JJMICROELECTRONICS

# 100V, 128A, 4.3mΩ N-channel Power SGT MOSFET

## JMSL1005PG

### Features

- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- 100% ΔVds Tested
- Halogen-free; RoHS-compliant

### Applications

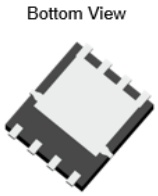
- Load Switch
- PWM Application
- Power Management

### Product Summary

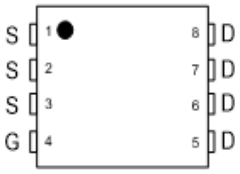
| Parameters | Value | Unit |
|---|---|---|
| $V_{DSS}$ | 100 | V |
| $V_{GS(th)_Typ}$ | 1.6 | V |
| $I_D$(@$V_{GS}$=10V) | 128 | A |
| $R_{DS(ON)_Typ}$(@$V_{GS}$=10V) | 4.3 | mΩ |
| $R_{DS(ON)_Typ}$(@$V_{GS}$=4.5V) | 5.3 | mΩ |

RoHS

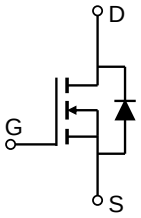



PDFN5x6-8L




Pin Assignment




Schematic Diagram

### Ordering Information

| Device | Marking | MSL | Form | Package | Reel(pcs) | Per Carton (pcs) |
|---|---|---|---|---|---|---|
| JMSL1005PG-13 | SL1005P | 1 | Tape&Reel | PDFN5x6-8L | 5000 | 50000 |

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

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | | 100 | V |
| $V_{GS}$ | Gate-to-Source Voltage | | ±20 | V |
| $I_D$ | Continuous Drain Current | $T_C$ = 25°C | 128 | A |
| | | $T_C$ = 100°C | 90 | |
| $I_{DM}$ | Pulsed Drain Current (1) | | Refer to Fig.4 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy (2) | | 423 | mJ |
| $P_D$ | Power Dissipation | $T_C$ = 25°C | 172 | W |
| | | $T_C$ = 100°C | 69 | |
| $T_J$, $T_{STG}$ | Junction & Storage Temperature Range | | -55 to 150 | °C |

### Thermal Characteristics

| Symbol | Parameter | Max | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient(3) | 41 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.7 | |


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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 100 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 80V, $V_{GS}$ = 0V | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.1 | 1.6 | 2.1 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance(4) | $V_{GS}$ = 10V, $I_D$ = 20A | - | 4.3 | 5.7 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 15A | - | 5.3 | 6.9 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $R_g$ | Gate Resistance | f = 1MHz | - | 2.1 | - | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 50V, f = 1MHz | - | 4766 | 7148 | pF |
| $C_{oss}$ | Output Capacitance | | - | 1517 | 2275 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 34 | 68 | pF |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 to 10V $V_{DS}$ = 50V, $I_D$ = 20A | - | 81 | - | nC |
| $Q_{gs}$ | Gate Source Charge | | - | 15 | - | nC |
| $Q_{gd}$ | Gate Drain("Miller") Charge | | - | 16 | - | nC |
| | | | | | | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On DelayTime | $V_{GS}$ = 10V, $V_{DD}$ = 50V $I_D$= 20A, $R_{GEN}$ = 3Ω | - | 15 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 29 | - | ns |
| $t_{d(off)}$ | Turn-Off DelayTime | | - | 71 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 73 | - | ns |
| **Body Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Body Diode Forward Current | | - | - | 128 | A |
| $I_{SM}$ | Maximum Pulsed Body Diode Forward Current | | - | - | 510 | A |
| $V_{SD}$ | Body Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 20A | - | | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$ = 20A, di/dt = 100A/us | 37 | 61 | 92 | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 99 | - | nC |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. $E_{AS}$ condition: Starting $T_J$=25C, $V_{DD}$=50V, $V_{GS}$=10V, $R_G$=25ohm, L=3mH, $I_{AS}$=16.8A, $V_{DD}$=0V during time in avalanche.
3. $R_{\theta JA}$ is measured with the device mounted on a 1inch$^2$ pad of 2oz copper FR4 PCB.
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.


