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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



60V COMPLEMENTARY ENHANCEMENT MODE MOSFET H-BRIDGE
Product Summary

| Device | V _{(BR)DSS} | R _{DS(ON)} Max | I _D Max T _A = 25°C |
|-----------|----------------------|---------------------------------|---|
| N-Channel | 60V | 100mΩ @ V _{GS} = 10V | 4.1A |
| | | 120mΩ @ V _{GS} = 4.5V | 3.7A |
| P-Channel | -60V | 170mΩ @ V _{GS} = -10V | 3.1A |
| | | 250mΩ @ V _{GS} = -4.5V | 2.6A |

Description

This new generation complementary MOSFET H-Bridge features low on-resistance achievable with low gate drive.

Applications

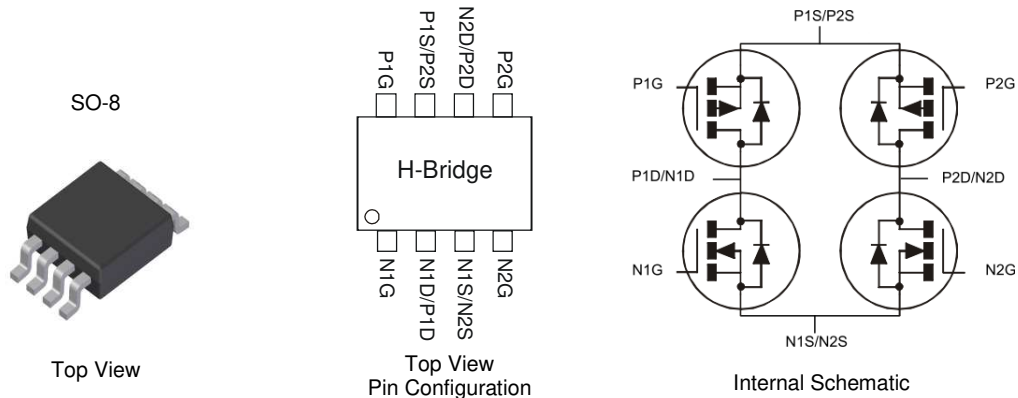
- DC Motor Control
- DC-AC Inverters

Features

- 2 x N + 2 x P Channels in a SOIC Package
- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

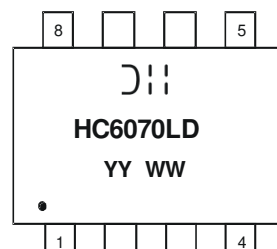
Mechanical Data

- 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 Indicator: See diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe.
Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.074 grams (Approximate)


Ordering Information (Note 4)

| Part Number | Case | Packaging |
|----------------|------|-------------------|
| DMHC6070LSD-13 | 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


D = Manufacturer's Marking
 HC6070LD = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 16 = 2016)
 WW = Week (01 - 53)

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

| Characteristic | | | Symbol | Value | Units |
|---|--------------|--|------------------|------------|-------|
| Drain-Source Voltage | | | V _{DSS} | 60 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 5) V _{GS} = 10V | Steady State | T _A = +25°C T _A = +70°C | I _D | 3.1 2.5 | A |
| | t < 10s | T _A = +25°C T _A = +70°C | I _D | 4.1 3.3 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | I _S | 2.0 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | I _{DM} | 15 | A |
| Avalanche Current (Note 6) L = 0.1mH | | | I _{AS} | 12 | A |
| Avalanche Energy (Note 6) L = 0.1mH | | | E _{AS} | 8 | mJ |

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

| Characteristic | | | Symbol | Value | Units |
|--|--------------|--|------------------|--------------|-------|
| Drain-Source Voltage | | | V _{DSS} | -60 | V |
| Gate-Source Voltage | | | V _{GSS} | ±20 | V |
| Continuous Drain Current (Note 5) V _{GS} = -10V | Steady State | T _A = 25°C T _A = 70°C | I _D | -2.4 -1.9 | A |
| | t < 10s | T _A = 25°C T _A = 70°C | I _D | -3.1 -2.5 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | I _S | -2.0 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | I _{DM} | -12 | A |
| Avalanche Current (Note 6) L = 0.1mH | | | I _{AS} | -12 | A |
| Avalanche Energy (Note 6) L = 0.1mH | | | E _{AS} | 8 | mJ |

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

| Characteristic | | Symbol | Value | Units |
|--|--------------|-----------------------------------|-------------|-------|
| Total Power Dissipation (Note 5) | | P _D | 1.6 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R _{θJA} | 75 | °C/W |
| | t < 10s | | 45 | |
| Thermal Resistance, Junction to Case (Note 5) | | R _{θJC} | 11 | |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

