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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current (Note 7) | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 470<br>370 | mA |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | $I_S$ | 0.5 | A |
| Single Pulse Drain−to−Source Avalanche Energy (For Relay's Coils/Inductive Loads of 80Ω or Higher) ($T_J$ Initial = +85°C) | | | $E_Z$ | 200 | mJ |
| Peak Power Dissipation, Drain−to−Source (Non repetitive current square pulse 1.0ms duration) ($T_J$ Initial = +85°C) | | | $P_{PK}$ | 20 | W |
| Load Dump Pulse, Drain−to−Source, $R_{SOURCE}$ = 0.5Ω, t = 300ms) (For Relay's Coils/Inductive Loads of 80Ω or Higher) ($T_J$ Initial = +85°C) | | | $E_{LD1}$ | 60 | V |
| Inductive Switching Transient 1, Drain−to−Source (Waveform: $R_{SOURCE}$ = 10Ω, t = 2.0ms) (For Relay's Coils/Inductive Loads of 80Ω or Higher) ($T_J$ Initial = +85°C) | | | $E_{LD2}$ | 100 | V |
| Inductive Switching Transient 2, Drain−to−Source (Waveform: $R_{SOURCE}$ = 4.0Ω, t = 50µs) (For Relay's Coils/Inductive Loads of 80Ω or Higher) ($T_J$ Initial = +85°C) | | | $E_{LD3}$ | 300 | V |
| Reverse Battery, 10 Minutes (Drain−to−Source) (For Relay's Coils/Inductive Loads of 80Ω or more) | | | Rev−Bat | -14 | V |
| Dual Voltage Jump Start, 10 Minutes (Drain−to−Source) | | | Dual−Volt | 28 | V |
| ESD Human Body Model (HBM) | | | ESD | 4,000 | V |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | | $P_D$ | 390 | mW |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 321 | °C/W |
| Total Power Dissipation (Note 7) | | $P_D$ | 610 | mW |
| Thermal Resistance, Junction to Ambient (Note 7) | Steady State | $R_{\theta JA}$ | 208 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

Notes: 6. Device mounted on FR-4 PCB, with minimum recommended pad layout.
7. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. copper, single sided.

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 60 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 10mA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 50<br>0.5 | μA | $V_{DS}$ = 60V, $V_{GS}$ = 0V<br>$V_{DS}$ = 12V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±90<br>±60 | μA | $V_{GS}$ = ±5V, $V_{DS}$ = 0V<br>$V_{GS}$ = ±3V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.3 | — | 2.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 1mA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 1.1<br>1.4 | 1.8<br>2.4 | Ω | $V_{GS}$ =5V, $I_D$ = 0.15A<br>$V_{GS}$ = 3V, $I_D$ = 0.15A |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | 80 | — | — | ms | $V_{DS}$ =12V, $I_D$ = 0.15A |
| Diode Forward Voltage | $V_{SD}$ | — | — | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 0.15A |
| **DYNAMIC CHARACTERISTICS** (Note 9) | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 12.9 | — | pF | $V_{DS}$ = 12V, $V_{GS}$ = 0V<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 17 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 0.84 | — | pF | |
| Total Gate Charge | $Q_g$ | — | 0.74 | — | nC | $V_{GS}$ = 5V, $V_{DS}$ = 12V,<br>$I_D$ =150mA |
| Gate-Source Charge | $Q_{gs}$ | — | 0.19 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 0.16 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 131 | — | ns | $V_{DD}$ = 12V, $V_{GS}$ = 5V. |
| Turn-On Rise Time | $t_R$ | — | 301 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 582 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 440 | — | ns | |

