

40V, 66A, 4.5mΩ N-channel Power SGT MOSFET
JMSL04055KQ
Features

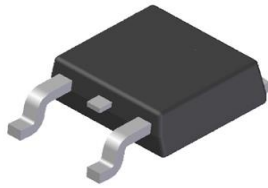
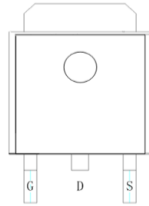
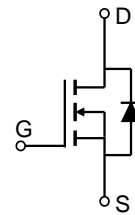
- Ultra-low ON-resistance, $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

Applications

- Load Switch
- PWM Application
- General Automotive Application

Product Summary

| Parameters | Value | Unit |
|---------------------------------|-------|------|
| V_{DSS} | 40 | V |
| $V_{GS(th_Typ)}$ | 1.8 | V |
| $I_D(@V_{GS}=10V)$ | 66 | A |
| $R_{DS(ON_Typ)}(@V_{GS}=10V)$ | 4.5 | mΩ |
| $R_{DS(ON_Typ)}(@V_{GS}=4.5V)$ | 6.1 | mΩ |


TO-252-3L

Pin Assignment

Schematic Diagram
Ordering Information

| Device | Marking | MSL | Form | Package | Reel(pcs) | Per Carton (pcs) |
|----------------|----------|-----|-----------|-----------|-----------|------------------|
| JMSL04055KQ-13 | SL04055Q | 1 | Tape&Reel | TO-252-3L | 2500 | 25000 |

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

| Symbol | Parameter | Value | Unit |
|----------------|---|---------------------------|------------------|
| V_{DS} | Drain-to-Source Voltage | 40 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| I_D | Continuous Drain Current | $T_C = 25^\circ\text{C}$ | 66 |
| | | $T_C = 100^\circ\text{C}$ | 47 |
| I_{DM} | Pulsed Drain Current ⁽¹⁾ | Refer to Fig.4 | A |
| E_{AS} | Single Pulsed Avalanche Energy ⁽²⁾ | 106 | mJ |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ | 48 |
| | | $T_C = 100^\circ\text{C}$ | 24 |
| 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⁾ | 44 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 3.1 | |

**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 | $I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$ | 40 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 32\text{V}$, $V_{GS} = 0\text{V}$ | - | - | 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 | $V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$ | 1.2 | 1.8 | 2.3 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance ⁽⁴⁾ | $V_{GS} = 10\text{V}$, $I_D = 20\text{A}$ | - | 4.5 | 5.8 | m Ω |
| | | $V_{GS} = 4.5\text{V}$, $I_D = 15\text{A}$ | - | 6.1 | 7.9 | m Ω |
| Dynamic Characteristics | | | | | | |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | - | 1.7 | - | Ω |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}$, $V_{DS} = 20\text{V}$, $f = 1\text{MHz}$ | 1053 | 1474 | 1990 | pF |
| C_{oss} | Output Capacitance | | 452 | 633 | 855 | pF |
| C_{riss} | Reverse Transfer Capacitance | | 44 | 61 | 83 | pF |
| Q_g | Total Gate Charge | $V_{GS} = 0$ to 10V $V_{DS} = 20\text{V}$, $I_D = 20\text{A}$ | 19 | 27 | 37 | nC |
| Q_{gs} | Gate Source Charge | | - | 4.8 | - | nC |
| Q_{gd} | Gate Drain("Miller") Charge | | - | 6.3 | - | nC |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On DelayTime | $V_{GS} = 10\text{V}$, $V_{DD} = 20\text{V}$ $I_D = 20\text{A}$, $R_{GEN} = 3\Omega$ | - | 8.1 | - | ns |
| t_r | Turn-On Rise Time | | - | 26 | - | ns |
| $t_{d(off)}$ | Turn-Off DelayTime | | - | 26 | - | ns |
| t_f | Turn-Off Fall Time | | - | 8 | - | ns |
| Body Diode Characteristics | | | | | | |
| I_S | Maximum Continuous Body Diode Forward Current | | - | - | 66 | A |
| I_{SM} | Maximum Pulsed Body Diode Forward Current | | - | - | 266 | 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 | $I_F = 20\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ | 20 | 28 | 38 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | | - | 18 | - | nC |

