

100V, 264A, 2.1mΩ N-channel Power SGT MOSFET
JMSH1001NEQ
Features

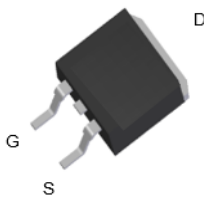
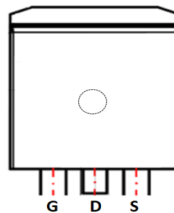
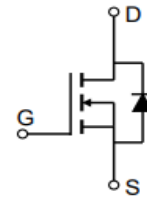
- Ultra-low ON-resistance, $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

Applications

- Load Switch
- PWM Application
- General Automotive Application

Product Summary

| Parameters | Value | Unit |
|--------------------------------|-------|------|
| V_{DSS} | 100 | V |
| $V_{GS(th_Typ)}$ | 2.9 | V |
| $I_D(@V_{GS}=10V)$ | 264 | A |
| $R_{DS(ON)_Typ}(@V_{GS}=10V)$ | 2.1 | mΩ |


TO-263-3L

Pin Assignment

Schematic Diagram
Ordering Information

| Device | Marking | MSL | Form | Package | Reel(pcs) | Per Carton (pcs) |
|----------------|----------|-----|-----------|-----------|-----------|------------------|
| JMSH1001NEQ-13 | SH1001NQ | 1 | Tape&Reel | TO-263-3L | 800 | 4000 |

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ 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 | $T_C = 25^\circ\text{C}$ | 264 |
| | | $T_C = 100^\circ\text{C}$ | 187 |
| I_{DM} | Pulsed Drain Current ⁽¹⁾ | Refer to Fig.4 | A |
| E_{AS} | Single Pulsed Avalanche Energy ⁽²⁾ | 1722 | mJ |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ | 375 |
| | | $T_C = 100^\circ\text{C}$ | 188 |
| 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⁾ | 33 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.4 | |

**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 | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ | 100 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 80\text{V}, V_{GS} = 0\text{V}$ | - | - | 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 | 2.9 | 4.0 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance ⁽⁴⁾ | $V_{GS} = 10\text{V}, I_D = 20\text{A}$ | - | 2.1 | 2.7 | m Ω |
| Dynamic Characteristics | | | | | | |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | - | 2.3 | - | Ω |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$ | 8341 | 11677 | 15764 | pF |
| C_{oss} | Output Capacitance | | 1260 | 1764 | 2381 | pF |
| C_{riss} | Reverse Transfer Capacitance | | 27 | 38 | 52 | pF |
| Q_g | Total Gate Charge | $V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 50\text{V}, I_D = 20\text{A}$ | 121 | 169 | 228 | nC |
| Q_{gs} | Gate Source Charge | | 39 | 55 | 74 | nC |
| Q_{gd} | Gate Drain ("Miller") Charge | | 26 | 36 | 49 | nC |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{GS} = 10\text{V}, V_{DD} = 50\text{V}$ $I_D = 20\text{A}, R_{GEN} = 3\Omega$ | - | 34 | - | ns |
| t_r | Turn-On Rise Time | | - | 43 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 95 | - | ns |
| t_f | Turn-Off Fall Time | | - | 51 | - | ns |
| Body Diode Characteristics | | | | | | |
| I_S | Maximum Continuous Body Diode Forward Current | | - | - | 264 | A |
| I_{SM} | Maximum Pulsed Body Diode Forward Current | | - | - | 1056 | 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 | $I_F = 15\text{A}, di/dt = 100\text{A}/\mu\text{s}$ | 74 | 104 | 140 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | | - | 350 | - | nC |

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 50\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 33.88\text{A}$, $V_{DD} = 0\text{V}$ 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