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# Typical Performance Characteristics

Figure 1: Power De-rating

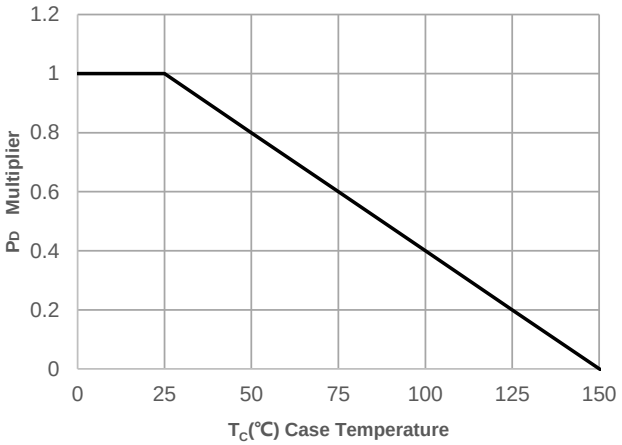



Figure 2: Current De-rating

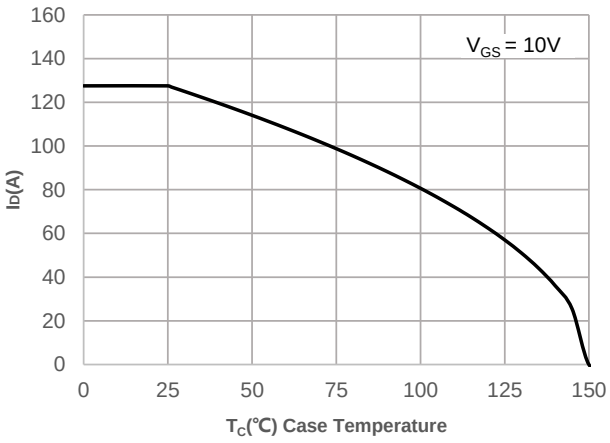



Figure 3: Normalized Maximum Transient Thermal Impedance

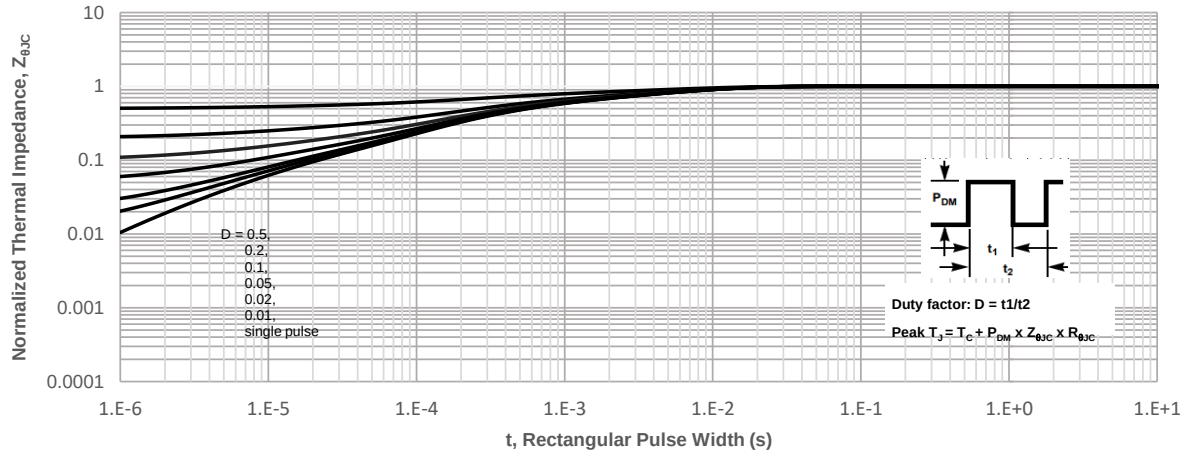
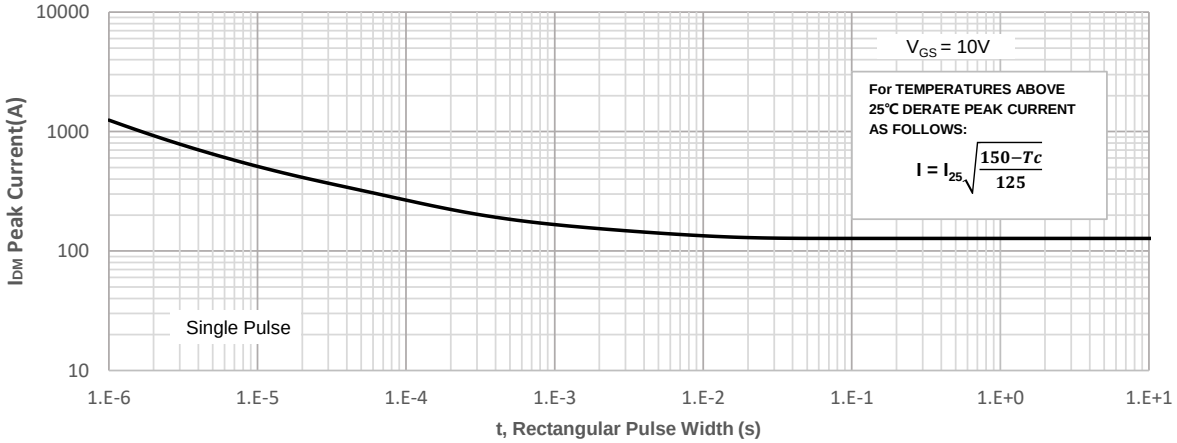