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 20\text{V}$, $V_G = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 8.4\text{A}$, $V_{DD} = 0\text{V}$ 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

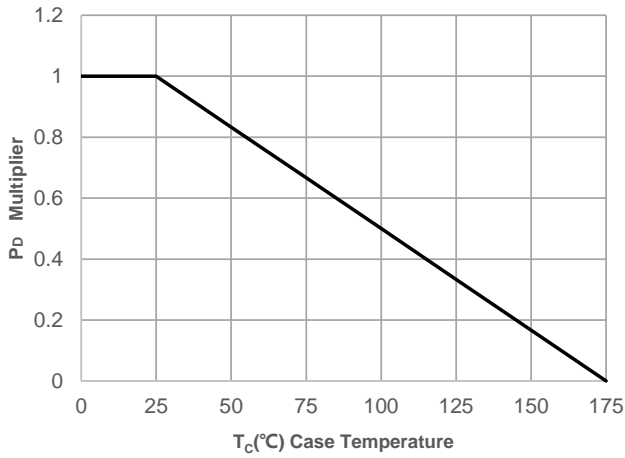


Figure 2: Current De-rating

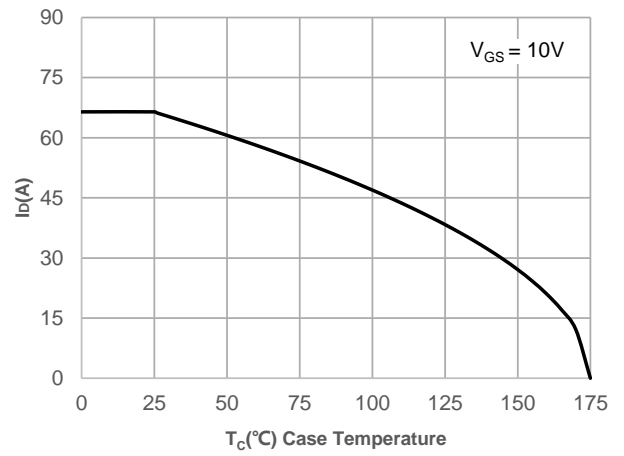


Figure 3: Normalized Maximum Transient Thermal Impedance

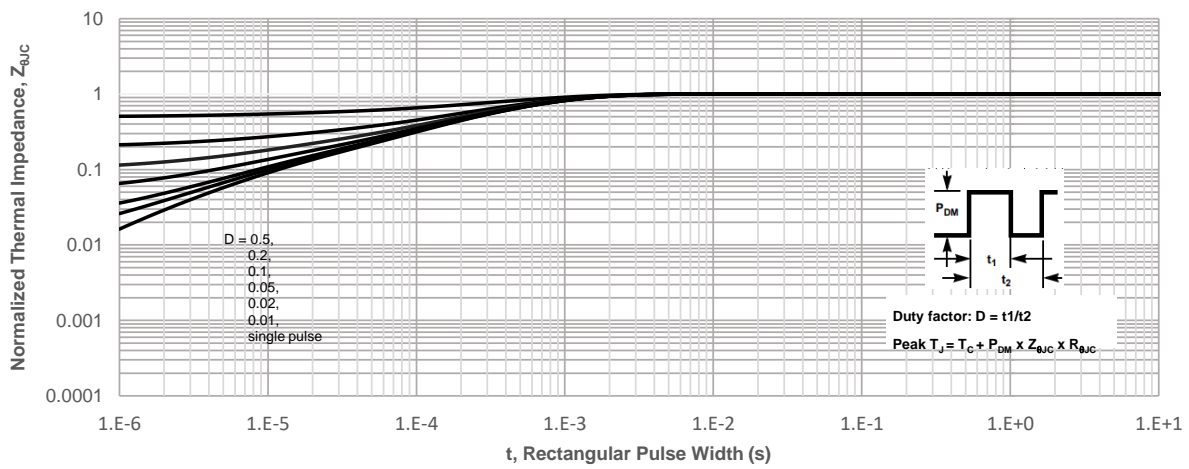
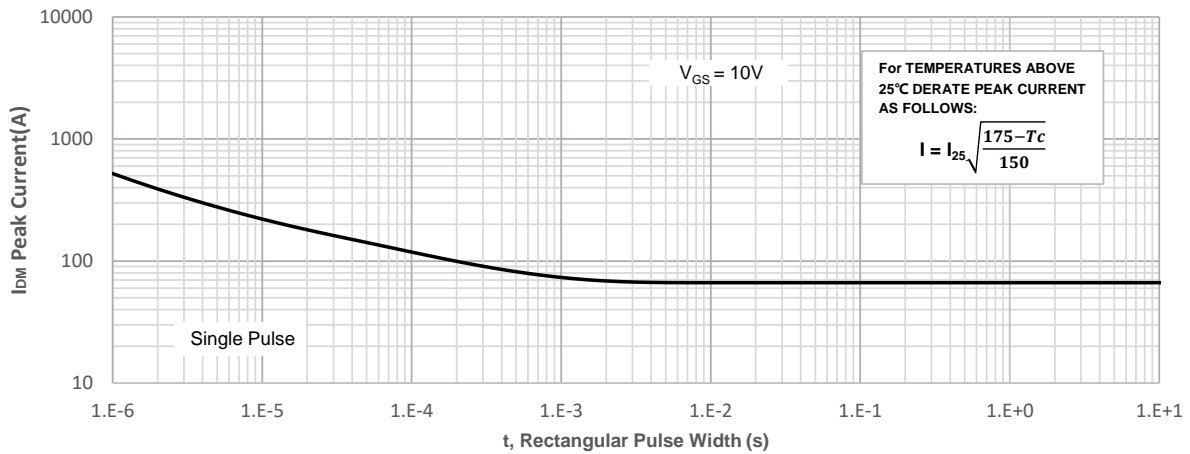