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

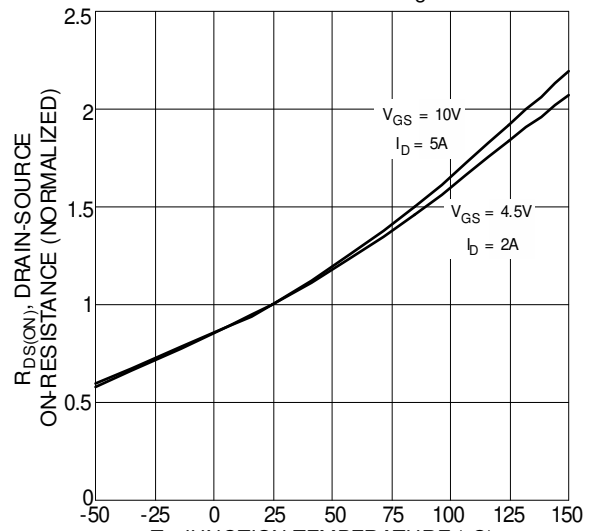
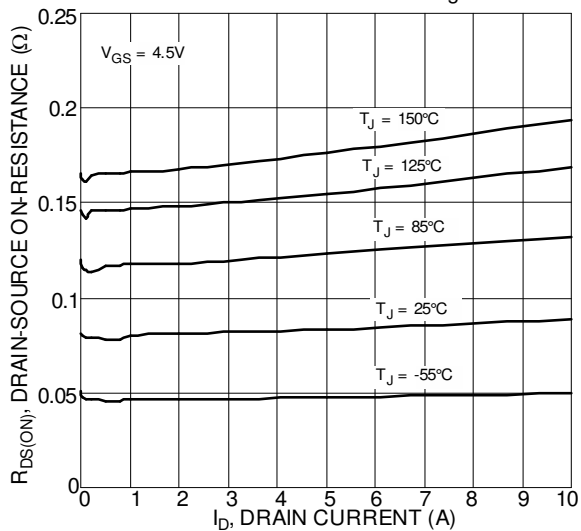
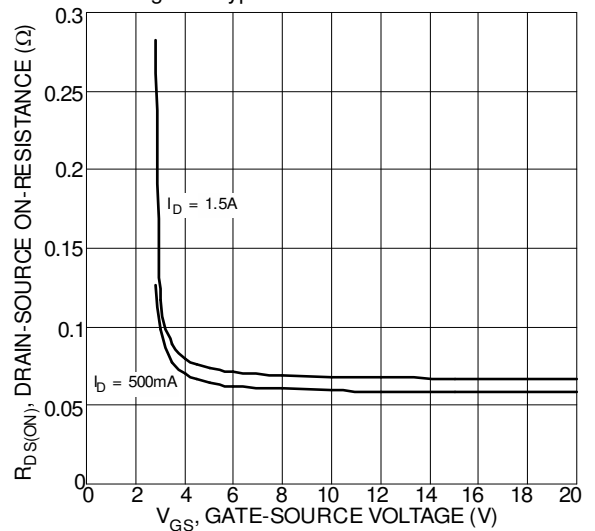
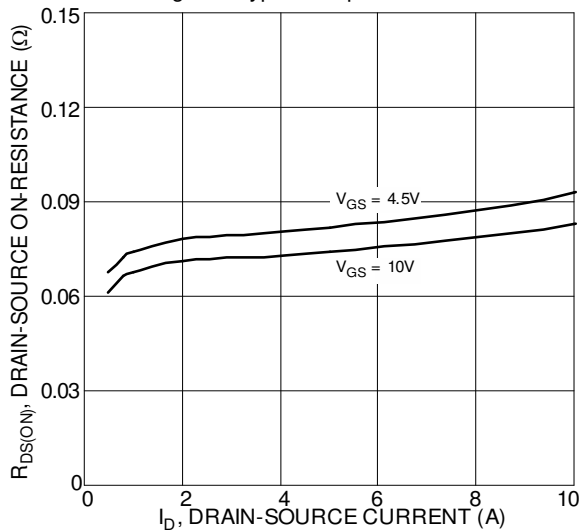
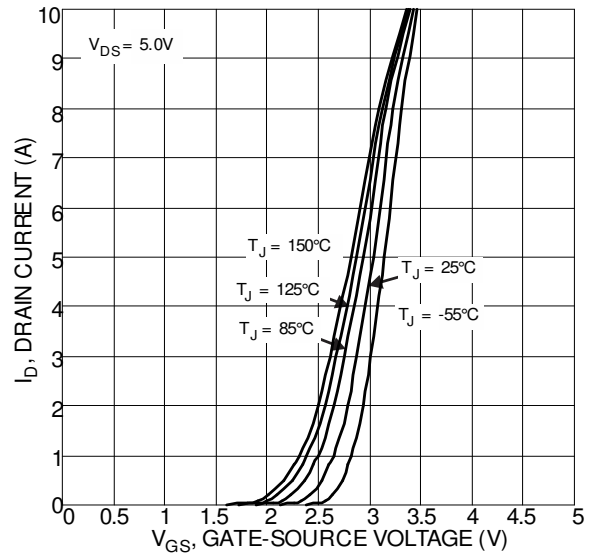
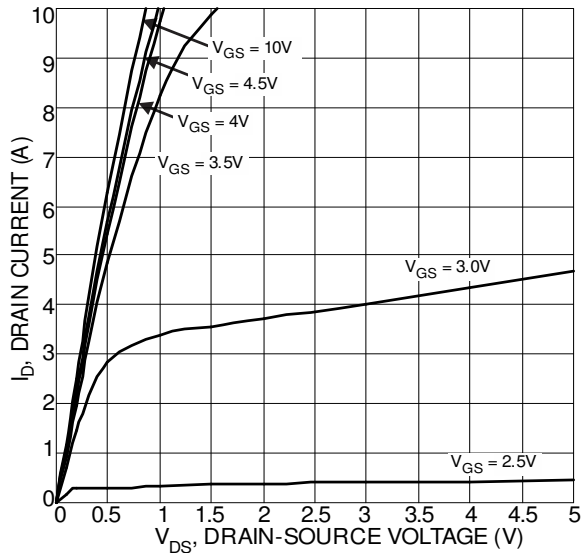
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---------------------|-----|------|------|------|--|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 60 | — | — | V | I _D = 250μA, V _{GS} = 0V |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 1 | 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 | — | 3.0 | V | I _D = 250μA, V _{DS} = V _{GS} |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 60 | 100 | mΩ | V _{GS} = 10V, I _D = 1.0A |
| | | | 70 | 120 | | V _{GS} = 4.5V, I _D = 0.5A |
| Diode Forward Voltage | V _{SD} | — | 0.8 | 1.2 | V | V _{GS} = 0V, I _S = 3A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{ISS} | — | 731 | — | pF | V _{DS} = 20V, V _{GS} = 0V f = 1MHz |
| Output Capacitance | C _{OSS} | — | 34 | — | | |
| Reverse Transfer Capacitance | C _{RSS} | — | 23 | — | | |
| Gate resistance | R _G | — | 1.3 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz |
| Total Gate Charge | Q _G | — | 5.2 | — | nC | V _{GS} = 4.5V V _{DS} = 30V I _D = 3A |
| Total Gate Charge | Q _G | — | 11.5 | — | | |
| Gate-Source Charge | Q _{GS} | — | 2.1 | — | | |
| Gate-Drain Charge | Q _{GD} | — | 1.5 | — | | |
| Turn-On Delay Time | t _{D(ON)} | — | 9.6 | — | ns | V _{DD} = 30V, V _{GS} = 10V R _L ≅ 50Ω, R _G ≅ 20Ω |
| Turn-On Rise Time | t _R | — | 11 | — | | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 61 | — | | |
| Turn-Off Fall Time | t _F | — | 21 | — | | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 10.5 | — | ns | I _S = 1.0A, dI/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 4.0 | — | nC | I _S = 1.0A, dI/dt = 100A/μs |