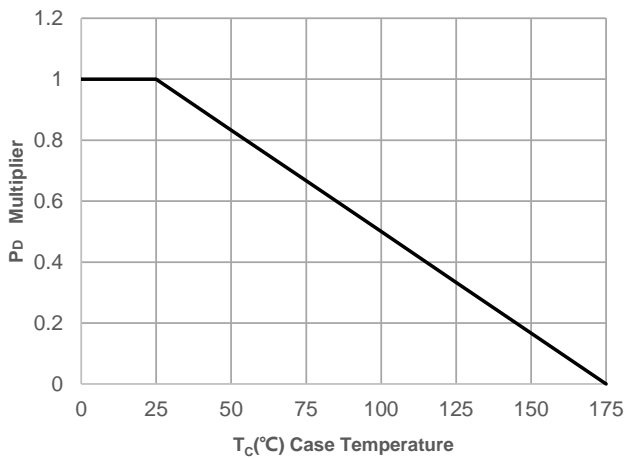


Figure 2: Current De-rating

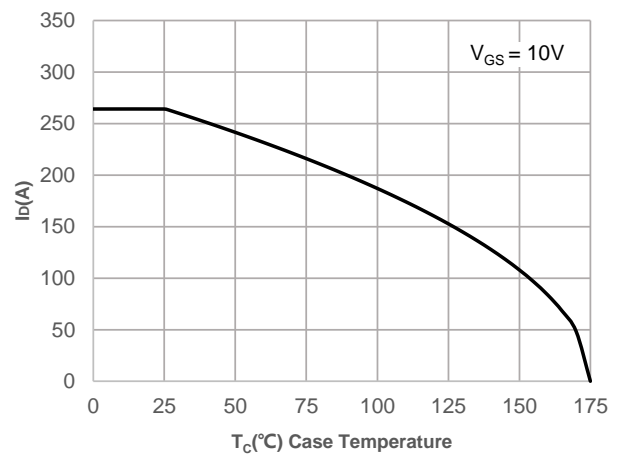


Figure 3: Normalized Maximum Transient Thermal Impedance

