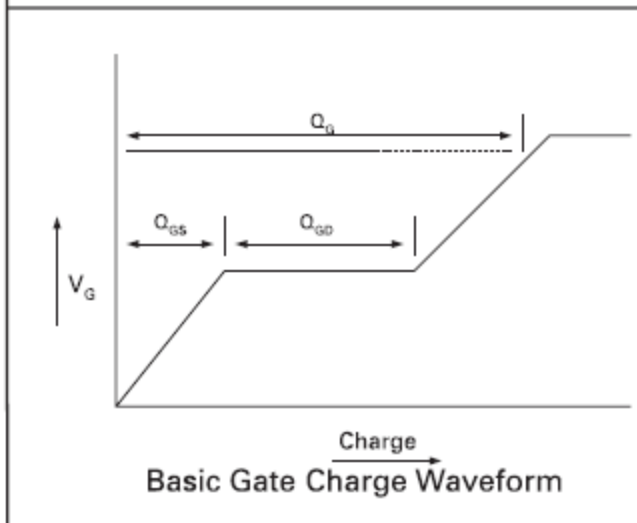
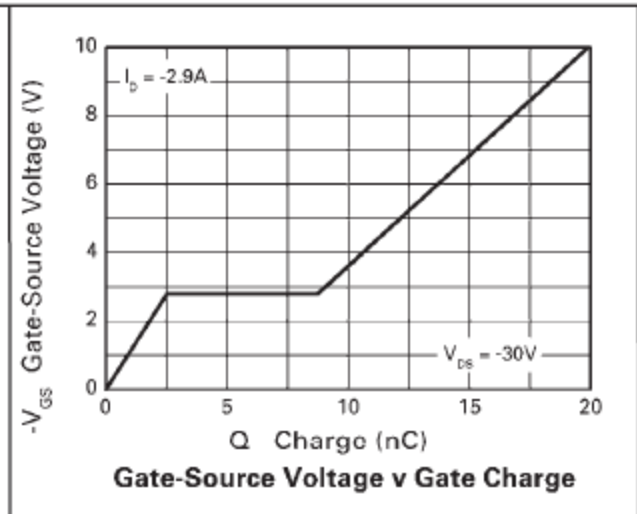
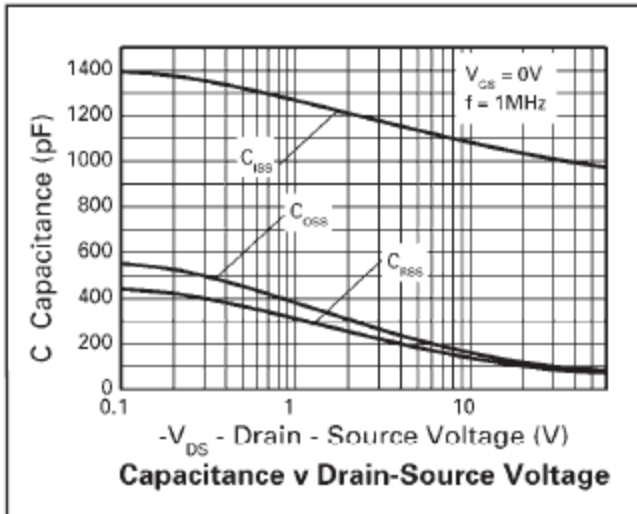
P-Channel Typical Characteristics

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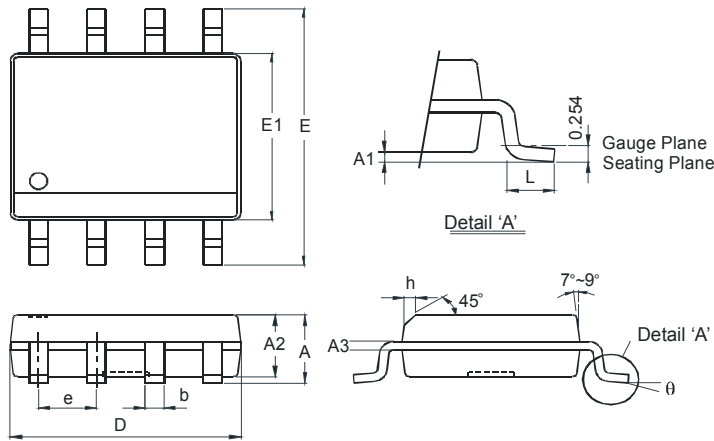
P-Channel Typical Characteristics (cont.)

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Package Outline Dimensions

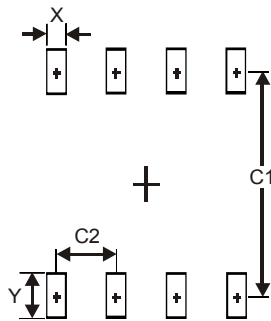
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SO-8 | | |
|----------------------|----------|------|
| Dim | Min | Max |
| A | - | 1.75 |
| A1 | 0.10 | 0.20 |
| A2 | 1.30 | 1.50 |
| A3 | 0.15 | 0.25 |
| b | 0.3 | 0.5 |
| D | 4.85 | 4.95 |
| E | 5.90 | 6.10 |
| E1 | 3.85 | 3.95 |
| e | 1.27 Typ | |
| h | - | 0.35 |
| L | 0.62 | 0.82 |
| θ | 0° | 8° |
| All Dimensions in mm | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| X | 0.60 |
| Y | 1.55 |
| C1 | 5.4 |
| C2 | 1.27 |

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