

Product Summary

| Device | $V_{(BR)DSS}$ | $R_{DS(ON) \max}$ | $I_D \max$ $T_A = +25^\circ C$ |
|-----------|---------------|----------------------------------|-----------------------------------|
| N-Channel | 40V | 45m Ω @ $V_{GS} = 10V$ | 4.5A |
| | | 58m Ω @ $V_{GS} = 4.5V$ | 4A |
| P-Channel | -40V | 65m Ω @ $V_{GS} = -10V$ | -3.7A |
| | | 100m Ω @ $V_{GS} = -4.5V$ | -2.9A |

Description

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

Applications

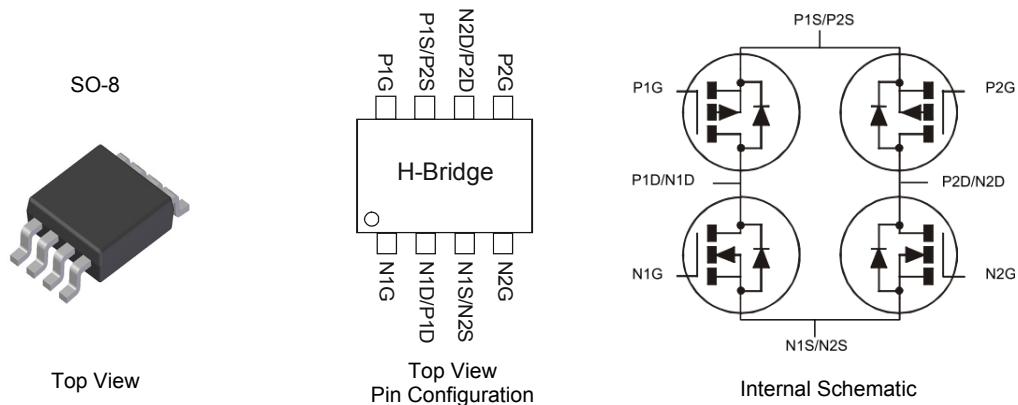
- DC Motor Control
- DC-AC Inverters

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)**
- **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 Indicator: See diagram
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.074 grams (approximate)

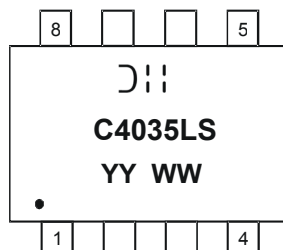
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Ordering Information (Note 4)

| Part Number | Compliance | Case | Packaging |
|----------------|------------|------|------------------|
| DMHC4035LSD-13 | Standard | SO-8 | 2500/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



☺☺☺ = Manufacturer's Marking
 C4035LS = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Year (ex: 13 = 2013)
 WW = Week (01 - 53)

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Units |
|--|------------------|-------------|--------------------|
| Total Power Dissipation (Note 5) | P_D | 1.5 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | 85 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | 53 | |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 15 | |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

Maximum Ratings N-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Units | |
|--|------------------|--|------------|---|
| Drain-Source Voltage | V_{DSS} | 40 | V | |
| Gate-Source Voltage | V_{GSS} | ± 20 | V | |
| Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | 4.5 3.5 | A |
| | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | 5.8 4.5 | A |
| Continuous Drain Current (Note 5) $V_{GS} = 4.5\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | 4 3.1 | A |
| | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | 5.1 4 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | I_S | 1.5 | A | |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | I_{DM} | 25 | A | |

Maximum Ratings P-CHANNEL (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Units | |
|--|------------------|--|--------------|---|
| Drain-Source Voltage | V_{DSS} | -40 | V | |
| Gate-Source Voltage | V_{GSS} | ± 20 | V | |
| Continuous Drain Current (Note 5) $V_{GS} = -10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | -3.7 -2.9 | A |
| | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | -4.8 -3.8 | A |
| Continuous Drain Current (Note 5) $V_{GS} = -4.5\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | -2.9 -2.3 | A |
| | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | -3.9 -3.0 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | I_S | -1.5 | A | |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | I_{DM} | -15 | A | |