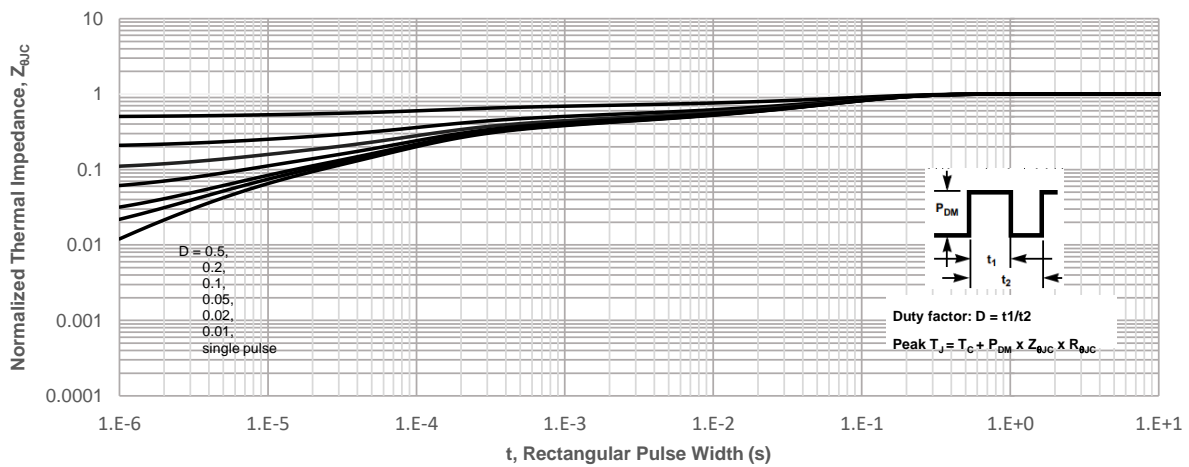
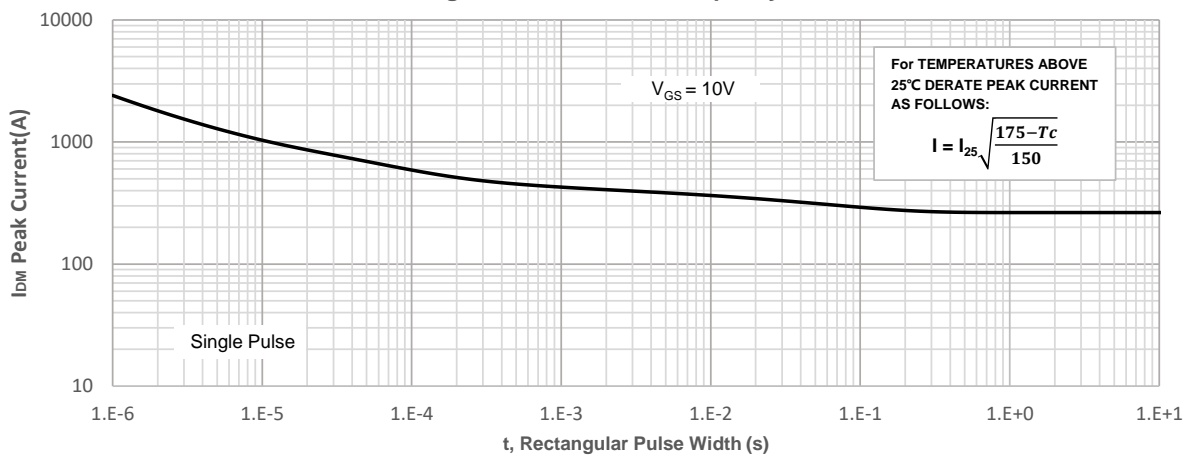
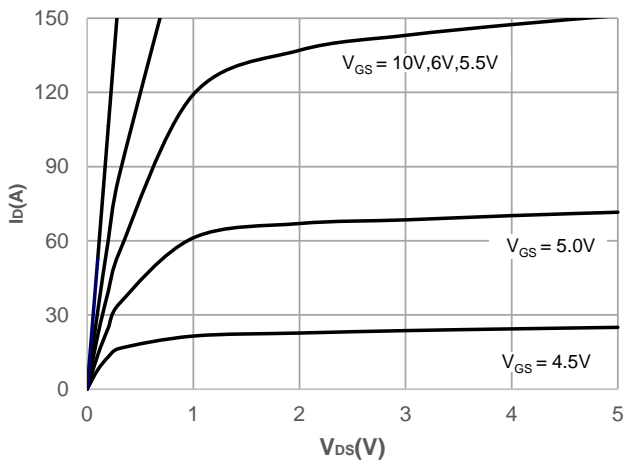
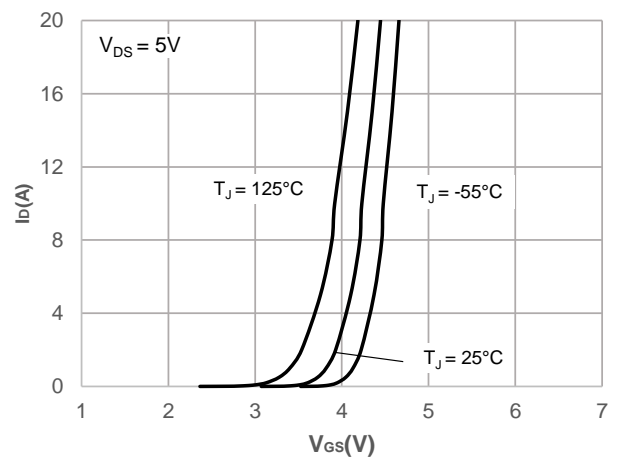