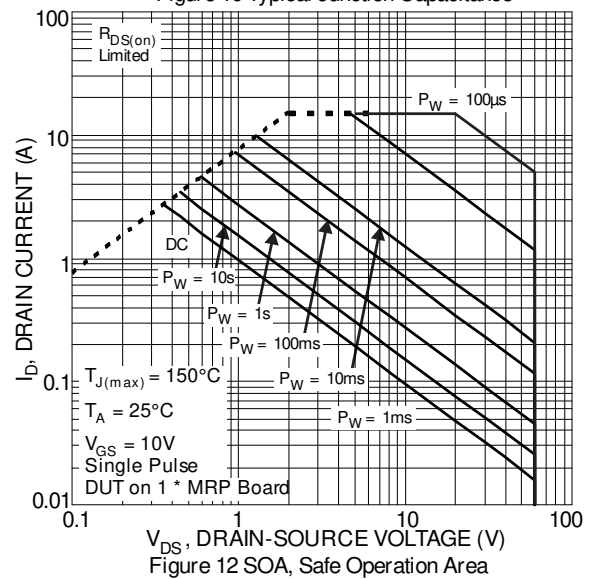
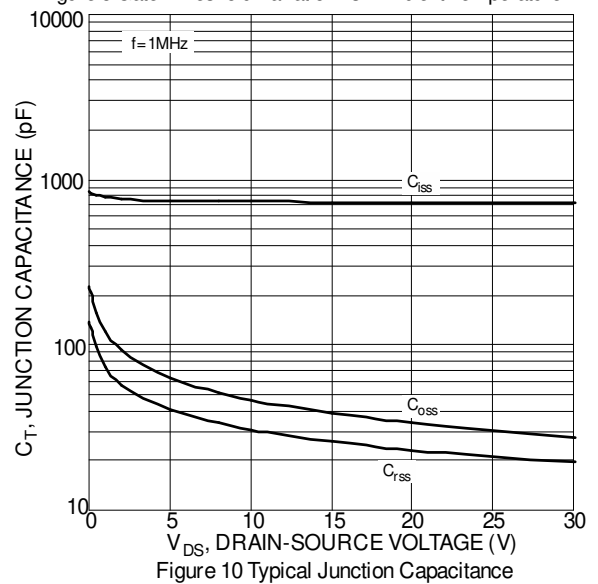
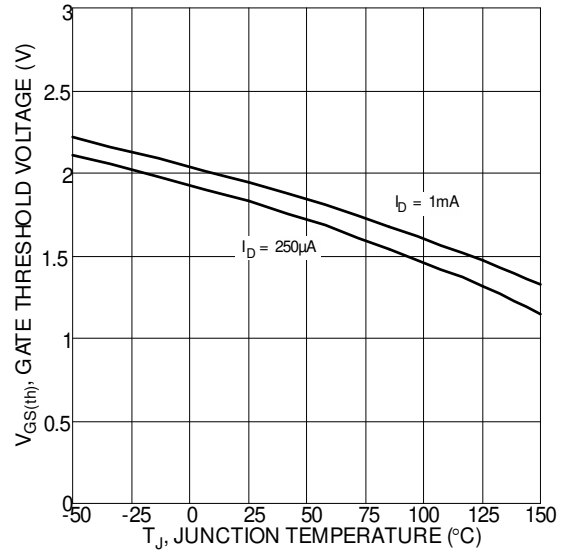
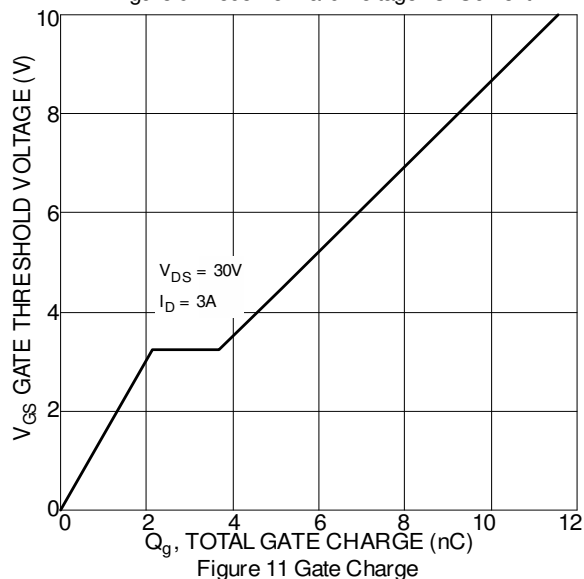
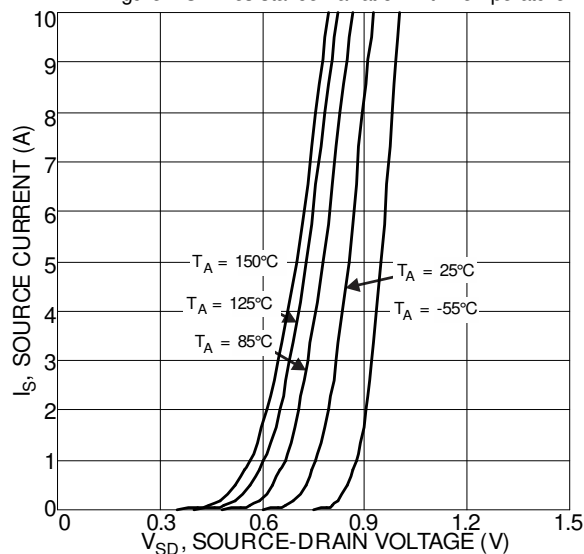
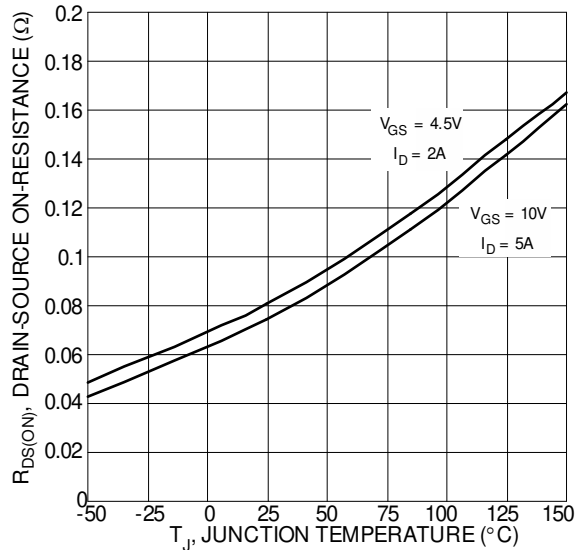
Electrical Characteristics – P-Channel (@T_A = +25°C, unless otherwise specified.)

