

60V, 163A, 2.3mΩ N-channel Power SGT MOSFET
JMSH0603MGQ
Features

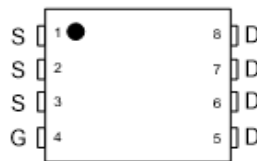
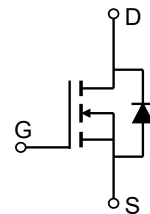
- Ultra-low ON-resistance, $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

Applications

- Load Switch
- PWM Application

Product Summary

| Parameters | Value | Unit |
|--------------------------------|-------|------|
| V_{DSS} | 60 | V |
| $V_{GS(th_Typ)}$ | 2.8 | V |
| $I_D(@V_{GS}=10V)$ | 163 | A |
| $R_{DS(ON)_Typ}(@V_{GS}=10V)$ | 2.3 | mΩ |


PDFN5X6-8L

Pin Assignment

Schematic Diagram
Ordering Information

| Device | Marking | MSL | Form | Package | Reel(pcs) | Per Carton (pcs) |
|----------------|----------|-----|-----------|------------|-----------|------------------|
| JMSH0603MGQ-13 | SH0603MQ | 1 | Tape&Reel | PDFN5x6-8L | 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 | $T_C = 25^\circ\text{C}$ | 163 |
| | | $T_C = 100^\circ\text{C}$ | 116 |
| I_{DM} | Pulsed Drain Current ⁽¹⁾ | Refer to Fig.4 | A |
| E_{AS} | Single Pulsed Avalanche Energy ⁽²⁾ | 423 | mJ |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ | 150 |
| | | $T_C = 100^\circ\text{C}$ | 75 |
| T_J, T_{STG} | Junction & Storage Temperature Range | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | Max | Unit |
|-----------------|--|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient ⁽³⁾ | 45 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 1.0 | |



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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|---|------|------|-----------|---------------|
| Off Characteristics | | | | | | |
| $V_{(BR)DSS}$ | 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 | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$ | 2.0 | 2.8 | 3.6 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance ⁽⁴⁾ | $V_{GS} = 10\text{V}$, $I_D = 20\text{A}$ | - | 2.3 | 2.9 | m Ω |
| Dynamic Characteristics | | | | | | |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | - | 2.2 | - | Ω |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}$, $V_{DS} = 30\text{V}$, $f = 1\text{MHz}$ | 2140 | 2996 | 4045 | pF |
| C_{oss} | Output Capacitance | | 1066 | 1493 | 2015 | pF |
| C_{rss} | Reverse Transfer Capacitance | | 51 | 71 | 96 | pF |
| Q_g | Total Gate Charge | $V_{GS} = 0$ to 10V $V_{DS} = 30\text{V}$, $I_D = 20\text{A}$ | 34 | 47 | 64 | nC |
| Q_{gs} | Gate Source Charge | | 10 | 14 | 19 | nC |
| Q_{gd} | Gate Drain ("Miller") Charge | | 9 | 13 | 17 | nC |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{GS} = 10\text{V}$, $V_{DD} = 30\text{V}$ $I_D = 20\text{A}$, $R_{GEN} = 3\Omega$ | - | 14 | - | ns |
| t_r | Turn-On Rise Time | | - | 26 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 33 | - | ns |
| t_f | Turn-Off Fall Time | | - | 16 | - | ns |
| Body Diode Characteristics | | | | | | |
| I_S | Maximum Continuous Body Diode Forward Current | | - | - | 163 | A |
| I_{SM} | Maximum Pulsed Body Diode Forward Current | | - | - | 654 | A |
| V_{SD} | Body Diode Forward Voltage | $V_{GS} = 0\text{V}$, $I_S = 20\text{A}$ | - | | 1.2 | V |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F = 20\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ | 37 | 52 | 71 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | | - | 64 | - | nC |

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 50\text{V}$, $V_G = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 16.8\text{A}$, $V_{DD} = 0\text{V}$ 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 $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



