

ASYMMETRIC DUAL N-CANNEL ENHANCEMENT MODE MOSFET

Features

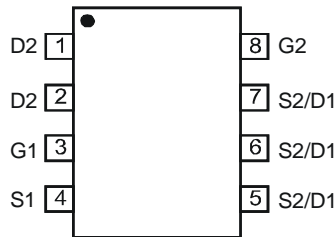
- DIOFET utilize a unique patented process to monolithically integrate a MOSFET and a Schottky in a single die to deliver:
 - Low $R_{DS(on)}$ – minimizes conduction loss
 - Low V_{SD} – reducing the losses due to body diode construction
 - Low Q_{rr} – lower Q_{rr} of the integrated Schottky reduces body diode switching losses
 - Low gate capacitance (Q_g/Q_{gs}) ratio – reduces risk of shoot-through or cross conduction currents at high frequencies
 - Avalanche rugged – I_{AR} and E_{AR} rated
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

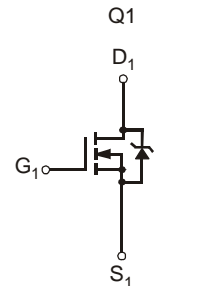
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.072 grams (approximate)



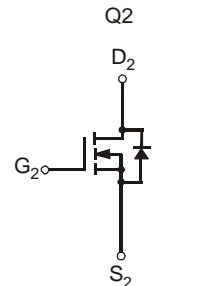
Top View



Top View
Internal Schematic



N-Channel MOSFET +
Integrated Schottky Diode



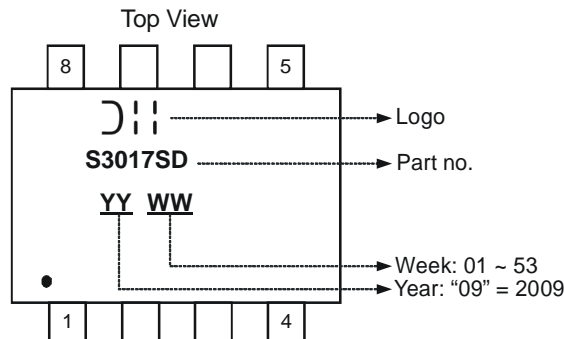
N-Channel MOSFET

Ordering Information (Note 3)

| Part Number | Case | Packaging |
|---------------|------|--------------------|
| DMS3017SSD-13 | SO-8 | 2500 / Tape & Reel |

- Notes:
1. No purposefully added lead.
 2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
 3. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

Marking Information



Maximum Ratings – Q1 @TA = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Unit |
|--|--------------|-----------------------|------------------|-------|------|
| Drain-Source Voltage | | | V _{DSS} | 30 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 4) V _{GS} = 10V | Steady State | T _A = 25°C | I _D | 8.0 | A |
| | | T _A = 70°C | | 6.5 | |
| Continuous Drain Current (Note 5) V _{GS} = 10V | Steady State | T _A = 25°C | I _D | 10 | A |
| | | T _A = 70°C | | 7.8 | |
| Continuous Drain Current (Note 5) V _{GS} = 4.5V | Steady State | T _A = 25°C | I _D | 8.7 | A |
| | | T _A = 70°C | | 7.0 | |
| Pulsed Drain Current (Note 6) | | | I _{DM} | 60 | A |
| Avalanche Current (Notes 6 & 7) | | | I _{AR} | 16 | A |
| Repetitive Avalanche Energy (Notes 6 & 7) L = 0.1mH | | | E _{AR} | 12.8 | mJ |

Maximum Ratings – Q2 @TA = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Unit |
|--|--------------|-----------------------|------------------|-------|------|
| Drain-Source Voltage | | | V _{DSS} | 30 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 4) V _{GS} = 10V | Steady State | T _A = 25°C | I _D | 6.0 | A |
| | | T _A = 70°C | | 4.7 | |
| Continuous Drain Current (Note 5) V _{GS} = 10V | Steady State | T _A = 25°C | I _D | 7.2 | A |
| | | T _A = 70°C | | 6.0 | |
| Continuous Drain Current (Note 5) V _{GS} = 4.5V | Steady State | T _A = 25°C | I _D | 6.0 | A |
| | | T _A = 70°C | | 5.0 | |
| Pulsed Drain Current (Note 6) | | | I _{DM} | 60 | A |
| Avalanche Current (Notes 6 & 7) | | | I _{AR} | 16 | A |
| Repetitive Avalanche Energy (Notes 6 & 7) L = 0.1mH | | | E _{AR} | 12.8 | mJ |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation (Note 4) | P _D | 1.19 | W |
| Thermal Resistance, Junction to Ambient @T _A = 25°C (Note 4) | R _{θJA} | 107 | °C/W |
| Power Dissipation (Note 5) | P _D | 1.79 | W |
| Thermal Resistance, Junction to Ambient @T _A = 25°C (Note 5) | R _{θJA} | 70 | °C/W |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |

