# 30V Dual Asymmetric N-Ch Power MOSFET

## Features

- Ultra-low ON-resistance, $R_{DS(ON)}$
- Low Gate Charge, $Q_g$
- 100% UIS and $R_g$ Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

## Product Summary

| Parameter | Value | | Unit |
|---|---|---|---|
| | Q1 | Q2 | |
| $V_{DS}$ | 30 | 30 | V |
| $V_{GS(th)\_Typ}$ | 1.8 | 1.8 | V |
| $I_D$ (@ $V_{GS}$ = 10V) (1) | 64 | 173 | A |
| $R_{DS(ON)\_Typ}$ (@ $V_{GS}$ = 10V) | 3.4 | 0.90 | mΩ |
| $R_{DS(ON)\_Typ}$ (@ $V_{GS}$ = 4.5V) | 5.6 | 1.6 | mΩ |

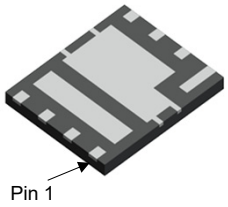
## Applications

- Current Switching in DC/DC Sub-systems
- Power Management in Computing, CE, IE 4.0, Communications

DFN5060-8L-B

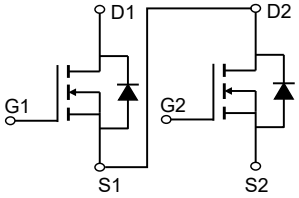
Top View

Bottom View

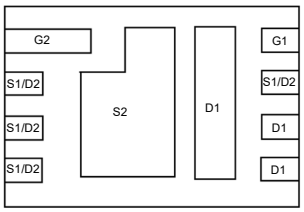



Pin Configuration

Schematic




Bottom View




## Ordering Information

| Device | Package | # of Pins | Marking | MSL | $T_J$ (°C) | Media | Quantity (pcs) |
|---|---|---|---|---|---|---|---|
| JMSL0301AGND-13 | DFN5060-8L-B | 8 | SL0301AD | 1 | -55 to 150 | 13-inch Reel | 5000 |

## Absolute Maximum Ratings (@ $T_A$ = 25°C unless otherwise specified)

| Parameter | | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | Q1 | Q2 | |
| Drain-to-Source Voltage | | $V_{DS}$ | 30 | 30 | V |
| Gate-to-Source Voltage | | $V_{GS}$ | ±20 | ±12 | V |
| Continuous Drain Current (1) | $T_C$ = 25°C | $I_D$ | 64 | 173 | A |
| | $T_C$ = 100°C | | 40 | 109 | |
| Continuous Drain Current | $T_A$ = 25°C | | 23 | 46 | A |
| | $T_A$ = 70°C | | 18.2 | 37 | |
| Pulsed Drain Current (2) | | $I_{DM}$ | 155 | 631 | A |
| Avalanche Current (3) | | $I_{AS}$ | 18.0 | 38 | A |
| Avalanche Energy (3) | | $E_{AS}$ | 49 | 217 | mJ |
| Power Dissipation (4) | $T_C$ = 25°C | $P_D$ | 28 | 50 | W |
| | $T_C$ = 100°C | | 11.1 | 20 | |
| Power Dissipation (5) | $T_A$ = 25°C | | 3.6 | 3.6 | W |
| | $T_A$ = 70°C | | 2.3 | 2.3 | |
| Junction & Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | | °C |

## Thermal Performance

| Parameter | Symbol | Typ. | | Max. | | Unit |
|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q1 | Q2 | |
| Thermal Resistance, Junction-to-Ambient (4) | $R_{\theta JA}$ | 35 | 35 | 45 | 45 | °C/W |
| Thermal Resistance, Junction-to-Case (5) | $R_{\theta JC}$ | 4.5 | 2.5 | 5.5 | 3.0 | °C/W |

**Notes:**

1. Computed continuous current assumes the condition of $T_{J\_Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board.
2. This single-pulse measurement was taken under $T_{J\_Max}$ = 150°C.

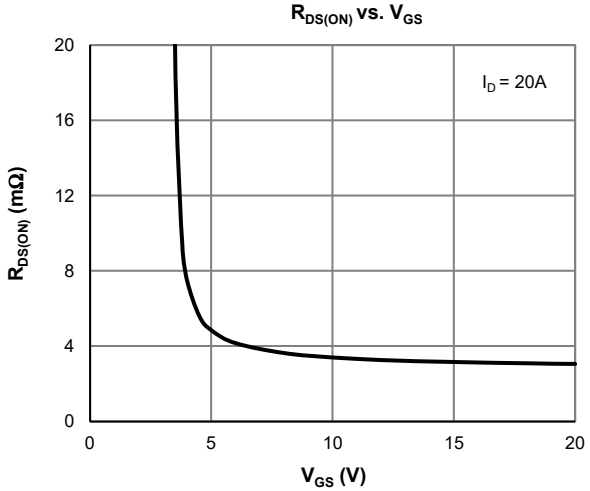
**Electrical Characteristics - Q1** (@ $T_J$ = 25°C unless otherwise specified)