Figure 4: Peak Current Capacity





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## Typical Performance Characteristics

Figure 5: Output Characteristics

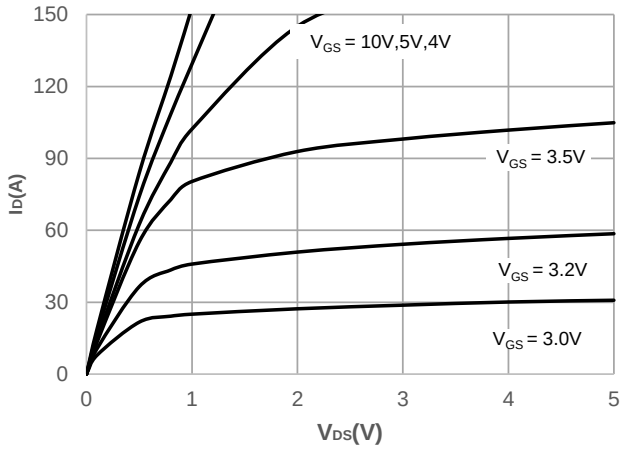



Figure 6: Typical Transfer Characteristics

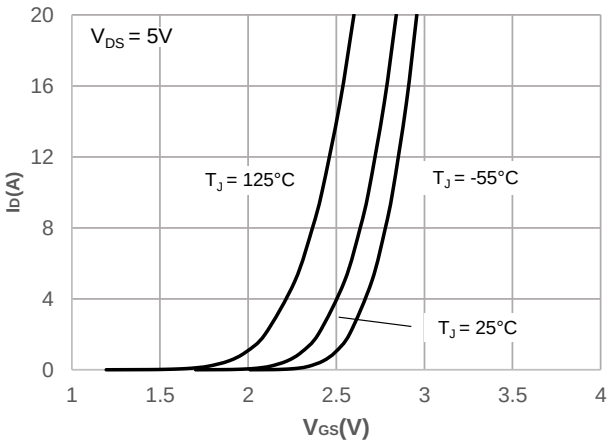



Figure 7: On-resistance vs. Drain Current

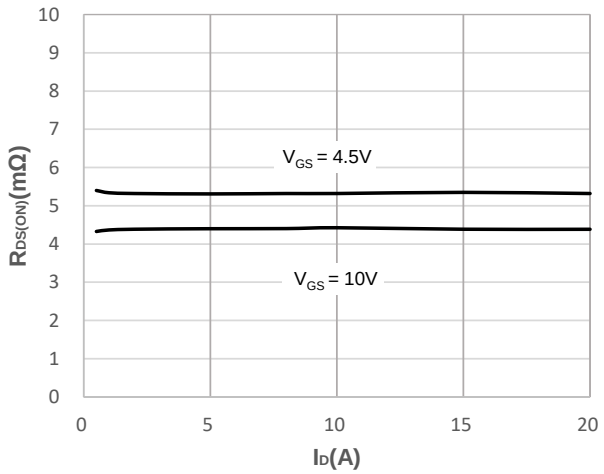