- Notes:
- Device mounted on FR-4 substrate PC board, with minimum recommended pad layout. The value in any given application depends on the user's specific board design. Device contains two active die running at equal power.
 - Device mounted on 1 inch x 1 inch FR4 PCB with high coverage of single sided 1oz copper, in still air conditions. Device contains two active die running at equal power.
 - Repetitive rating, pulse width limited by junction temperature.
 - I_{AR} and E_{AR} rating are based on low frequency and duty cycles to keep T_J = 25°C

Electrical Characteristics – Q1 @ T_A = 25°C unless otherwise stated

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 30 | - | - | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | - | - | 100 | μA | V _{DS} = 30V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | - | - | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 1.0 | - | 2.5 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | - | 8.5 | 12 | mΩ | V _{GS} = 10V, I _D = 9.5A |
| | | | 9.5 | 15 | | V _{GS} = 4.5V, I _D = 8.8A |
| Forward Transfer Admittance | Y _{fs} | - | 18 | - | S | V _{DS} = 5V, I _D = 9.5A |
| Diode Forward Voltage | V _{SD} | - | 0.45 | 0.60 | V | V _{GS} = 0V, I _S = 1A |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iSS} | - | 1276 | - | pF | V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oSS} | - | 160 | - | | |
| Reverse Transfer Capacitance | C _{rSS} | - | 136 | - | | |
| Gate Resistance | R _g | - | 1.48 | 2.7 | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | - | 14.3 | - | nC | V _{DS} = 15V, V _{GS} = 4.5V, I _D = 8.8A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | - | 30.6 | - | | |
| Gate-Source Charge | Q _{gs} | - | 3.4 | - | | |
| Gate-Drain Charge | Q _{gd} | - | 4.3 | - | | |
| Turn-On Delay Time | t _{D(on)} | - | 15.8 | - | ns | V _{GS} = 4.5V, V _{DS} = 15V, R _G = 1.8Ω, I _D = 8.8A |
| Turn-On Rise Time | t _r | - | 27.8 | - | | |
| Turn-Off Delay Time | t _{D(off)} | - | 29.7 | - | | |
| Turn-Off Fall Time | t _f | - | 13.6 | - | | |

Notes: 8. Short duration pulse test used to minimize self-heating effect.
 9. Guaranteed by design. Not subject to production testing.

