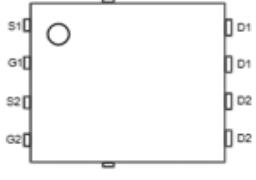
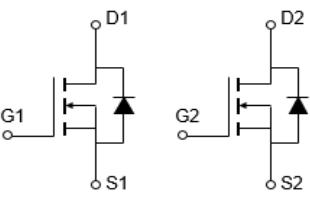


60V, 78A, 12.1mΩ N-channel Power SGT MOSFET

JMSL0615PGDQ

| Features | Product Summary | | |
|---|--------------------------------|-------|------|
| • Ultra-low ON-resistance, $R_{DS(ON)}$ | Parameters | Value | Unit |
| • Low Gate Charge | V_{DSS} | 60 | V |
| • 100% UIS Tested | $V_{GS(th),Typ}$ | 1.9 | V |
| • 100% ΔV_{ds} Tested | $I_D(@V_{GS}=10V)$ | 78 | A |
| • Halogen-free; RoHS-compliant | $R_{DS(ON),Typ}(@V_{GS}=10V)$ | 8.3 | mΩ |
| • AEC-Q101 Qualified | $R_{DS(ON),Typ}(@V_{GS}=4.5V)$ | 12.1 | mΩ |

| Applications | RoHS |
|--|---|
| • Load Switch • PWM Application • General Automotive Application |  |

| | | | |
|--|---|---|---|
|  Top View |  Bottom View |  Pin Assignment |  Schematic Diagram |
| PDFN5X6-8L-D | | | |

Ordering Information

| Device | Marking | MSL | Form | Package | Reel(pcs) | Per Carton (pcs) |
|-----------------|----------|-----|-----------|--------------|-----------|------------------|
| JMSL0615PGDQ-13 | L0615PDQ | 1 | Tape&Reel | PDFN5x6-8L-D | 5000 | 50000 |

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

| Symbol | Parameter | Value | Unit |
|----------------|---|---------------------------|------|
| V_{DS} | Drain-to-Source Voltage | 60 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| I_D | Continuous Drain Current | $T_C = 25^\circ\text{C}$ | 78 |
| | | $T_C = 100^\circ\text{C}$ | 55 |
| I_{DM} | Pulsed Drain Current ⁽¹⁾ | Refer to Fig.4 | A |
| E_{AS} | Single Pulsed Avalanche Energy ⁽²⁾ | 74 | mJ |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ | 125 |
| | | $T_C = 100^\circ\text{C}$ | 63 |
| T_J, T_{STG} | Junction & Storage Temperature Range | -55 to 175 | °C |

Thermal Characteristics

| Symbol | Parameter | Max | Unit |
|-----------------|--|-----|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient ⁽³⁾ | 56 | °C/W |
| | Thermal Resistance, Junction to Case | 1.2 | |



Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|------|-----------|------------------|
| Off Characteristics | | | | | | |
| $V_{(\text{BR})\text{DSS}}$ | Drain-Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ | 60 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$ | - | - | 1.0 | μA |
| I_{GSS} | Gate-Body Leakage Current | $V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$ | - | - | ± 100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(\text{th})}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | 1.4 | 1.9 | 2.5 | V |
| $R_{\text{DS}(\text{ON})}$ | Static Drain-Source ON-Resistance ⁽⁴⁾ | $V_{GS} = 10\text{V}, I_D = 20\text{A}$ | - | 8.3 | 10.8 | $\text{m}\Omega$ |
| | | $V_{GS} = 4.5\text{V}, I_D = 15\text{A}$ | - | 12.1 | 15.7 | $\text{m}\Omega$ |
| Dynamic Characteristics | | | | | | |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | - | 1.8 | - | Ω |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$ | 803 | 1125 | 1518 | pF |
| C_{oss} | Output Capacitance | | 317 | 444 | 600 | pF |
| C_{rss} | Reverse Transfer Capacitance | | 22 | 31 | 41 | pF |
| Q_g | Total Gate Charge | $V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 30\text{V}, I_D = 20\text{A}$ | 14 | 19 | 26 | nC |
| Q_{gs} | Gate Source Charge | | - | 4.6 | - | nC |
| Q_{gd} | Gate Drain("Miller") Charge | | - | 4.2 | - | nC |
| Switching Characteristics | | | | | | |
| $t_{d(\text{on})}$ | Turn-On Delay Time | $V_{GS} = 10\text{V}, V_{DD} = 30\text{V}$ $I_D = 20\text{A}, R_{\text{GEN}} = 3\Omega$ | - | 7.4 | - | ns |
| t_r | Turn-On Rise Time | | - | 19 | - | ns |
| $t_{d(\text{off})}$ | Turn-Off Delay Time | | - | 19 | - | ns |
| t_f | Turn-Off Fall Time | | - | 4.7 | - | ns |
| Body Diode Characteristics | | | | | | |
| I_s | Maximum Continuous Body Diode Forward Current | - | - | 78 | - | A |
| I_{SM} | Maximum Pulsed Body Diode Forward Current | - | - | 311 | - | A |
| V_{SD} | Body Diode Forward Voltage | $V_{GS} = 0\text{V}, I_s = 20\text{A}$ | - | | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F = 20\text{A}, \text{di/dt} = 100\text{A/us}$ | 21 | 29 | 39 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | | - | 23 | - | nC |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. E_{AS} condition: Starting $T_J=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $V_G=10\text{V}$, $R_G=25\text{ohm}$, $L=3\text{mH}$, $I_{AS}=7\text{A}$, $V_{DD}=0\text{V}$ during time in avalanche.

3. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.

4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



Typical Performance Characteristics

Figure 1: Power De-rating

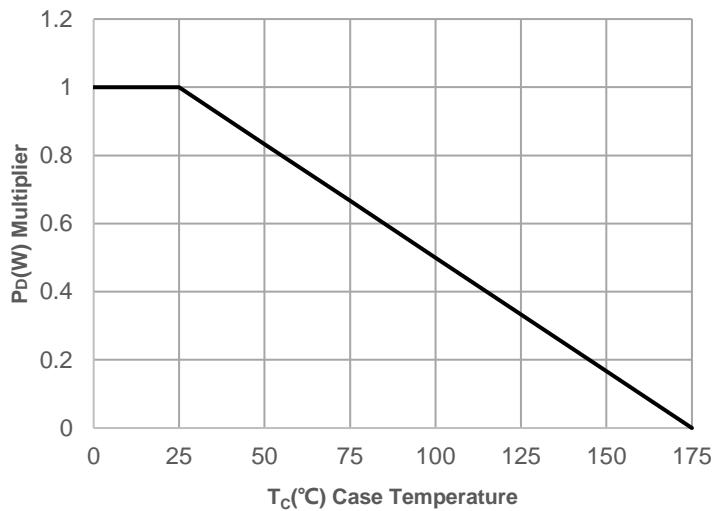