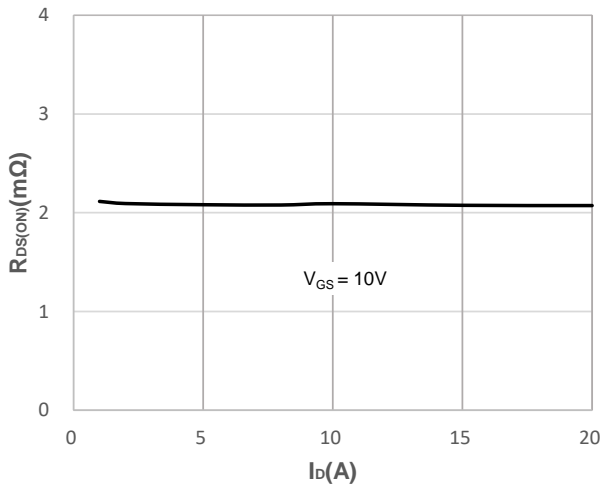
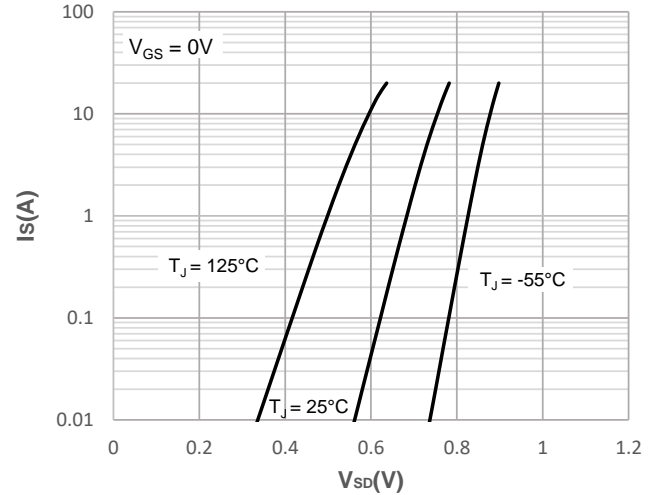
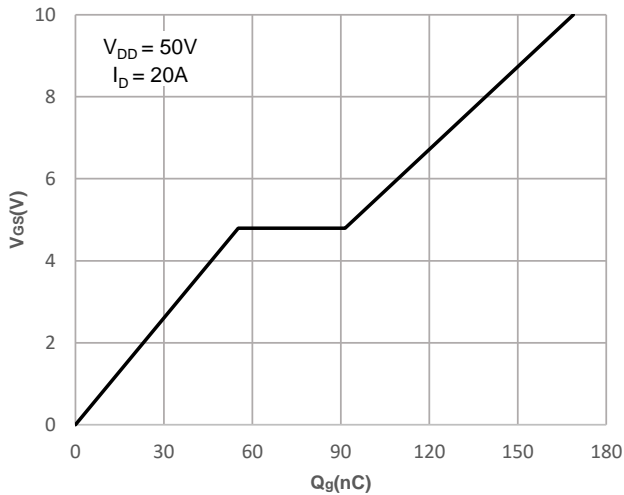
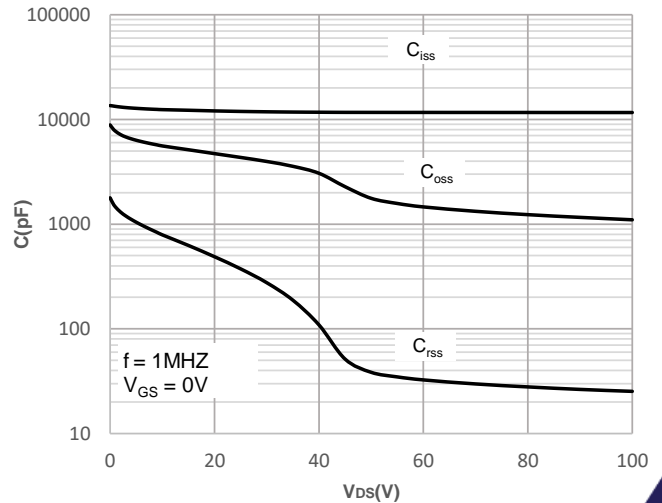