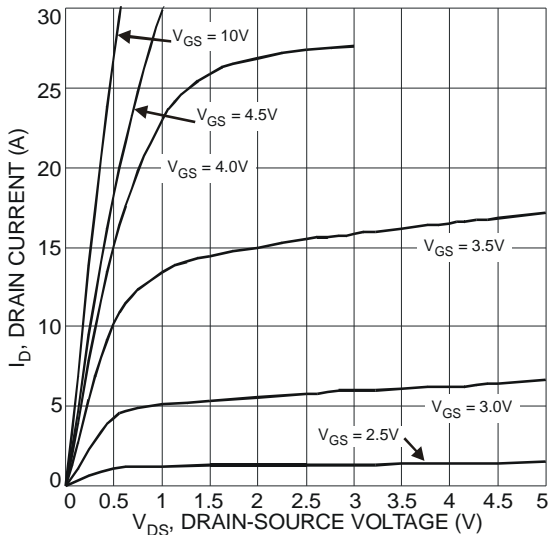


Fig. 1 Typical Output Characteristic

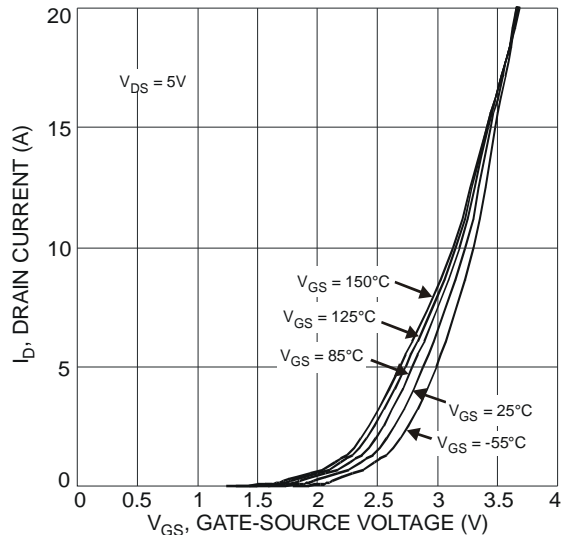


Fig. 2 Typical Transfer Characteristic

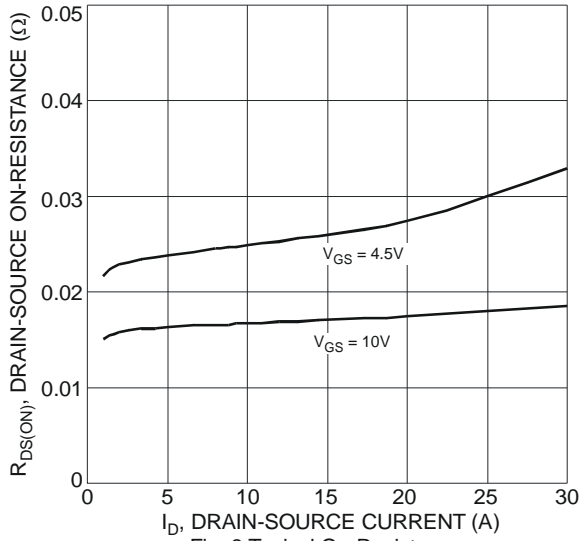


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

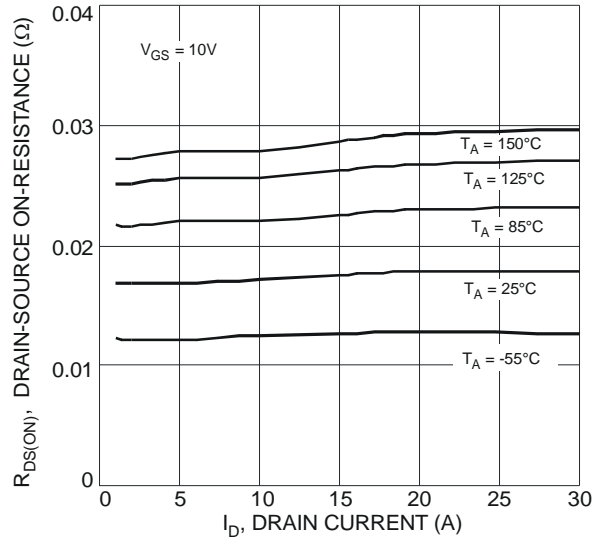


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

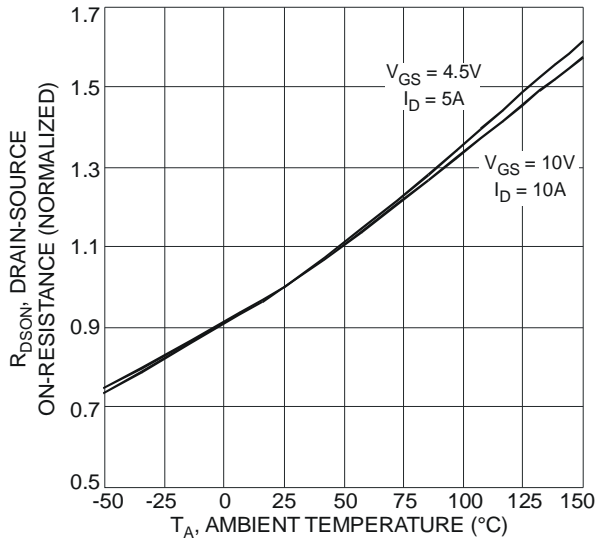


Fig. 5 On-Resistance Variation with Temperature

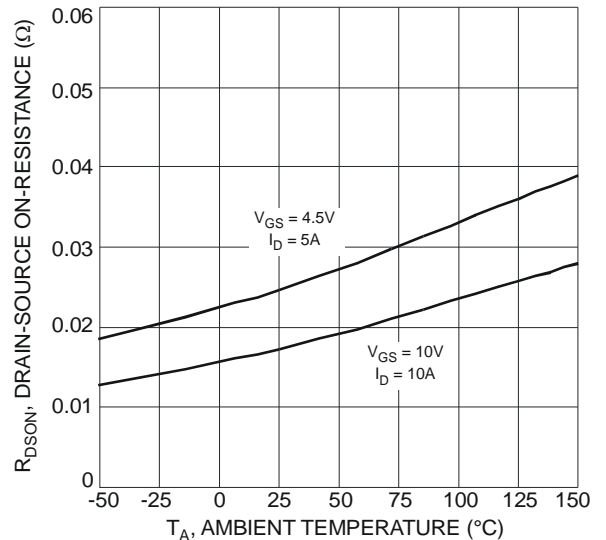


Fig. 6 On-Resistance Variation with Temperature

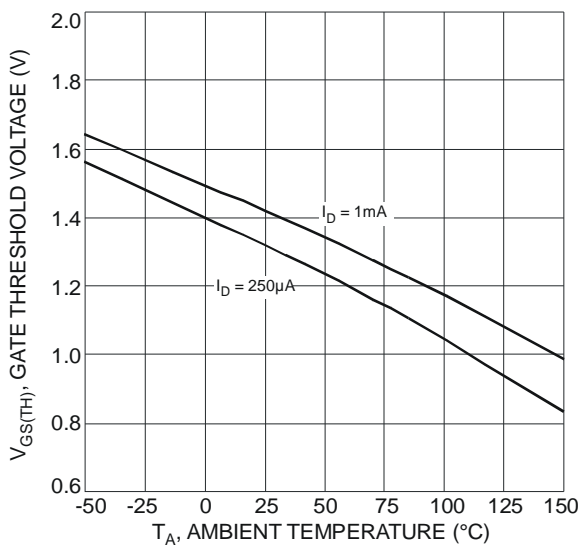


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

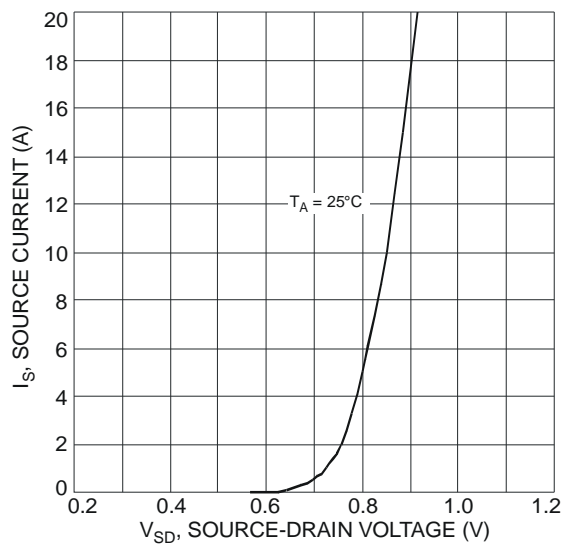


Fig. 8 Diode Forward Voltage vs. Current

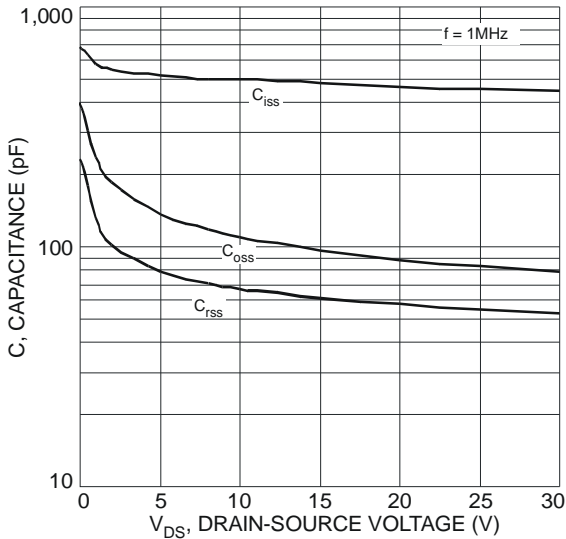


Fig. 9 Typical Total Capacitance

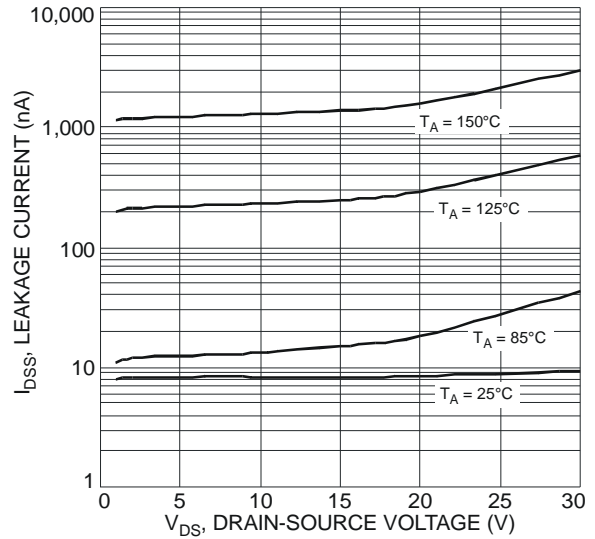


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

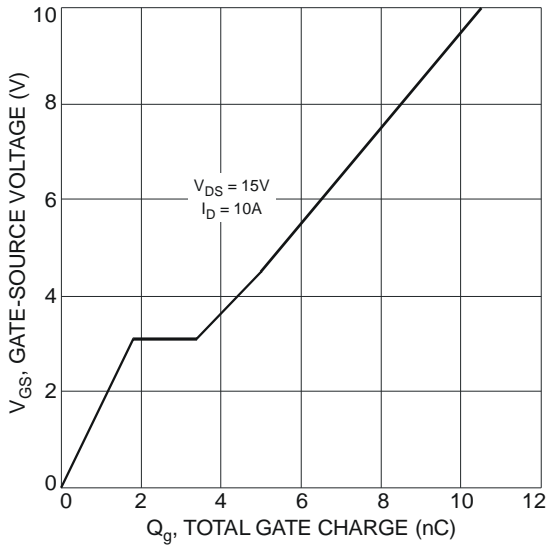