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

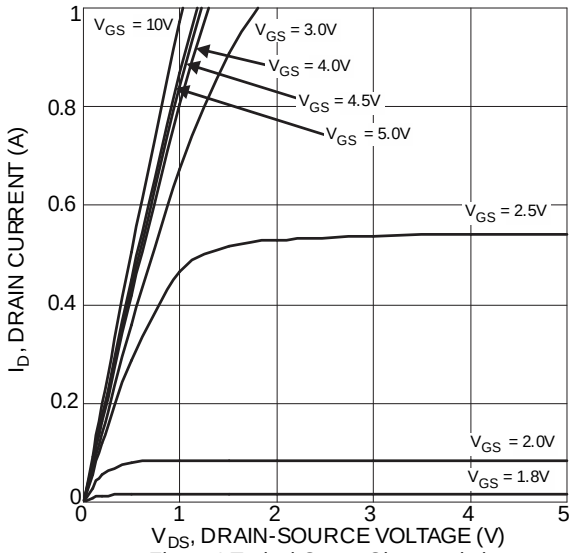


Figure 1 Typical Output Characteristic

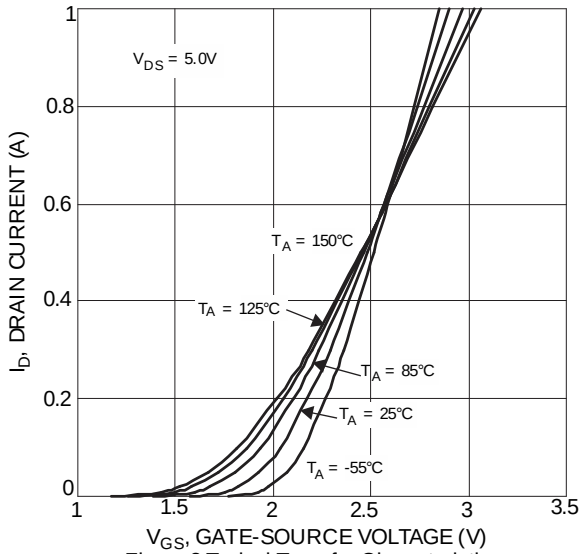


Figure 2 Typical Transfer Characteristics

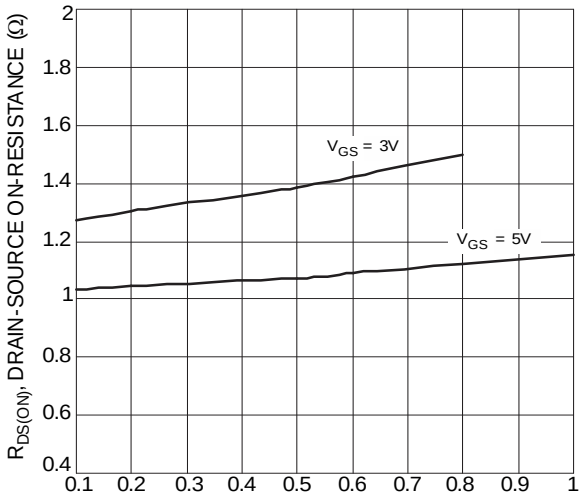



Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

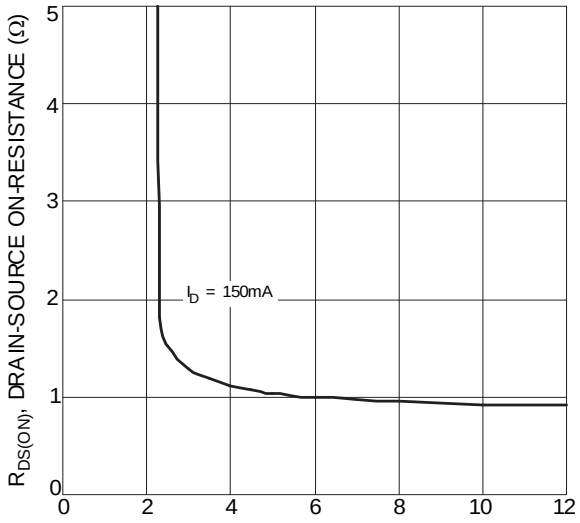



Figure 4 Typical Transfer Characteristic

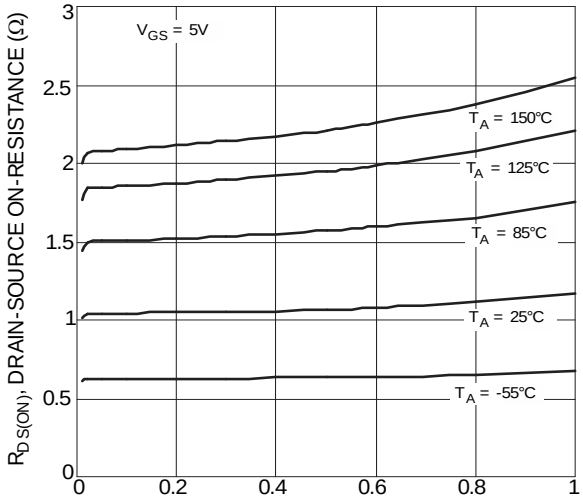



Figure 5 Typical On-Resistance vs. Drain Current and Temperature