Figure 4: Peak Current Capacity



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

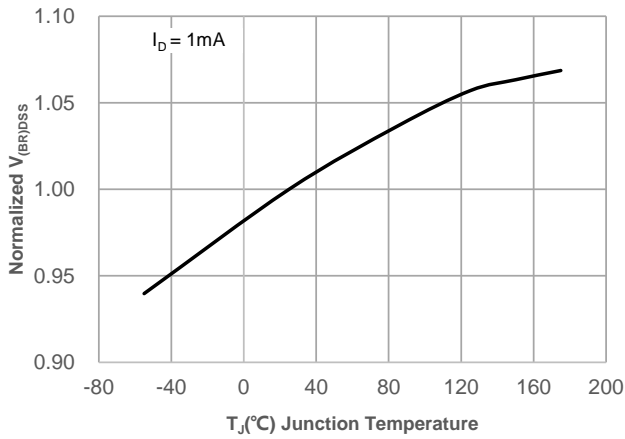


Figure 12: Normalized on Resistance vs. Junction Temperature

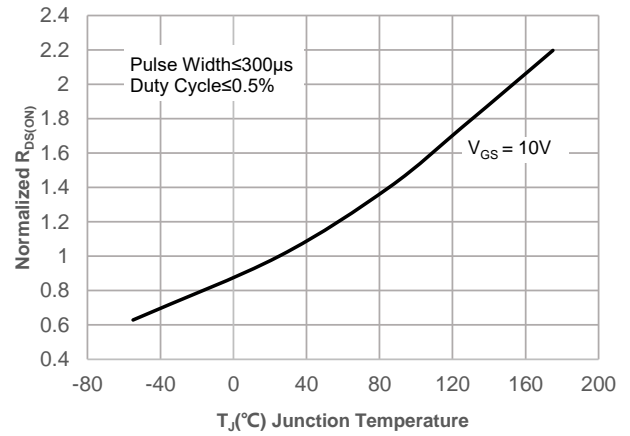


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

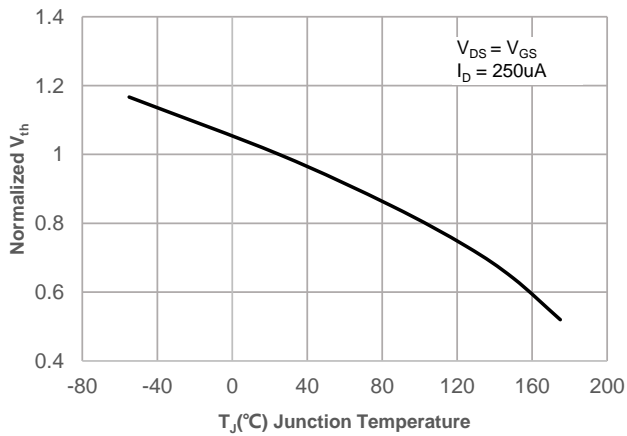


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

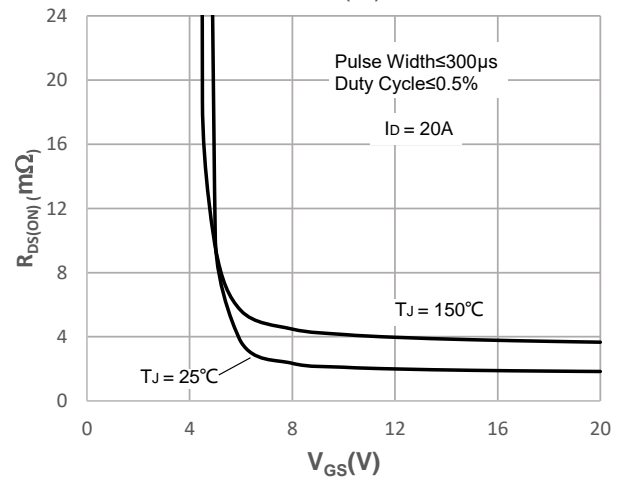
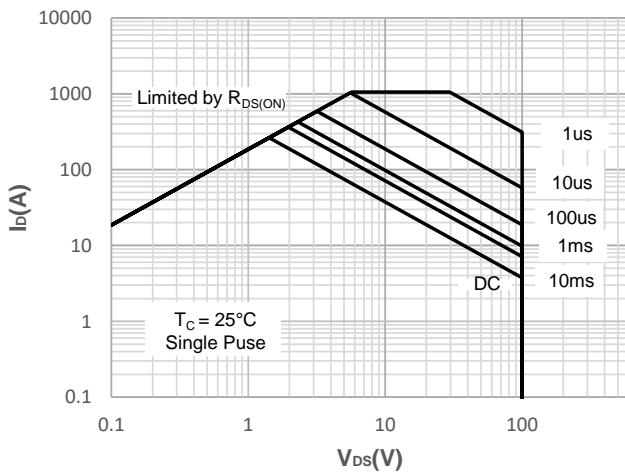