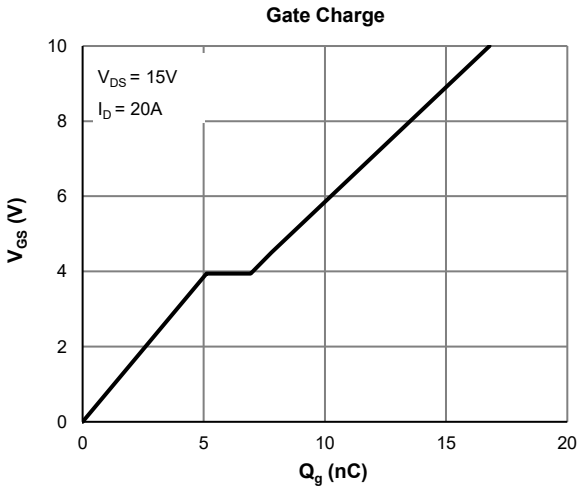
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$ = 1.0mA, $V_{GS}$ = 0V | 30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | | | 1.0 | µA |
| | | $T_J$ = 55°C | | | 5.0 | |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | | | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA | 1.2 | 1.8 | 2.5 | V |
| Static Drain-Source ON-Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 20A | | 3.4 | 4.3 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 15A | | 5.6 | 7.3 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 5V, $I_D$ = 20A | | 24 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 1A, $V_{GS}$ = 0V | | 0.7 | 1.0 | V |
| Diode Continuous Current | $I_S$ | $T_C$ = 25°C | | | 28 | A |
| **DYNAMIC PARAMETERS** [6] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz | | 1043 | | pF |
| Output Capacitance | $C_{oss}$ | | | 861 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 59 | | pF |
| Gate Resistance | $R_g$ | $V_{GS}$ = 0V, $V_{DS}$= 0V, f = 1MHz | | 1.0 | | Ω |
| **SWITCHING PARAMETERS** [6] | | | | | | |
| Total Gate Charge (@ $V_{GS}$ = 10V) | $Q_g$ | $V_{GS}$ = 0 to 10V<br>$V_{DS}$ = 15V, $I_D$ = 20A | | 16.8 | | nC |
| Total Gate Charge (@ $V_{GS}$ = 4.5V) | $Q_g$ | | | 7.8 | | nC |
| Gate Source Charge | $Q_{gs}$ | | | 5.1 | | nC |
| Gate Drain Charge | $Q_{gd}$ | | | 1.8 | | nC |
| Turn-On DelayTime | $t_{D(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V<br>$R_L$ = 0.75Ω, $R_{GEN}$ = 3Ω | | 8.1 | | ns |
| Turn-On Rise Time | $t_r$ | | | 63 | | ns |
| Turn-Off DelayTime | $t_{D(off)}$ | | | 17.1 | | ns |
| Turn-Off Fall Time | $t_f$ | | | 4.0 | | ns |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 20A, $dI_F/dt$ = 100A/µs | | 26 | | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | $I_F$ = 20A, $dI_F/dt$ = 100A/µs | | 9.7 | | nC |

**Notes:**

3. This single-pulse measurement was taken under the following condition [L = 300mH, $V_{GS}$ = 10V, $V_{DD}$ = 15V] while its value is limited by $T_{J\_Max}$ = 150°C.

4. The power dissipation $P_D$ is based on $R_{\theta JA}$ with t≤ 10s and the maximum allowed junction temperature of 150°C.