Figure 2: Current De-rating

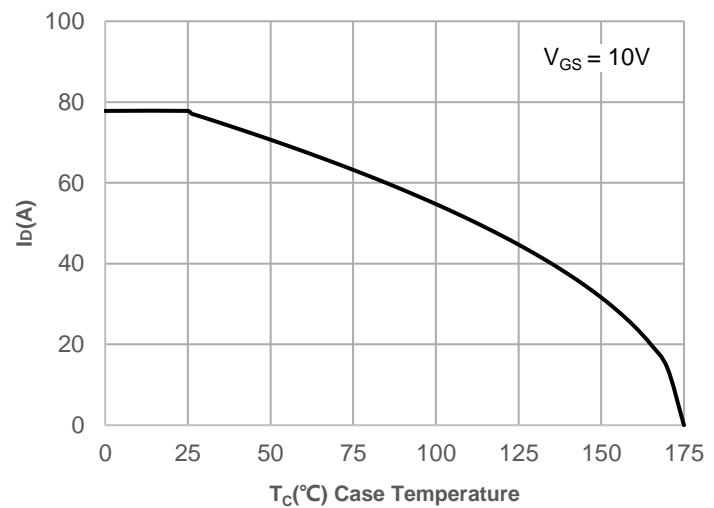


Figure 3: Normalized Maximum Transient Thermal Impedance

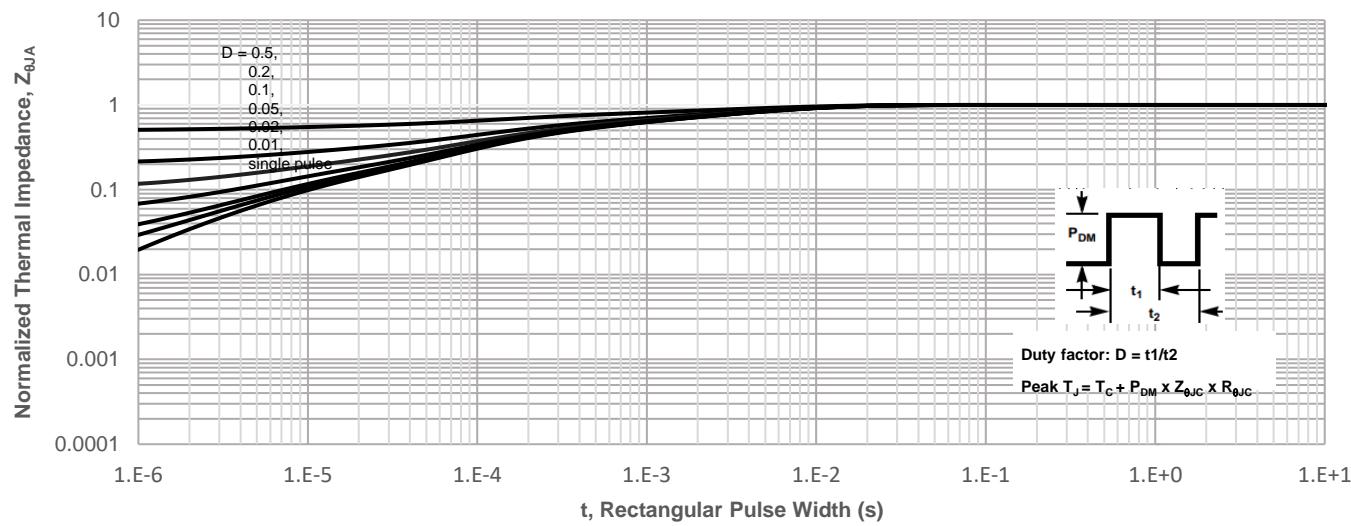
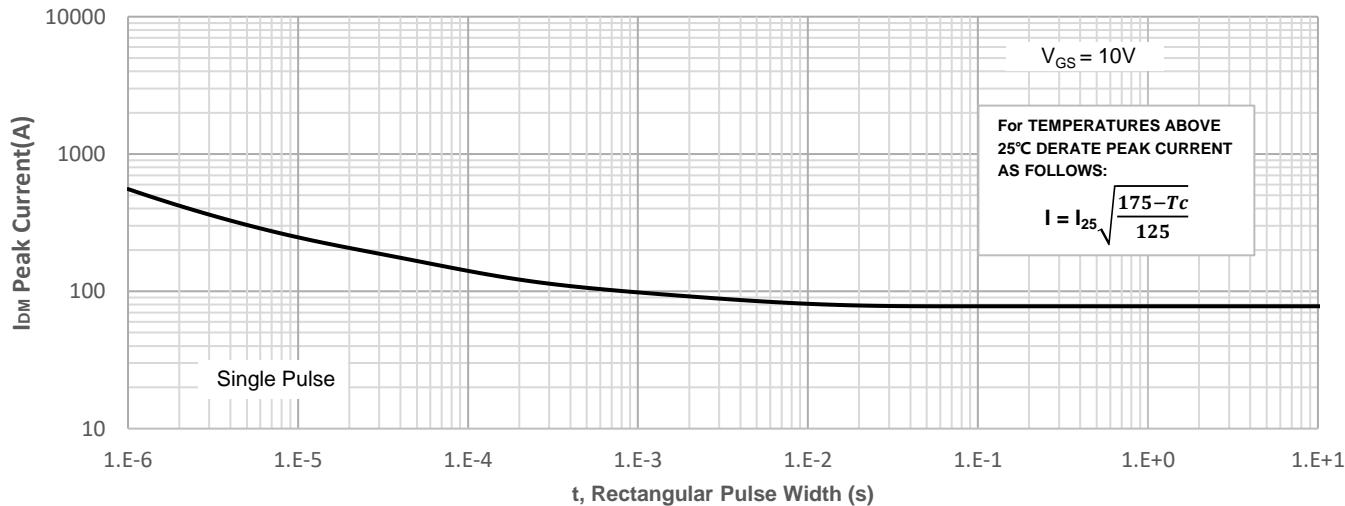