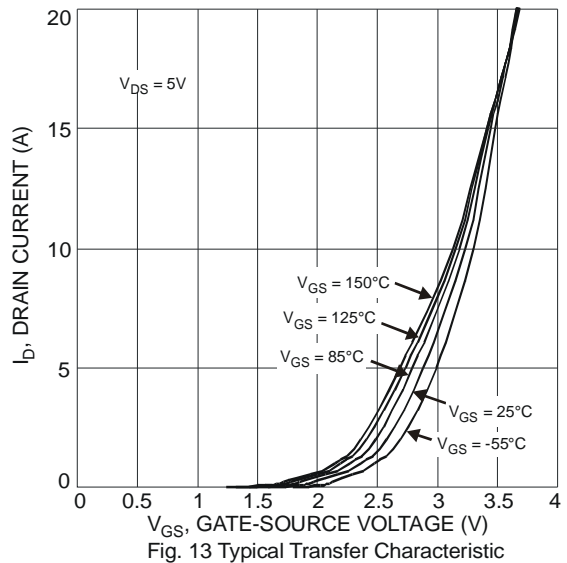
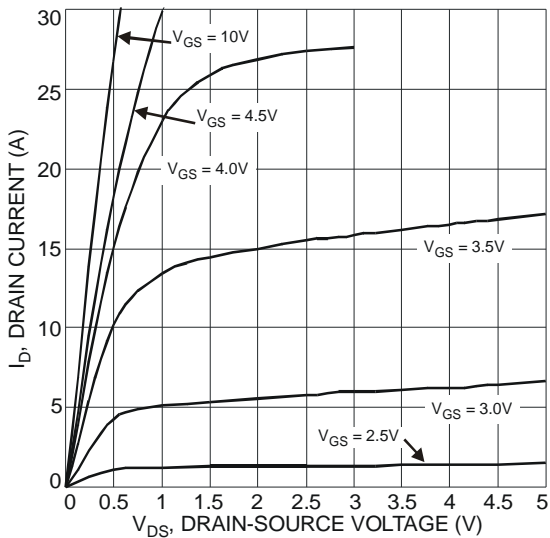


Fig. 11 Gate-Charge Characteristics

Electrical Characteristics – Q2 @ T_A = 25°C unless otherwise stated

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|-------|------|------|--|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 30 | - | - | V | V _{GS} = 0V, I _D = 1mA |
| Zero Gate Voltage Drain Current | I _{DSS} | - | - | 1 | μA | V _{DS} = 30V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | - | - | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 1.0 | - | 2.4 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | - | 15 | 22 | mΩ | V _{GS} = 10V, I _D = 8.8A |
| | | | 25 | 32 | | V _{GS} = 4.5V, I _D = 7A |
| Forward Transfer Admittance | Y _{fs} | - | 2.5 | - | S | V _{DS} = 5V, I _D = 8.8A |
| Diode Forward Voltage | V _{SD} | - | 0.7 | 1 | V | V _{GS} = 0V, I _S = 1A |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iSS} | - | 478.9 | - | pF | V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oSS} | - | 96.7 | - | | |
| Reverse Transfer Capacitance | C _{rSS} | - | 61.4 | - | | |
| Gate Resistance | R _g | - | 1.1 | - | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | - | 5.0 | - | nC | V _{DS} = 15V, V _{GS} = 4.5V, I _D = 10A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | - | 10.5 | - | | |
| Gate-Source Charge | Q _{gs} | - | 1.8 | - | | |
| Gate-Drain Charge | Q _{gd} | - | 1.6 | - | | |
| Turn-On Delay Time | t _{D(on)} | - | 2.9 | - | ns | V _{GS} = 10V, V _{DS} = 15V, R _G = 3Ω, R _L = 1.5Ω |
| Turn-On Rise Time | t _r | - | 7.9 | - | | |
| Turn-Off Delay Time | t _{D(off)} | - | 14.6 | - | | |
| Turn-Off Fall Time | t _f | - | 3.1 | - | | |

Notes: 8. Short duration pulse test used to minimize self-heating effect.
 9. Guaranteed by design. Not subject to production testing.