Note: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 40 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 1 | μA | V _{DS} = 40V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | 1 | — | 3 | V | V _{DS} = V _{GS} , I _D = 250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 26 | 45 | mΩ | V _{GS} = 10V, I _D = 3.9A |
| | | — | 35 | 58 | | V _{GS} = 4.5V, I _D = 3.5A |
| Diode Forward Voltage | V _{SD} | — | 0.7 | 1 | V | V _{GS} = 0V, I _S = 1.25A |
| DYNAMIC CHARACTERISTICS (Note 7) | | | | | | |
| Input Capacitance | C _{iss} | — | 574 | — | pF | V _{DS} = 20V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 87.8 | — | | |
| Reverse Transfer Capacitance | C _{rss} | — | 38.7 | — | | |
| Gate resistance | R _g | — | 1.6 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 5.9 | — | nC | V _{DS} = 20V, I _D = 3.9A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 12.5 | — | | |
| Gate-Source Charge | Q _{gs} | — | 1.7 | — | | |
| Gate-Drain Charge | Q _{gd} | — | 2.2 | — | | |
| Turn-On Delay Time | t _{D(on)} | — | 3.1 | — | ns | V _{DD} = 20V, V _{GS} = 10V, R _L = 20Ω, R _G = 6Ω, |
| Turn-On Rise Time | t _r | — | 2.6 | — | | |
| Turn-Off Delay Time | t _{D(off)} | — | 15 | — | | |
| Turn-Off Fall Time | t _f | — | 5.5 | — | | |
| Reverse Recovery Time | t _{rr} | — | 6.5 | — | ns | I _F = 3.9A, di/dt = 500A/μs |
| Reverse Recovery Charge | Q _{rr} | — | 1.2 | — | nC | |

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---------------------|-----|------|------|------|--|
| OFF CHARACTERISTICS (Note 6) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -40 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | -1 | μA | V _{DS} = -40V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 6) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | -1 | — | -3 | V | V _{DS} = V _{GS} , I _D = -250μA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 49 | 65 | mΩ | V _{GS} = -10V, I _D = -4.2A |
| | | — | 73 | 100 | | V _{GS} = -4.5V, I _D = -3.3A |
| Diode Forward Voltage | V _{SD} | — | -0.7 | -1.2 | V | V _{GS} = 0V, I _S = -1A |
| DYNAMIC CHARACTERISTICS (Note 7) | | | | | | |
| Input Capacitance | C _{iss} | — | 587 | — | pF | V _{DS} = -20V, V _{GS} = 0V, f = 1MHz |
| Output Capacitance | C _{oss} | — | 88.1 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 40.2 | — | pF | |
| Gate resistance | R _g | — | 12.3 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = -4.5V) | Q _g | — | 5.4 | — | nC | V _{DS} = -20V, I _D = -4.2A |
| Total Gate Charge (V _{GS} = -10V) | Q _g | — | 11.1 | — | | |
| Gate-Source Charge | Q _{gs} | — | 1.5 | — | | |
| Gate-Drain Charge | Q _{gd} | — | 2 | — | | |
| Turn-On Delay Time | t _{D(on)} | — | 3.6 | — | ns | V _{DD} = -15V, V _{GS} = -10V, R _G = 6Ω, I _D = -1A |
| Turn-On Rise Time | t _r | — | 2.9 | — | | |
| Turn-Off Delay Time | t _{D(off)} | — | 36.3 | — | | |
| Turn-Off Fall Time | t _f | — | 15.3 | — | | |
| Reverse Recovery Time | t _{rr} | — | 15.5 | — | ns | I _F = -4.2A, di/dt = 500A/μs |
| Reverse Recovery Charge | Q _{rr} | — | 16.9 | — | nC | |

Notes: 6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to product testing.

Typical Characteristics - N-CHANNEL

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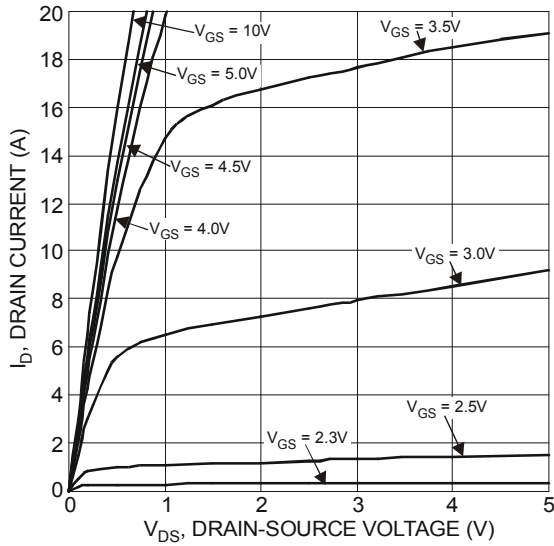