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

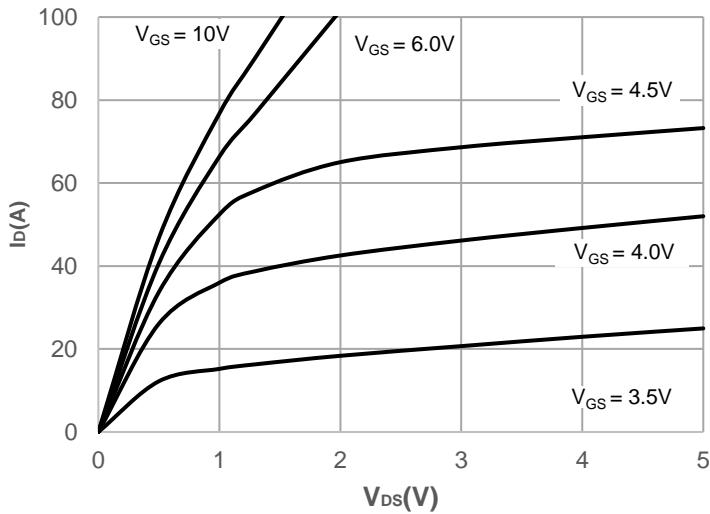


Figure 6: Typical Transfer Characteristics

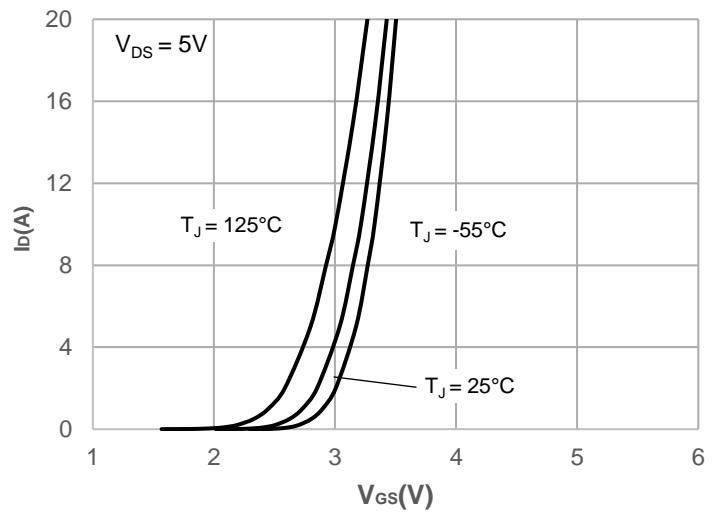


Figure 7: On-resistance vs. Drain Current