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

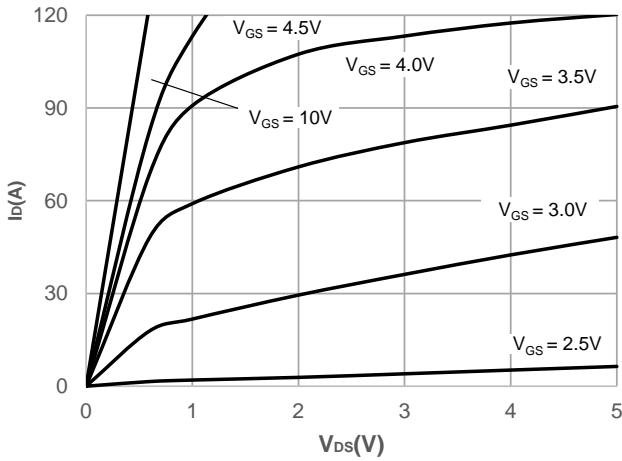


Figure 6: Typical Transfer Characteristics

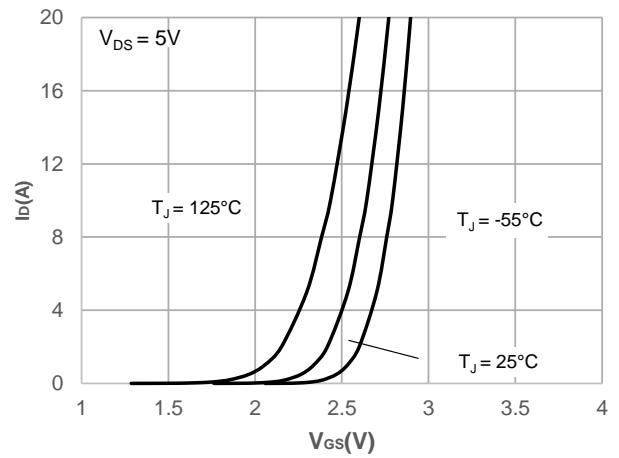


Figure 7: On-resistance vs. Drain Current