Figure 1 Typical Output Characteristics

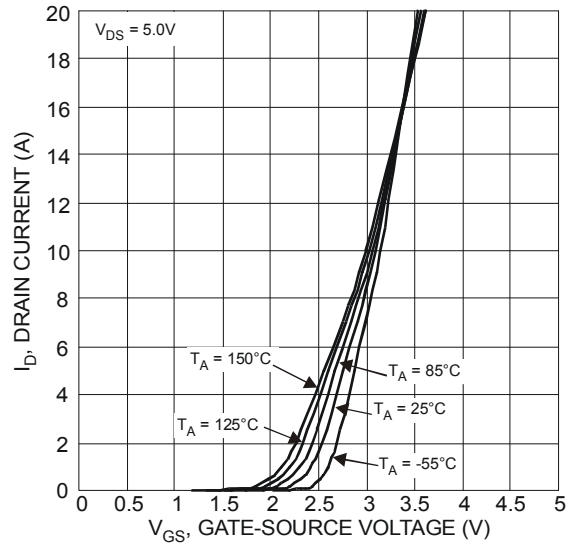


Figure 2 Typical Transfer Characteristics

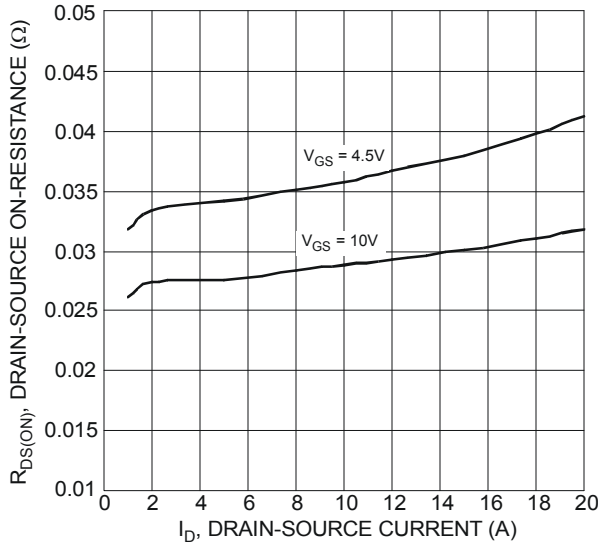


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

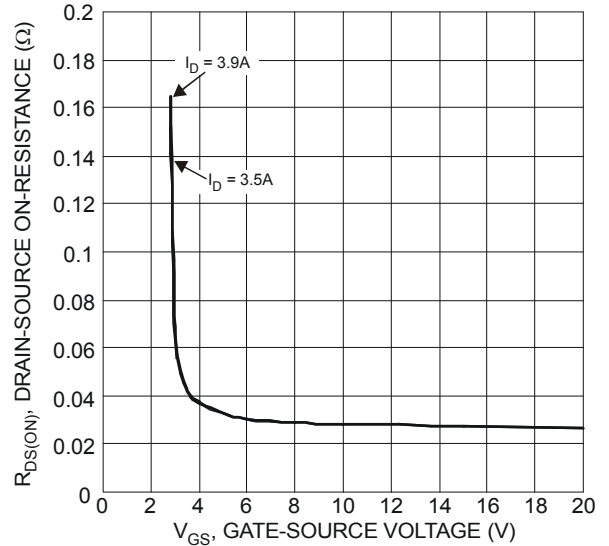


Figure 4 Typical Transfer Characteristics

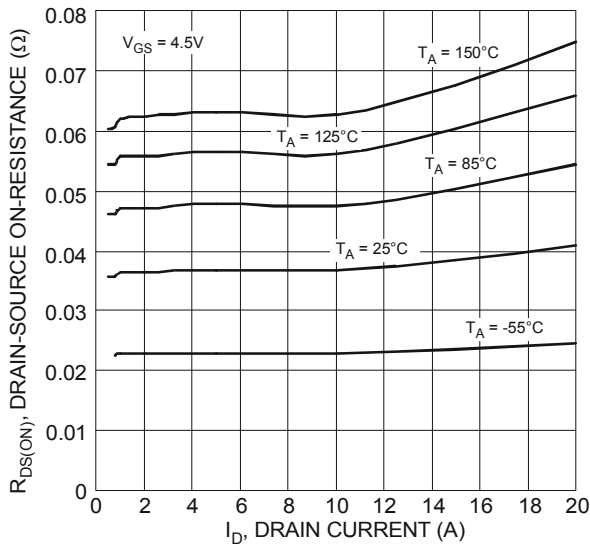


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