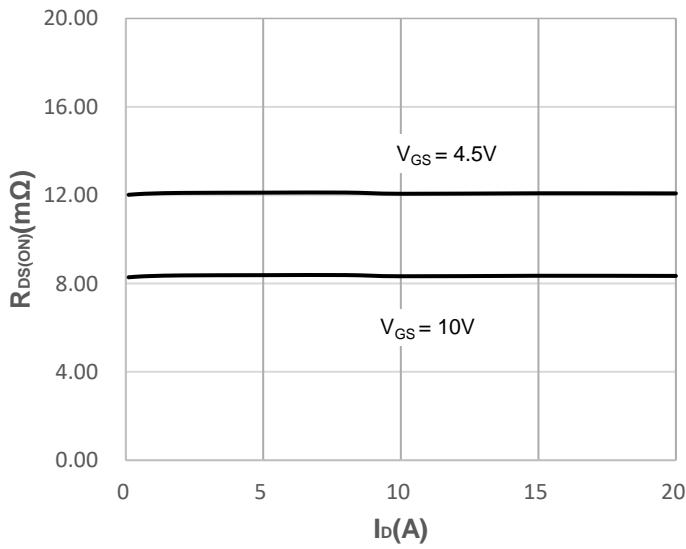


Figure 8: Body Diode Characteristics

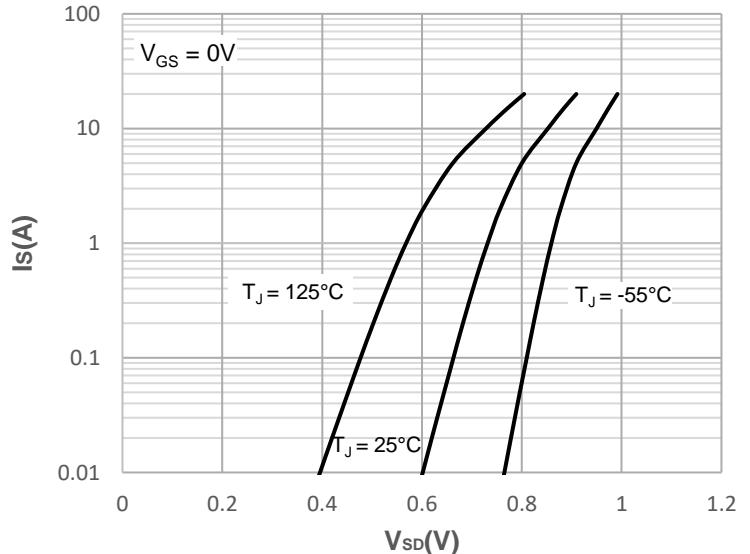


Figure 9: Gate Charge Characteristics

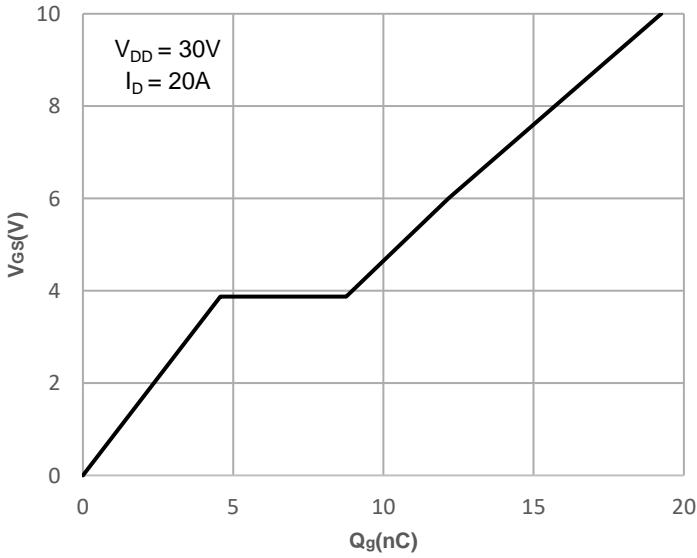
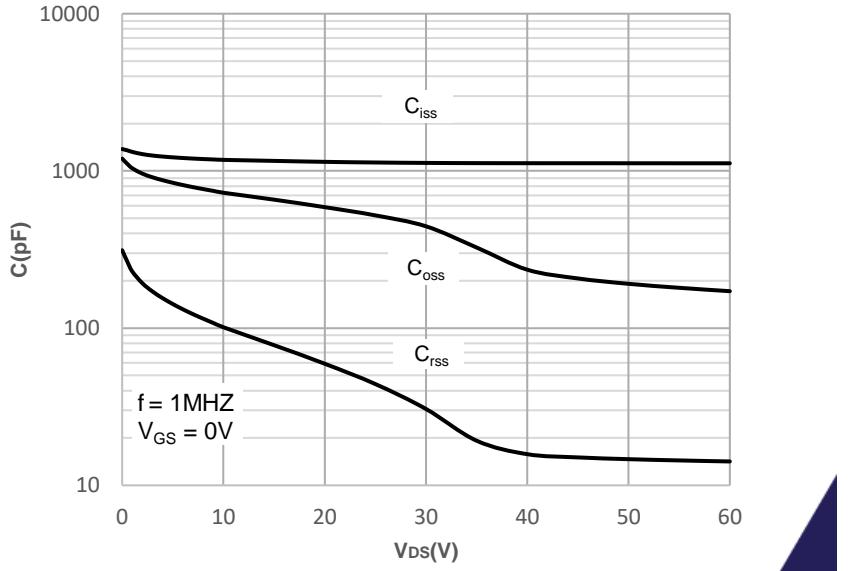