## Typical Electrical & Thermal Characteristics - Q1

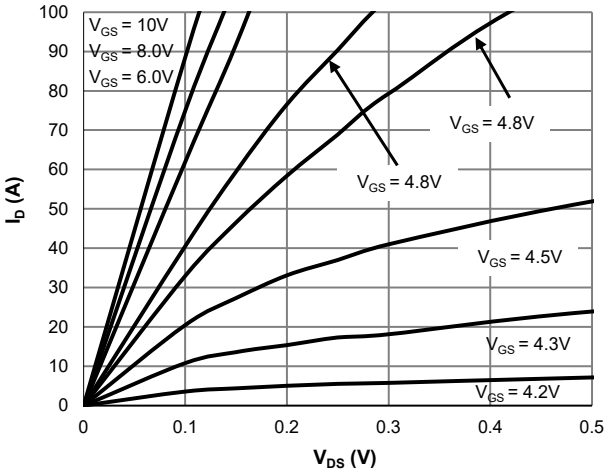



Figure 1: Saturation Characteristics

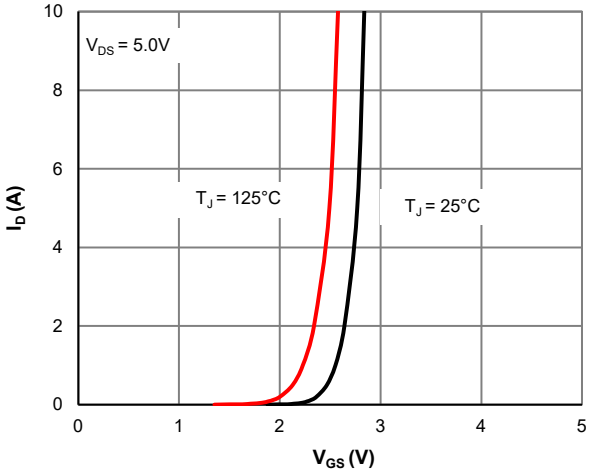



Figure 2: Transfer Characteristics

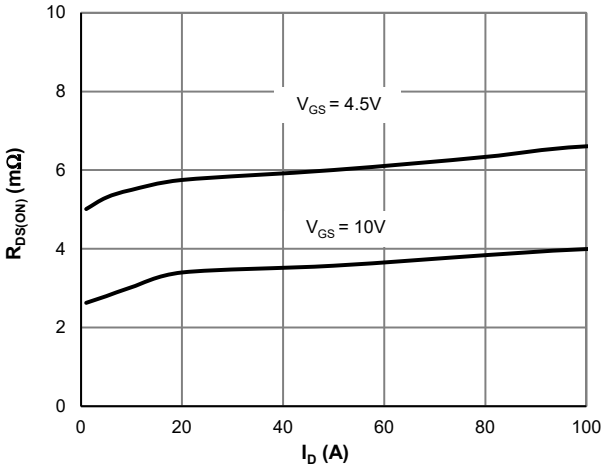



Figure 3: $R_{DS(ON)}$ vs. Drain Current

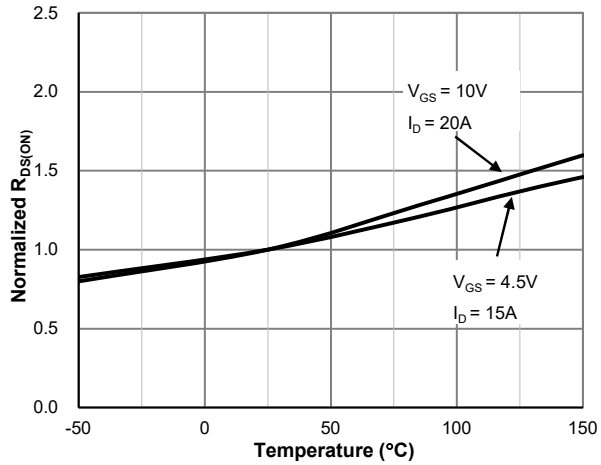



Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

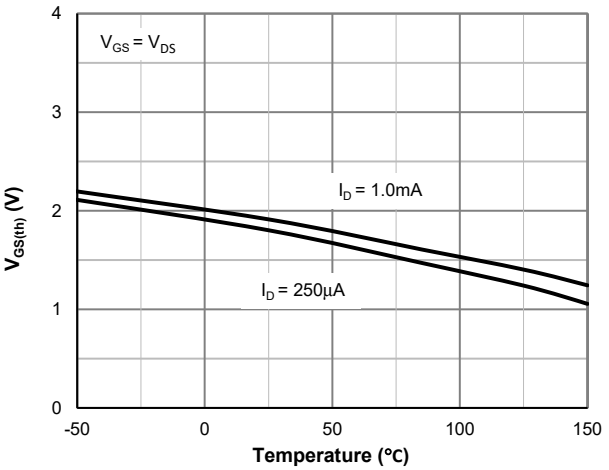



Figure 5: $V_{GS(th)}$ vs. Junction Temperature

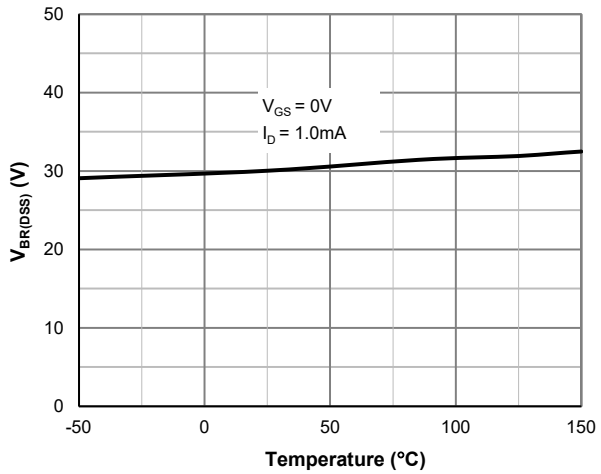



Figure 6: $V_{BR(DSS)}$ vs. Junction Temperature

## Typical Electrical & Thermal Characteristics - Q1

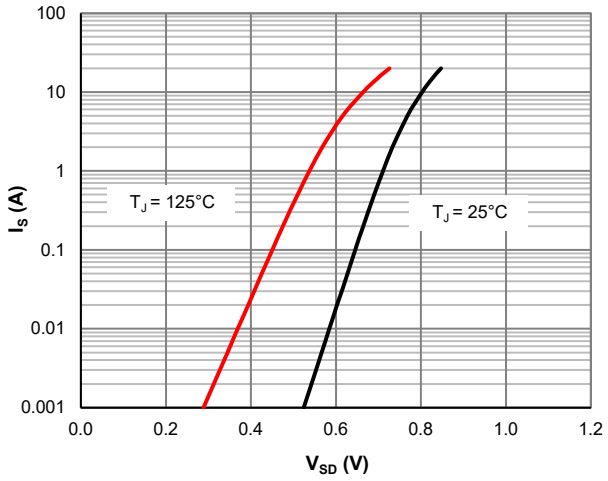



Figure 7: Body-Diode Characteristics

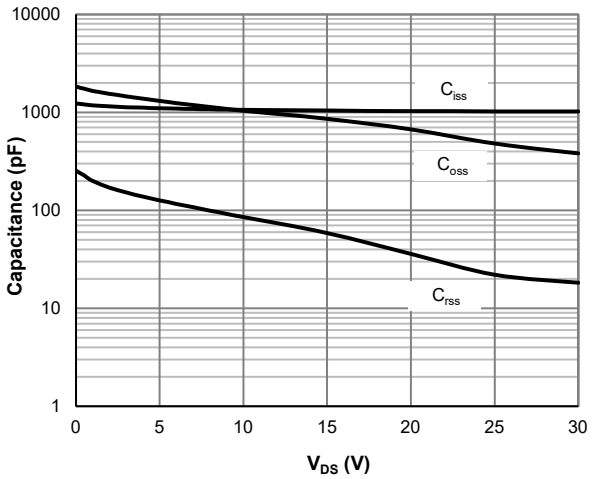



Figure 8: Capacitance Characteristics

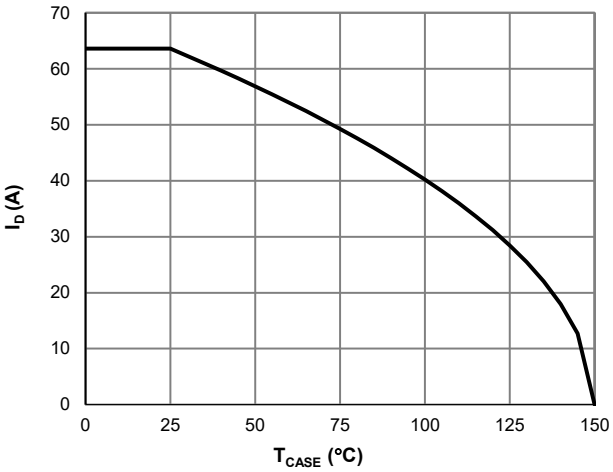



Figure 9: Current De-rating

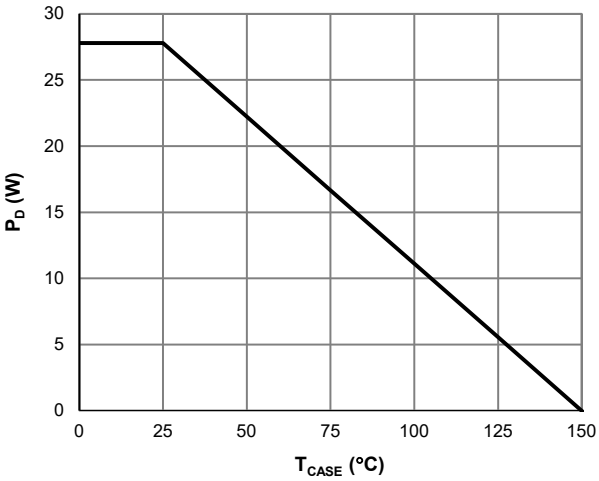



Figure 10: Power De-rating

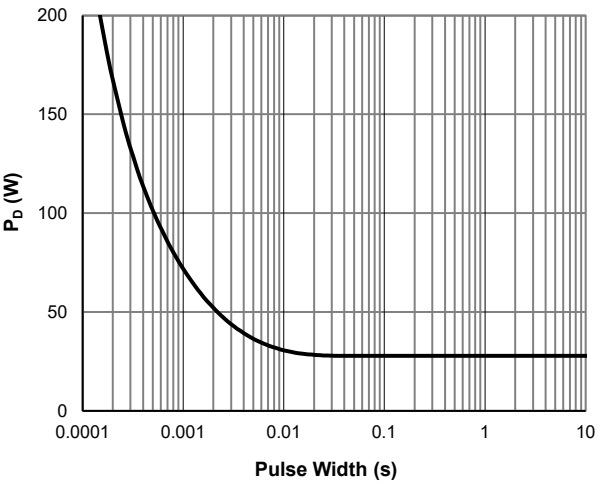



Figure 11: Single Pulse Power Rating, Junction-to-Case

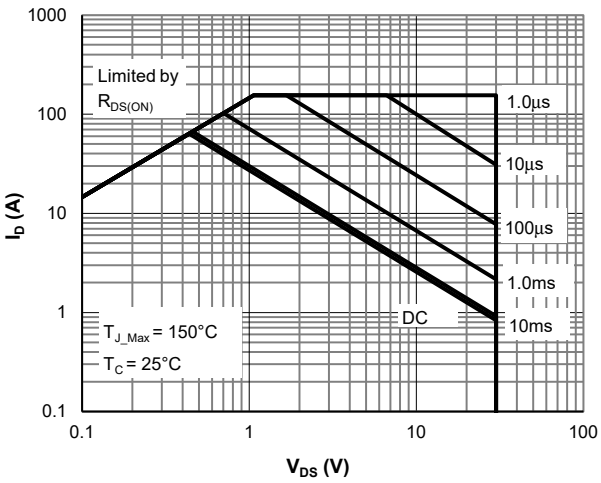