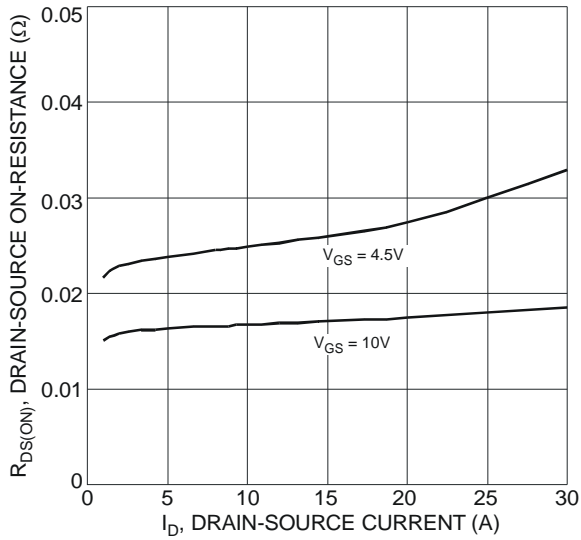


Fig. 14 Typical On-Resistance vs. Drain Current and Gate Voltage

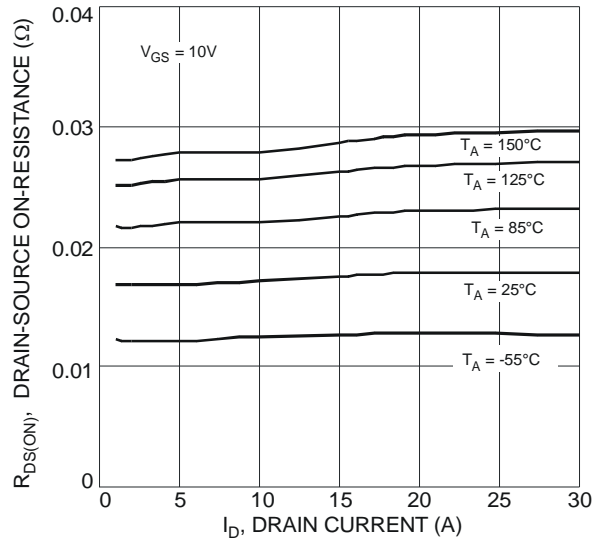


Fig. 15 Typical On-Resistance vs. Drain Current and Temperature

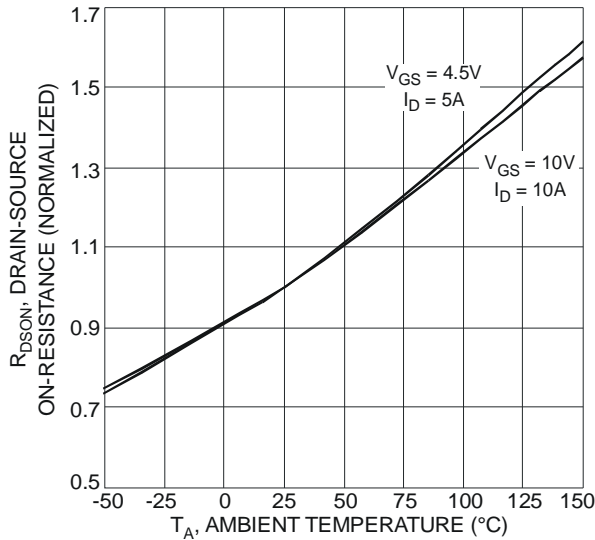


Fig. 16 On-Resistance Variation with Temperature

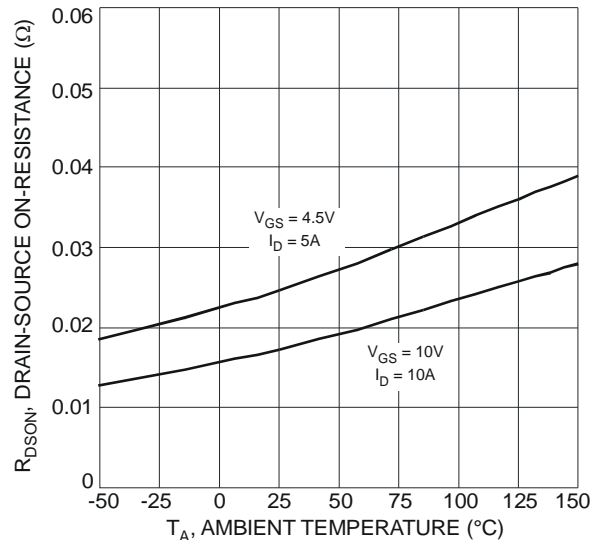


Fig. 17 On-Resistance Variation with Temperature

