

# -100V, -31A, 36mΩ P-channel Power SGT MOSFET

## JMPL1050PE

### Features

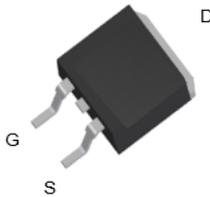
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free; RoHS-compliant

### Applications

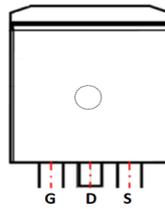
- Load Switch
- PWM Application
- Power Management

### Product Summary

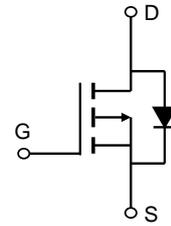
| Parameters                       | Value | Unit |
|----------------------------------|-------|------|
| $V_{DSS}$                        | -100  | V    |
| $V_{GS(th\_Typ)}$                | -1.7  | V    |
| $I_D(@V_{GS}=-10V)$              | -31   | A    |
| $R_{DS(ON\_Typ)}(@V_{GS}=-10V)$  | 36    | mΩ   |
| $R_{DS(ON\_Typ)}(@V_{GS}=-4.5V)$ | 45    | mΩ   |



TO-263-3L



Pin Assignment



Schematic Diagram

### Ordering Information

| Device        | Marking | MSL | Form      | Package   | Reel(pcs) | Per Carton (pcs) |
|---------------|---------|-----|-----------|-----------|-----------|------------------|
| JMPL1050PE-13 | PL1050P | 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                        | $\pm 20$                  | V                |
| $I_D$          | Continuous Drain Current                      | $T_C = 25^\circ\text{C}$  | -31              |
|                |   | $T_C = 100^\circ\text{C}$ | -19              |
| $I_{DM}$       | Pulsed Drain Current <sup>(1)</sup>           | Refer to Fig.4            | A                |
| $E_{AS}$       | Single Pulsed Avalanche Energy <sup>(2)</sup> | 144                       | mJ               |
| $P_D$          | Power Dissipation                             | $T_C = 25^\circ\text{C}$  | 88               |
|                |   | $T_C = 100^\circ\text{C}$ | 35               |
| $T_J, T_{STG}$ | Junction & Storage Temperature Range          | -55 to 150                | $^\circ\text{C}$ |

### Thermal Characteristics

| Symbol          | Parameter  | Max | Unit                      |
|-----------------|--|-----|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient <sup>(3)</sup> | 38  | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case                   | 1.4 |                           |