| 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 | 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 | — | -3 | V | V _{DS} = V _{GS} , I _D = -250μA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 120 | 170 | mΩ | V _{GS} = -10V, I _D = -1.0A |
| | | | 170 | 250 | | V _{GS} = -4.5V, I _D = -0.5A |
| Diode Forward Voltage | V _{SD} | — | -0.8 | -1.2 | V | V _{GS} = 0V, I _S = -2A |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{ISS} | — | 618 | — | pF | V _{DS} = -20V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{OSS} | — | 36 | — | | |
| Reverse Transfer Capacitance | C _{RSS} | — | 26 | — | | |
| Gate resistance | R _G | — | 13 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz |
| Total Gate Charge | Q _G | — | 4.3 | — | nC | V _{GS} = -4.5V V _{DS} = -30V I _D = -2A |
| Total Gate Charge | Q _G | — | 8.9 | — | | |
| Gate-Source Charge | Q _{GS} | — | 1.4 | — | | |
| Gate-Drain Charge | Q _{GD} | — | 1.7 | — | | |
| Turn-On Delay Time | t _{D(ON)} | — | 7.6 | — | ns | V _{DD} = -30V, V _{GS} = -10V R _L ≅ 50Ω, R _G ≅ 20Ω |
| Turn-On Rise Time | t _R | — | 11.6 | — | | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 79.8 | — | | |
| Turn-Off Fall Time | t _F | — | 37.8 | — | | |
| Body Diode Reverse Recovery Time | t _{RR} | — | 10.8 | — | ns | I _S = -1.0A, dI/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | Q _{RR} | — | 3.8 | — | nC | I _S = -1.0A, dI/dt = 100A/μs |

