# COMPLEMENTARY PAIR ENHANCEMENT MODE MOSFET

## Product Summary

| Device | $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | $I_D$ max $T_A$ = 25°C |
|---|---|---|---|
| Q1 | 20V | 0.5Ω @ $V_{GS}$ = 4.5V | 1030mA |
| | | 0.9Ω @ $V_{GS}$ = 1.8V | 740mA |
| Q2 | -20V | 1.0Ω @ $V_{GS}$ = -4.5V | -700mA |
| | | 2.0Ω @ $V_{GS}$ = -1.8V | -460mA |

## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage $V_{GS(th)}$ <1V
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Complementary Pair MOSFET
- Ultra-Small Surface Mount Package
- **ESD Protected Gate to 2kV HBM**
- **Lead Free/RoHS Compliant (Note 1)**
- **"Green" Device, Halogan and Antimony Free (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

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.

- Power management functions
- Battery Operated Systems and Solid-State Relays
- Load switch

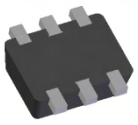
## Mechanical Data

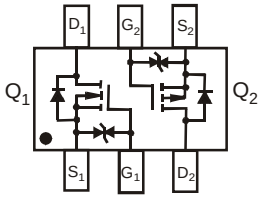
- Case: SOT563
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.003 grams (approximate)


ESD PROTECTED TO 2kV

SOT563


Top View


Bottom View



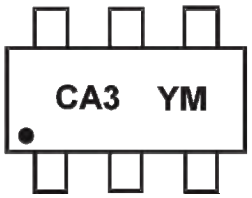
Equivalent Circuit

## Ordering Information (Note 3)

| Part Number | Case | Packaging |
|---|---|---|
| DMC2400UV-7 | SOT563 | 3000/Tape & Reel |
| DMC2400UV-13 | SOT563 | 10000/Tape & Reel |

Notes: 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free
2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

## Marking Information




CA3 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| Code | Y | Z | A | B | C | D | E |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

## Maximum Ratings - Q1 N-CHANNEL @$T_A$ = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = 4.5V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 1030<br>800 | mA |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 1150<br>900 | mA |
| Continuous Drain Current (Note 5) $V_{GS}$ = 1.8V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 740<br>570 | mA |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 870<br>700 | mA |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | 3 | A |
| Maximum Body Diode continuous Current | | | $I_S$ | 800 | mA |

## Maximum Ratings - Q2 P-CHANNEL @$T_A$ = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | -20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±8 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = -4.5V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -700<br>-550 | mA |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -820<br>-640 | mA |
| Continuous Drain Current (Note 5) $V_{GS}$ = -1.8V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -460<br>-350 | mA |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | -550<br>-420 | mA |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | -2 | A |
| Maximum Body Diode continuous Current | | | $I_S$ | -800 | mA |

## Thermal Characteristics @$T_A$ = 25°C unless otherwise specified

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 4) | | $P_D$ | 0.45 | W |
| Thermal Resistance, Junction to Ambient (Note 4) | Steady state | $R_{\theta JA}$ | 281 | °C/W |
| | t<10s | | 210 | °C/W |
| Total Power Dissipation (Note 5) | | $P_D$ | 1 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | $R_{\theta JA}$ | 129 | °C/W |
| | t<10s | | 97 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics - Q1 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 | $BV_{DSS}$ | 20 | - | - | V | $V_{GS}$ = 0V, $I_D$ = 1mA |
| Zero Gate Voltage Drain Current $T_J$ = 25°C | $I_{DSS}$ | - | - | 100 | nA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | - | - | ±1 | µA | $V_{GS}$ = ±5V, $V_{DS}$ = 0V |
| | | - | - | ±4.0 | | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 6)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.5 | - | 0.9 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | - | 0.3 | 0.48 | Ω | $V_{GS}$ = 5.0V, $I_D$ = 200mA |
| | | - | 0.35 | 0.5 | | $V_{GS}$ = 4.5V, $I_D$ = 200mA |
| | | - | 0.45 | 0.7 | | $V_{GS}$ = 2.5V, $I_D$ = 200mA |
| | | - | 0.55 | 0.9 | | $V_{GS}$ = 1.8V, $I_D$ = 100mA |
| | | - | 0.65 | 1.5 | | $V_{GS}$ = 1.5V, $I_D$ = 50mA |
| | | - | 2 | - | | $V_{GS}$ = 1.2V, $I_D$ = 1mA |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | - | 1.4 | - | S | $V_{DS}$ = 3V, $I_D$ = 200mA |
| Diode Forward Voltage | $V_{SD}$ | - | 0.7 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 500mA, |
| **DYNAMIC CHARACTERISTICS (Note 7)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 37.1 | - | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 6.5 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 4.8 | - | | |
| Gate Resistance | $R_g$ | - | 68 | - | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, |
| Total Gate Charge | $Q_g$ | - | 0.5 | - | nC | $V_{GS}$ = 4.5V, $V_{DS}$ = 10V, $I_D$ = 250mA |
| Gate-Source Charge | $Q_{gs}$ | - | 0.07 | - | | |
| Gate-Drain Charge | $Q_{gd}$ | - | 0.1 | - | | |
| Turn-On Delay Time | $t_{D(on)}$ | - | 4.06 | - | ns | $V_{DD}$ = 10V, $V_{GS}$ = 4.5V, $R_L$ = 47Ω, $R_G$ = 10Ω, $I_D$ = 200mA |
| Turn-On Rise Time | $t_r$ | - | 7.28 | - | | |
| Turn-Off Delay Time | $t_{D(off)}$ | - | 13.74 | - | | |
| Turn-Off Fall Time | $t_f$ | - | 10.54 | - | | |