Typical Performance Characteristics

Figure 1: Power De-rating

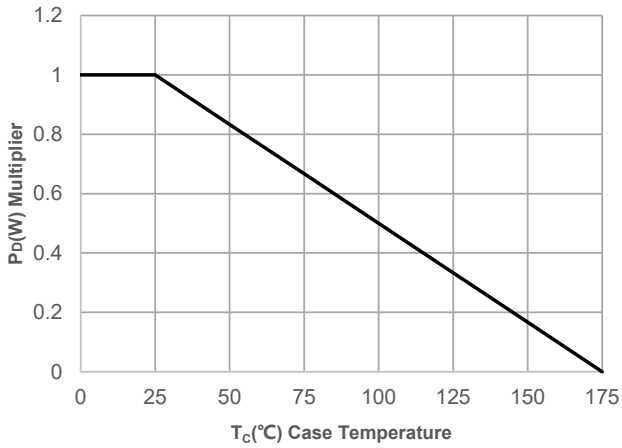


Figure 2: Current De-rating

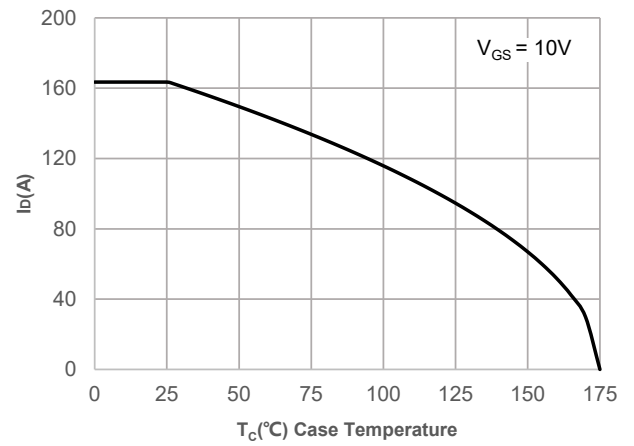


Figure 3: Normalized Maximum Transient Thermal Impedance

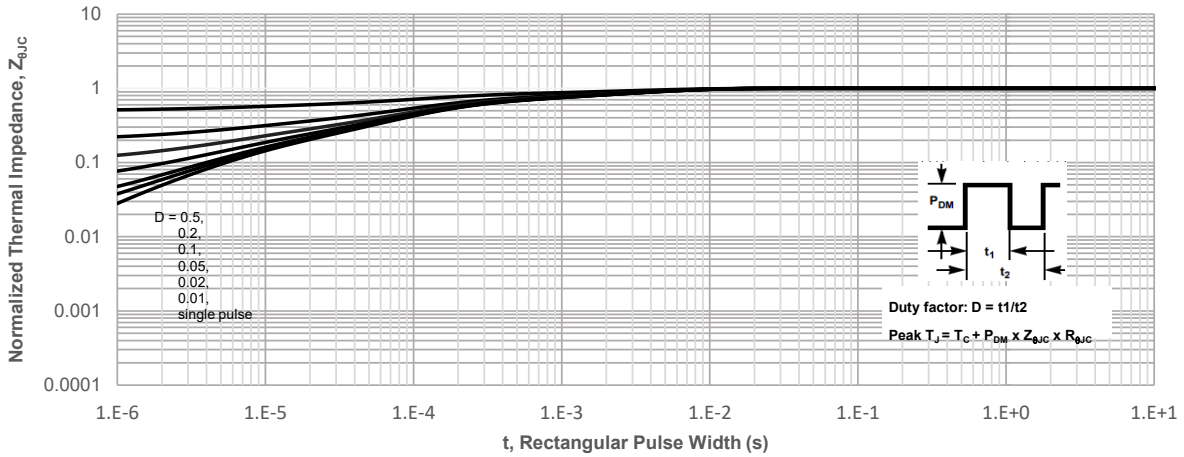
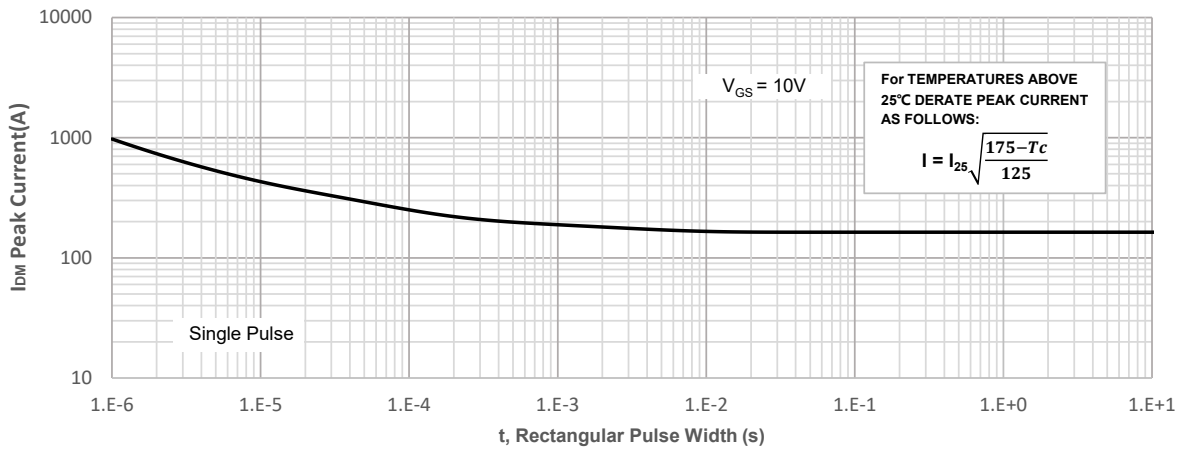