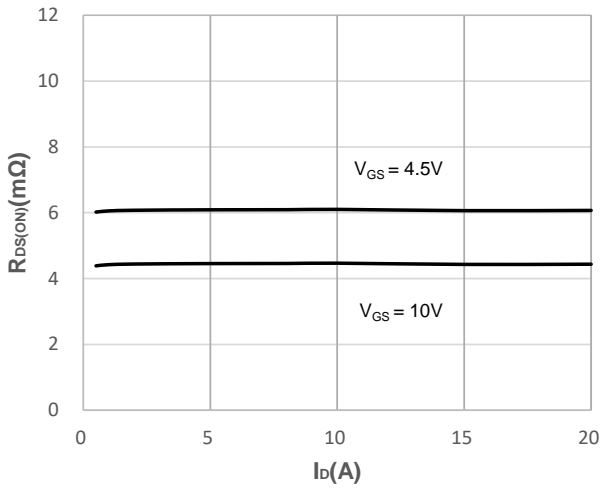


Figure 8: Body Diode Characteristics

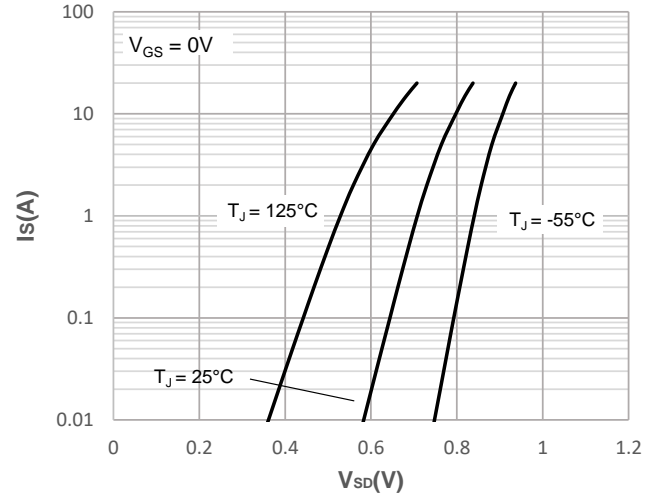


Figure 9: Gate Charge Characteristics

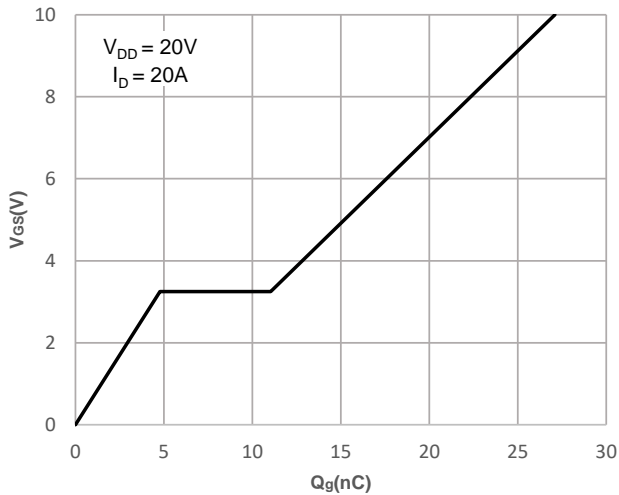
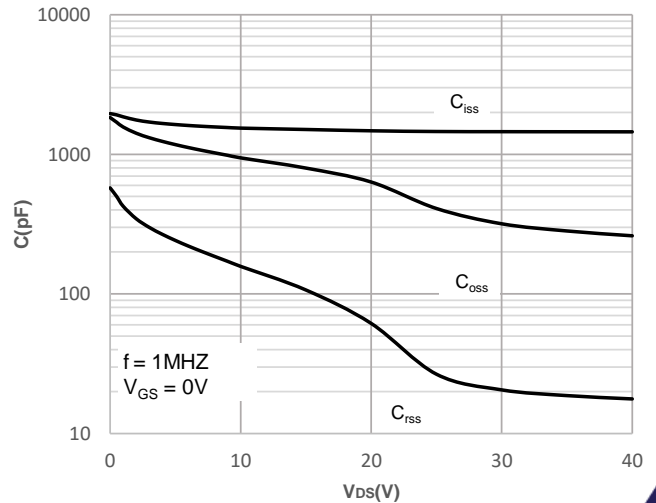