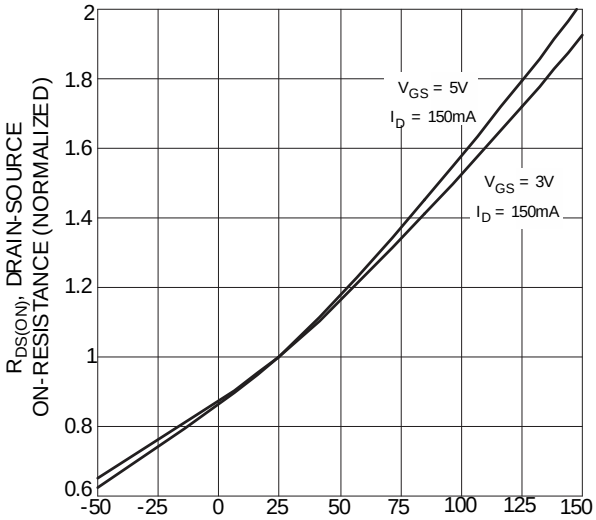



Figure 6 On-Resistance Variation with Temperature

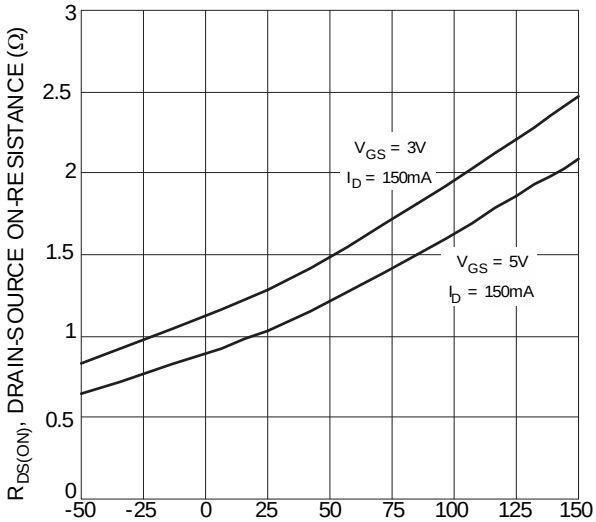



Figure 7 On-Resistance Variation with Temperature

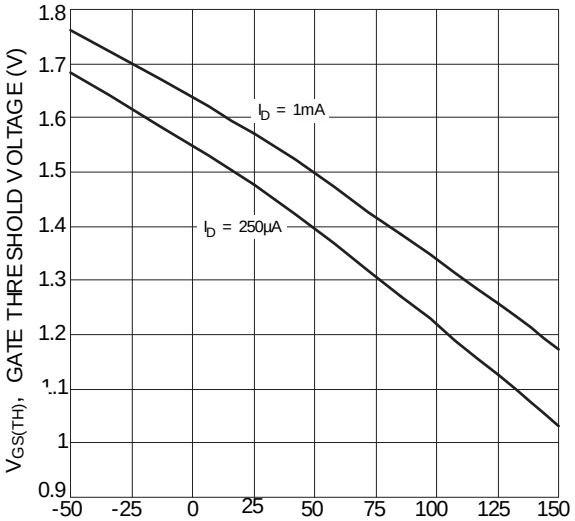



Figure 8 Gate Threshold Variation vs.Junction Temperature

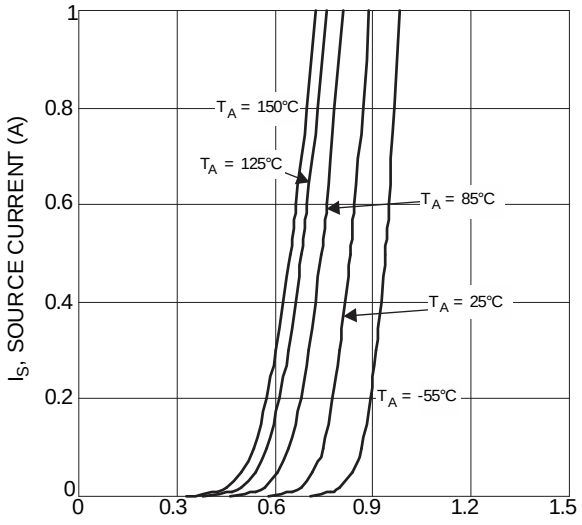


Figure 9 Diode Forward Voltage vs. Current

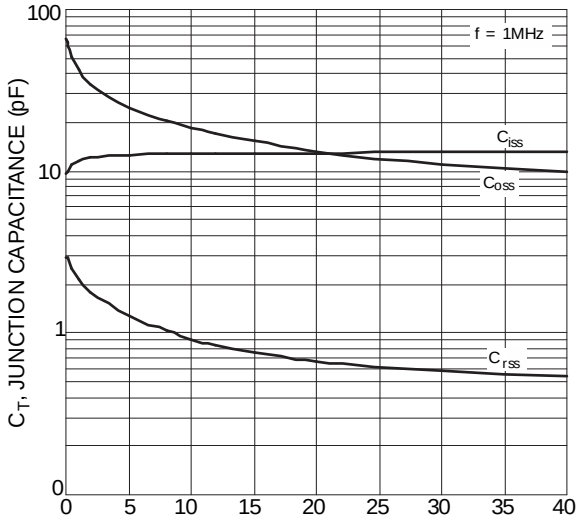


Figure 10 Typical Junction Capacitance

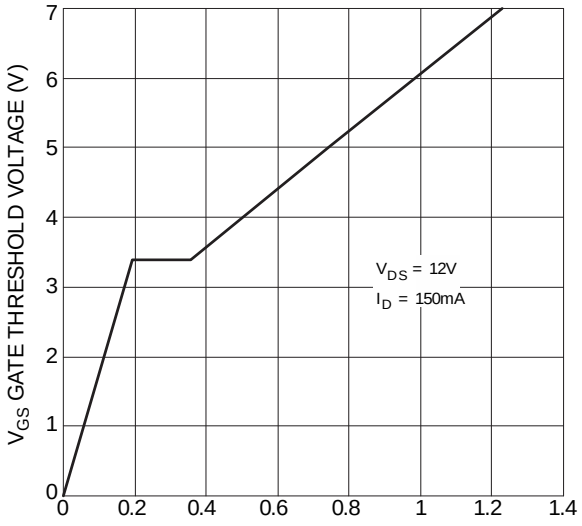


