



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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企业微信二维码



企业QQ二维码

## Product Summary

| Device    | BV <sub>DSS</sub> | R <sub>DS(ON)</sub> Max        | Package | I <sub>D</sub> Max<br>T <sub>A</sub> = +25°C |
|-----------|-------------------|--------------------------------|---------|--|
| N-Channel | 30V               | 20mΩ @ V <sub>GS</sub> = 10V   | SO-8    | 8.5A   |
|           |                   | 32mΩ @ V <sub>GS</sub> = 4.5V  |         | 7.0A   |
| P-Channel | -30V              | 45mΩ @ V <sub>GS</sub> = -10V  |         | -5.5A  |
|           |                   | 85mΩ @ V <sub>GS</sub> = -4.5V |         | -4.1A  |

## Features

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed

## Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

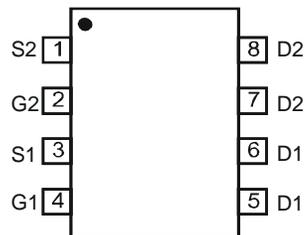
- DC Motor Control
- DC-AC Inverters

## Mechanical Data

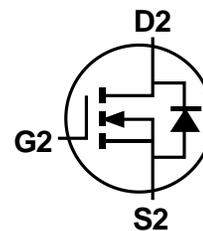
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed Over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (Approximate)



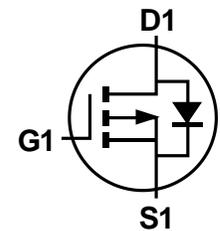
Top View



Pin Configuration



Q2 N-CHANNEL MOSFET



Q1 P-CHANNEL MOSFET

Equivalent Circuit

**Maximum Ratings N-CHANNEL – Q2** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic  |                  |  | Symbol    | Value      | Units |
|---|------------------|--|-----------|------------|-------|
| Drain-Source Voltage  |                  |  | $V_{DSS}$ | 30         | V     |
| Gate-Source Voltage   |                  |  | $V_{GSS}$ | $\pm 20$   | V     |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$             | Steady State     | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 6.5<br>5.1 | A     |
|   | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 8.5<br>6.8 | A     |
| Continuous Drain Current (Note 6) $V_{GS} = 4.5\text{V}$            | Steady State     | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 5.3<br>4.1 | A     |
|   | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | 7.0<br>5.5 | A     |
| Maximum Continuous Body Diode Forward Current (Note 6)              |                  |  | $I_S$     | 2          | A     |
| Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)      |                  |  | $I_{DM}$  | 60         | A     |
| Pulsed Body Diode Current (10 $\mu\text{s}$ pulse, duty cycle = 1%) |                  |  | $I_{SM}$  | 60         | A     |
| Avalanche Current (Note 8) $L = 0.1\text{mH}$                       |                  |  | $I_{AS}$  | 14         | A     |
| Avalanche Energy (Note 8) $L = 0.1\text{mH}$                        |                  |  | $E_{AS}$  | 10         | mJ    |

**Maximum Ratings P-CHANNEL – Q1** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic  |                  |  | Symbol    | Value        | Units |
|---|------------------|--|-----------|--------------|-------|
| Drain-Source Voltage  |                  |  | $V_{DSS}$ | -30          | V     |
| Gate-Source Voltage   |                  |  | $V_{GSS}$ | $\pm 20$     | V     |
| Continuous Drain Current (Note 6) $V_{GS} = -10\text{V}$            | Steady State     | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | -4.2<br>-3.2 | A     |
|   | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | -5.5<br>-4.3 | A     |
| Continuous Drain Current (Note 6) $V_{GS} = -4.5\text{V}$           | Steady State     | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | -3.5<br>-2.3 | A     |
|   | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$<br>$T_A = +70^\circ\text{C}$ | $I_D$     | -4.1<br>-3.2 | A     |
| Maximum Continuous Body Diode Forward Current (Note 6)              |                  |  | $I_S$     | -2           | A     |
| Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)      |                  |  | $I_{DM}$  | -30          | A     |
| Pulsed Body Diode Current (10 $\mu\text{s}$ pulse, duty cycle = 1%) |                  |  | $I_{SM}$  | -30          | A     |
| Avalanche Current (Note 8) $L = 0.1\text{mH}$                       |                  |  | $I_{AS}$  | -14          | A     |
| Avalanche Energy (Note 8) $L = 0.1\text{mH}$                        |                  |  | $E_{AS}$  | 10           | mJ    |

**Thermal Characteristics**

| Characteristic                                   |                           | Symbol          | Value       | Units              |
|--|---------------------------|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 7)                 | $T_A = +25^\circ\text{C}$ | $P_D$           | 1.2         | W                  |
|  | $T_A = +70^\circ\text{C}$ |                 | 0.77        |                    |
| Thermal Resistance, Junction to Ambient (Note 7) | Steady State              | $R_{\theta JA}$ | 104         | $^\circ\text{C/W}$ |
|  | $t < 10\text{s}$          |                 | 62          |                    |
| Total Power Dissipation (Note 6)                 | $T_A = +25^\circ\text{C}$ | $P_D$           | 1.5         | W                  |
|  | $T_A = +70^\circ\text{C}$ |                 | 0.95        |                    |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State              | $R_{\theta JA}$ | 83          | $^\circ\text{C/W}$ |
|  | $t < 10\text{s}$          |                 | 49          |                    |
| Thermal Resistance, Junction to Case (Note 6)    |                           | $R_{\theta JC}$ | 15          | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          |                           | $T_J, T_{STG}$  | -55 to +150 |                    |

- Notes:
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  7. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  8.  $I_{AS}$  and  $E_{AS}$  rating are based on low frequency and duty cycles to keep  $T_J = 25^\circ\text{C}$ .