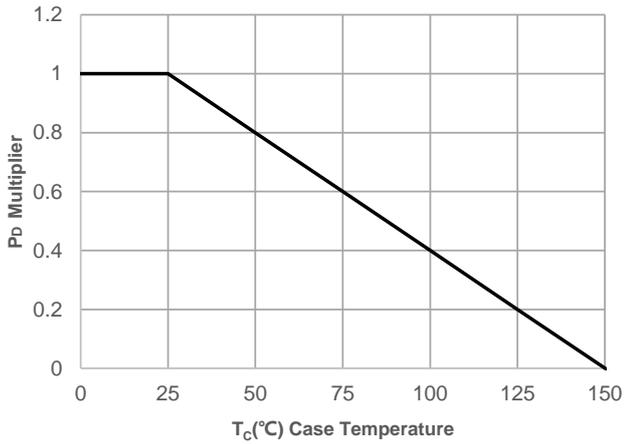
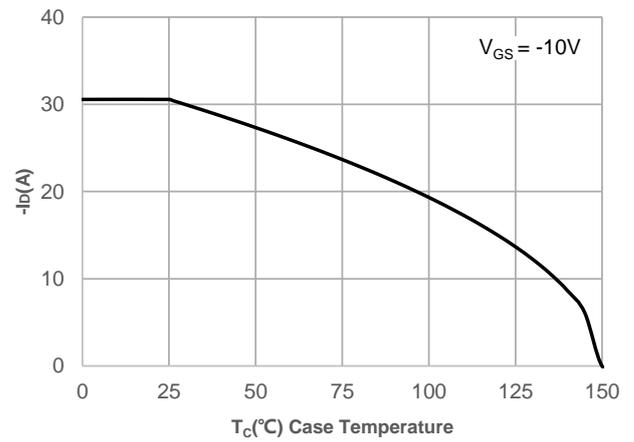
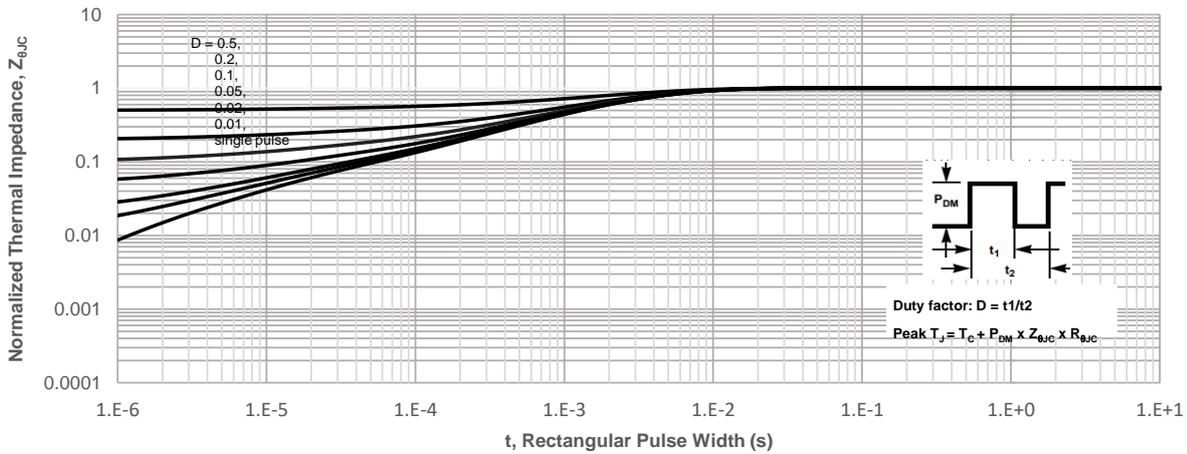
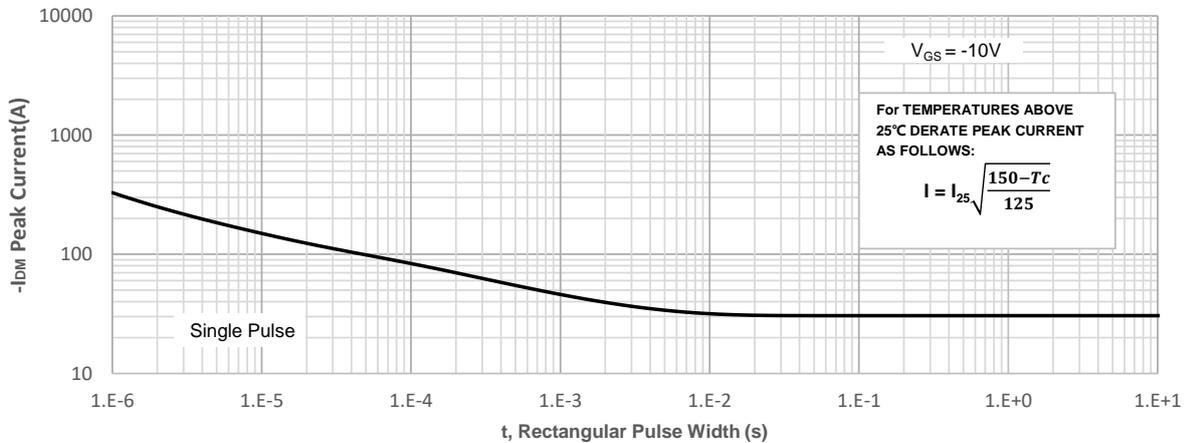
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Symbol                            | Parameter  | Conditions   | Min. | Typ. | Max.      | Unit             |
|-----------------------------------|--|--|------|------|-----------|------------------|
| <b>Off Characteristics</b>        |  |  |      |      |           |                  |
| $V_{(BR)DSS}$                     | 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      | $\mu\text{A}$    |
| $I_{GSS}$                         | Gate-Body Leakage Current                        | $V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$   | -    | -    | $\pm 100$ | nA               |
| <b>On Characteristics</b>         |  |  |      |      |           |                  |
| $V_{GS(th)}$                      | Gate Threshold Voltage                           | $V_{DS} = V_{GS}$ , $I_D = -250\mu\text{A}$  | -1.2 | -1.7 | -2.2      | V                |
| $R_{DS(ON)}$                      | Static Drain-Source ON-Resistance <sup>(4)</sup> | $V_{GS} = -10\text{V}$ , $I_D = -20\text{A}$   | -    | 36   | 50        | $\text{m}\Omega$ |
|                                   |  | $V_{GS} = -4.5\text{V}$ , $I_D = -15\text{A}$  | -    | 45   | 58        | $\text{m}\Omega$ |
| <b>Dynamic Characteristics</b>    |  |  |      |      |           |                  |
| $R_g$                             | Gate Resistance                                  | $f = 1\text{MHz}$  | -    | 7.6  | -         | $\Omega$         |
| $C_{iss}$                         | Input Capacitance                                | $V_{GS} = 0\text{V}$ , $V_{DS} = -50\text{V}$ ,<br>$f = 1\text{MHz}$                         | -    | 1535 | 2302      | pF               |
| $C_{oss}$                         | Output Capacitance                               |  | -    | 282  | 423       | pF               |