Figure 11 Gate Charge

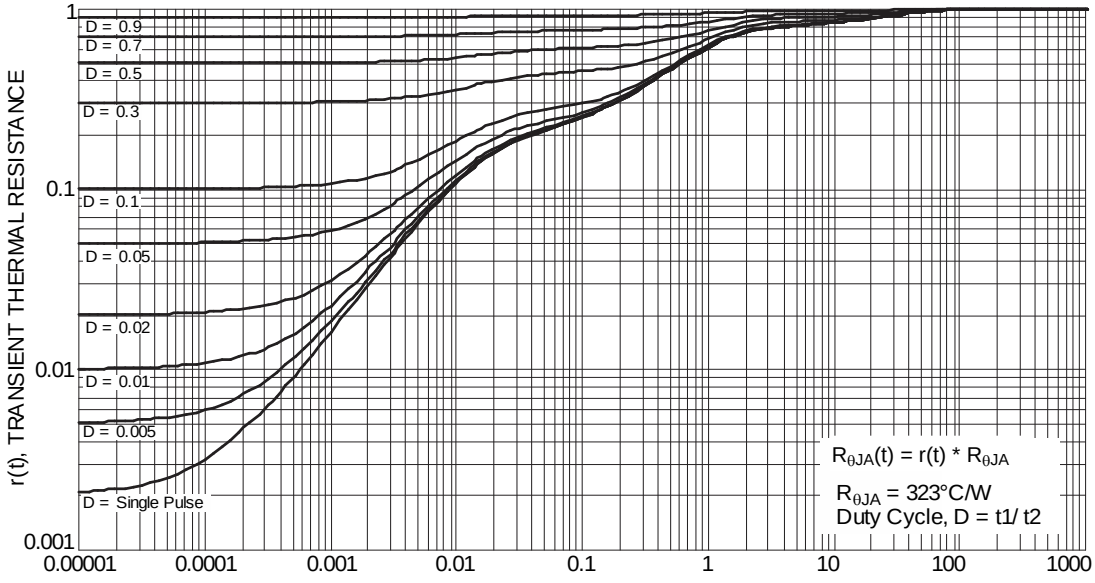
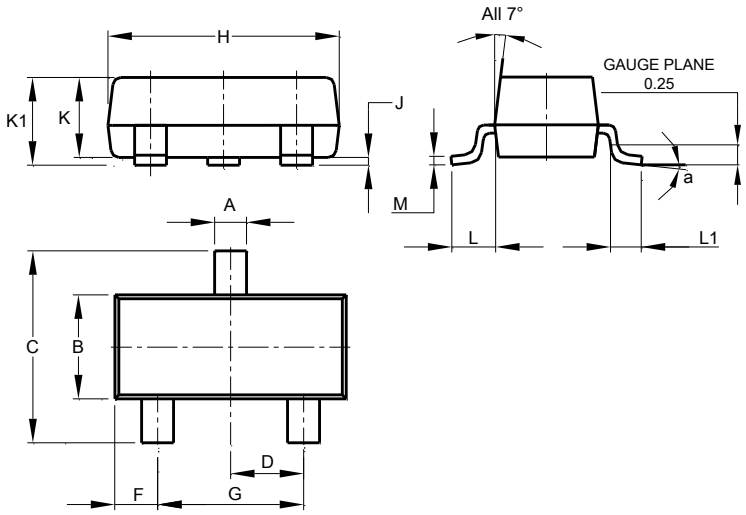


Figure 12 Transient Thermal Resistance

## Package Outline Dimensions

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

**SOT23**

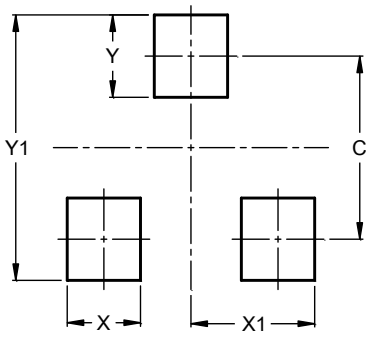



| SOT23 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.37 | 0.51 | 0.40 |
| **B** | 1.20 | 1.40 | 1.30 |
| **C** | 2.30 | 2.50 | 2.40 |
| **D** | 0.89 | 1.03 | 0.915 |
| **F** | 0.45 | 0.60 | 0.535 |
| **G** | 1.78 | 2.05 | 1.83 |
| **H** | 2.80 | 3.00 | 2.90 |
| **J** | 0.013 | 0.10 | 0.05 |
| **K** | 0.890 | 1.00 | 0.975 |
| **K1** | 0.903 | 1.10 | 1.025 |
| **L** | 0.45 | 0.61 | 0.55 |
| **L1** | 0.25 | 0.55 | 0.40 |
| **M** | 0.085 | 0.150 | 0.110 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**SOT23**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 2.0 |
| **X** | 0.8 |
| **X1** | 1.35 |
| **Y** | 0.9 |
| **Y1** | 2.9 |

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