**Electrical Characteristics N-CHANNEL – Q2** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                             | Symbol              | Min | Typ  | Max | Unit | Test Condition  |
|--|---------------------|-----|------|-----|------|---|
| <b>OFF CHARACTERISTICS</b> (Note 9)        |                     |     |      |     |      |   |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | 30  | —    | —   | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA  |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —   | —    | 1   | μA   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V   |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —   | —    | ±1  | μA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS</b> (Note 9)         |                     |     |      |     |      |   |
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub> | 1.0 | —    | 2.0 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | —   | 15   | 20  | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 7.4A  |
|  |                     | —   | 23   | 32  |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A   |
| Forward Transfer Admittance                | Y <sub>FSL</sub>    | —   | 8    | —   | S    | V <sub>DS</sub> = 5V, I <sub>D</sub> = 10A  |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —   | 0.70 | 1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A   |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 10)   |                     |     |      |     |      |   |
| Input Capacitance                          | C <sub>ISS</sub>    | —   | 501  | —   | pF   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                |
| Output Capacitance                         | C <sub>OSS</sub>    | —   | 72   | —   |      |   |
| Reverse Transfer Capacitance               | C <sub>RSS</sub>    | —   | 57   | —   |      |   |
| Gate Resistance                            | R <sub>G</sub>      | —   | 1.84 | —   | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                    |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>G</sub>      | —   | 4.6  | —   | nC   | V <sub>DS</sub> = 15V, I <sub>D</sub> = 10A   |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>G</sub>      | —   | 9.8  | —   |      |   |
| Gate-Source Charge                         | Q <sub>GS</sub>     | —   | 1.6  | —   |      |   |
| Gate-Drain Charge                          | Q <sub>GD</sub>     | —   | 2.0  | —   |      |   |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —   | 3.9  | —   | ns   | V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V,<br>R <sub>G</sub> = 6Ω, I <sub>D</sub> = 1A |
| Turn-On Rise Time                          | t <sub>R</sub>      | —   | 4.2  | —   |      |   |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —   | 16.6 | —   |      |   |
| Turn-Off Fall Time                         | t <sub>F</sub>      | —   | 5.8  | —   | ns   | I <sub>F</sub> = 12A, di/dt = 500A/μs   |
| Reverse Recovery Time                      | t <sub>RR</sub>     | —   | 5.5  | —   |      |   |
| Reverse Recovery Charge                    | Q <sub>RR</sub>     | —   | 2.6  | —   | nC   |   |

**Electrical Characteristics P-CHANNEL – Q1** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                             | Symbol              | Min  | Typ  | Max  | Unit | Test Condition   |
|--|---------------------|------|------|------|------|--|
| <b>OFF CHARACTERISTICS</b> (Note 9)        |                     |      |      |      |      |  |
| Drain-Source Breakdown Voltage             | BV <sub>DSS</sub>   | -30  | —    | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA  |
| Zero Gate Voltage Drain Current            | I <sub>DSS</sub>    | —    | —    | -1   | μA   | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V   |
| Gate-Source Leakage                        | I <sub>GSS</sub>    | —    | —    | ±100 | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS</b> (Note 9)         |                     |      |      |      |      |  |
| Gate Threshold Voltage                     | V <sub>GS(TH)</sub> | -1.0 | —    | -2.0 | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                  |
| Static Drain-Source On-Resistance          | R <sub>DS(ON)</sub> | —    | 38   | 45   | mΩ   | V <sub>GS</sub> = -10V, I <sub>D</sub> = -5.2A   |
|  |                     | —    | 65   | 85   |      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A  |
| Forward Transfer Admittance                | Y <sub>FS</sub>     | —    | 5    | —    | S    | V <sub>DS</sub> = -5V, I <sub>D</sub> = -5.2A  |
| Diode Forward Voltage                      | V <sub>SD</sub>     | —    | -0.7 | -1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A   |
| <b>DYNAMIC CHARACTERISTICS</b> (Note 10)   |                     |      |      |      |      |  |
| Input Capacitance                          | C <sub>ISS</sub>    | —    | 590  | —    | pF   | V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                  |
| Output Capacitance                         | C <sub>OSS</sub>    | —    | 69   | —    | pF   |  |
| Reverse Transfer Capacitance               | C <sub>RSS</sub>    | —    | 53   | —    | pF   |  |
| Gate resistance                            | R <sub>G</sub>      | —    | 11   | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz                                       |
| Total Gate Charge (V <sub>GS</sub> = 4.5V) | Q <sub>G</sub>      | —    | 5.1  | —    | nC   | V <sub>DS</sub> = -15V, I <sub>D</sub> = -6A   |
| Total Gate Charge (V <sub>GS</sub> = 10V)  | Q <sub>G</sub>      | —    | 10.5 | —    | nC   |  |
| Gate-Source Charge                         | Q <sub>GS</sub>     | —    | 1.8  | —    | nC   |  |
| Gate-Drain Charge                          | Q <sub>GD</sub>     | —    | 1.9  | —    | nC   |  |
| Turn-On Delay Time                         | t <sub>D(ON)</sub>  | —    | 6.8  | —    | ns   | V <sub>DD</sub> = -15V, V <sub>GS</sub> = -10V,<br>R <sub>G</sub> = 6Ω, I <sub>D</sub> = -1A |
| Turn-On Rise Time                          | t <sub>R</sub>      | —    | 4.9  | —    | ns   |  |
| Turn-Off Delay Time                        | t <sub>D(OFF)</sub> | —    | 28.4 | —    | ns   |  |
| Turn-Off Fall Time                         | t <sub>F</sub>      | —    | 12.4 | —    | ns   |  |
| Reverse Recovery Time                      | t <sub>RR</sub>     | —    | 14   | —    | ns   | I <sub>F</sub> = 12A, di/dt = 500A/μs  |
| Reverse Recovery Charge                    | Q <sub>RR</sub>     | —    | 11   | —    | nC   |  |