Figure 8: Body Diode Characteristics

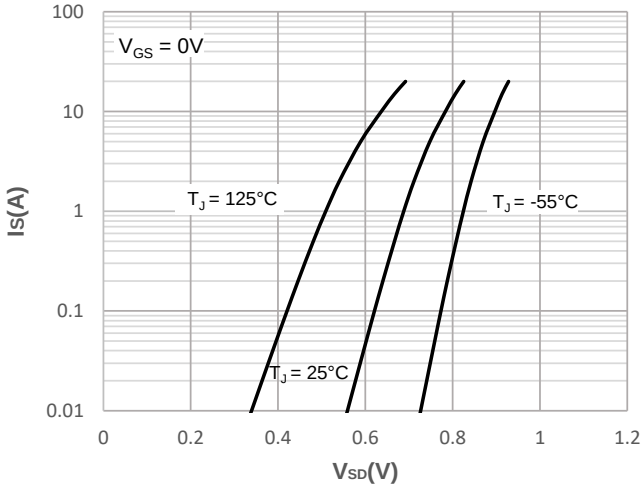



Figure 9: Gate Charge Characteristics

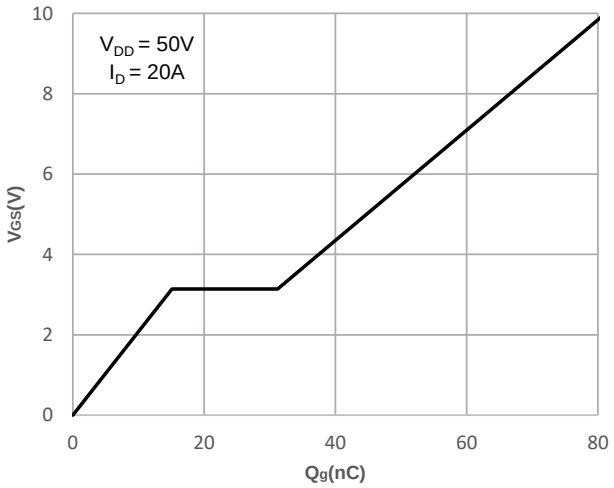
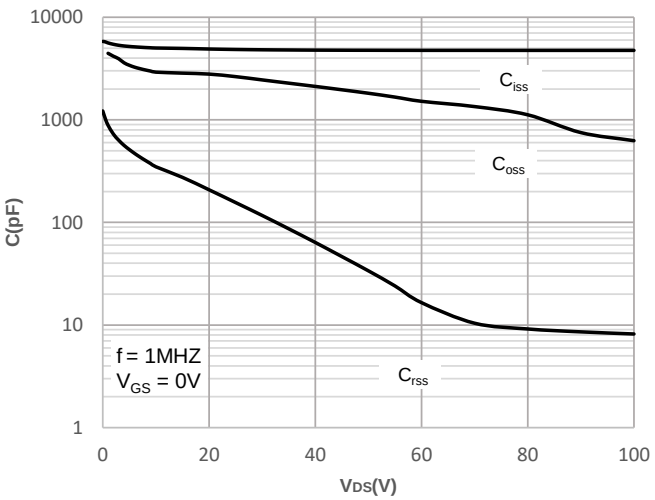



Figure 10: Capacitance Characteristics





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## Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