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

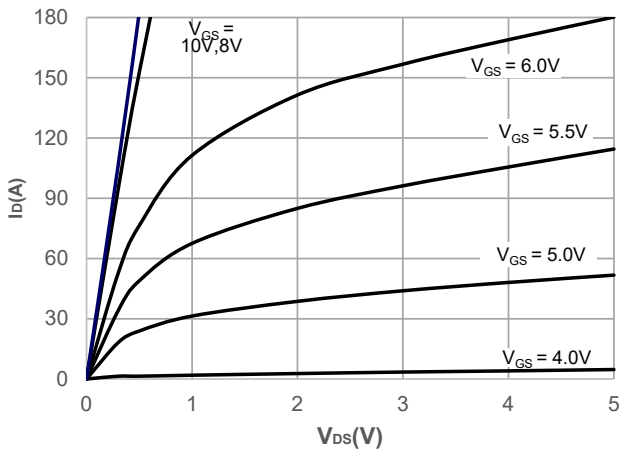


Figure 6: Typical Transfer Characteristics

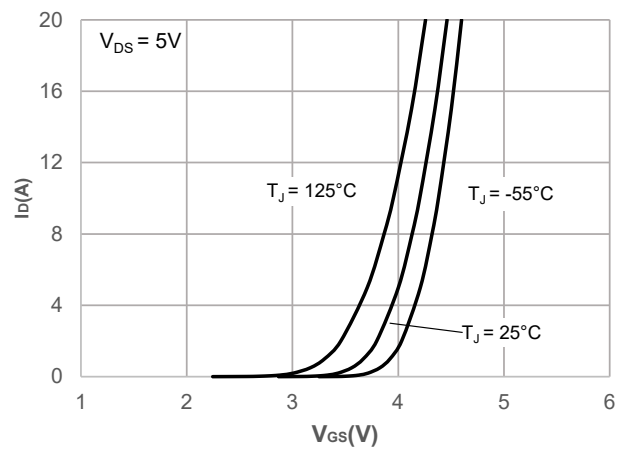


Figure 7: On-resistance vs. Drain Current