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

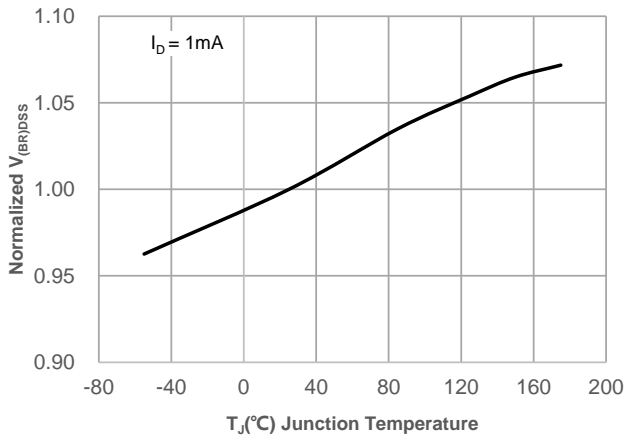


Figure 12: Normalized on Resistance vs. Junction Temperature

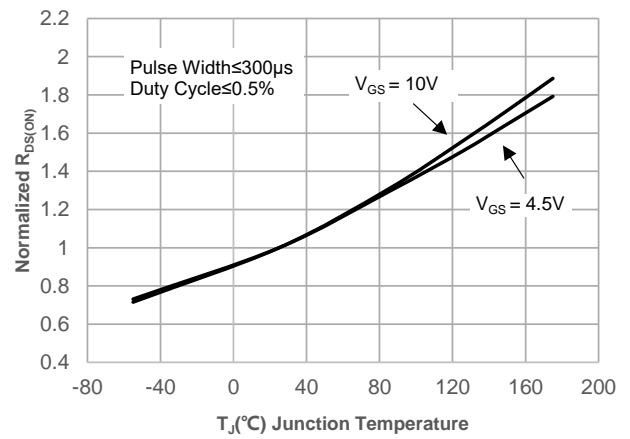


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

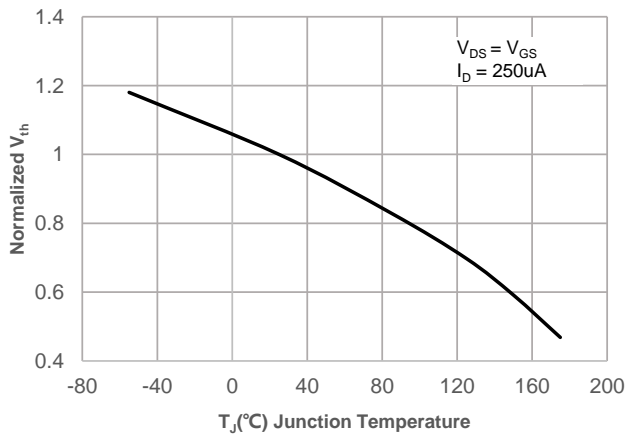


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

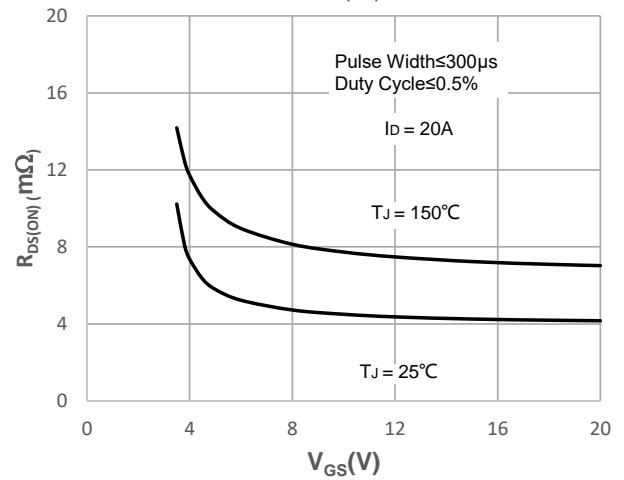
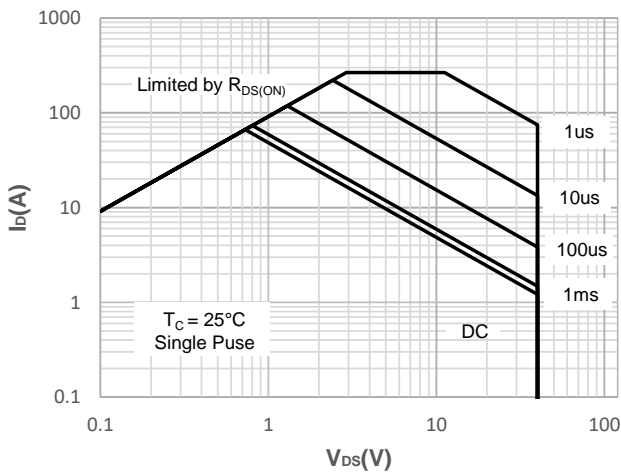