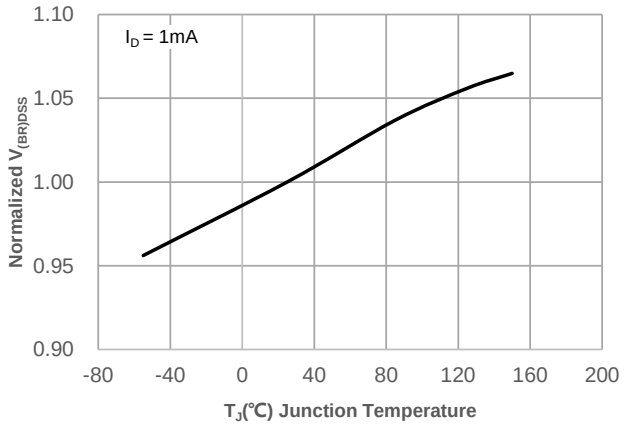



Figure 12: Normalized on Resistance vs. Junction Temperature

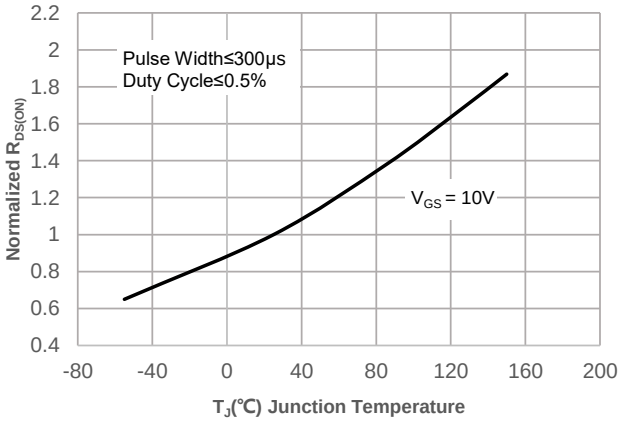



Figure 13: Normalized Threshold Voltage vs. Junction Temperature

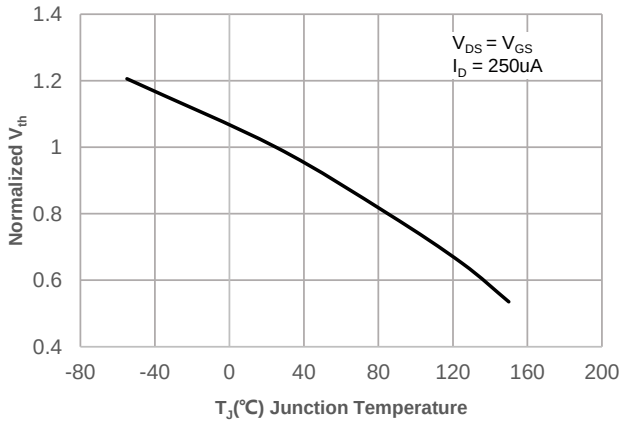



Figure 14: $R_{DS(ON)}$ vs. $V_{GS}$

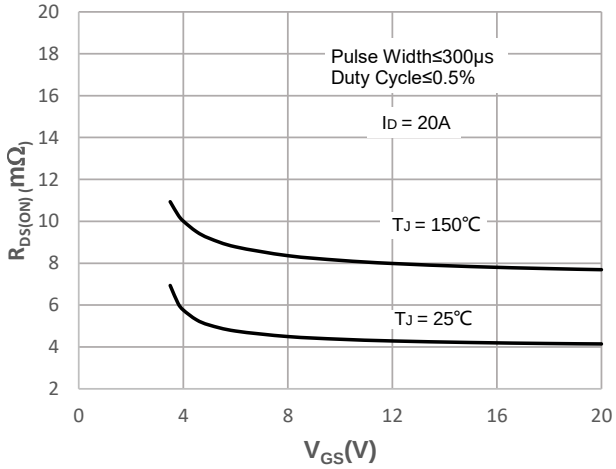
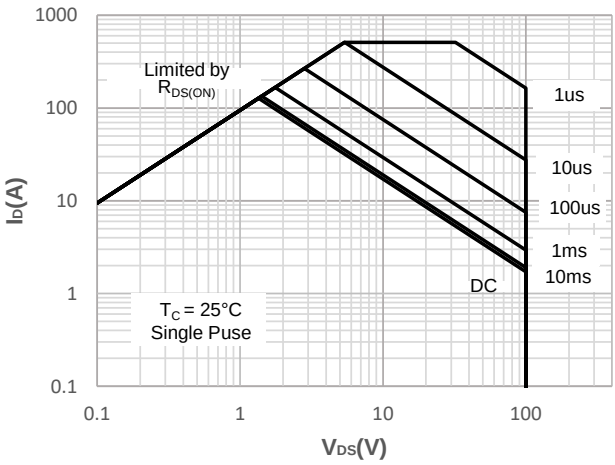