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

**N-CHANNEL**

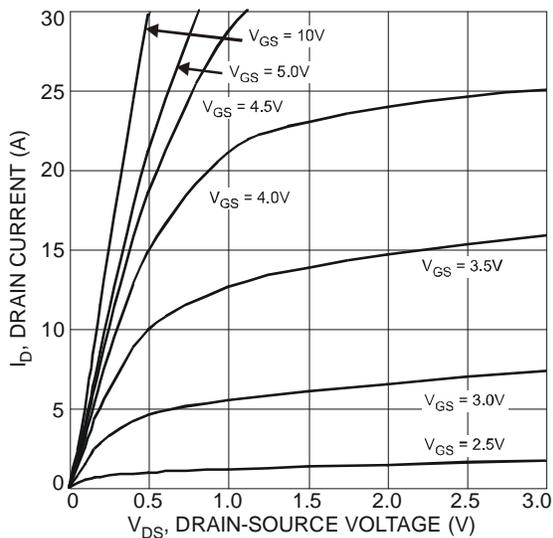


Figure 1. Typical Output Characteristic

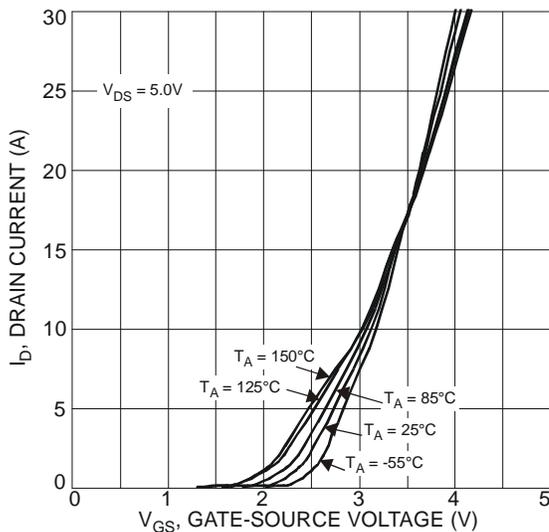


Figure 2. Typical Transfer Characteristics

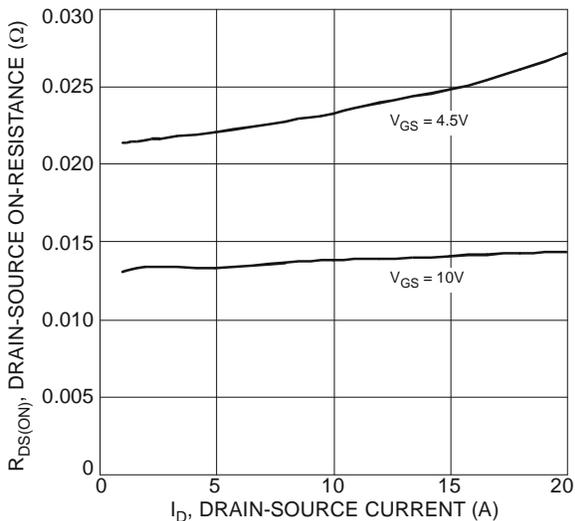


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

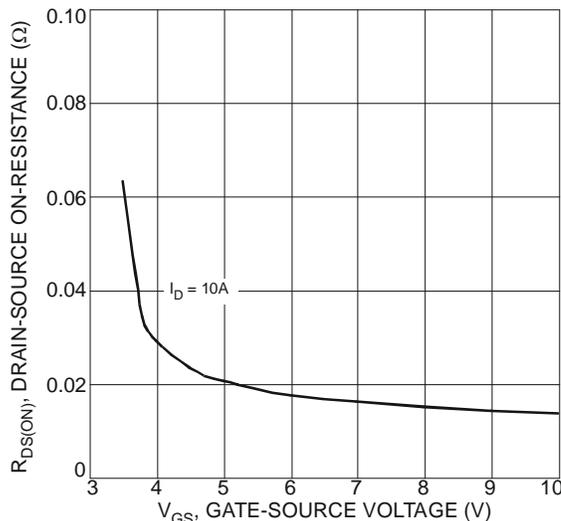


Figure 4. Typical On-Resistance vs. Drain Current and Gate Voltage

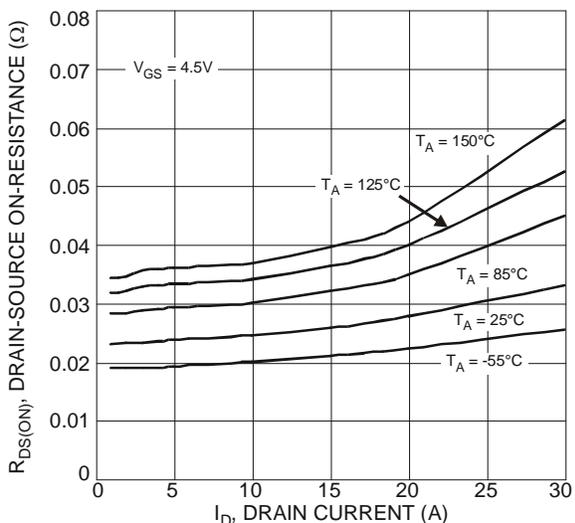


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