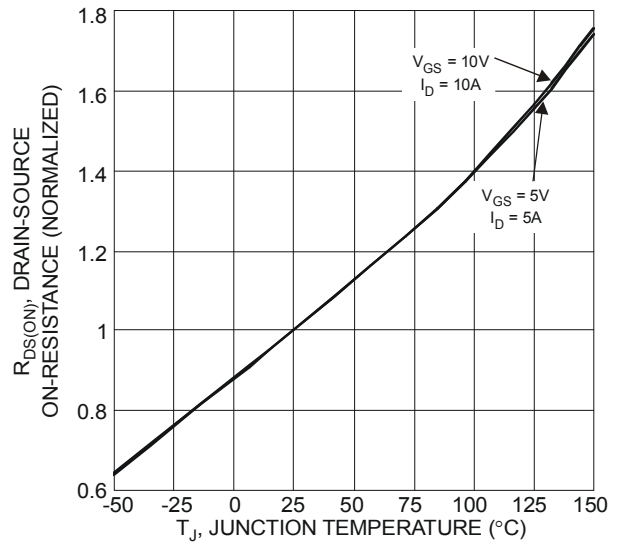


Figure 6 On-Resistance Variation with Temperature

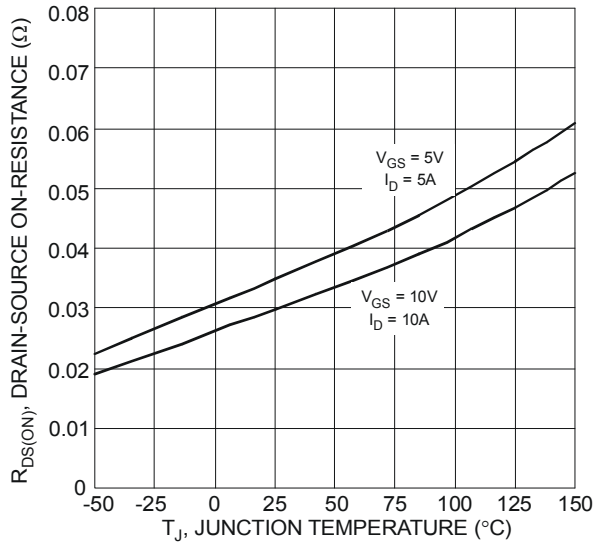


Figure 7 On-Resistance Variation with Temperature

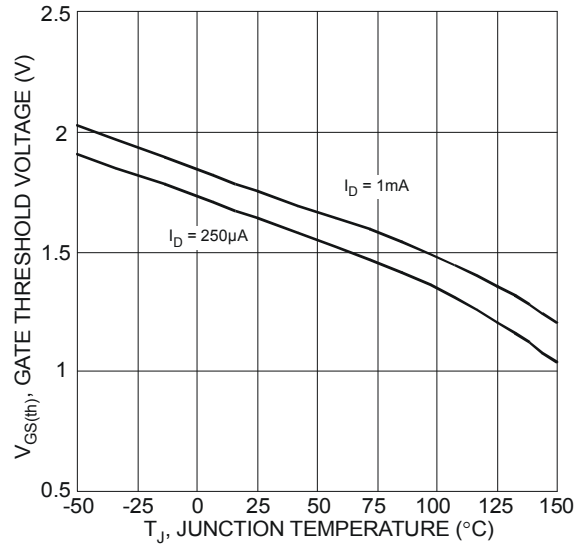


Figure 8 Gate Threshold Variation vs. Ambient Temperature

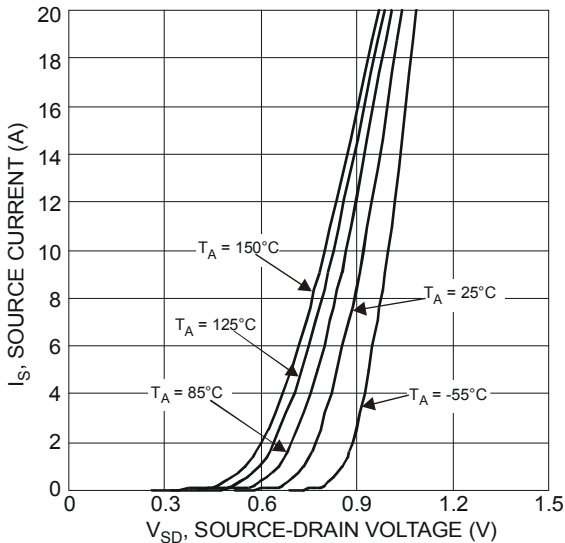


Figure 9 Diode Forward Voltage vs. Current