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

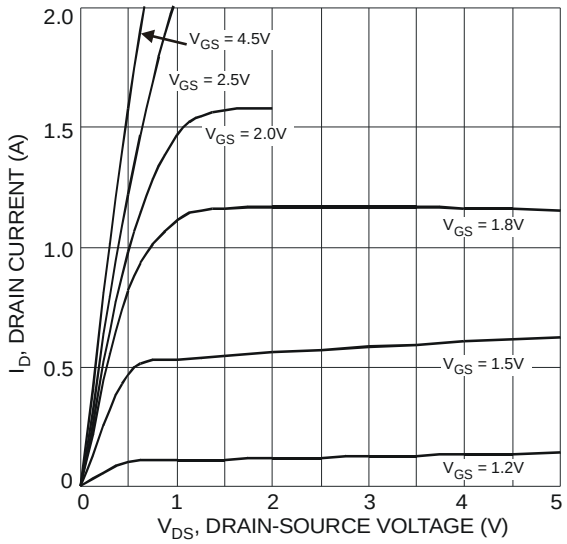


Fig. 1 Typical Output Characteristics

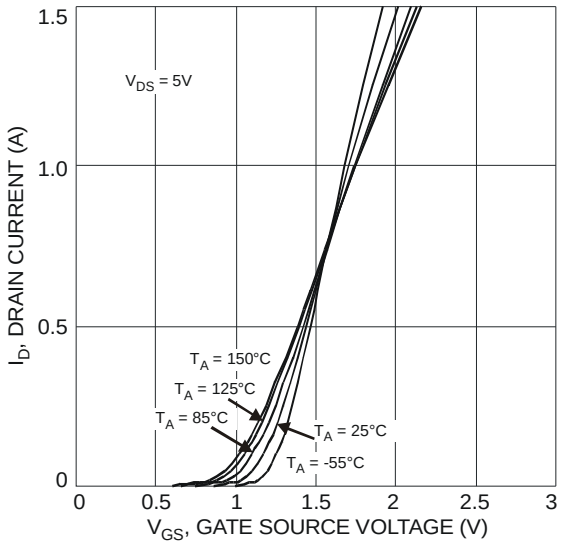


Fig. 2 Typical Transfer Characteristics

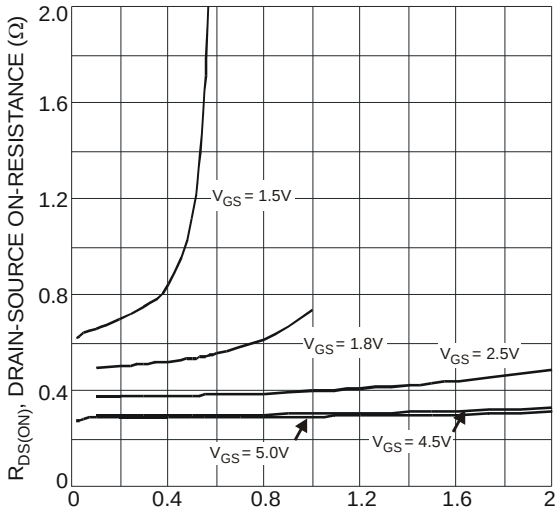



Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

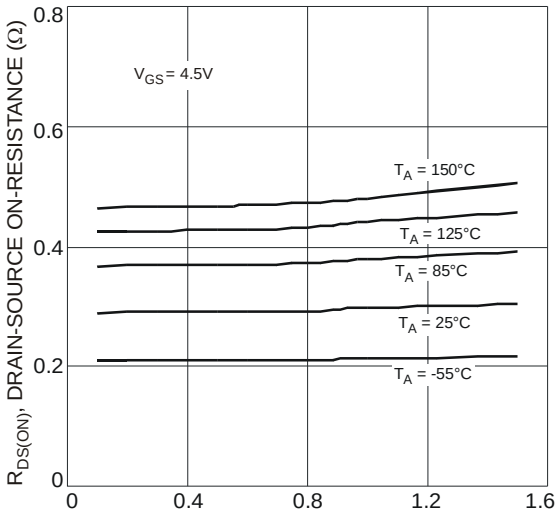



Fig. 4 Typical Drain-Source On-Resistance
vs. Drain Current and Temperature

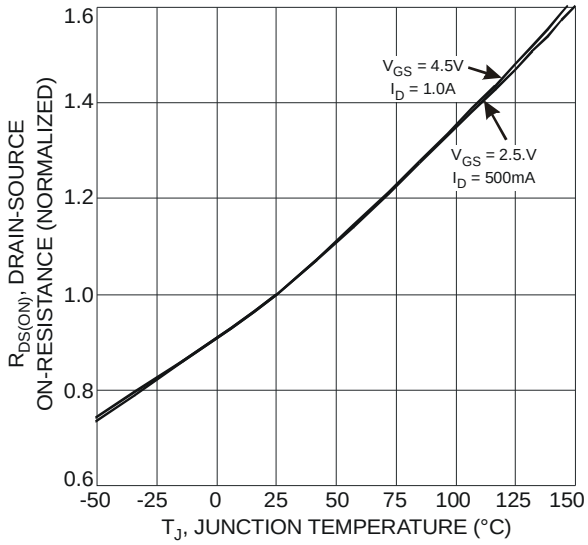



Fig. 5 On-Resistance Variation with Temperature

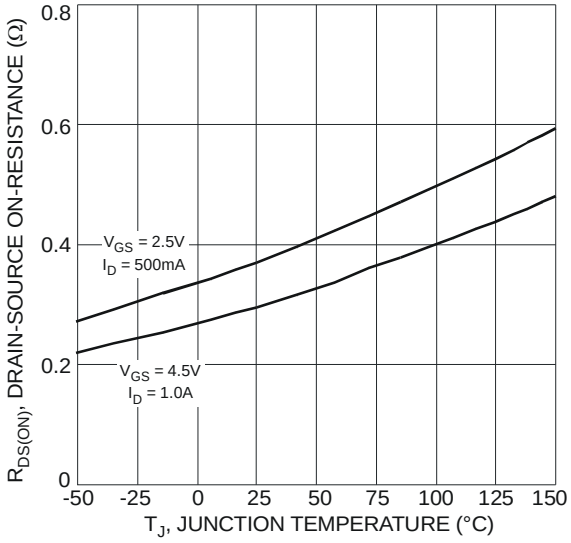



Fig. 6 On-Resistance Variation with Temperature

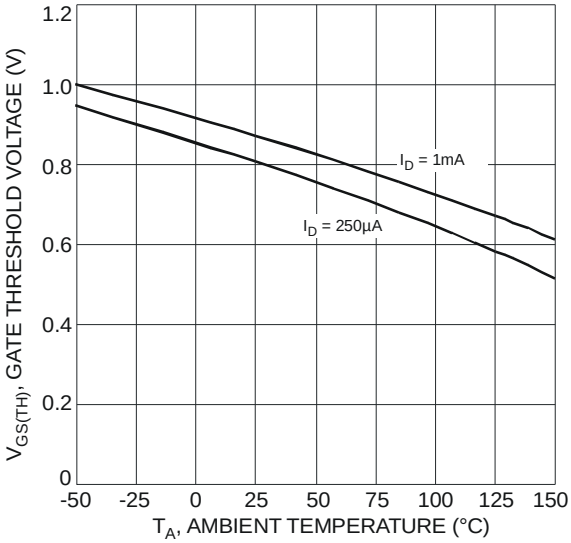



Fig. 7 Gate Threshold Variation vs. Ambient Temperature

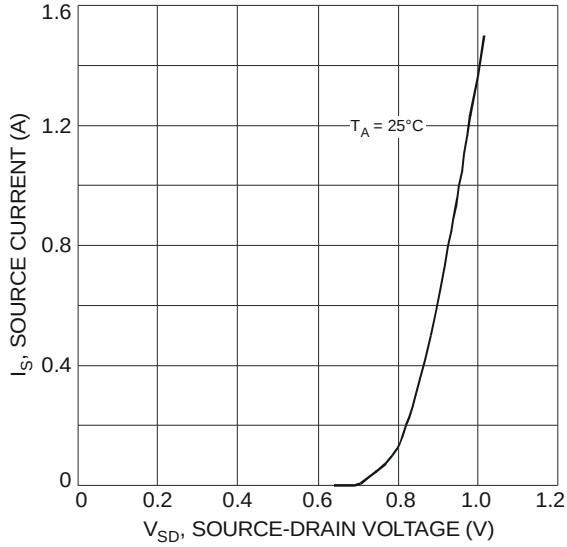



Fig. 8 Diode Forward Voltage vs. Current

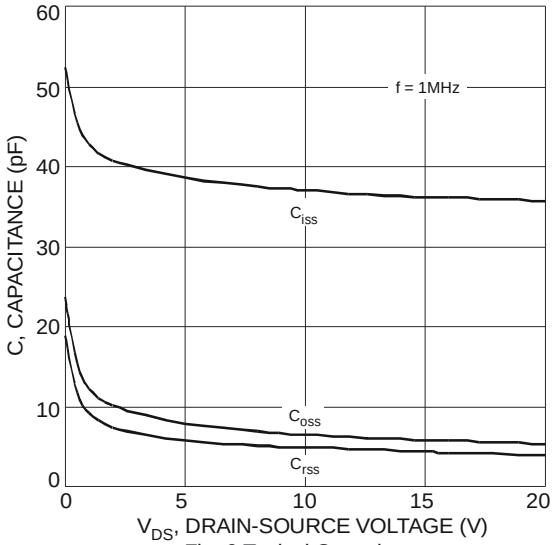



Fig. 9 Typical Capacitance

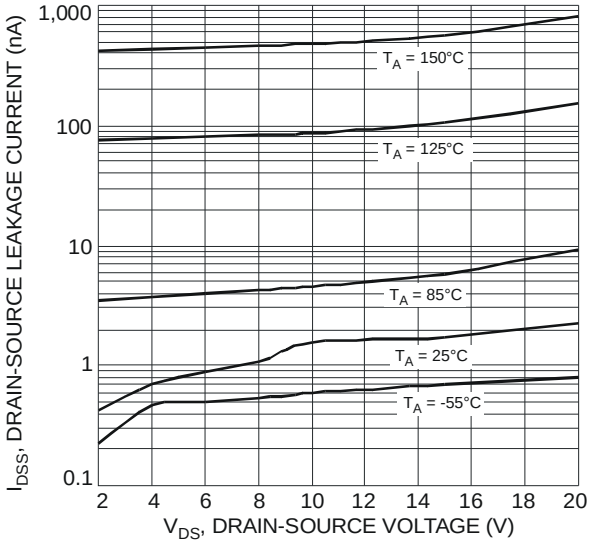



Fig. 10 Typical Drain-Source Leakage Current vs. Drain-Source Voltage

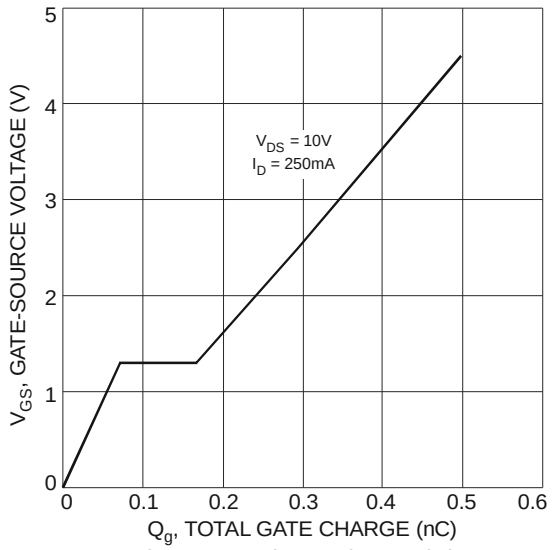