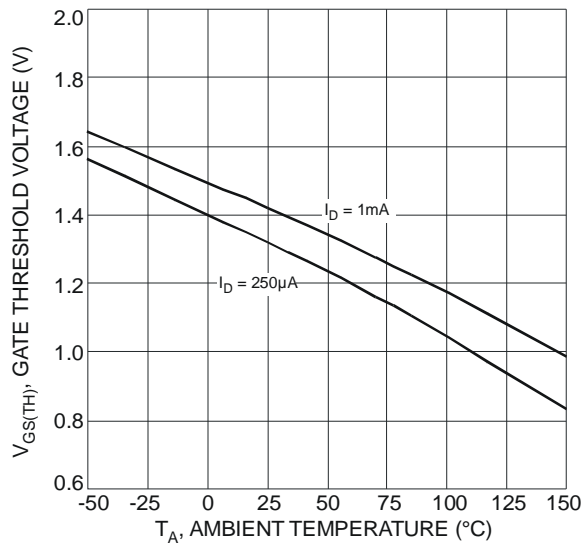


Fig. 18 Gate Threshold Variation vs. Ambient Temperature

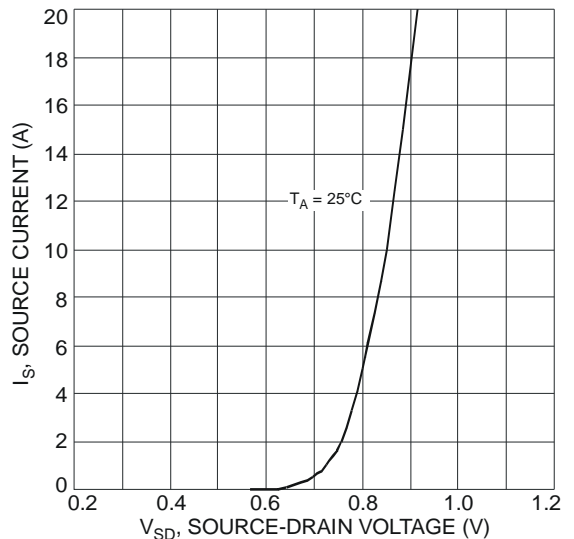


Fig. 19 Diode Forward Voltage vs. Current

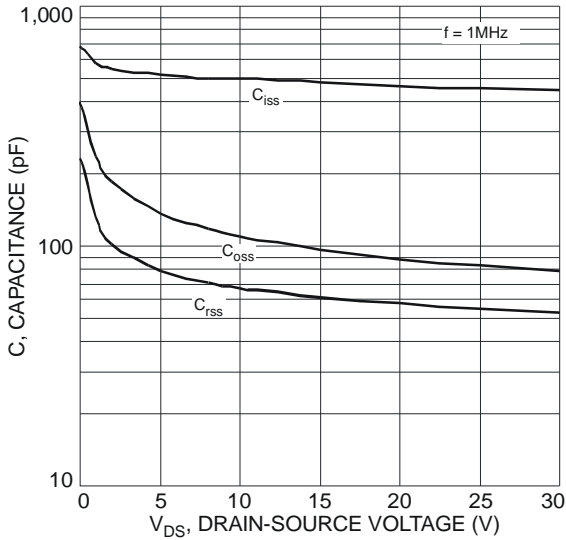


Fig. 20 Typical Total Capacitance

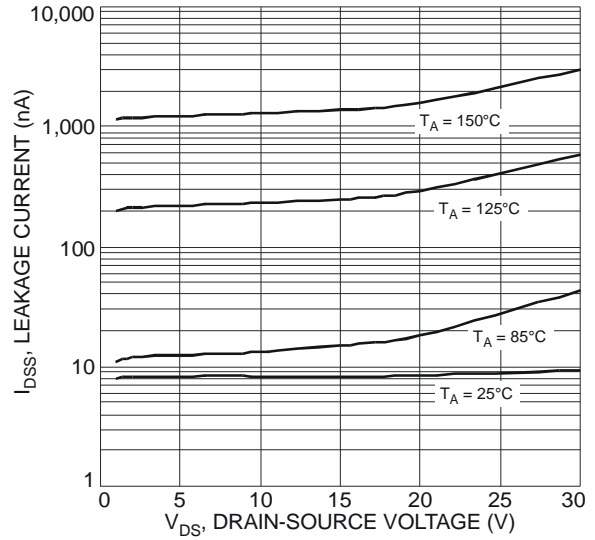


Fig. 21 Typical Leakage Current vs. Drain-Source Voltage

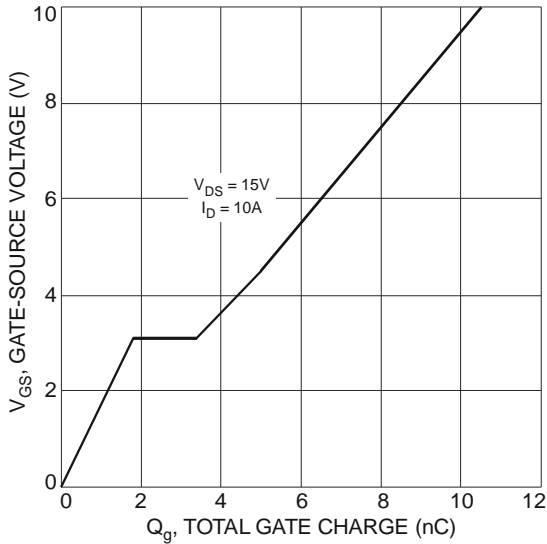