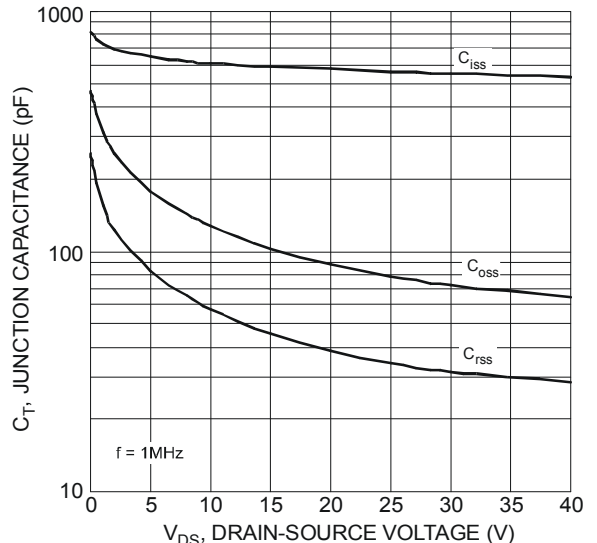


Figure 10 Typical Junction Capacitance

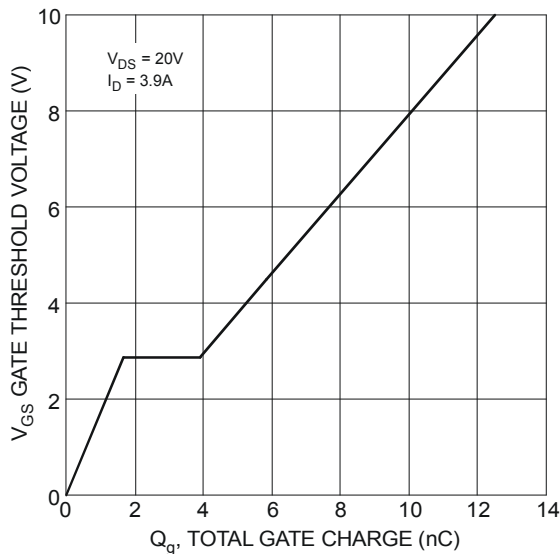


Figure 11 Gate Charge

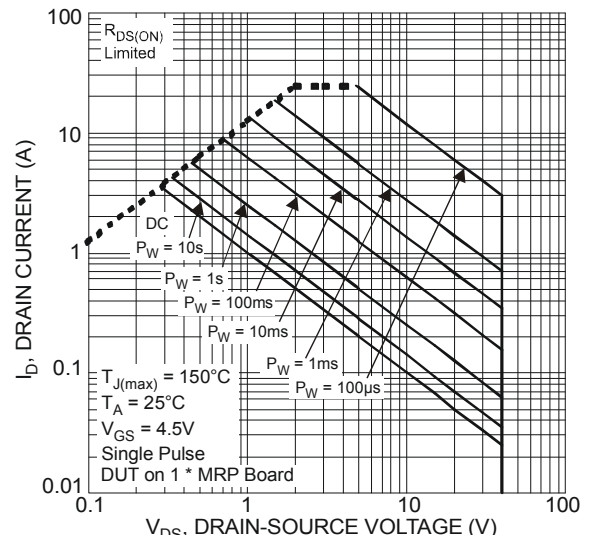


Figure 12 SOA, Safe Operation Area

Typical Characteristics - P-CHANNEL

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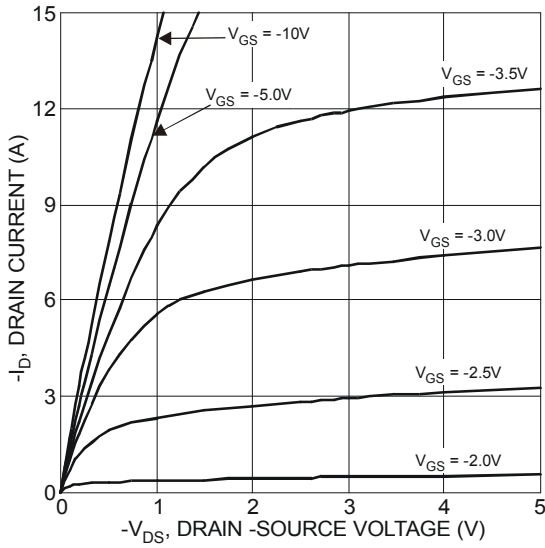