Figure 15: Maximum Safe Operating Area





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## Test Circuit

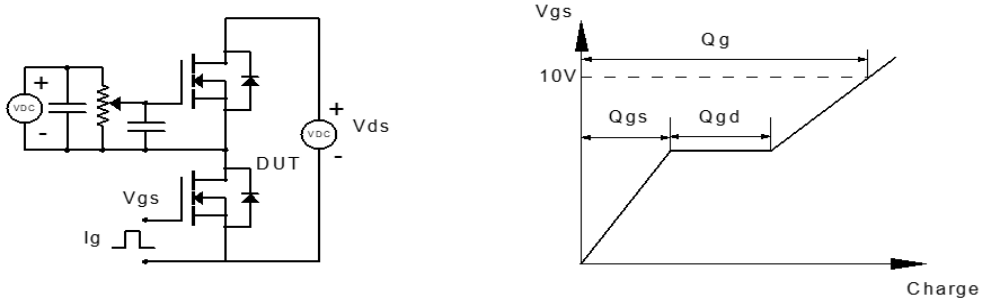



**Figure 1: Gate Charge Test Circuit & Waveform**

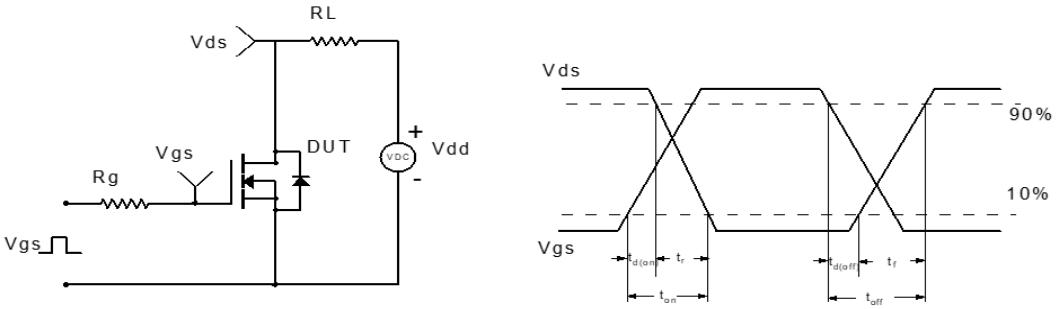



**Figure 2: Resistive Switching Test Circuit & Waveform**

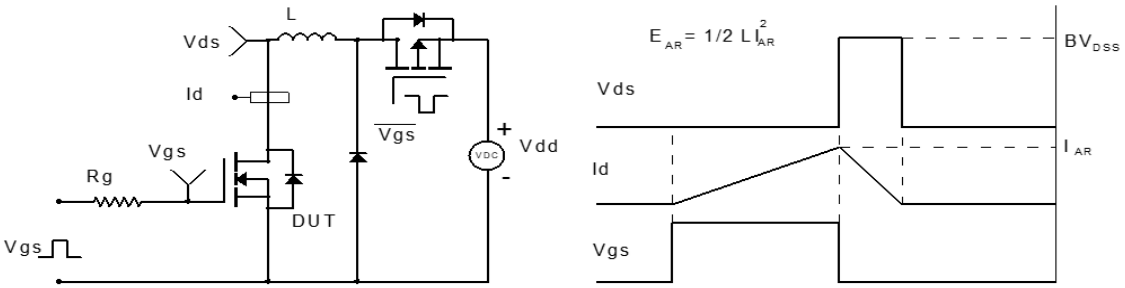



**Figure 3: Unclamped Inductive Switching Test Circuit& Waveform**

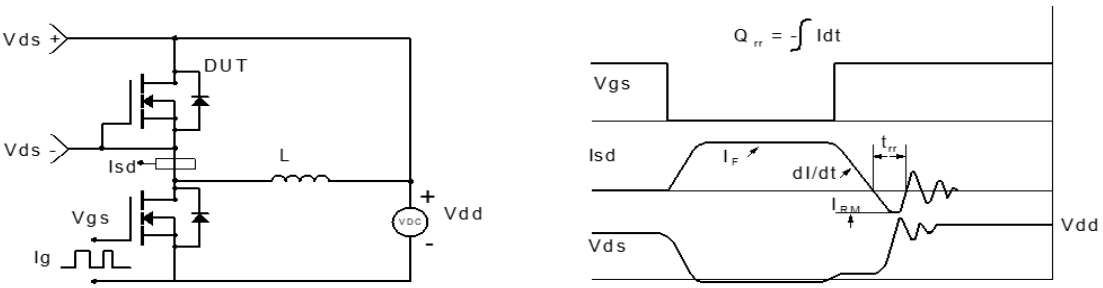
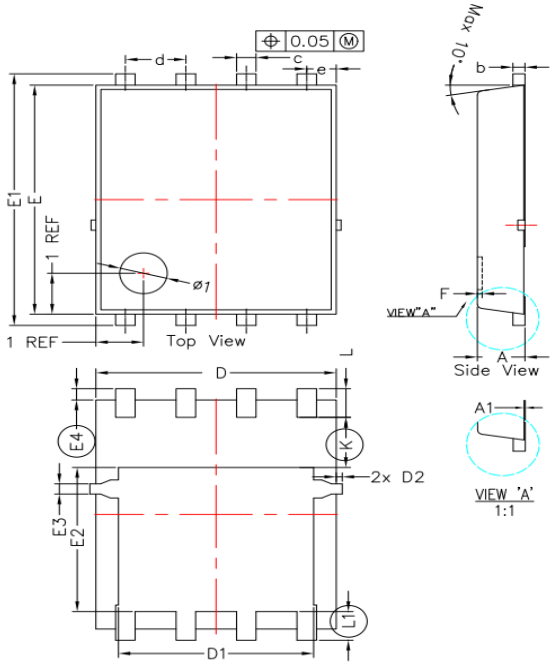



**Figure 4: Diode Recovery Test Circuit & Waveform**

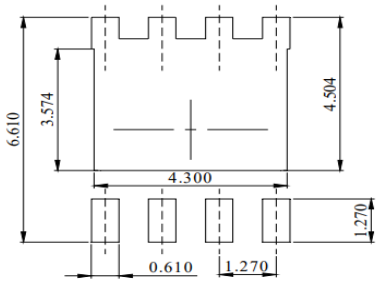

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## Package Mechanical Data(PDFN5x6-8L )




| SYMBOLS | DIMENSION IN MM | | | DIMENSION IN INCHES | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| *A | 0.900 | 1.000 | 1.150 | 0.035 | 0.039 | 0.045 |