Fig. 11 Gate-Charge Characteristics

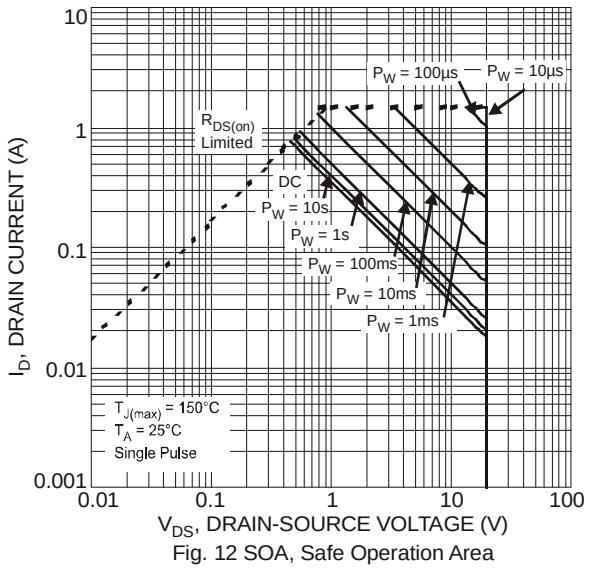



Fig. 12 SOA, Safe Operation Area

## Electrical Characteristics - Q2 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 | $BV_{DSS}$ | -20 | - | - | V | $V_{GS}$ = 0V, $I_D$ = -1mA |
| Zero Gate Voltage Drain Current $T_J$ = 25°C | $I_{DSS}$ | - | - | -100 | nA | $V_{DS}$ = -20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | - | - | ±1.0 | µA | $V_{GS}$ = ±5V, $V_{DS}$ = 0V |
| | | - | - | ±5.0 | | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 6)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -0.5 | - | -1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | - | 0.67 | 0.97 | Ω | $V_{GS}$ = -5V, $I_D$ = -100mA |
| | | | 0.7 | 1.0 | | $V_{GS}$ = -4.5V, $I_D$ = -100mA |
| | | - | 0.9 | 1.5 | | $V_{GS}$ = -2.5V, $I_D$ = -80mA |
| | | - | 1.2 | 2.0 | | $V_{GS}$ = -1.8V, $I_D$ = -40mA |
| | | - | 1.5 | 3.0 | | $V_{GS}$ = -1.5V, $I_D$ = -30mA |
| | | - | 5 | - | | $V_{GS}$ = -1.2V, $I_D$ = -1mA |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | - | 0.7 | - | S | $V_{DS}$ = -3V, $I_D$ = -100mA |