| $C_{riss}$                        | Reverse Transfer Capacitance                     |  | -    | 20   | 39        | pF               |
| $Q_g$                             | Total Gate Charge                                | $V_{GS} = 0$ to $-10\text{V}$<br>$V_{DS} = -50\text{V}$ , $I_D = -20\text{A}$                | -    | 26   | -         | nC               |
| $Q_{gs}$                          | Gate Source Charge                               |  | -    | 6.5  | -         | nC               |
| $Q_{gd}$                          | Gate Drain ("Miller") Charge                     |  | -    | 5.3  | -         | nC               |
| <b>Switching Characteristics</b>  |  |  |      |      |           |                  |
| $t_{d(on)}$                       | Turn-On Delay Time                               | $V_{GS} = -10\text{V}$ , $V_{DD} = -50\text{V}$<br>$I_D = -20\text{A}$ , $R_{GEN} = 3\Omega$ | -    | 7.3  | -         | ns               |
| $t_r$                             | Turn-On Rise Time                                |  | -    | 20   | -         | ns               |
| $t_{d(off)}$                      | Turn-Off Delay Time                              |  | -    | 36   | -         | ns               |
| $t_f$                             | Turn-Off Fall Time                               |  | -    | 13   | -         | ns               |
| <b>Body Diode Characteristics</b> |  |  |      |      |           |                  |
| $I_S$                             | Maximum Continuous Body Diode Forward Current    |  | -    | -    | -31       | A                |
| $I_{SM}$                          | Maximum Pulsed Body Diode Forward Current        |  | -    | -    | -122      | 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                 | $I_F = -20\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$                                      | 32   | 53   | 79        | ns               |
| $Q_{rr}$                          | Body Diode Reverse Recovery Charge               |  | -    | 139  | -         | nC               |