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

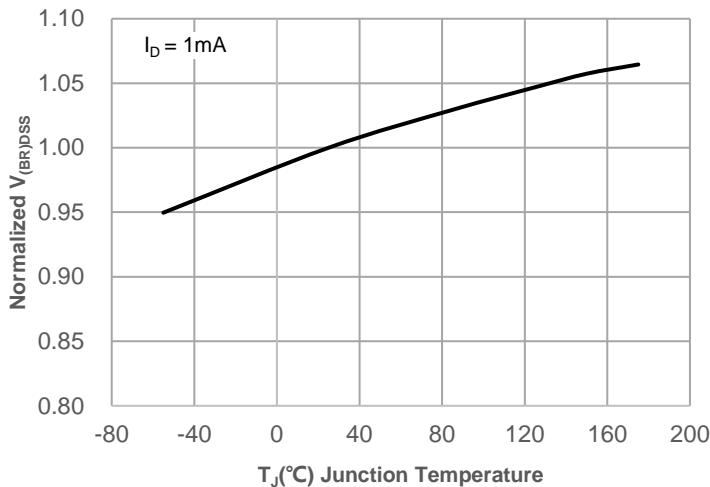


Figure 12: Normalized on Resistance vs. Junction Temperature

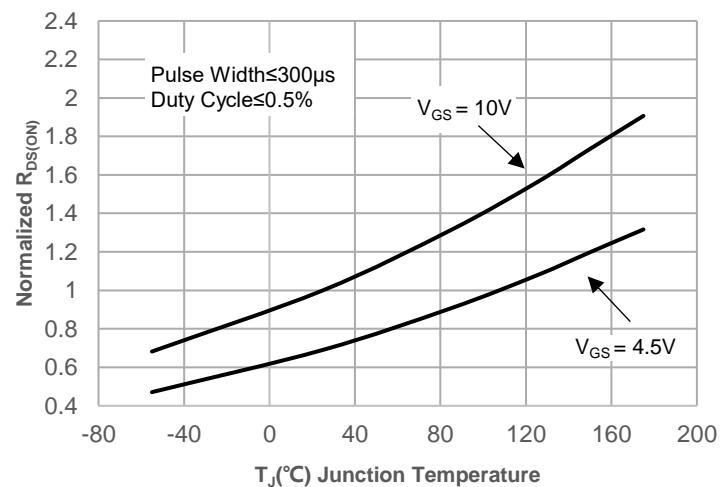


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

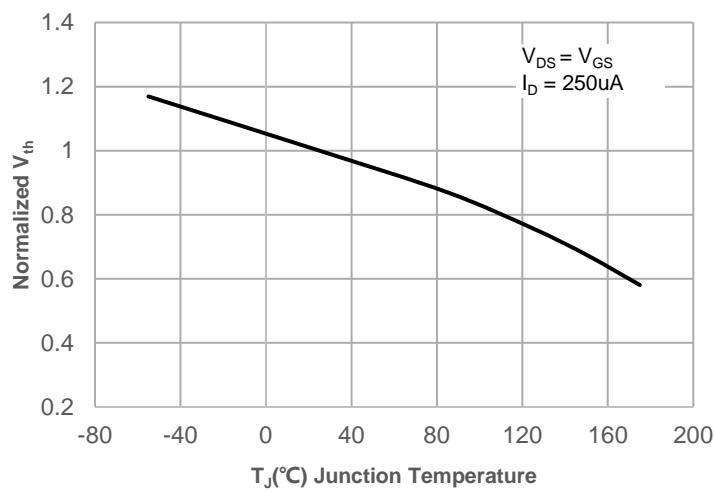


Figure 14: R_{D(on)} vs. V_{GS}

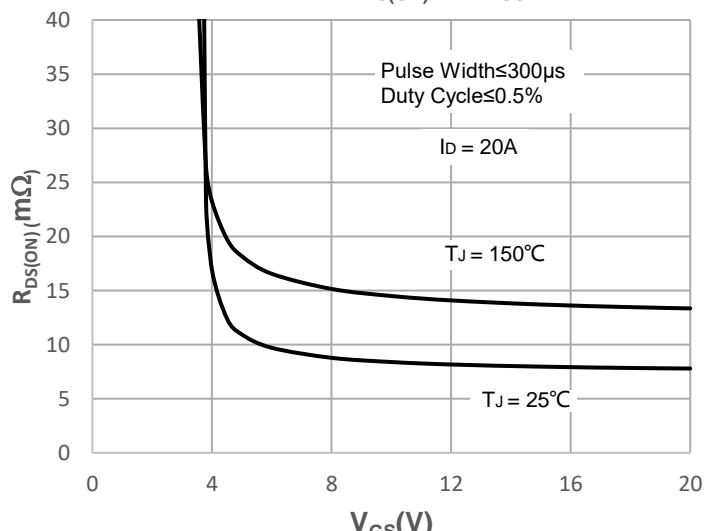
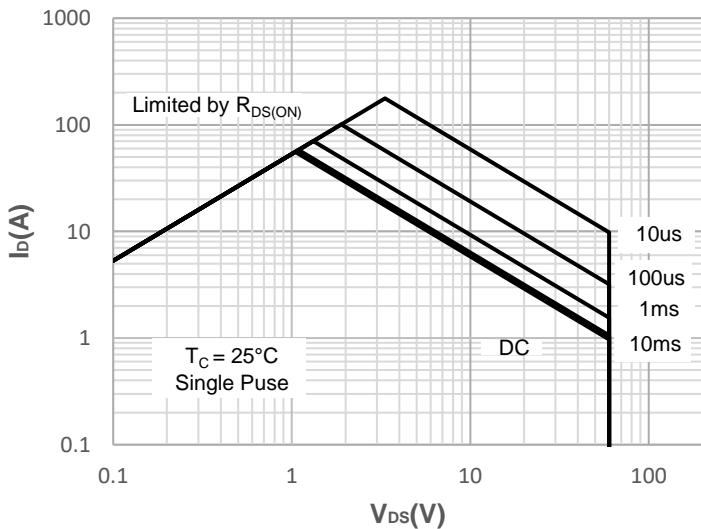