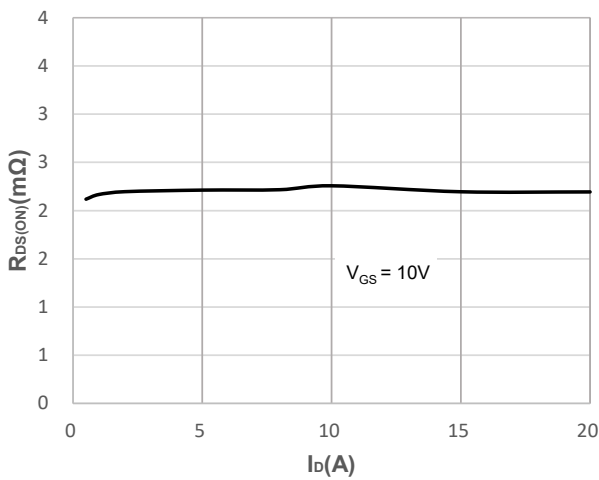


Figure 8: Body Diode Characteristics

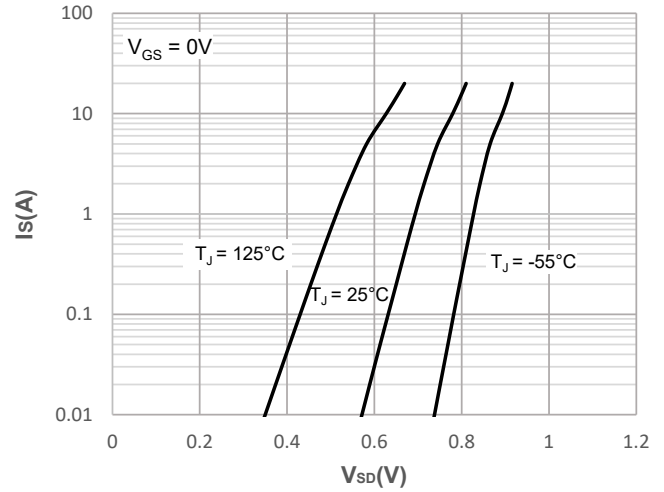


Figure 9: Gate Charge Characteristics

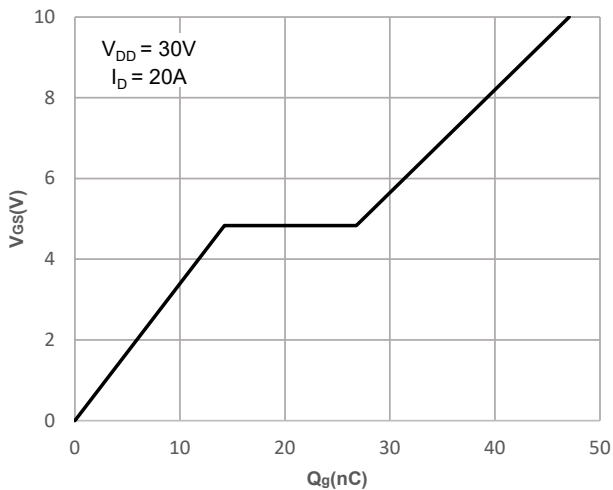
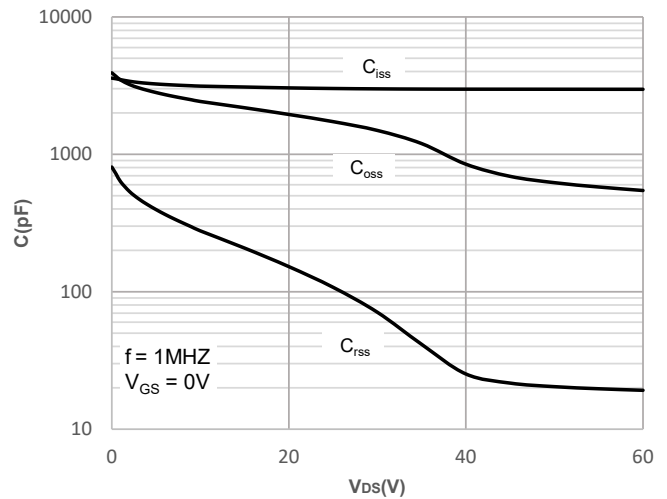