Figure 12: Maximum Safe Operating Area

## Typical Electrical & Thermal Characteristics - Q1

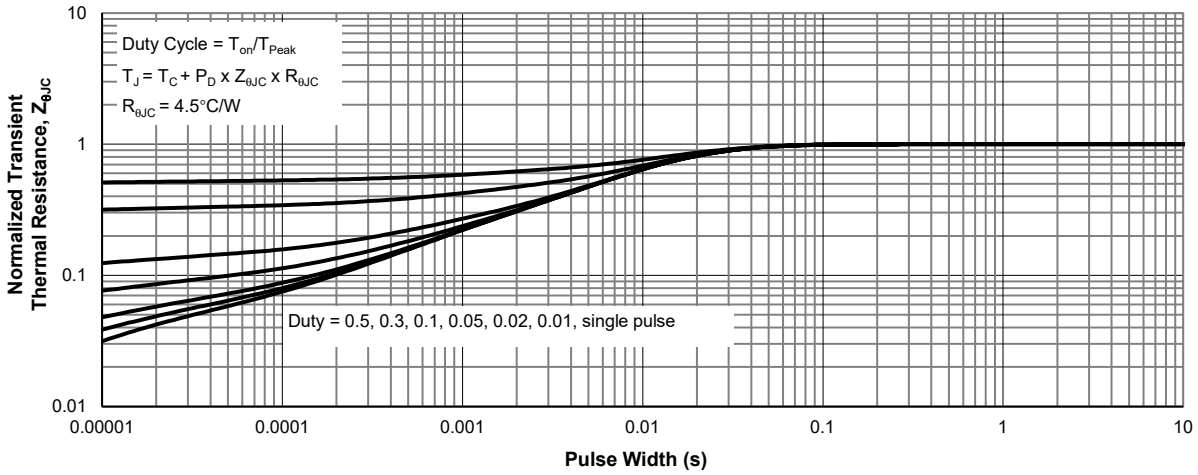



**Figure 13: Normalized Maximum Transient Thermal Impedance**

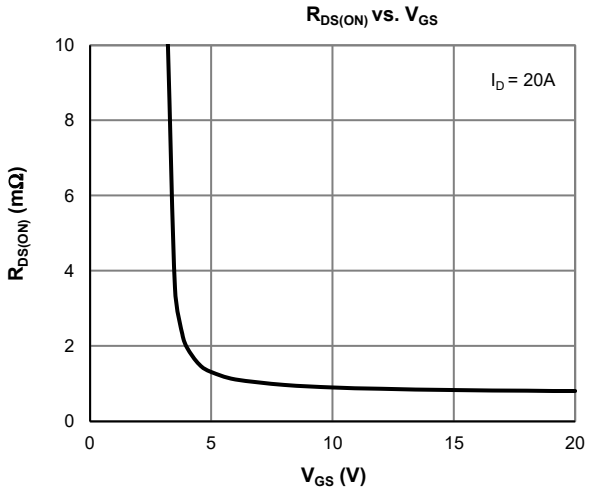
**Electrical Characteristics - Q2** (@ $T_J$ = 25°C unless otherwise specified)

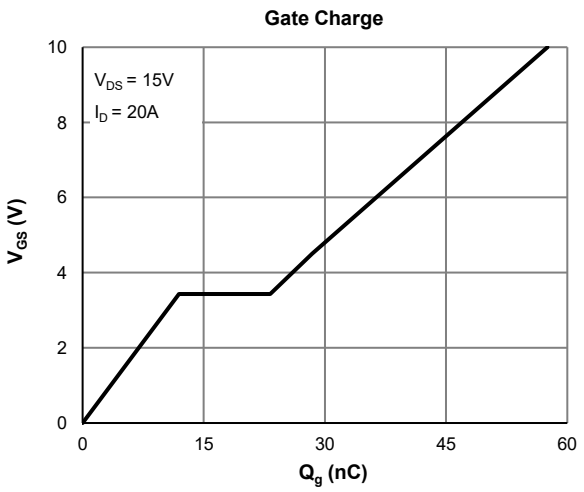
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$ = 1.0mA, $V_{GS}$ = 0V | 30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | | | 1.0 | µA |
| | | $T_J$ = 55°C | | | 5.0 | |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±12V | | | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA | 1.2 | 1.8 | 2.5 | V |
| Static Drain-Source ON-Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 20A | | 0.90 | 1.2 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 15A | | 1.55 | 1.9 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 5V, $I_D$ = 20A | | 60 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 1A, $V_{GS}$ = 0V | | 0.7 | 1.0 | V |
| Diode Continuous Current | $I_S$ | $T_C$ = 25°C | | | 28 | A |