Figure 15: Maximum Safe Operating Area



Test Circuit

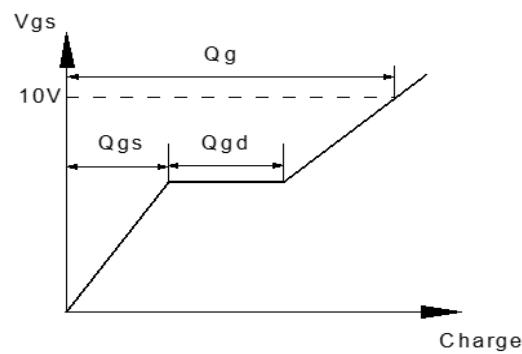
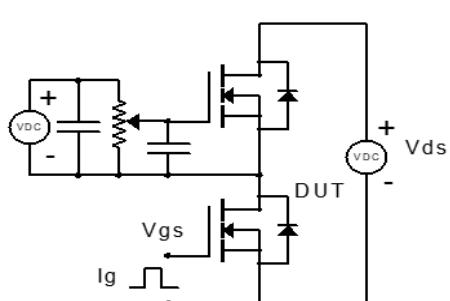


Figure 1: Gate Charge Test Circuit & Waveform

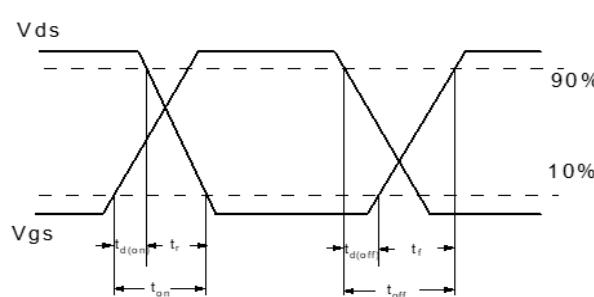
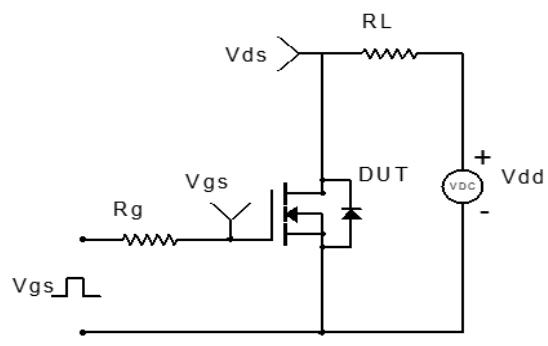