| Diode Forward Voltage | $V_{SD}$ | - | -0.75 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -330mA, |
| **DYNAMIC CHARACTERISTICS (Note 7)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 46.1 | - | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 7.2 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 4.9 | - | | |
| Gate Resistance | $R_g$ | - | 14.3 | - | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, |
| Total Gate Charge $V_{GS}$ = -4.5V | $Q_g$ | - | 0.5 | - | nC | $V_{DS}$ = -10V, $I_D$ = -250mA |
| Total Gate Charge $V_{GS}$ = -10V | $Q_g$ | - | 0.85 | - | | |
| Gate-Source Charge | $Q_{gs}$ | - | 0.09 | - | | |
| Gate-Drain Charge | $Q_{gd}$ | - | 0.09 | - | | |
| Turn-On Delay Time | $t_{D(on)}$ | - | 8.5 | - | ns | $V_{DD}$ = -3V, $V_{GS}$ = -2.5V, $R_L$ = 300Ω, $R_G$ = 25Ω, $I_D$ = -100mA |
| Turn-On Rise Time | $t_r$ | - | 4.3 | - | | |
| Turn-Off Delay Time | $t_{D(off)}$ | - | 20.2 | - | | |
| Turn-Off Fall Time | $t_f$ | - | 19.2 | - | | |