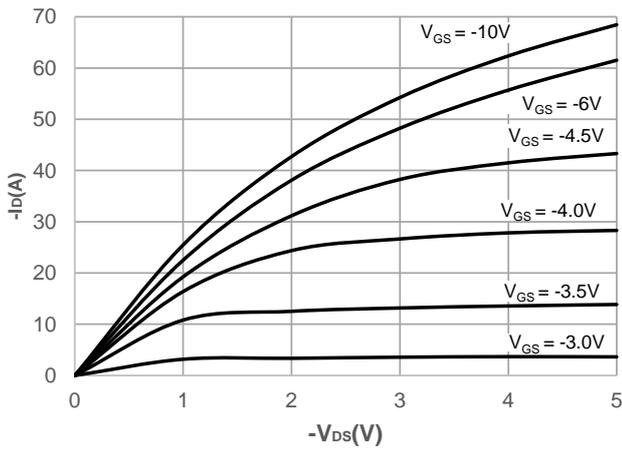
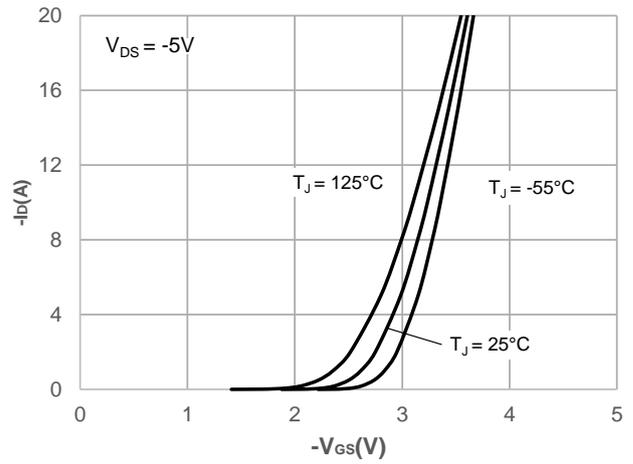
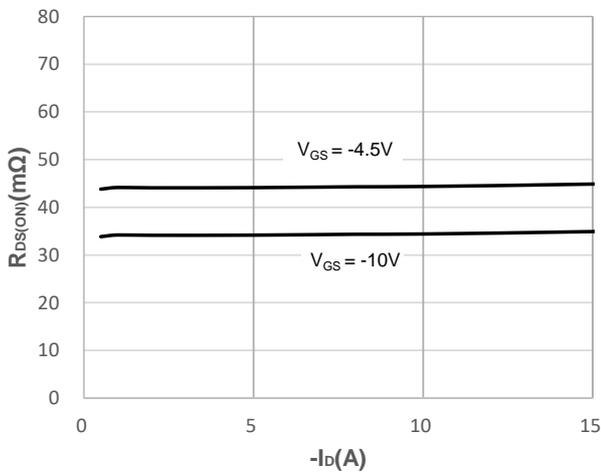
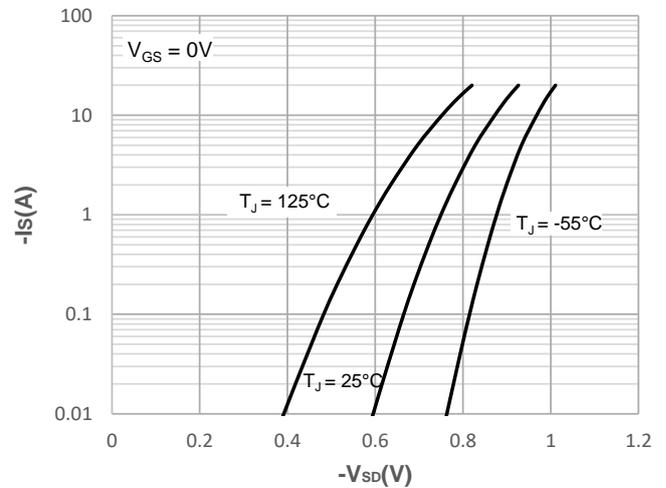
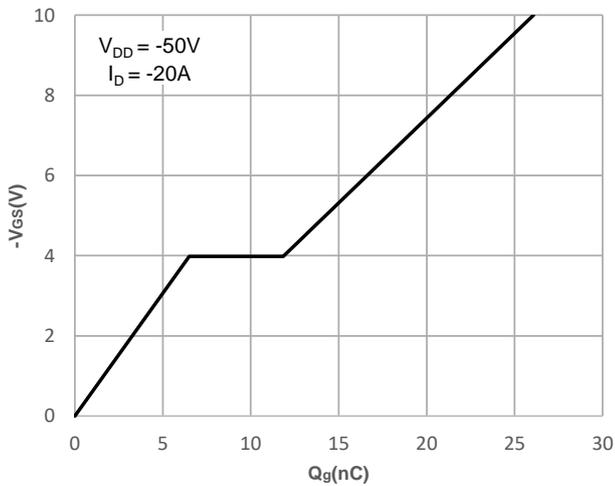
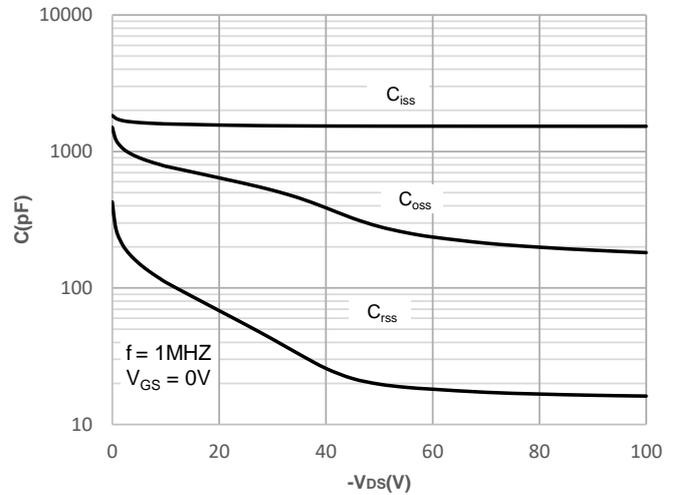
- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
  2.  $E_{AS}$  condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = -50\text{V}$ ,  $V_{GS} = -10\text{V}$ ,  $R_G = 25\text{ohm}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = -9.8\text{A}$ ,  $V_{DD} = 0\text{V}$  during time in avalanche.
  3.  $R_{\theta JA}$  is measured with the device mounted on a  $1\text{inch}^2$  pad of 2oz copper FR4 PCB.
  4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .



## Typical Performance Characteristics

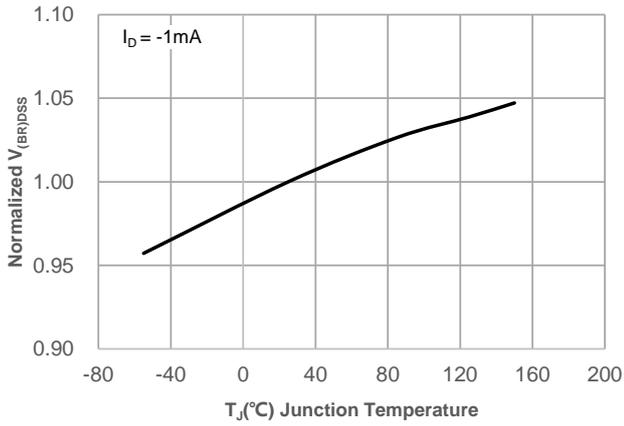
**Figure 1: Power De-rating**

**Figure 2: Current De-rating**

**Figure 3: Normalized Maximum Transient Thermal Impedance**

**Figure 4: Peak Current Capacity**


## Typical Performance Characteristics

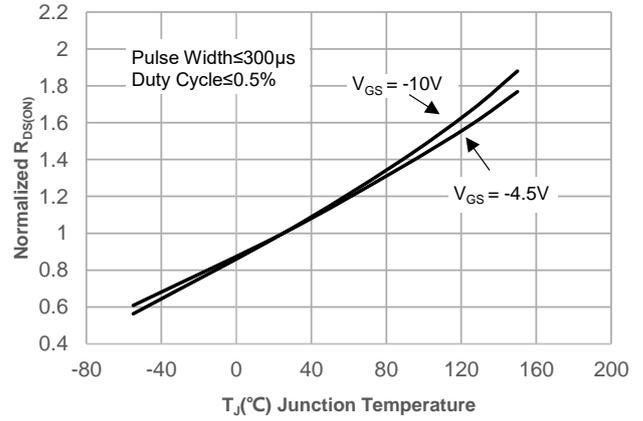
**Figure 5: Output Characteristics**

**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

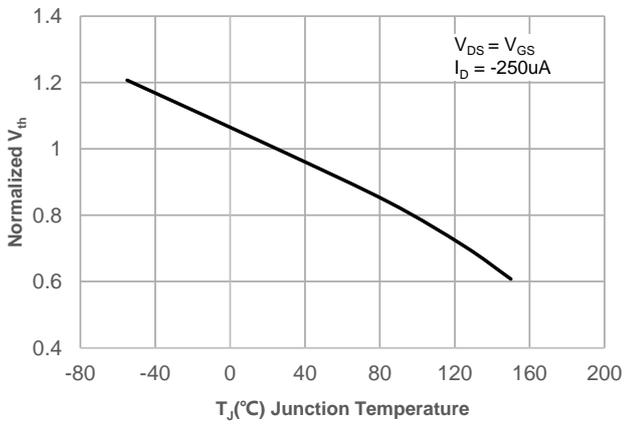
**Figure 11: Normalized Breakdown voltage vs. Junction Temperature**