Figure 15: Maximum Safe Operating Area



Test Circuit

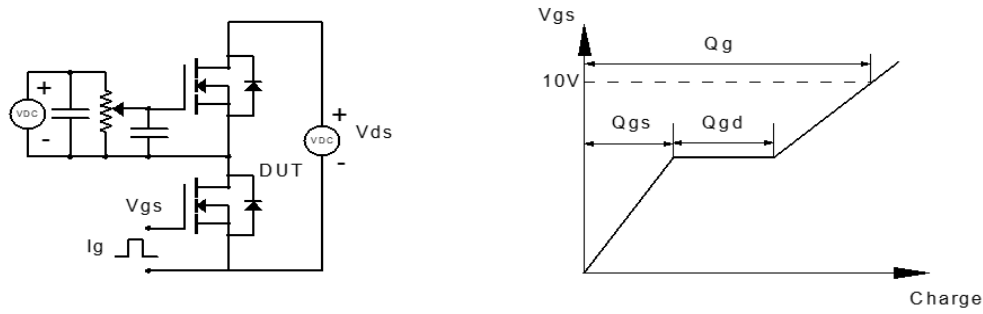


Figure 1: Gate Charge Test Circuit & Waveform

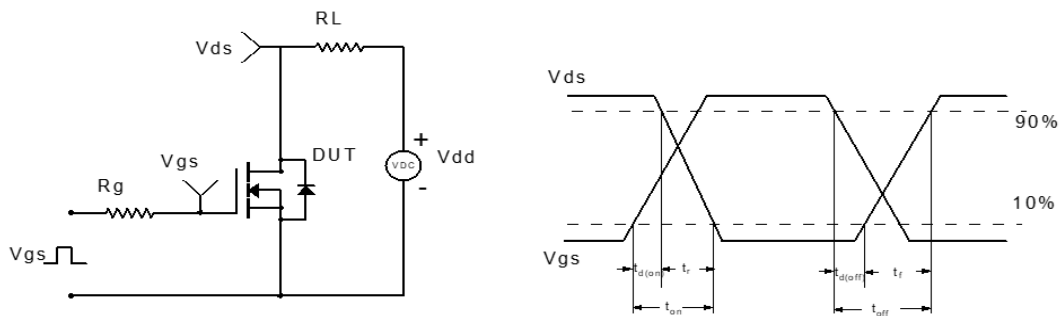


Figure 2: Resistive Switching Test Circuit & Waveform

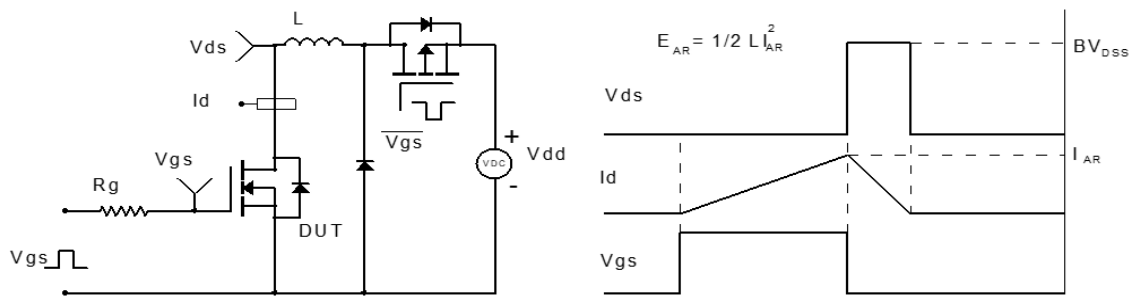


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

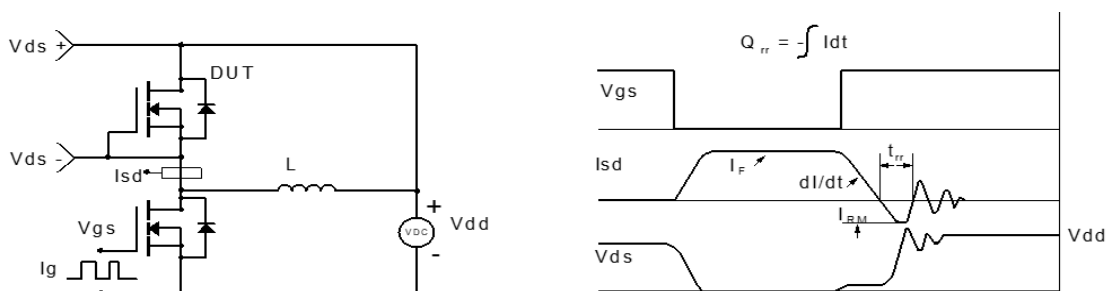
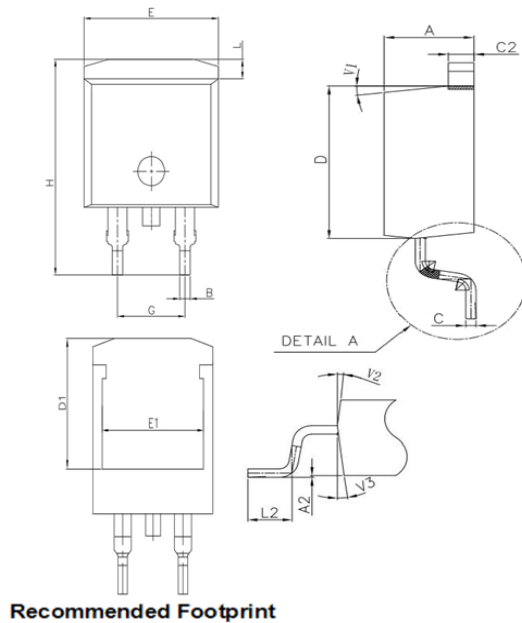


Figure 4: Diode Recovery Test Circuit & Waveform

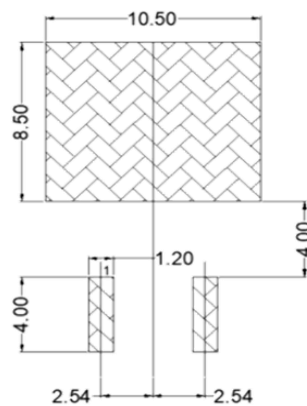


Package Mechanical Data(TO-263 -3L)

Package Outline



| SYMBOL | DIMENSIONS | | |
|--------|------------|-------|-------|
| | MIN | NOM | MAX |
| A | 4.3 | 4.55 | 4.7 |
| A2 | 0 | | 0.15 |
| B | 0.75 | 0.8 | 0.85 |
| C | 0.38 | 0.46 | 0.55 |
| C2 | 1.25 | 1.3 | 1.35 |
| D | 8.9 | 9.3 | 9.6 |
| D1 | 7.4 | 7.65 | 7.9 |
| E | 9.9 | 10.05 | 10.21 |
| E1 | 8.3 | 8.6 | 8.9 |
| G | 5.03 | 5.08 | 5.13 |
| H | 14.7 | 15 | 15.8 |
| L2 | 2.2 | 2.35 | 2.5 |



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