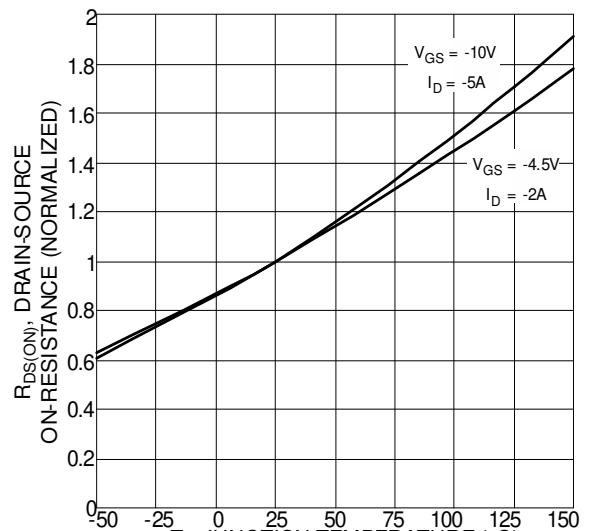
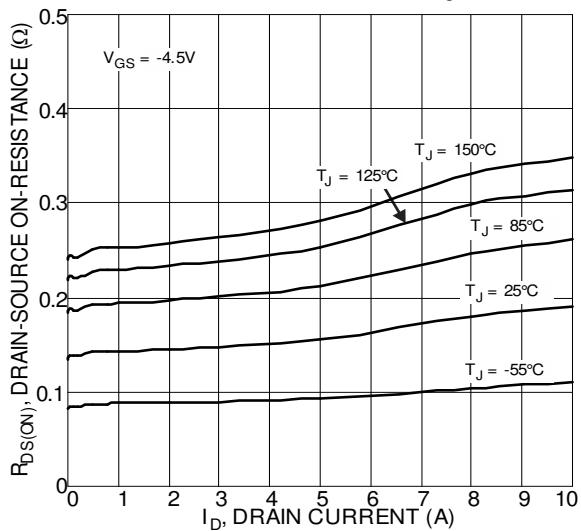
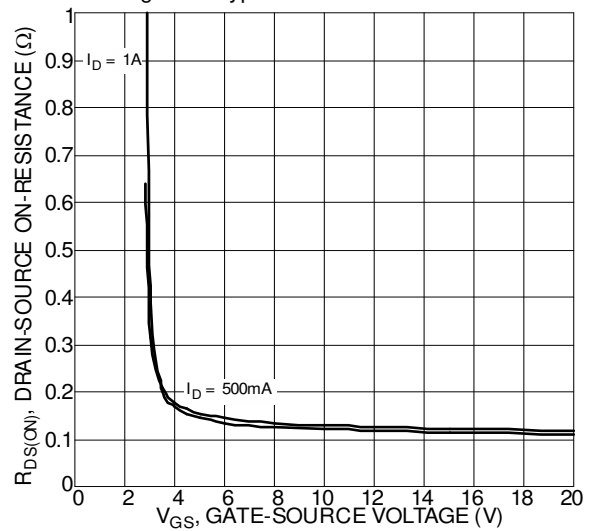
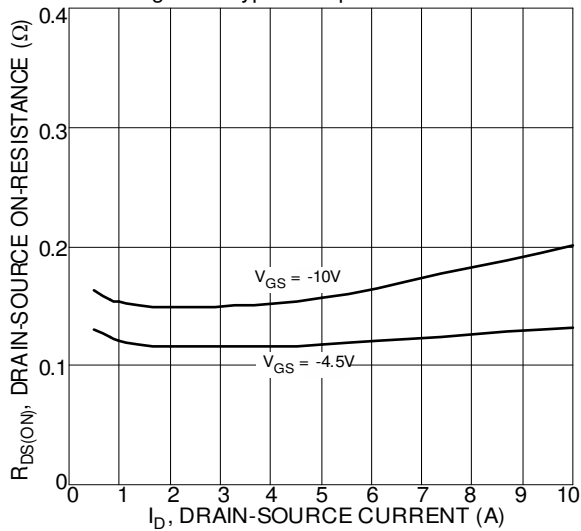
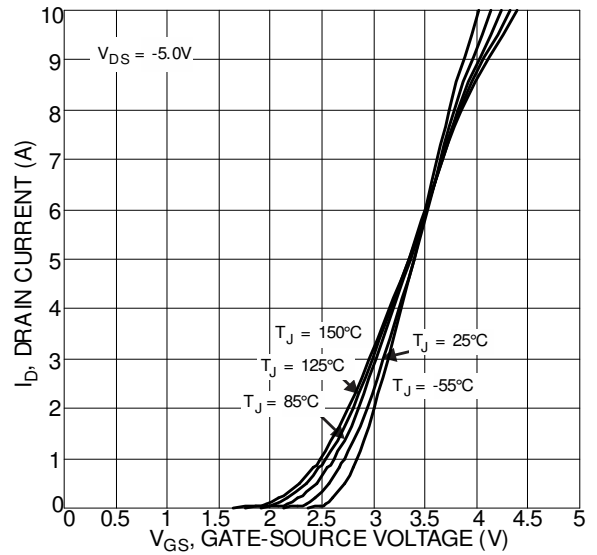
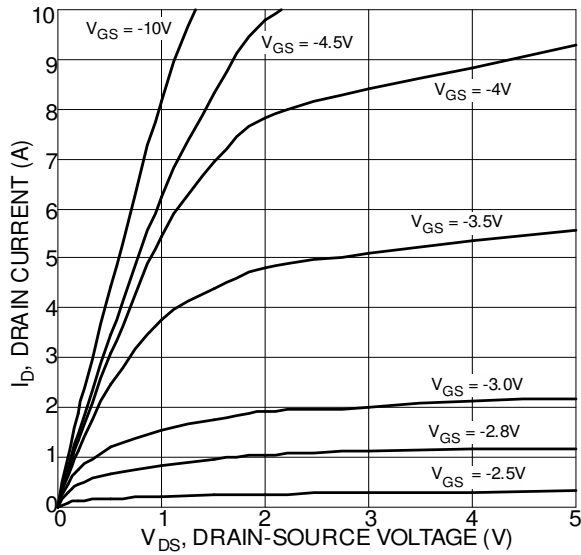
- Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep T_J = +25°C
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