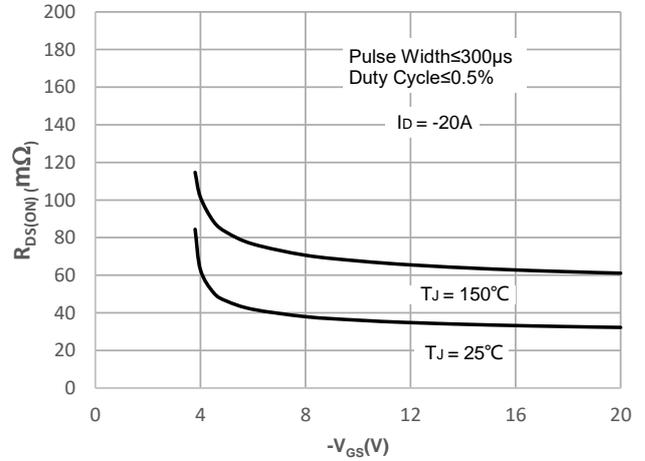
**Figure 12: Normalized on Resistance vs. Junction Temperature**



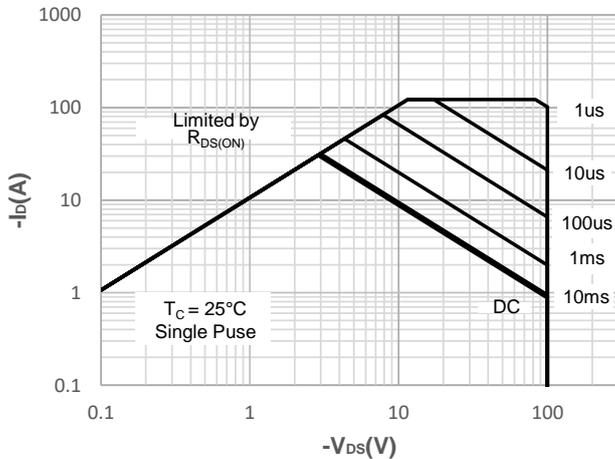
**Figure 13: Normalized Threshold Voltage vs. Junction Temperature**