Figure 2: Resistive Switching Test Circuit & Waveform

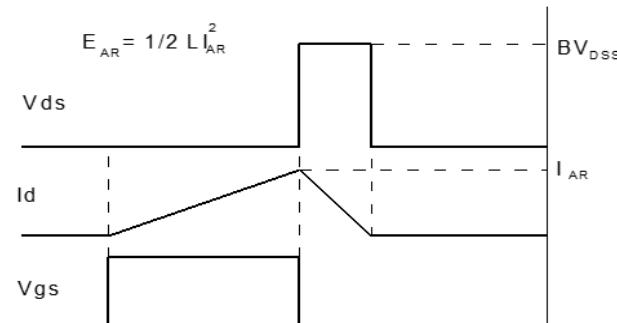
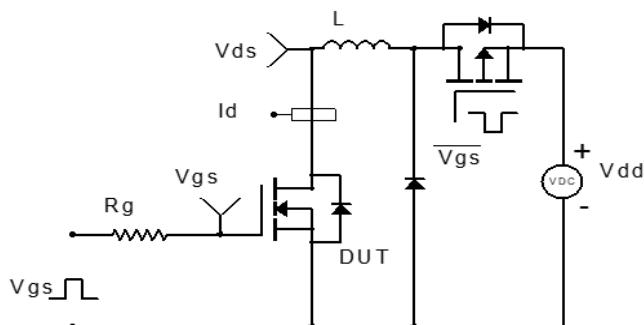


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

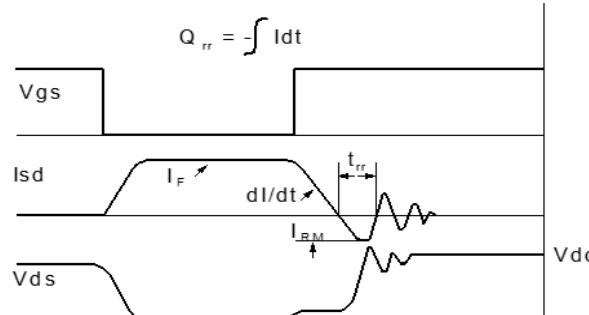
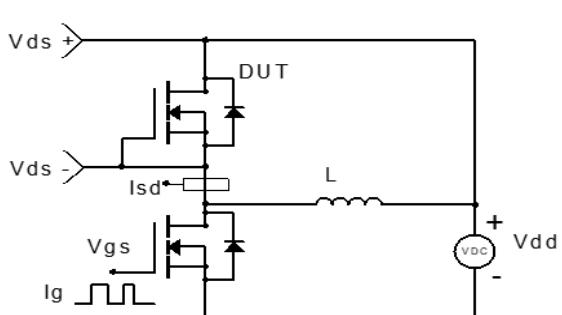
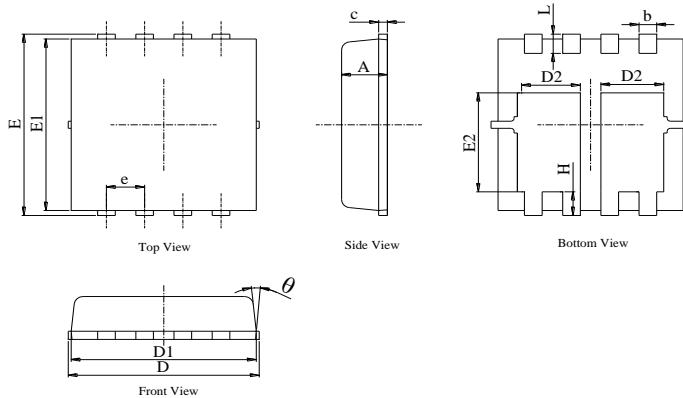


Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(PDFN5X6-8L-D)

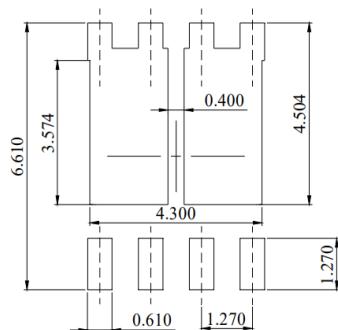
Package Outline



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. ALL DIMENSIONS IN MILLIMETER (ANGLE IN DEGREE).
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETER | | |
|-----|------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.15 |
| A1 | 0.00 | — | 0.10 |
| b | 0.31 | 0.41 | 0.51 |
| b1 | 0.15 | 0.25 | 0.35 |
| c | 0.24 | 0.32 | 0.40 |
| DIM | 4.95 | 5.05 | 5.15 |
| D1 | 4.00 | 4.10 | 4.20 |
| D2 | 0.50 | 0.60 | 0.70 |
| E | 6.05 | 6.15 | 6.25 |
| E1 | 5.50 | 5.60 | 5.70 |
| E2 | 3.31 | 3.41 | 3.51 |
| e | 1.27BSC | | |
| H | 0.60 | 0.70 | 0.80 |
| L | 0.50 | 0.70 | 0.80 |
| L1 | — | — | 0.13 |
| a | — | — | 12° |

Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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