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

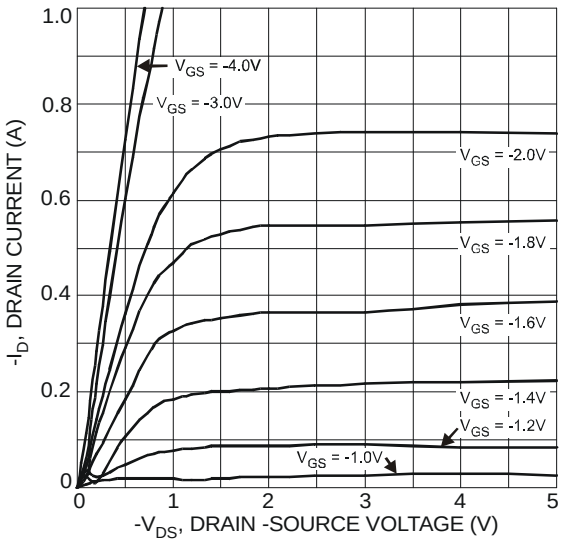


Fig. 13 Typical Output Characteristics

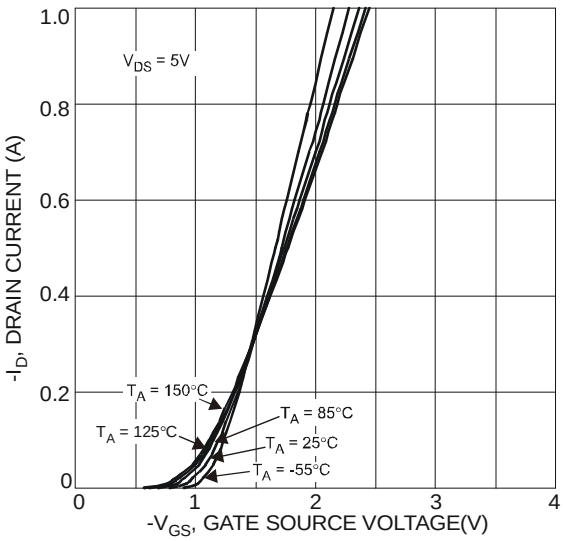


Fig. 14 Typical Transfer Characteristics

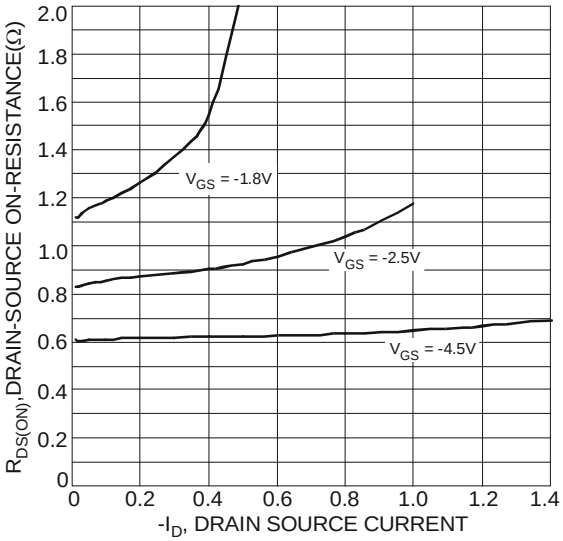



Fig. 15 Typical On-Resistance vs. Drain Current and Gate Voltage

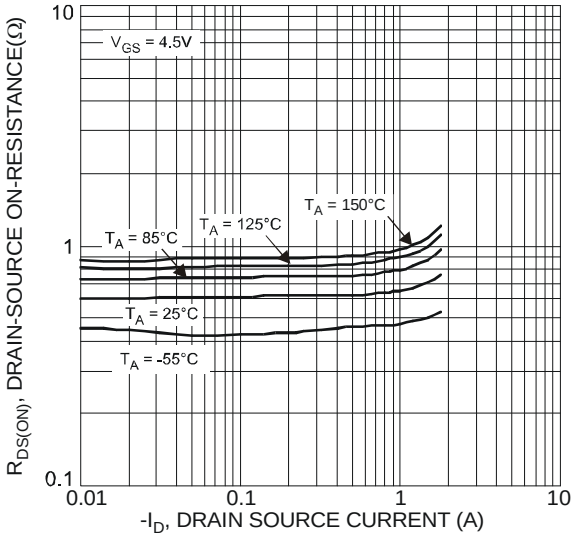



Fig. 16 Typical On-Resistance vs. Drain Current and Temperature

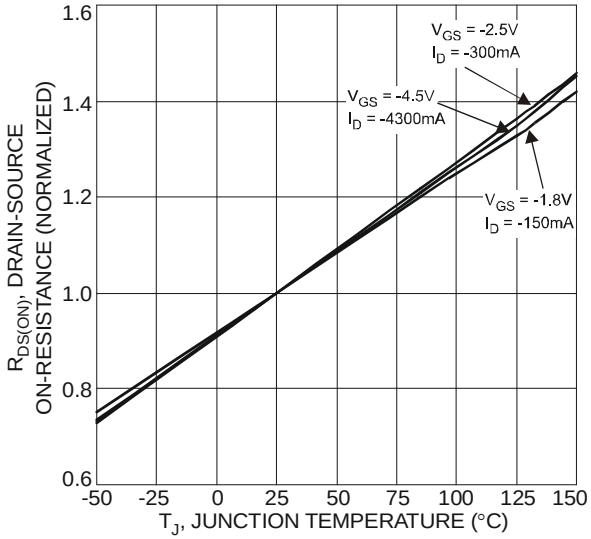



Fig. 17 On-Resistance Variation with Temperature