| A1 | 0.000 | --- | 0.050 | 0.000 | ---- | 0.002 |
| b | 0.246 | 0.254 | 0.350 | 0.010 | 0.010 | 0.014 |
| *C | 0.310 | 0.410 | 0.510 | 0.012 | 0.016 | 0.020 |
| d | | 1.27BSC | | | 0.050BSC | |
| *D | 4.950 | 5.050 | 5.150 | 0.195 | 0.199 | 0.203 |
| D1 | 4.000 | 4.100 | 4.200 | 0.157 | 0.161 | 0.165 |
| *D2 | | 0.125REF | | | 0.005REF | |
| e | | 0.62BSC | | | 0.024BSC | |
| *E | 5.500 | 5.600 | 5.700 | 0.217 | 0.220 | 0.224 |
| *E1 | 6.050 | 6.150 | 6.250 | 0.238 | 0.242 | 0.246 |
| E2 | 3.425 | 3.525 | 3.625 | 0.135 | 0.139 | 0.143 |
| E3 | | 0.250REF | | | 0.010REF | |
| * E4 | | 0.275REF | | | 0.011REF | |
| F | - | - | 0.100 | - | - | 0.004 |
| *L | 0.500 | 0.600 | 0.700 | 0.02 | 0.02 | 0.03 |
| L1 | 0.600 | 0.700 | 0.800 | 0.02 | 0.03 | 0.03 |
| K | | 1.225REF | | | 0.05REF | |

**Recommended Soldering Footprint**




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