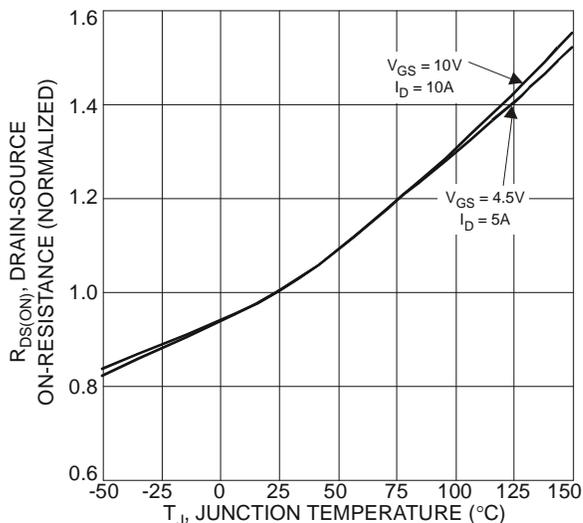


Figure 6. On-Resistance Variation with Temperature

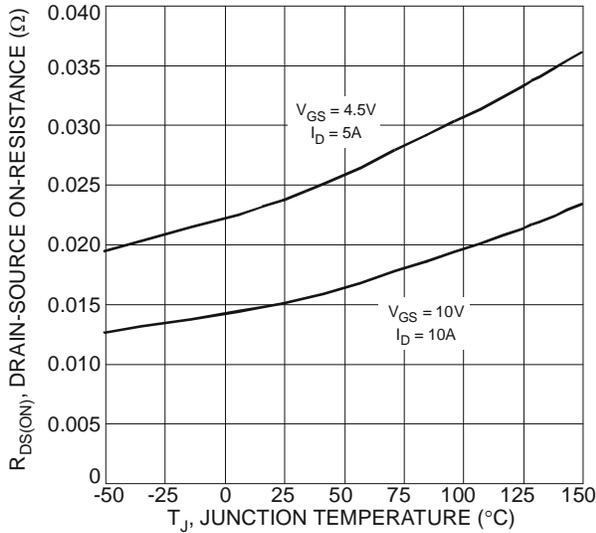


Figure 7. On-Resistance Variation with Temperature

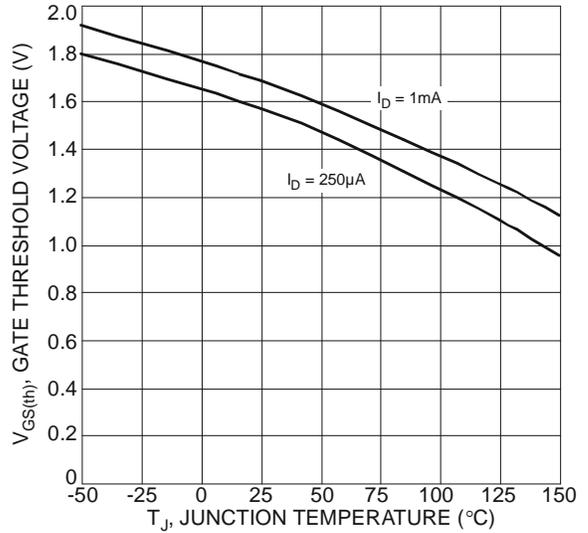


Figure 8. Gate Threshold Variation vs. Ambient Temperature

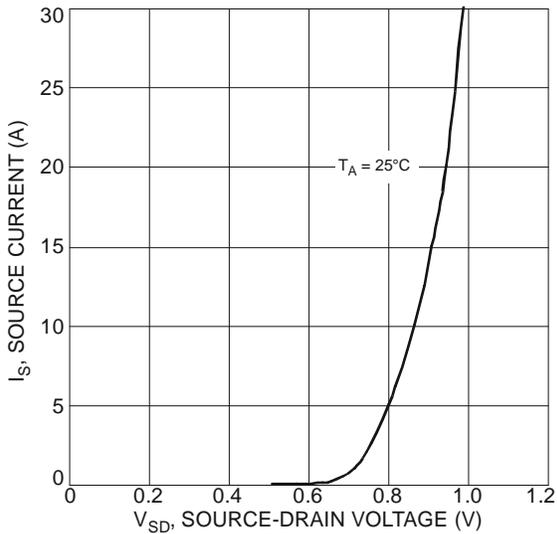


Figure 9. Diode Forward Voltage vs. Current

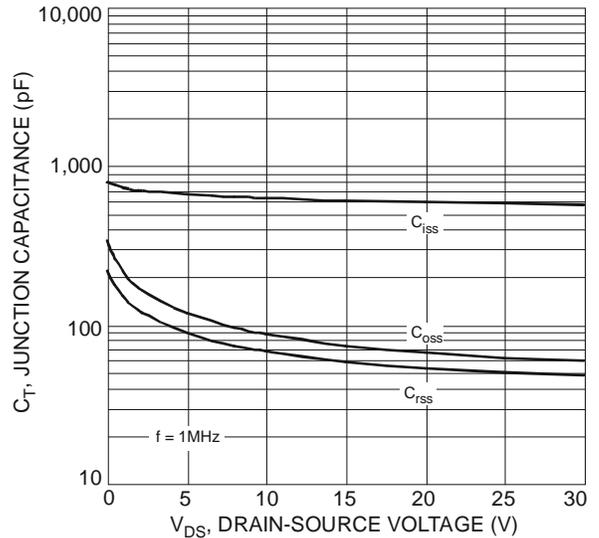


Figure 10. Typical Junction Capacitance

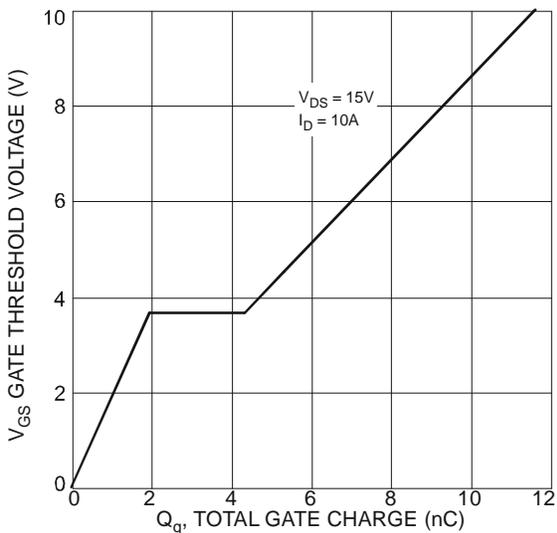


Figure 11. Gate Charge

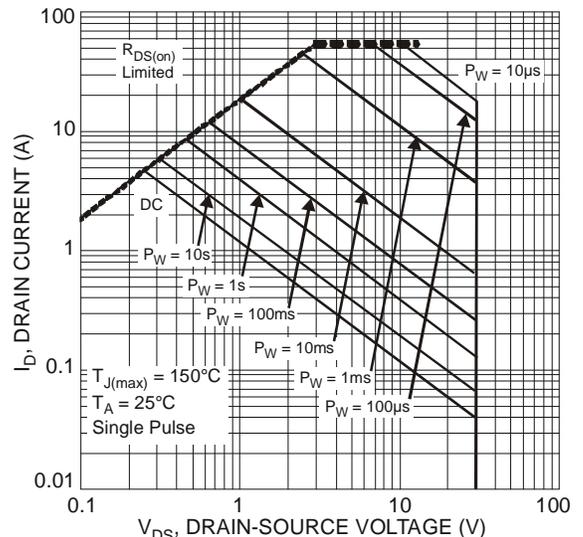