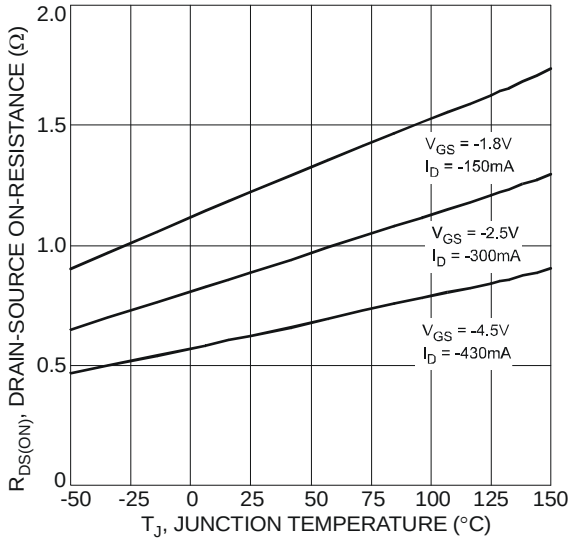



Fig. 18 On-Resistance vs.Temperature

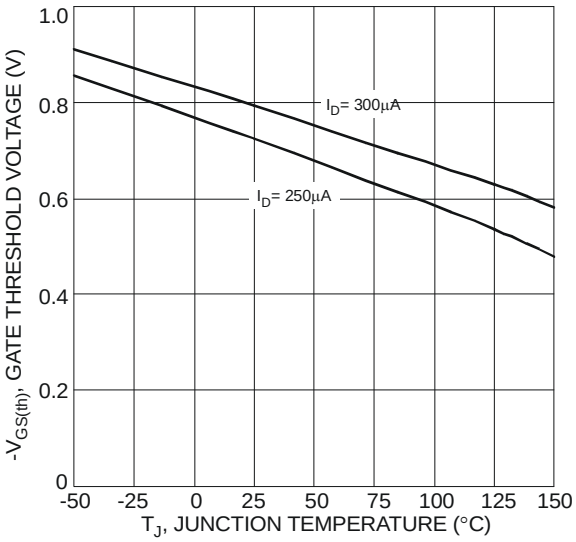



Fig. 19 Gate Threshold Variation vs. Ambient Temperature

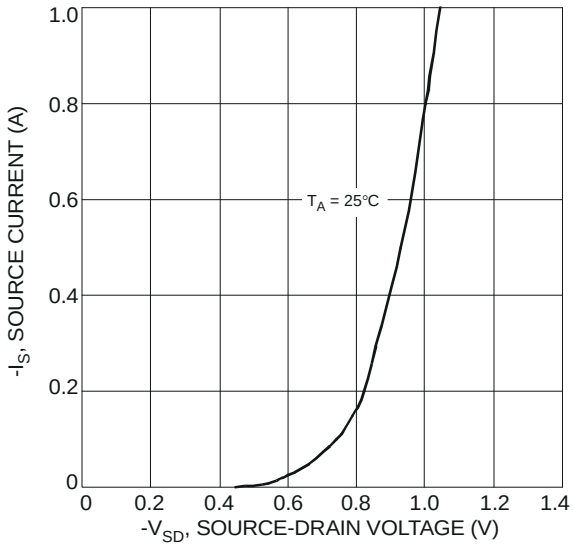



Fig. 20 Diode Forward Voltage vs. Current

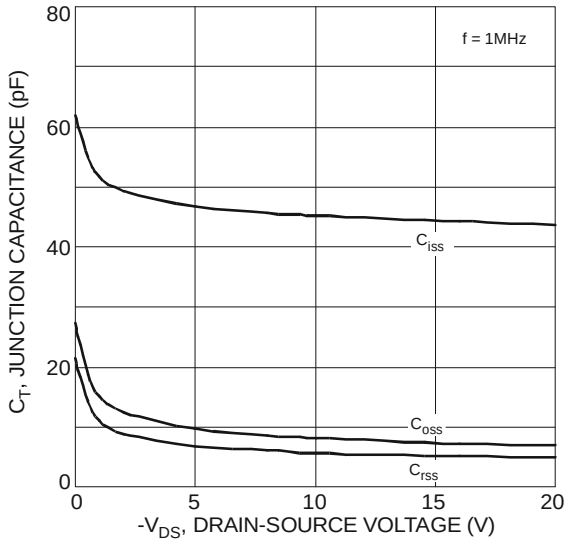



Fig. 21 Typical Junction Capacitance

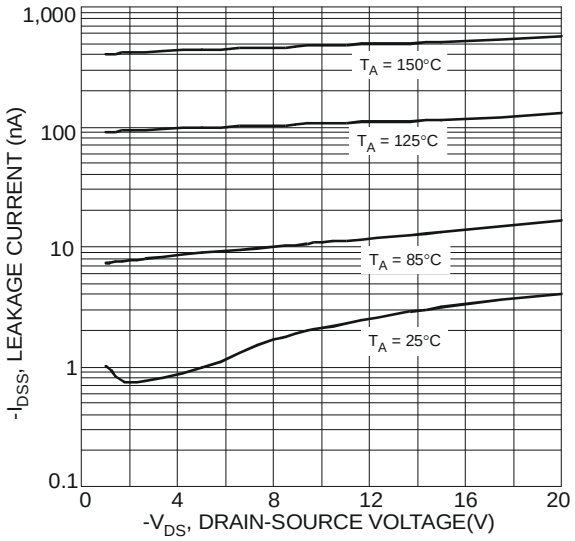



Fig. 22 Typical Drain-Source Leakage Current vs. Voltage

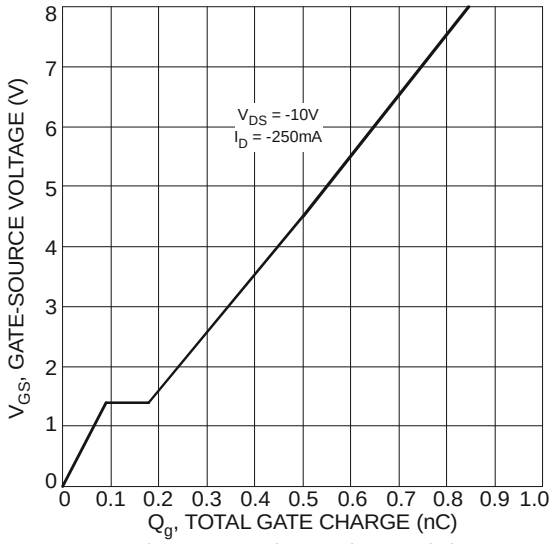



Fig. 23 Gate-Charge Characteristics