| **DYNAMIC PARAMETERS** [6] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz | | 3565 | | pF |
| Output Capacitance | $C_{oss}$ | | | 2557 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 200 | | pF |
| Gate Resistance | $R_g$ | $V_{GS}$ = 0V, $V_{DS}$= 0V, f = 1MHz | | 1.6 | | Ω |
| **SWITCHING PARAMETERS** [6] | | | | | | |
| Total Gate Charge (@ $V_{GS}$ = 10V) | $Q_g$ | $V_{GS}$ = 0 to 10V<br>$V_{DS}$ = 15V, $I_D$ = 20A | | 58 | | nC |
| Total Gate Charge (@ $V_{GS}$ = 4.5V) | $Q_g$ | | | 29 | | nC |
| Gate Source Charge | $Q_{gs}$ | | | 12.0 | | nC |
| Gate Drain Charge | $Q_{gd}$ | | | 11.3 | | nC |
| Turn-On DelayTime | $t_{D(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V<br>$R_L$ = 0.75Ω, $R_{GEN}$ = 3Ω | | 13.9 | | ns |
| Turn-On Rise Time | $t_r$ | | | 66 | | ns |
| Turn-Off DelayTime | $t_{D(off)}$ | | | 44 | | ns |
| Turn-Off Fall Time | $t_f$ | | | 14.0 | | ns |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 20A, $dI_F/dt$ = 100A/µs | | 54 | | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | $I_F$ = 20A, $dI_F/dt$ = 100A/µs | | 48 | | nC |