Figure 12. SOA, Safe Operation Area

**P-CHANNEL**

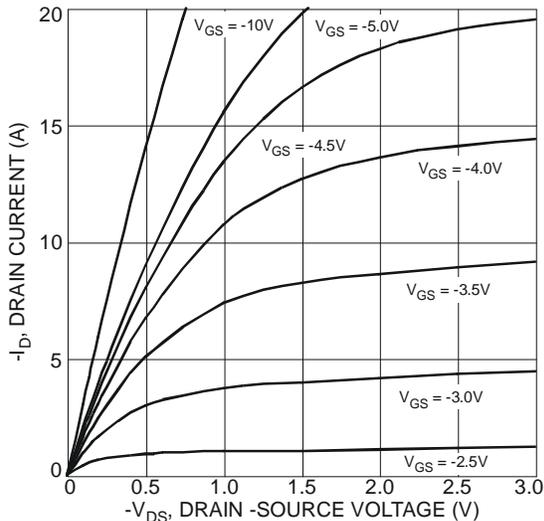


Figure 13. Typical Output Characteristics

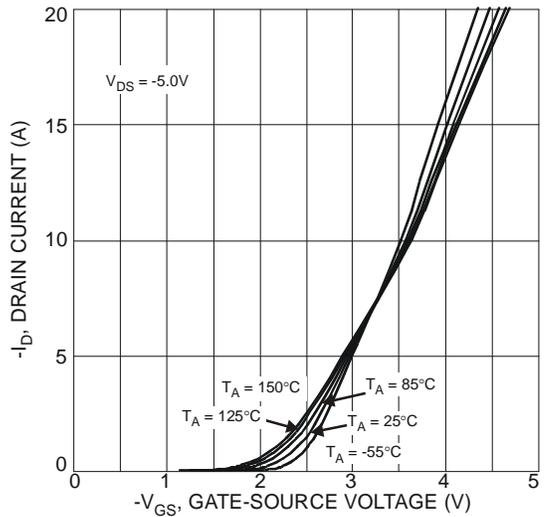


Figure 14. Typical Transfer Characteristics

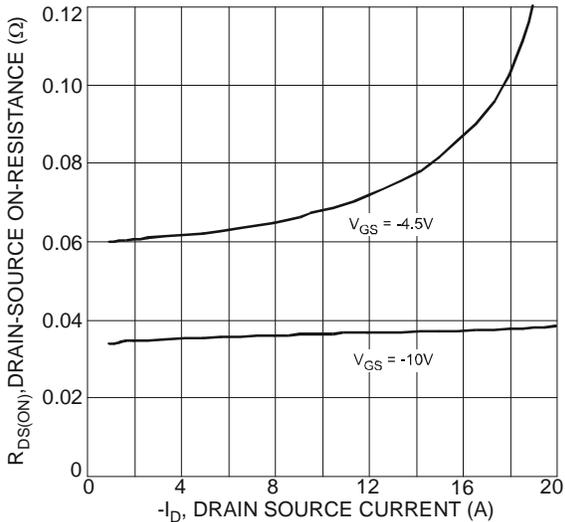


Figure 15. Typical On-Resistance vs. Drain Current and Gate Voltage

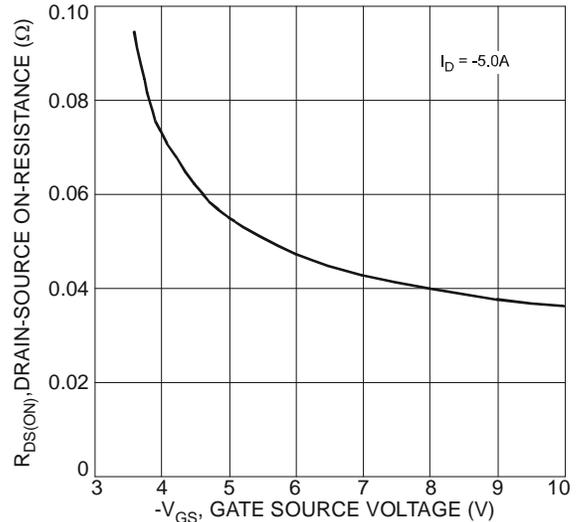


Figure 16. Typical On-Resistance vs. Drain Current and Gate Voltage

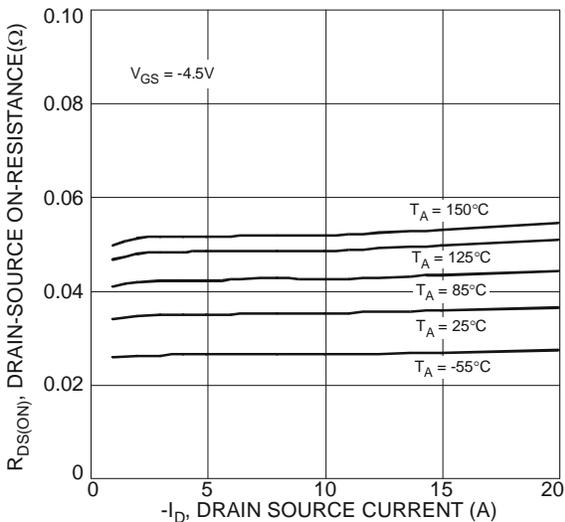


Figure 17. Typical On-Resistance vs. Drain Current and Temperature