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

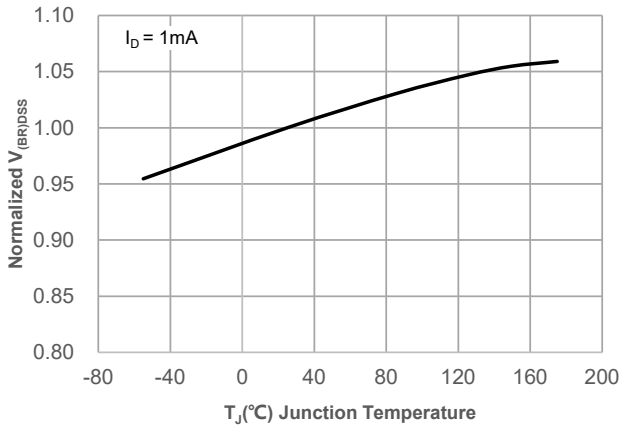


Figure 12: Normalized on Resistance vs. Junction Temperature

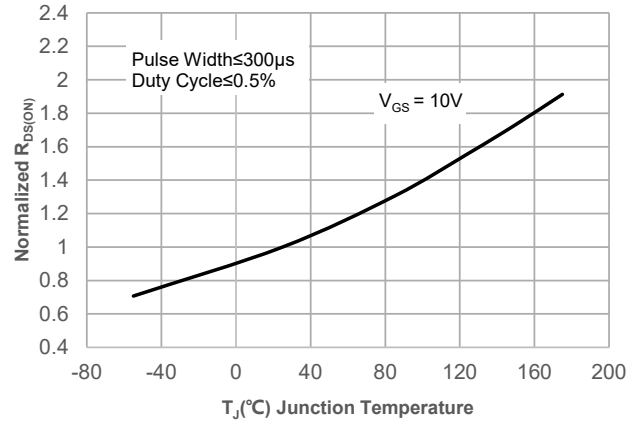


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

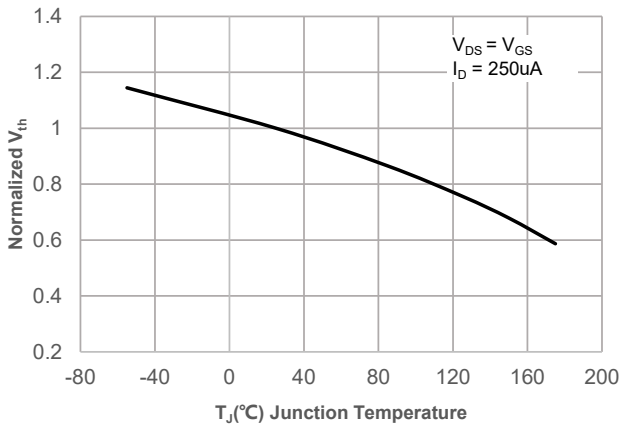


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

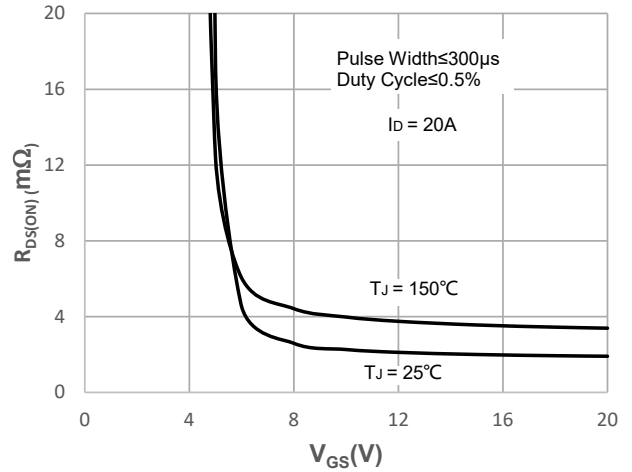
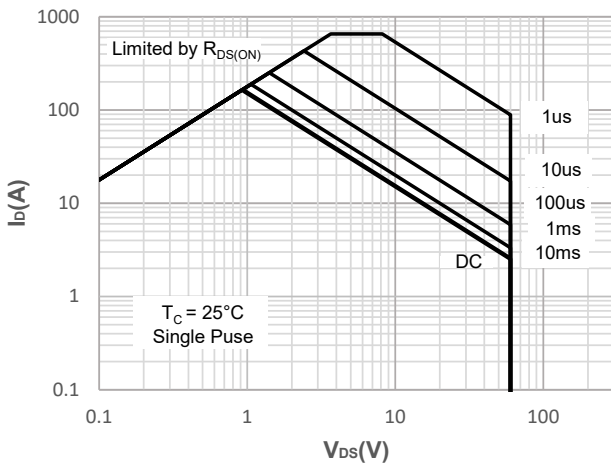