**Notes:**

5. The power dissipation $P_D$ is based on additional heatsinking and the maximum allowed junction temperature of 150°C.

6. This value is guaranteed by design hence it is not included in the production test.



## Typical Electrical & Thermal Characteristics - Q2

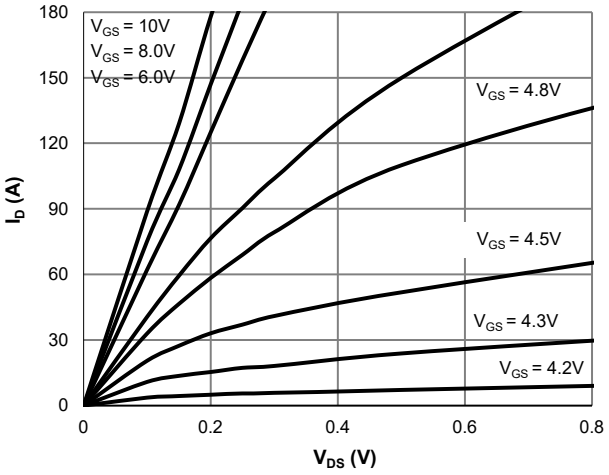



**Figure 1: Saturation Characteristics**

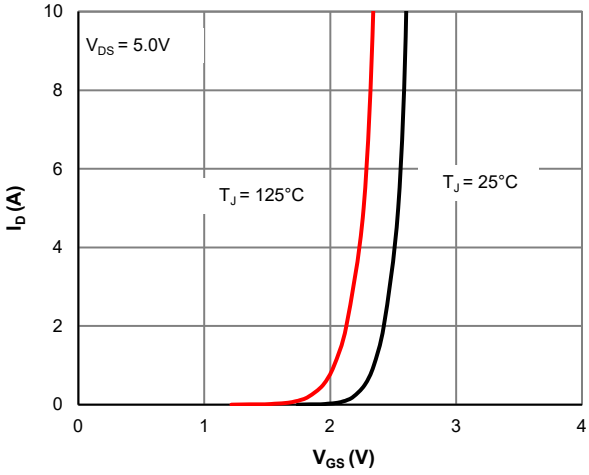



**Figure 2: Transfer Characteristics**

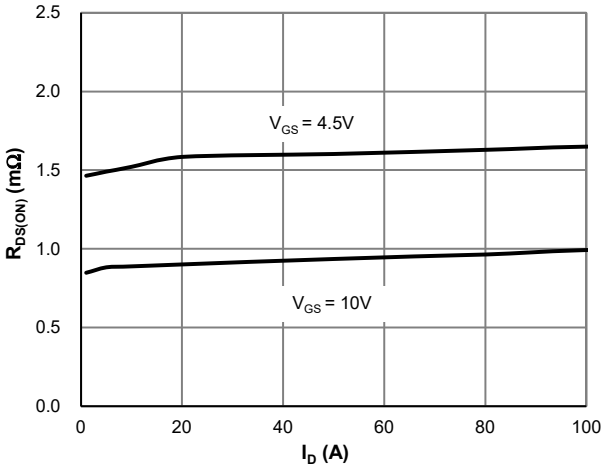



**Figure 3: $R_{DS(ON)}$ vs. Drain Current**

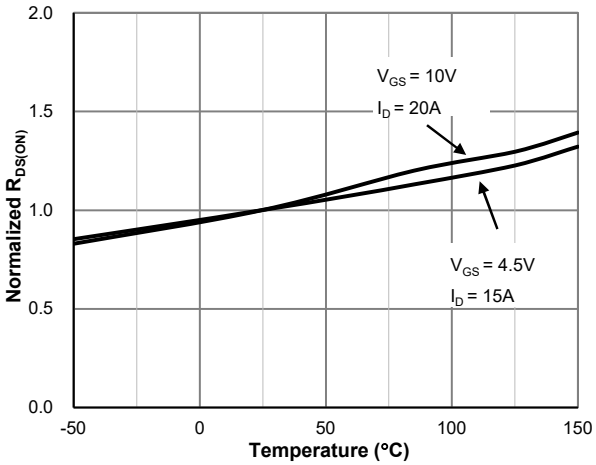



**Figure 4: $R_{DS(ON)}$ vs. Junction Temperature**

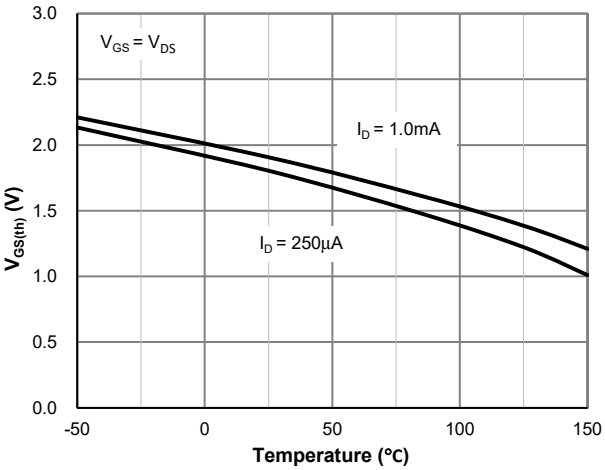



**Figure 5: $V_{GS(th)}$ vs. Junction Temperature**

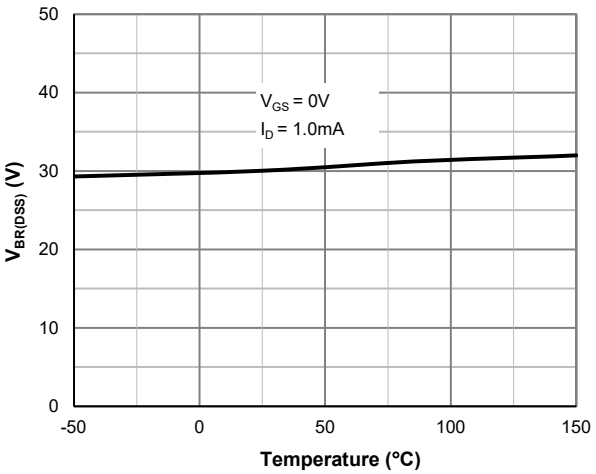