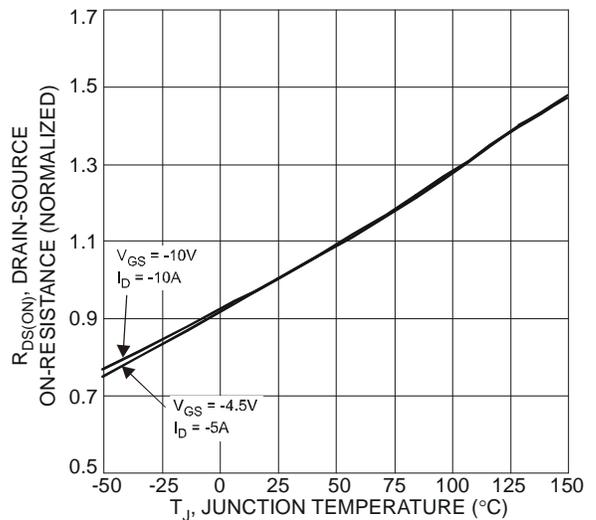


Figure 18. On-Resistance Variation with Temperature

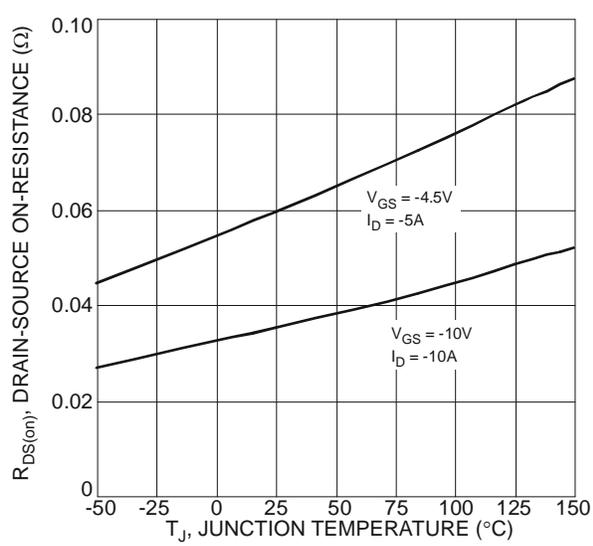


Figure 19. On-Resistance Variation with Temperature

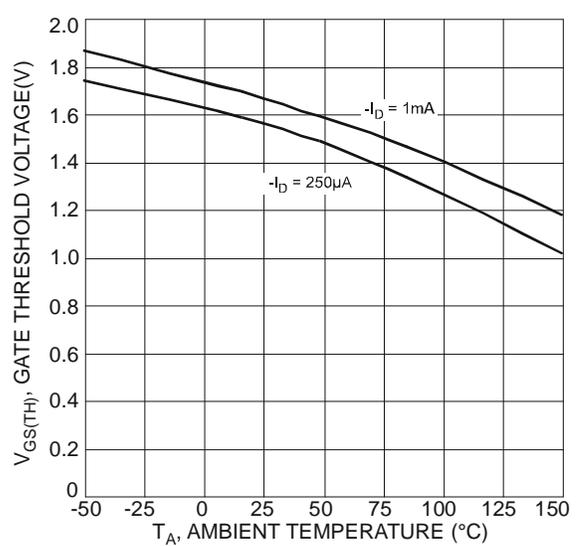


Figure 20. Gate Threshold Variation vs. Ambient Temperature

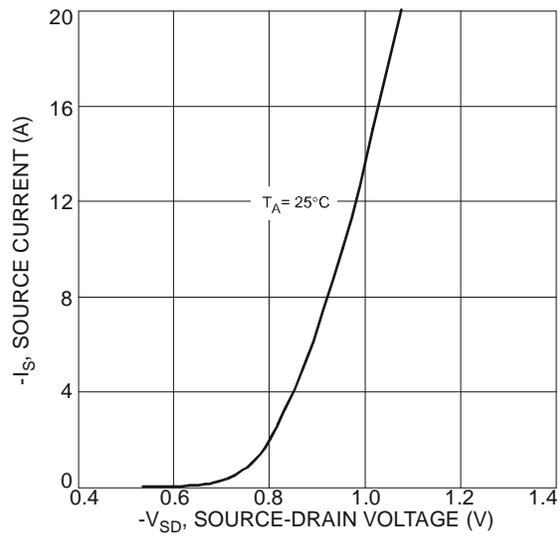


Figure 21. Diode Forward Voltage vs. Current

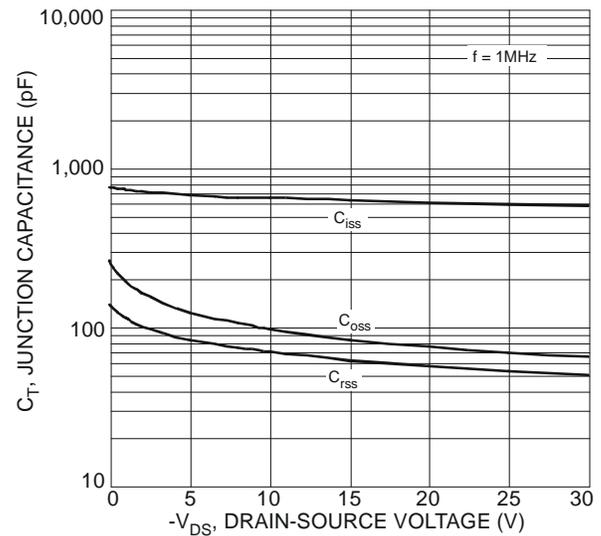


Figure 22. Typical Junction Capacitance

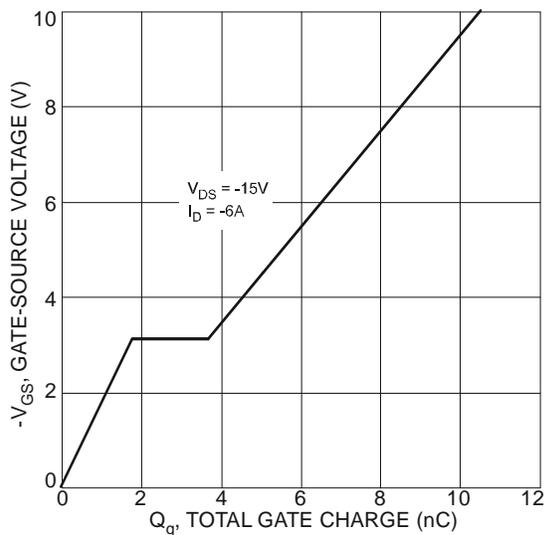


Figure 23. Gate-Charge Characteristics