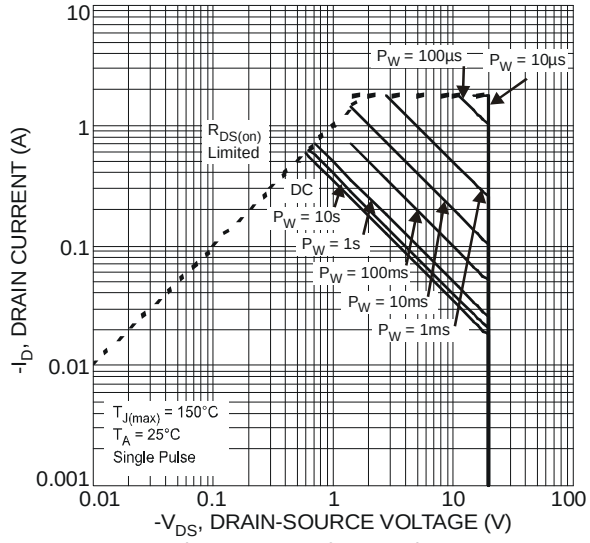



Fig. 24 SOA, Safe Operation Area

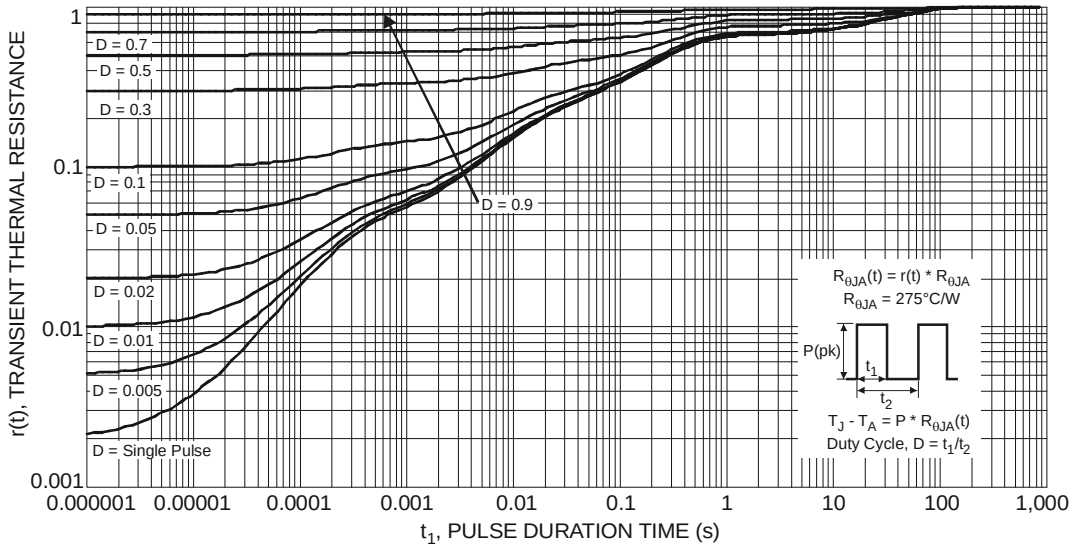
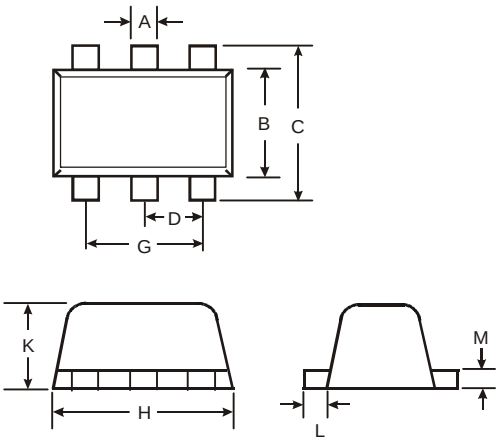


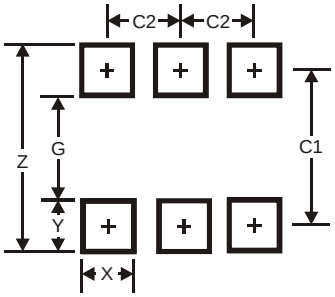

Fig. 25 Transient Thermal Response

## Package Outline Dimensions




| SOT563 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.15 | 0.30 | 0.20 |
| **B** | 1.10 | 1.25 | 1.20 |
| **C** | 1.55 | 1.70 | 1.60 |
| **D** | - | - | 0.50 |
| **G** | 0.90 | 1.10 | 1.00 |
| **H** | 1.50 | 1.70 | 1.60 |
| **K** | 0.55 | 0.60 | 0.60 |
| **L** | 0.10 | 0.30 | 0.20 |
| **M** | 0.10 | 0.18 | 0.11 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout




| Dimensions | Value (in mm) |
|---|---|
| **Z** | 2.2 |
| **G** | 1.2 |
| **X** | 0.375 |
| **Y** | 0.5 |
| **C1** | 1.7 |
| **C2** | 0.5 |

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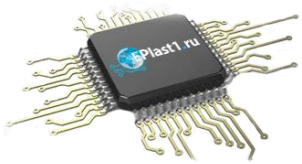
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

**Телефон:** 8 (812) 309 58 32 (многоканальный)
**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.