**Figure 6: $V_{BR(DSS)}$ vs. Junction Temperature**

## Typical Electrical & Thermal Characteristics - Q2

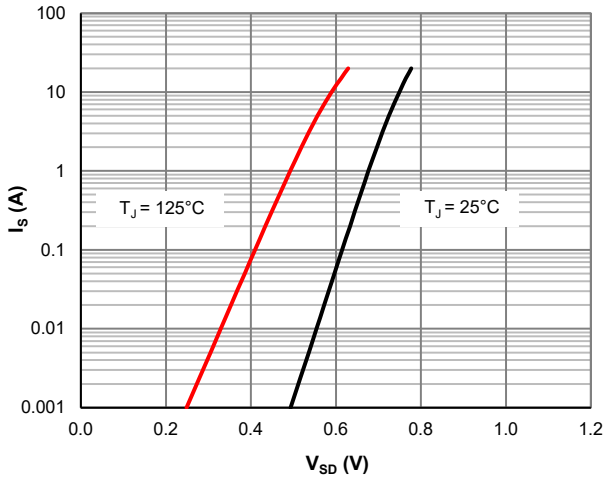



Figure 7: Body-Diode Characteristics

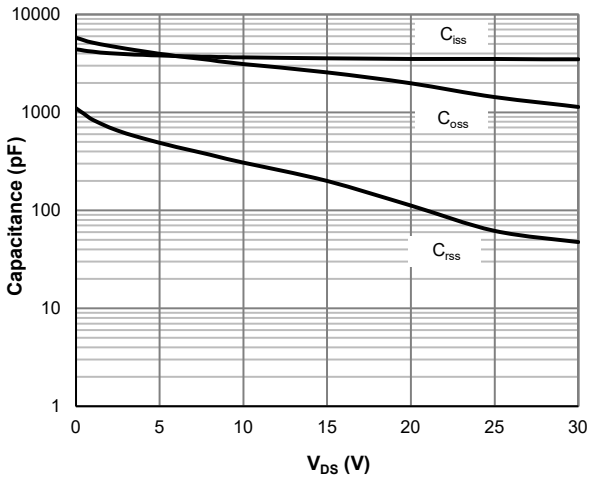



Figure 8: Capacitance Characteristics

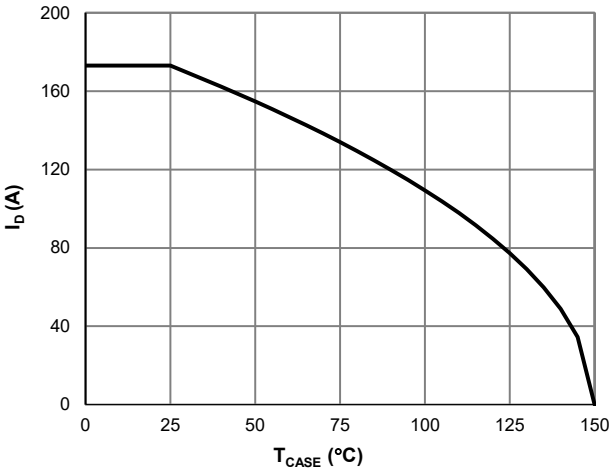



Figure 9: Current De-rating

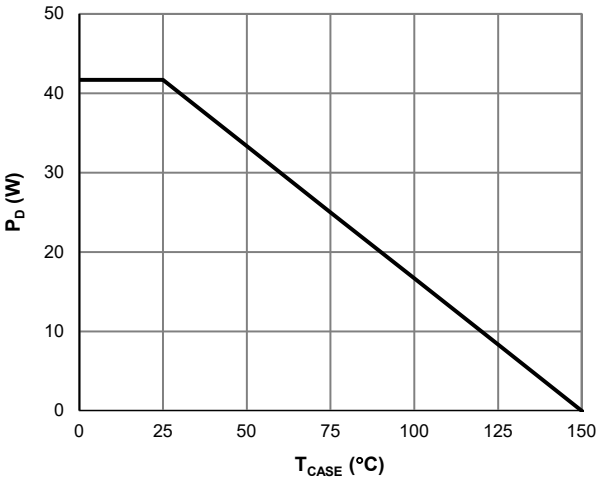



Figure 10: Power De-rating

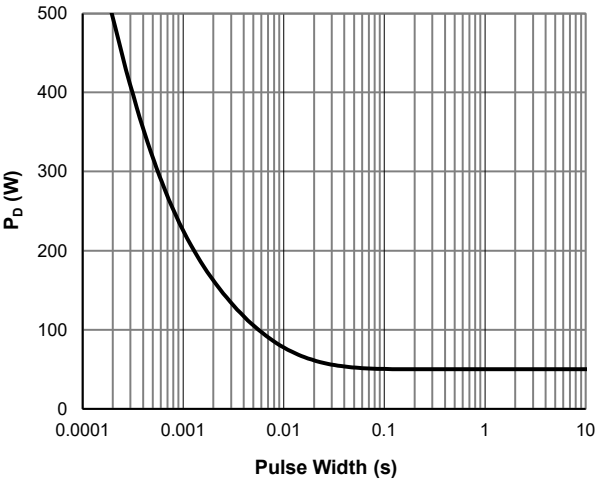



Figure 11: Single Pulse Power Rating, Junction-to-Case

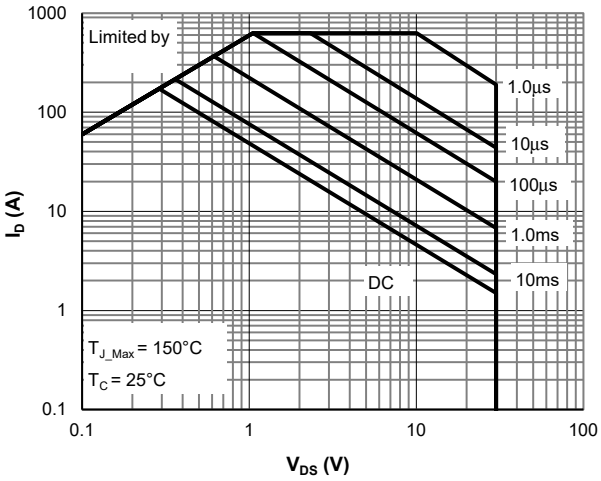



Figure 12: Maximum Safe Operating Area

## Typical Electrical & Thermal Characteristics - Q2

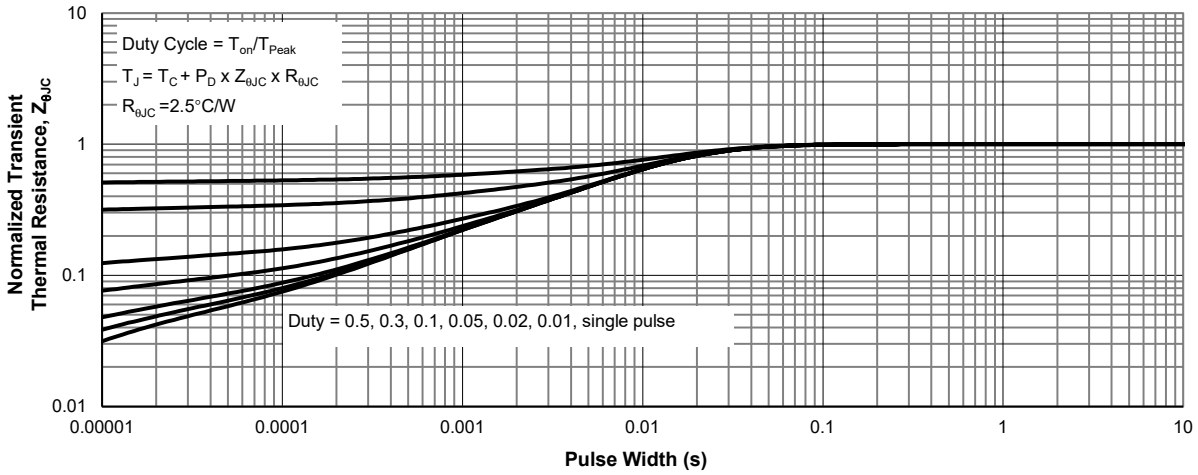
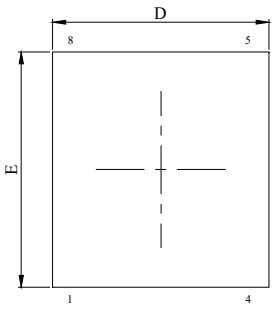


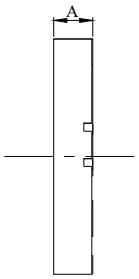