Figure 13 Typical Output Characteristics

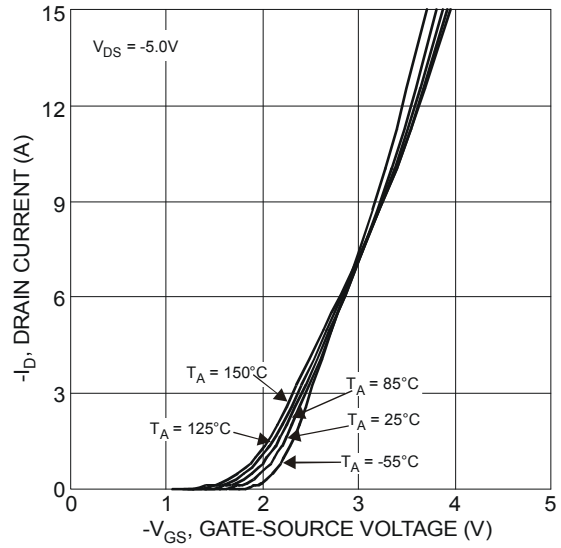


Figure 14 Typical Transfer Characteristics

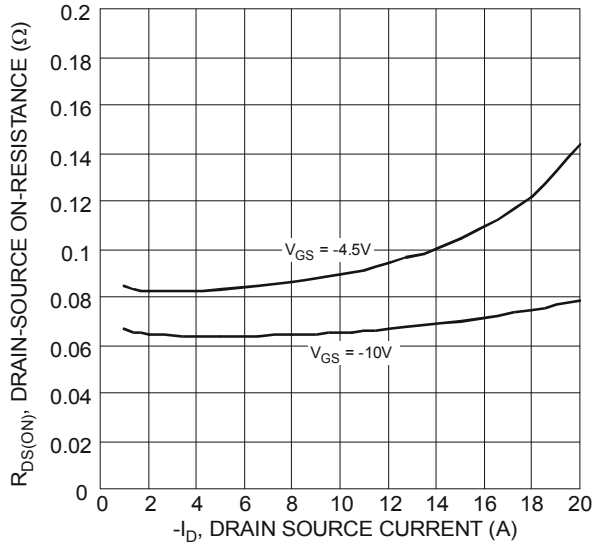


Figure 15 Typical On-Resistance vs. Drain Current and Gate Voltage

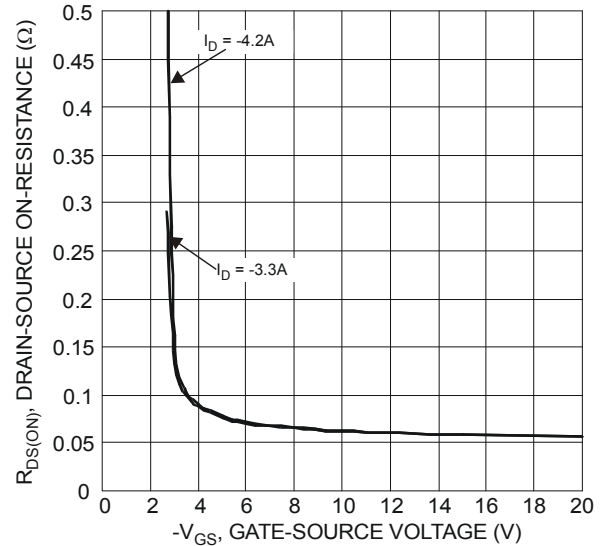


Figure 16 Typical Transfer Characteristics

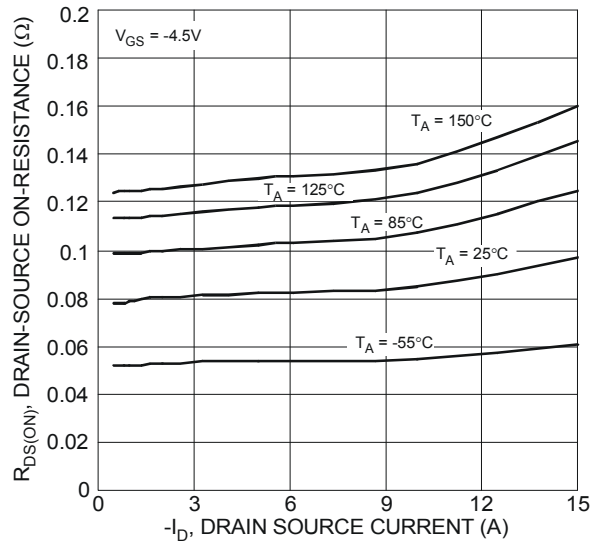


Figure 17 Typical On-Resistance vs. Drain Current and Temperature

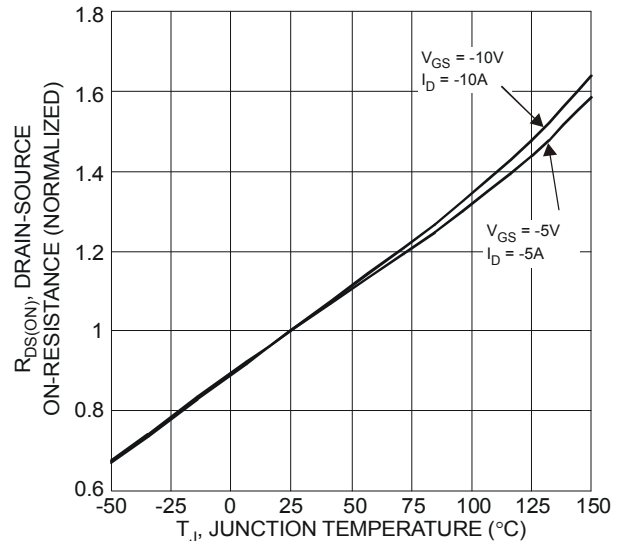


Figure 18 On-Resistance Variation with Temperature

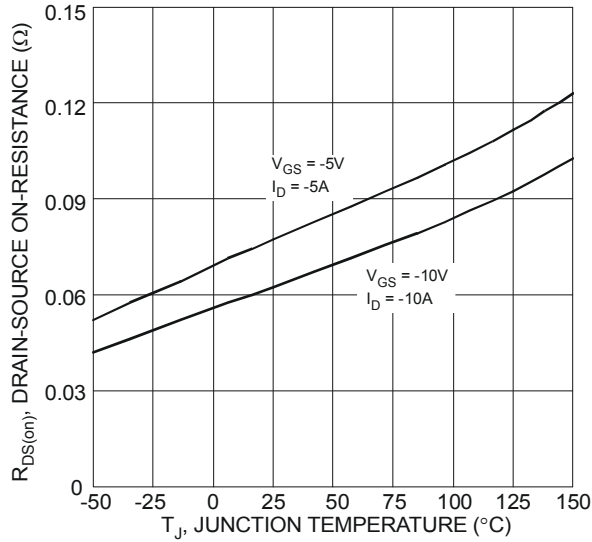


Figure 19 On-Resistance Variation with Temperature