Figure 15: Maximum Safe Operating Area



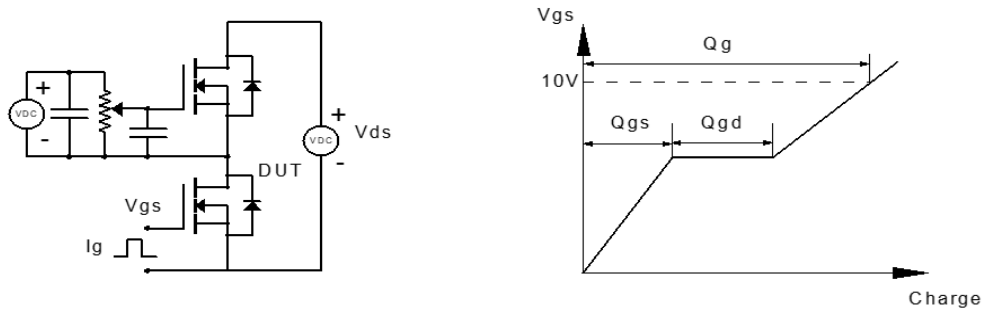
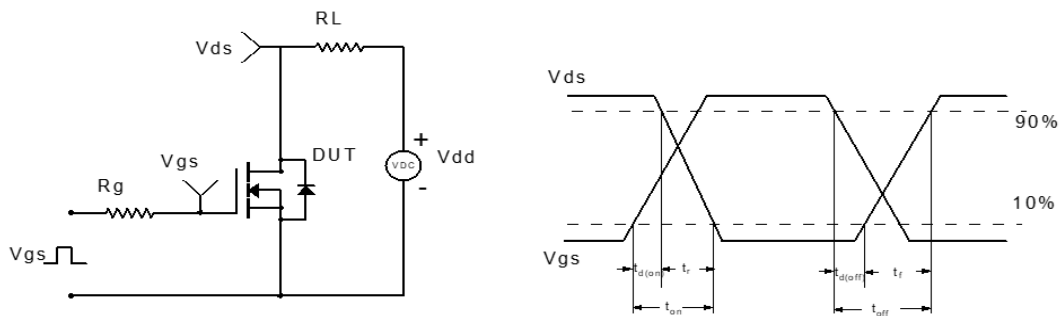
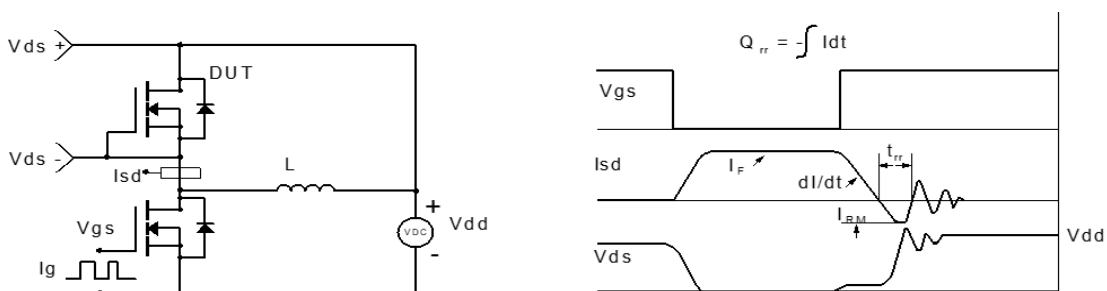
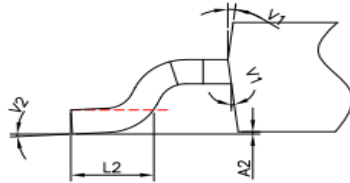
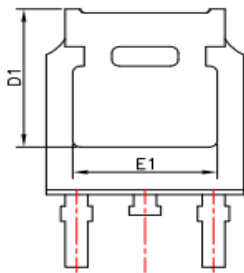
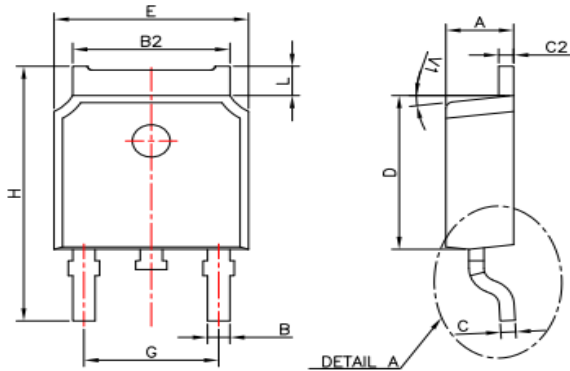
Test Circuit

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(TO-252-3L)


| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|----------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | 2.30 | 2.50 | 0.083 | 0.091 | 0.098 |
| A2 | 0 | --- | 0.15 | 0 | --- | 0.006 |
| B | 0.66 | 0.76 | 0.86 | 0.026 | 0.030 | 0.034 |
| B2 | 5.18 | 5.33 | 5.48 | 0.202 | 0.210 | 0.216 |
| C | 0.40 | 0.508 | 0.60 | 0.016 | 0.020 | 0.024 |
| C2 | 0.44 | 0.508 | 0.58 | 0.017 | 0.020 | 0.023 |
| D | 5.90 | 6.10 | 6.30 | 0.232 | 0.240 | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | 6.60 | 6.80 | 0.252 | 0.260 | 0.268 |
| E1 | 4.826 REF | | | 0.19 REF | | |
| G | 4.47 | 4.57 | 4.67 | 0.176 | 0.180 | 0.184 |
| H | 9.50 | 10.10 | 10.70 | 0.374 | 0.398 | 0.421 |
| L | 0.95 | 1.16 | 1.30 | 0.037 | 0.046 | 0.051 |
| L2 | 1.35 | 1.50 | 1.65 | 0.053 | 0.059 | 0.065 |
| V1 | --- | 7° | --- | --- | 7° | --- |
| V2 | 0° | --- | 6° | 0° | --- | 6° |

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