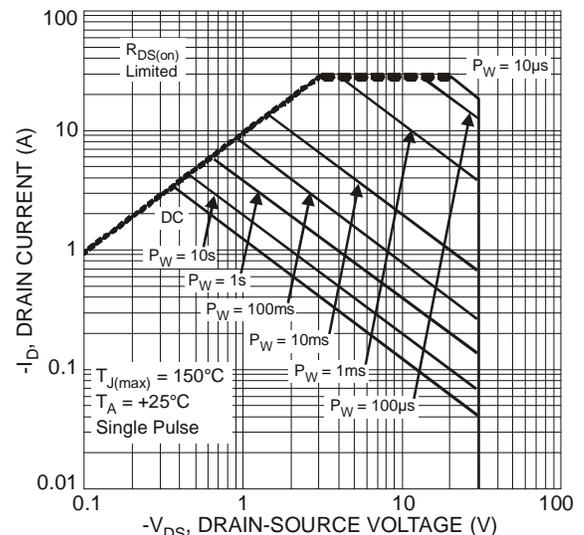


Figure 24. SOA, Safe Operation Area

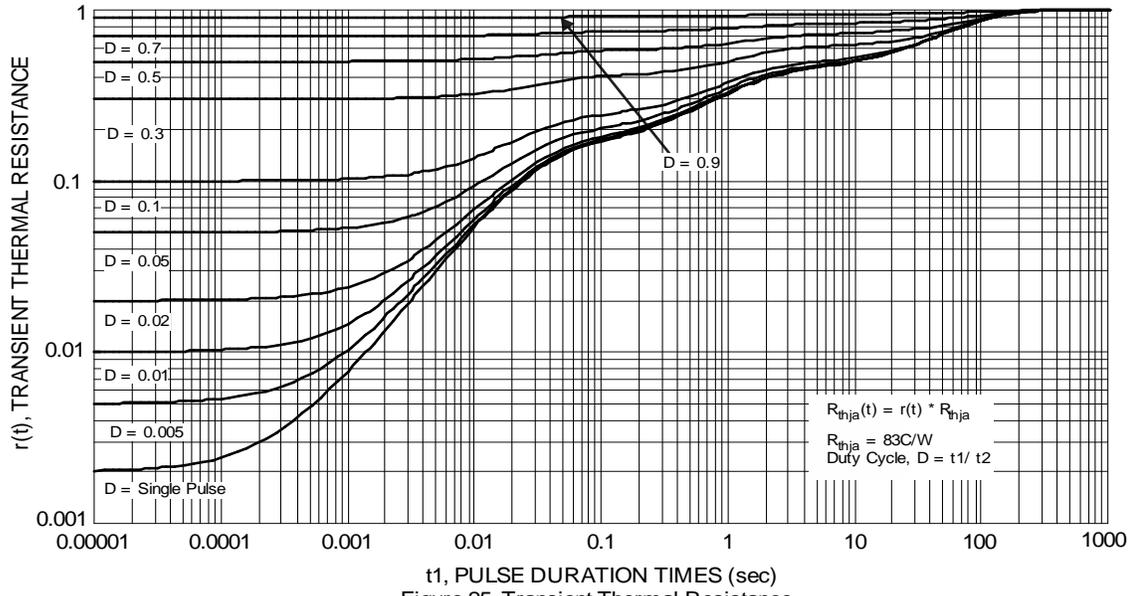
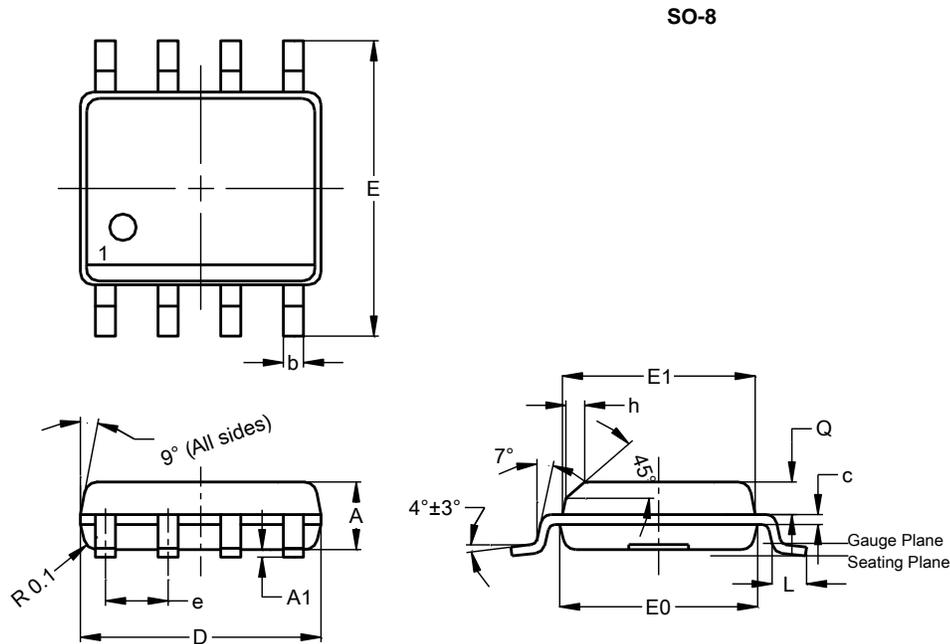


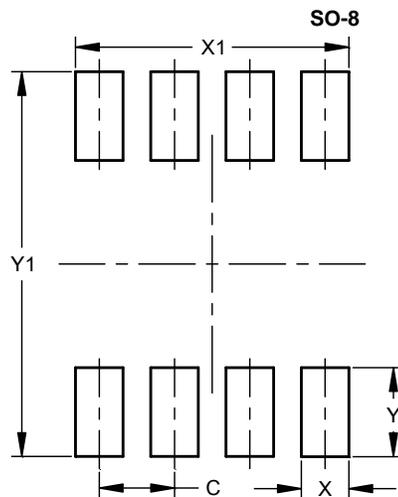
Figure 25 Transient Thermal Resistance

### Package Outline Dimensions



| SO-8                 |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 1.40 | 1.50 | 1.45 |
| A1                   | 0.10 | 0.20 | 0.15 |
| b                    | 0.30 | 0.50 | 0.40 |
| c                    | 0.15 | 0.25 | 0.20 |
| D                    | 4.85 | 4.95 | 4.90 |
| E                    | 5.90 | 6.10 | 6.00 |
| E1                   | 3.80 | 3.90 | 3.85 |
| E0                   | 3.85 | 3.95 | 3.90 |
| e                    | --   | --   | 1.27 |
| h                    | -    | --   | 0.35 |
| L                    | 0.62 | 0.82 | 0.72 |
| Q                    | 0.60 | 0.70 | 0.65 |
| All Dimensions in mm |      |      |      |

### Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 1.27          |
| X          | 0.802         |
| X1         | 4.612         |
| Y          | 1.505         |
| Y1         | 6.50          |