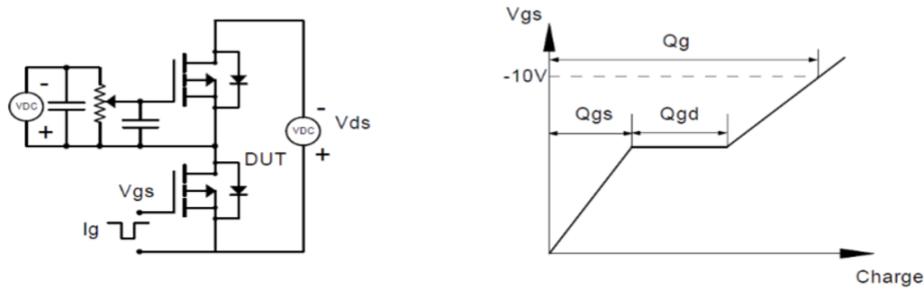
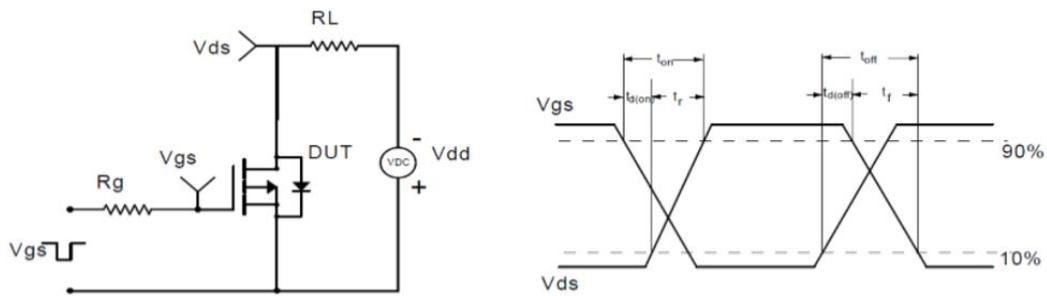
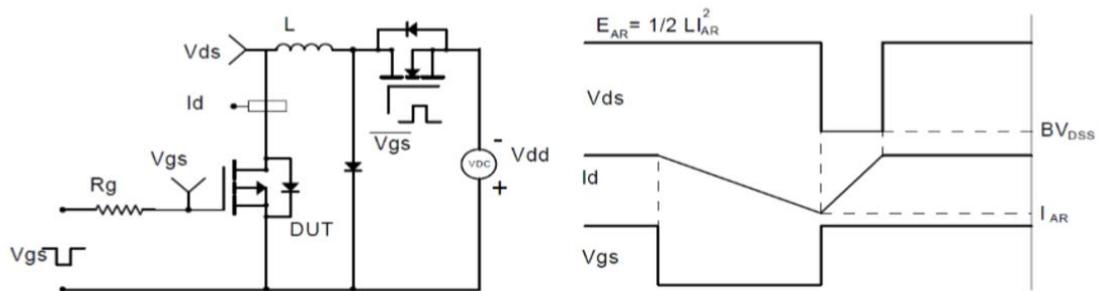
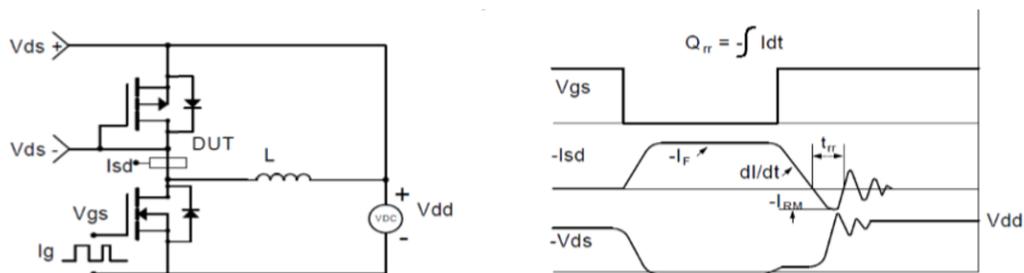


**Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$**



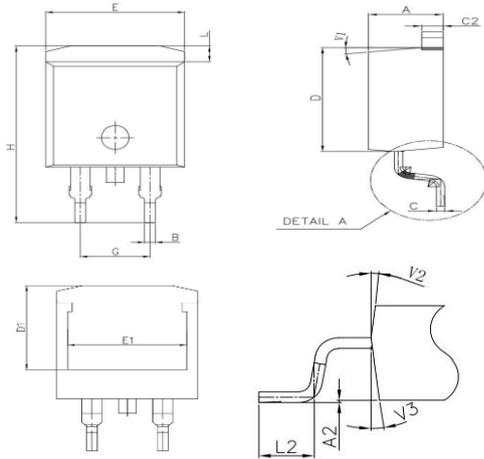
**Figure 15: Maximum Safe Operating Area**



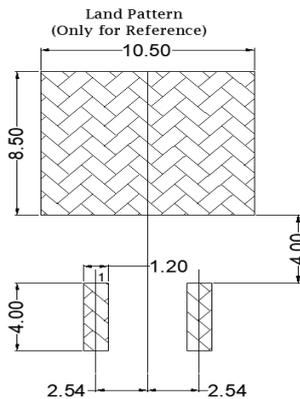
**Test Circuit**

**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   |
| L      | 1.16       | 1.36  | 1.61  |
| V1     | 5°         | 7°    | 9°    |
| V2     | 3°         | 5°    | 7°    |
| V3     | 6°         | 8°    | 10°   |



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