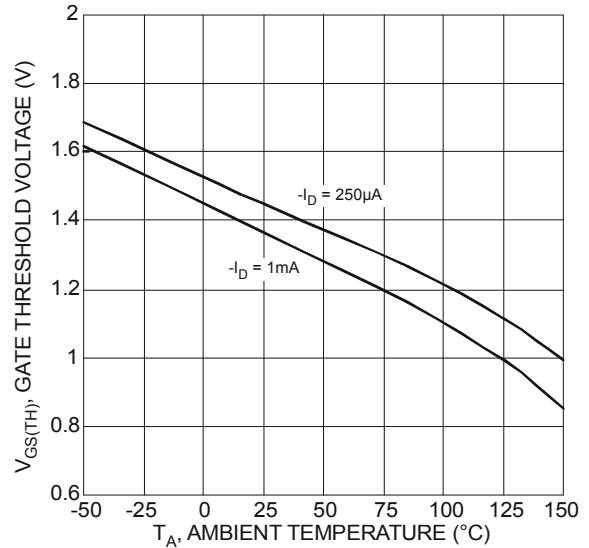


Figure 20 Gate Threshold Variation vs. Ambient Temperature

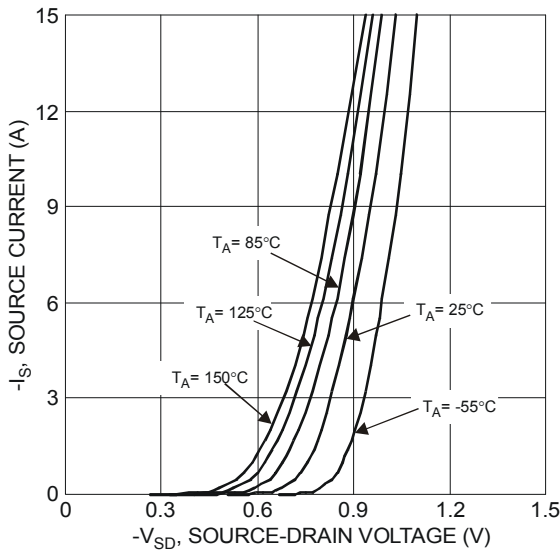


Figure 21 Diode Forward Voltage vs. Current

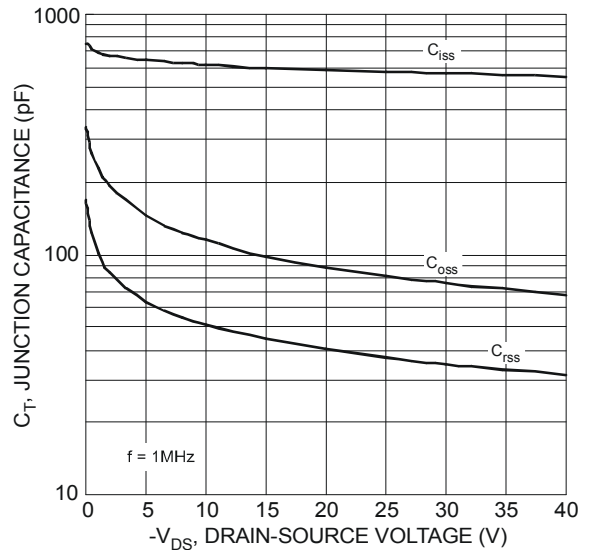


Figure 22 Typical Junction Capacitance

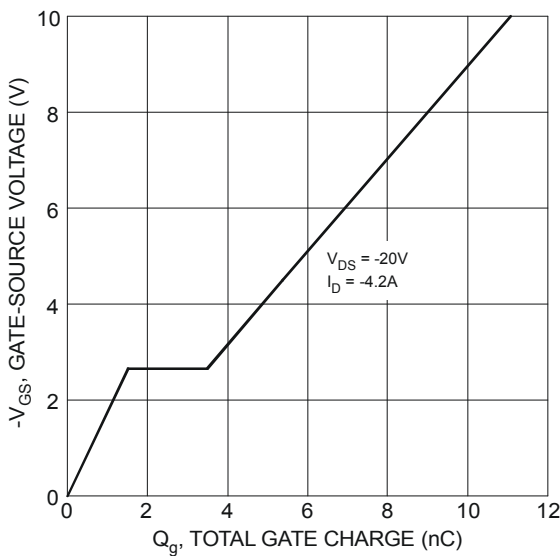


Figure 23 Gate-Charge Characteristics

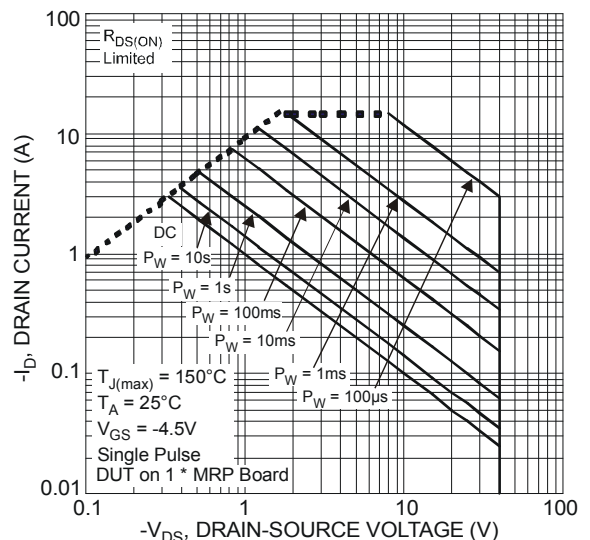


Figure 24 SOA, Safe Operation Area

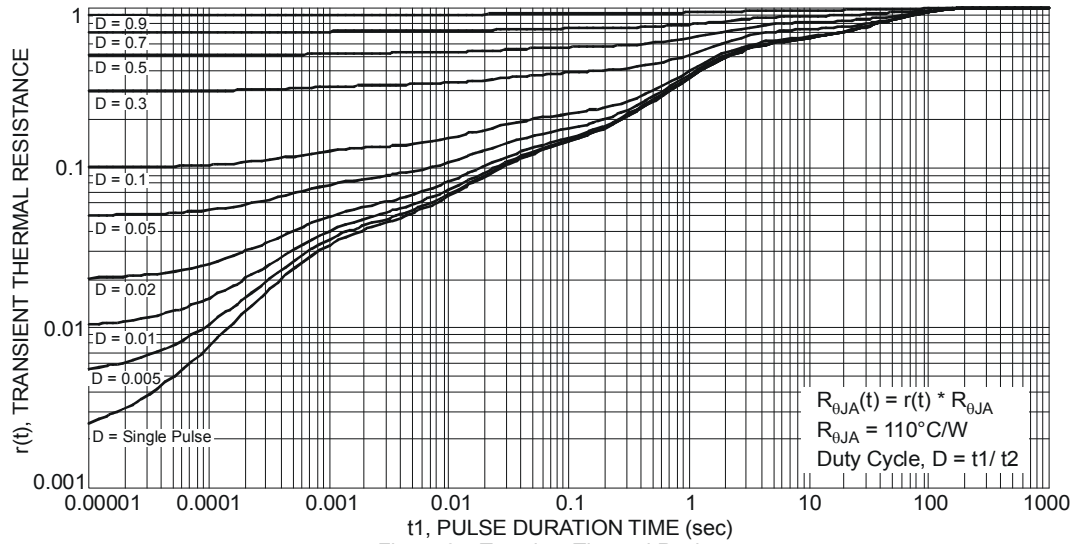
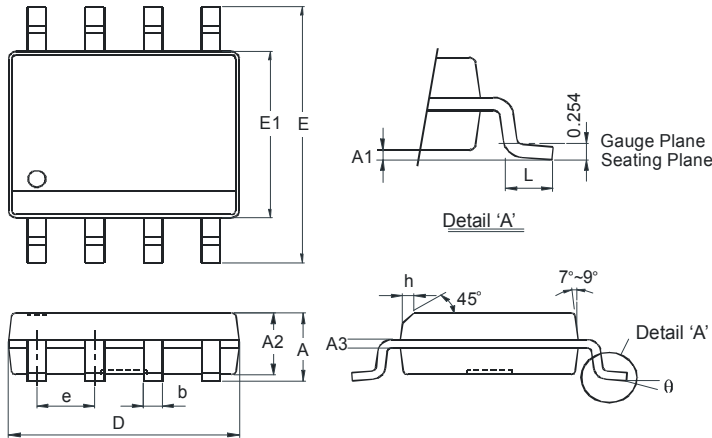


Figure 25 Transient Thermal Resistance

Package Outline Dimensions

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

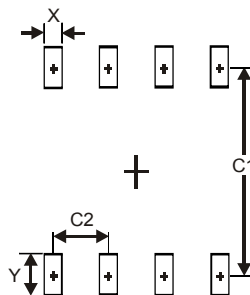


| SO-8 | | |
|------|----------|------|
| Dim | Min | Max |
| A | - | 1.75 |
| A1 | 0.10 | 0.20 |
| A2 | 1.30 | 1.50 |
| A3 | 0.15 | 0.25 |
| b | 0.3 | 0.5 |
| D | 4.85 | 4.95 |
| E | 5.90 | 6.10 |
| E1 | 3.85 | 3.95 |
| e | 1.27 Typ | |
| h | - | 0.35 |
| L | 0.62 | 0.82 |
| θ | 0° | 8° |

All Dimensions in mm

Suggested Pad Layout

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



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

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