Typical Performance Characteristics – N-Channel





Typical Performance Characteristics – P-Channel



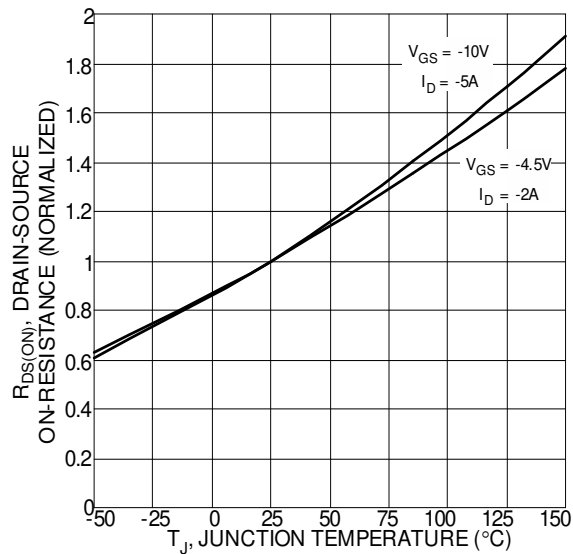


Figure 18 On-Resistance Variation with Temperature

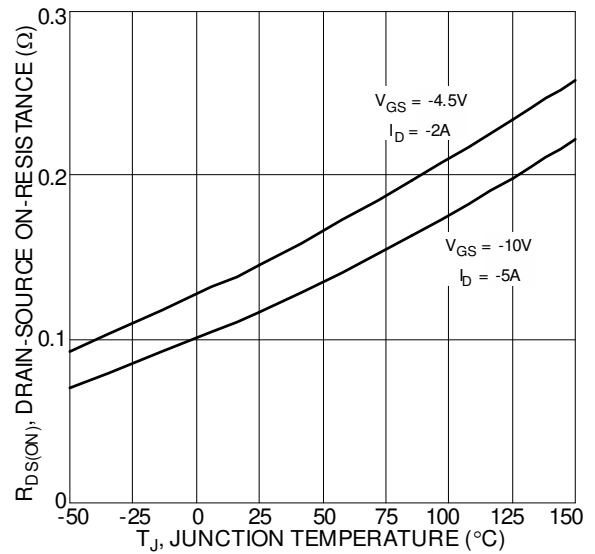


Figure 19 On-Resistance Variation with Temperature

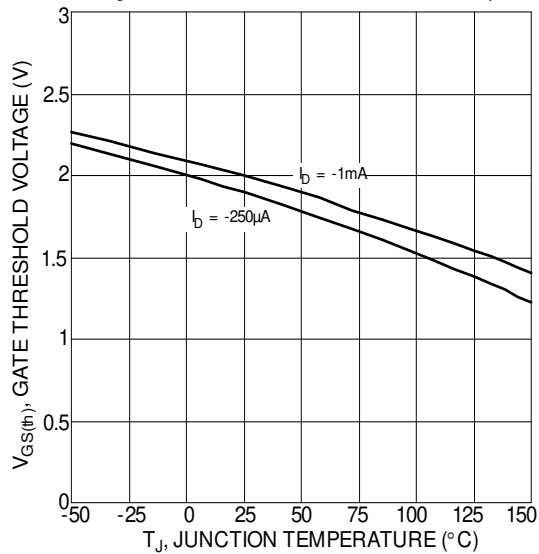


Figure 20 Gate Threshold Variation vs. Ambient Temperature

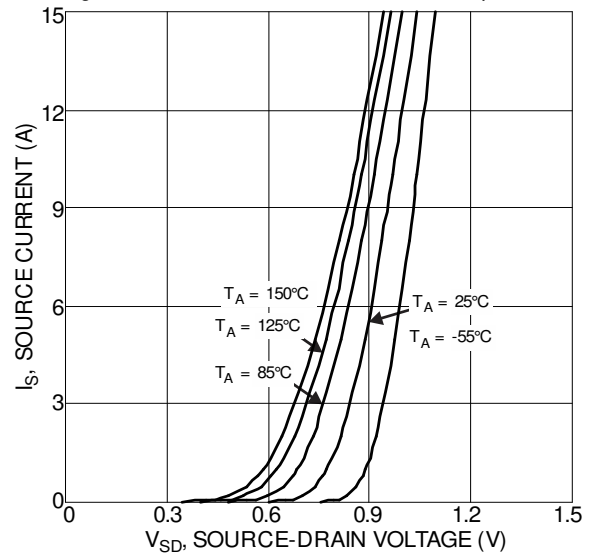


Figure 21 Diode Forward Voltage vs. Current

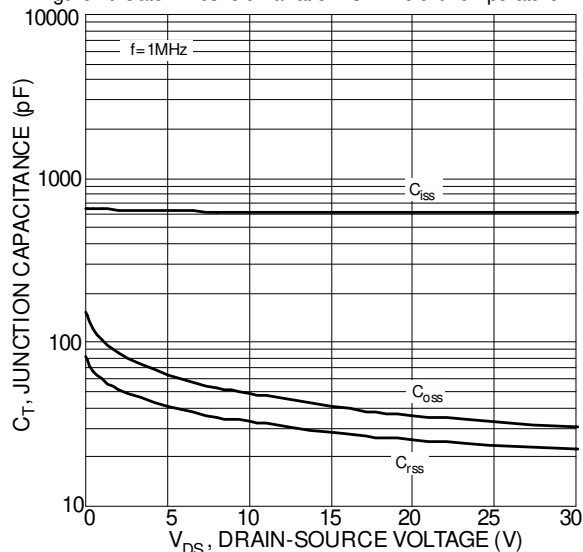


Figure 22 Typical Junction Capacitance

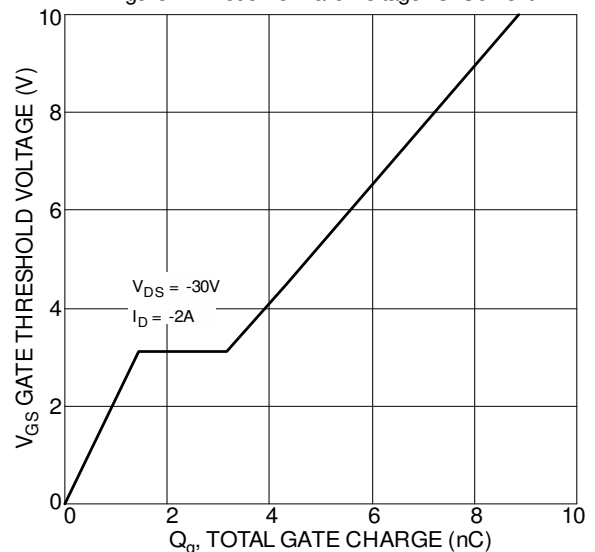
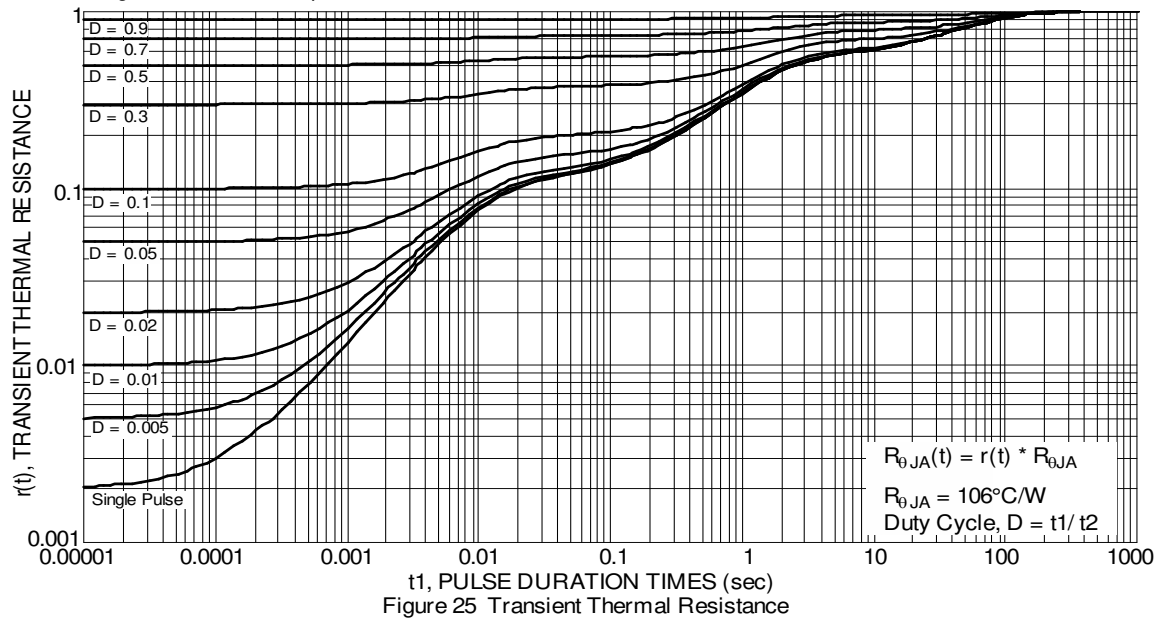
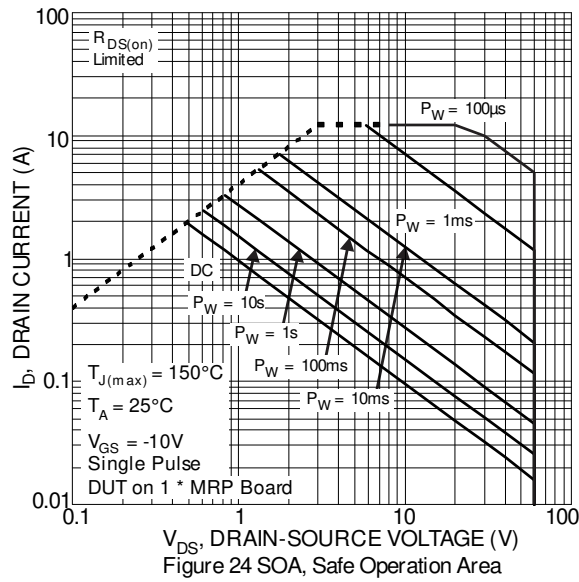


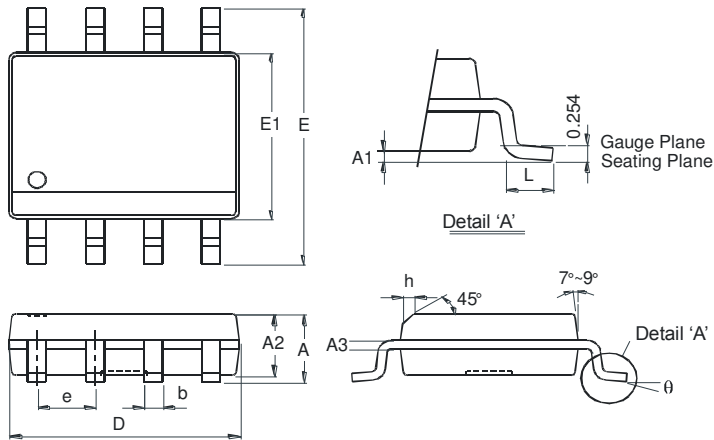
Figure 23 Gate Charge



Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SO-8

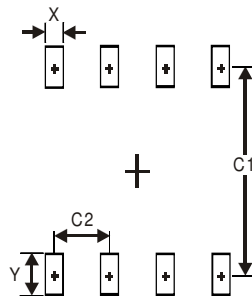


| SO-8 | | |
|----------------------|----------|------|
| Dim | Min | Max |
| A | — | 1.75 |
| A1 | 0.10 | 0.20 |
| A2 | 1.30 | 1.50 |
| A3 | 0.15 | 0.25 |
| b | 0.3 | 0.5 |
| D | 4.85 | 4.95 |
| E | 5.90 | 6.10 |
| E1 | 3.85 | 3.95 |
| e | 1.27 Typ | |
| h | — | 0.35 |
| L | 0.62 | 0.82 |
| θ | 0° |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

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SO-8



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

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

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