**Figure 13: Normalized Maximum Transient Thermal Impedance**

## DFN5060-8L-B Package Information

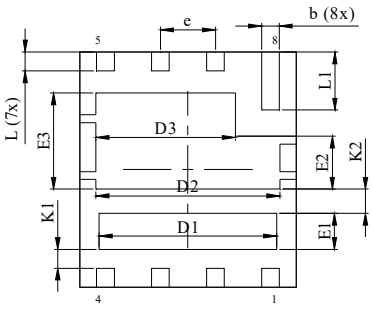
### Package Outlines



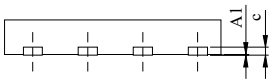

Top View




Side View



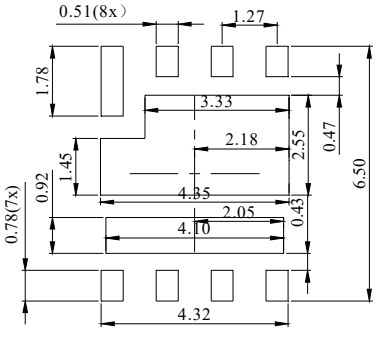

Bottom View




Front View

| DIM. | MILLIMETER | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | -- | -- | 0.05 |
| b | 0.36 | 0.41 | 0.46 |
| c | -- | 0.20 | -- |
| D | 4.90 | 5.00 | 5.10 |
| D1 | 4.00 | 4.10 | 4.20 |
| D2 | 4.15 | 4.25 | 4.35 |
| D3 | 3.13 | 3.23 | 3.33 |
| E | 5.90 | 6.00 | 6.10 |
| E1 | 0.82 | 0.92 | 1.02 |
| E2 | 1.25 | 1.35 | 1.45 |
| E3 | 2.35 | 2.45 | 2.55 |
| L | 0.38 | 0.48 | 0.58 |
| L1 | 1.38 | 1.48 | 1.58 |
| K1 | 0.48 | | |
| K2 | 0.62 | | |
| e | 1.27 BSC | | |

### Recommended Soldering Footprint




DIMENSIONS:MILLIMETERS