Fig. 22 Gate-Charge Characteristics

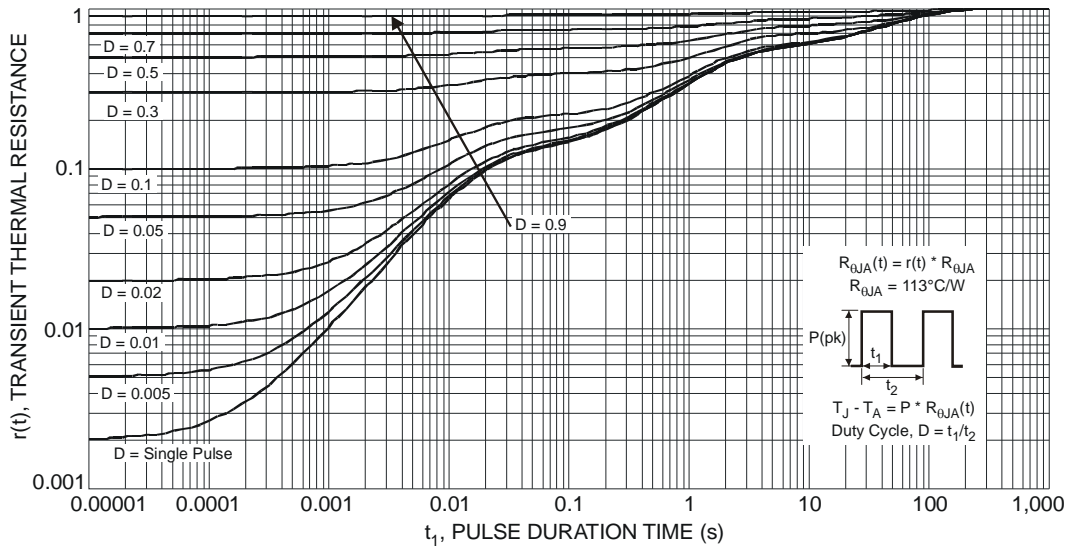
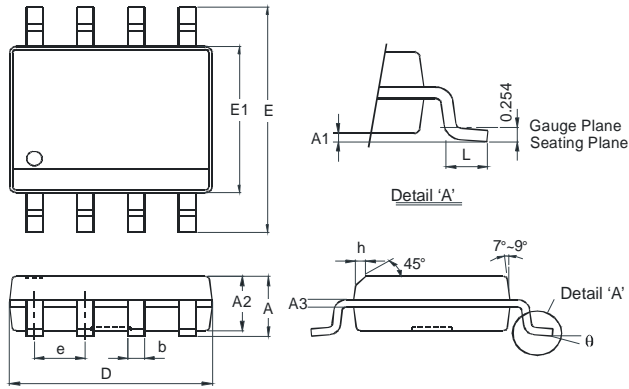


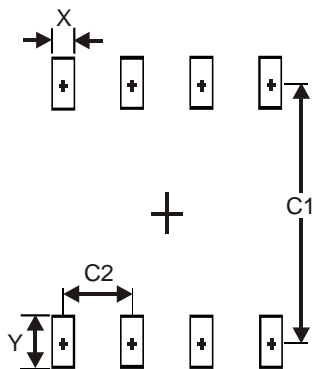
Fig. 23 Transient Thermal Response

Package Outline Dimensions



| 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



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

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