Figure 15: Maximum Safe Operating Area



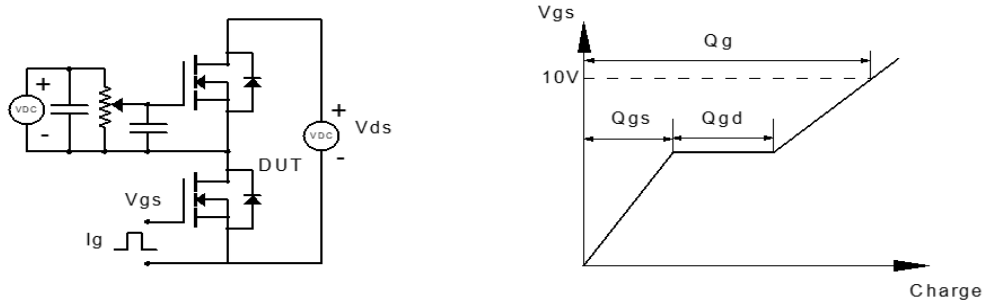
Test Circuit

Figure 1: Gate Charge Test Circuit & Waveform

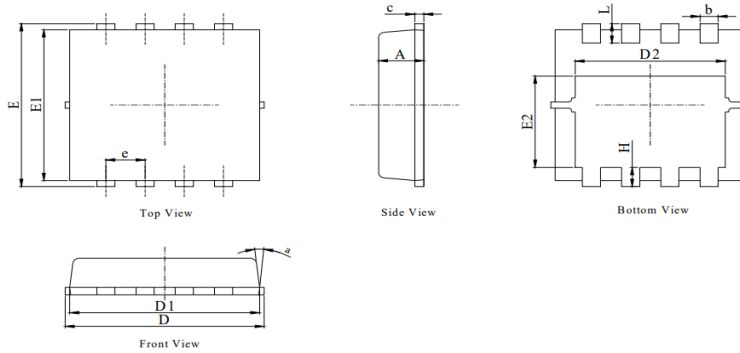
Figure 2: Resistive Switching Test Circuit & Waveform

Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

Figure 4: Diode Recovery Test Circuit & Waveform

Package Mechanical Data(PDFN5X6-8L)

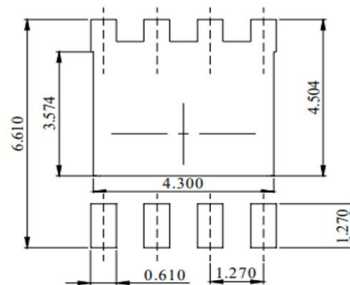
Package Outline



- 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 | 0.9 | 1 | 1.15 |
| b | 0.31 | 0.41 | 0.51 |
| C | 0.24 | 0.32 | 0.4 |
| D | 5 | 5.2 | 5.4 |
| D1 | 4.95 | 5.05 | 5.15 |
| D2 | 4 | 4.1 | 4.2 |
| E | 6.05 | 6.15 | 6.25 |
| E1 | 5.5 | 5.6 | 5.7 |
| E2 | 3.42 | 3.53 | 3.63 |
| e | 1.27BSC | | |
| H | 0.6 | 0.7 | 0.8 |
| L | 0.5 | 0.7 | 0.8 |
| K | 1.23 REF | | |
| 0 | | | 10 |

Recommended Soldering Footprint



DIMENSIONS:MILLIMETERS

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