

# 150V, 134A, 5.2mΩ N-channel Power SGT MOSFET

## JMSH1507PEQ

### Features

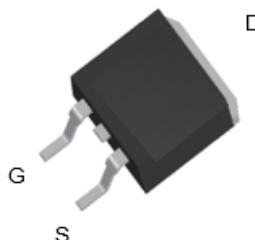
- Ultra-low ON-resistance,  $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{DS}$  Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

### Product Summary

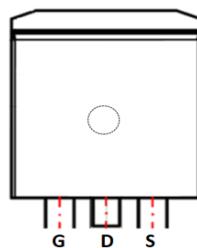
Parameters	Value	Unit
$V_{DSS}$	150	V
$V_{GS(th)}_{Typ}$	3.2	V
$I_D(@V_{GS}=10V)$	134	A
$R_{DS(ON)}_{Typ}(@V_{GS}=10V)$	5.2	mΩ

### Applications

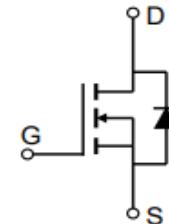
- Load Switch
- PWM Application
- General Automotive Application



TO-263 -3L



Pin Assignment



Schematic Diagram

### Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH1507PEQ-13	SH1507PQ	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	150	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	134
		$T_C = 100^\circ\text{C}$	95
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	Refer to Fig.4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	850	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	300
		$T_C = 100^\circ\text{C}$	150
$T_J, T_{STG}$	Junction & Storage Temperature Range	-55 to 175	°C

### Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	31	°C/W
	Thermal Resistance, Junction to Case	0.5	

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

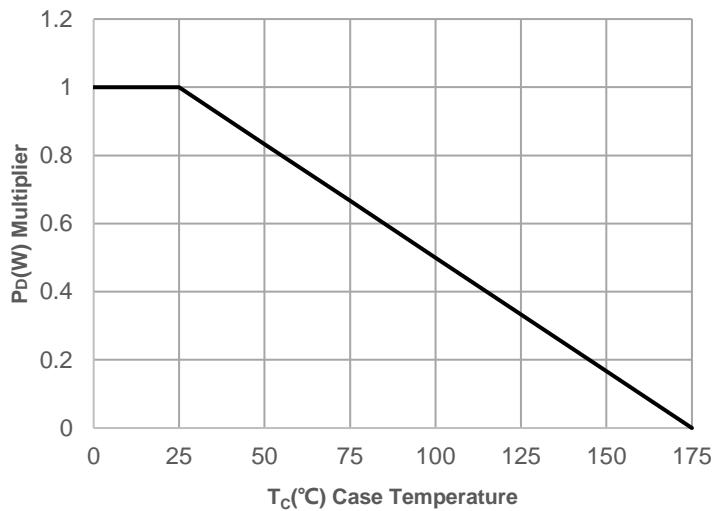
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	150	-	-	V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 105\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.2	3.2	4.1	V
$R_{\text{DS(ON)}}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = 10\text{V}, I_D = 20\text{A}$	-	5.2	6.7	$\text{m}\Omega$
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance	$f = 1\text{MHz}$	-	3.8	-	$\Omega$
$C_{\text{iss}}$	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 75\text{V}, f = 1\text{MHz}$	4143	5800	7830	pF
$C_{\text{oss}}$	Output Capacitance		398	557	752	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		12	17	23	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 75\text{V}, I_D = 20\text{A}$	59	83	112	nC
$Q_{gs}$	Gate Source Charge		20	28	38	nC
$Q_{gd}$	Gate Drain("Miller") Charge		14	19	26	nC
<b>Switching Characteristics</b>						
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DD} = 75\text{V}$ $I_D = 20\text{A}, R_{\text{GEN}} = 3\Omega$	-	21	-	ns
$t_r$	Turn-On Rise Time		-	39	-	ns
$t_{d(\text{off})}$	Turn-Off Delay Time		-	63	-	ns
$t_f$	Turn-Off Fall Time		-	32	-	ns
<b>Body Diode Characteristics</b>						
$I_S$	Maximum Continuous Body Diode Forward Current	-	-	134	-	A
$I_{\text{SM}}$	Maximum Pulsed Body Diode Forward Current	-	-	535	-	A
$V_{SD}$	Body Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 20\text{A}$	-		1.2	V
$trr$	Body Diode Reverse Recovery Time	$I_F = 15\text{A}, di/dt = 100\text{A/us}$	70	98	132	ns
$Qrr$	Body Diode Reverse Recovery Charge		-	316	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
  2.  $E_{AS}$  condition: Starting  $T_J=25^\circ\text{C}$ ,  $V_{DD}=70\text{V}$ ,  $V_G=10\text{V}$ ,  $R_G=25\text{ohm}$ ,  $L=3\text{mH}$ ,  $I_{AS}=23.8\text{A}$ ,  $V_{DD}=0\text{V}$  during time in avalanche.
  3.  $R_{\theta JA}$  is measured with the device mounted on a 1inch<sup>2</sup> pad of 2oz copper FR4 PCB.
  4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .

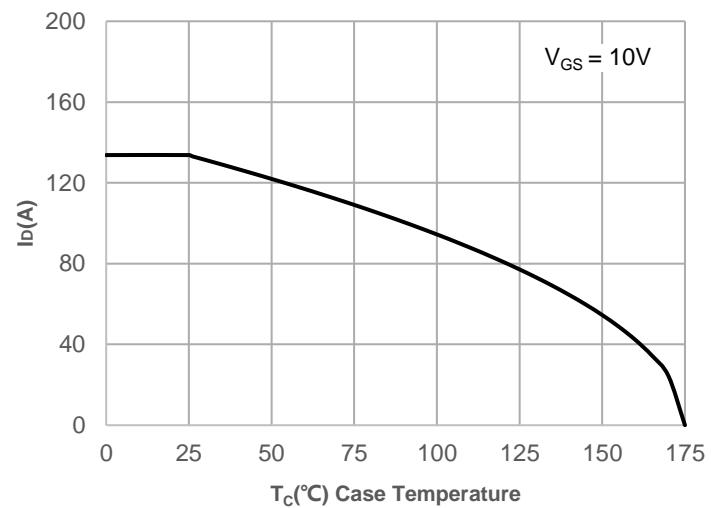


## Typical Performance Characteristics

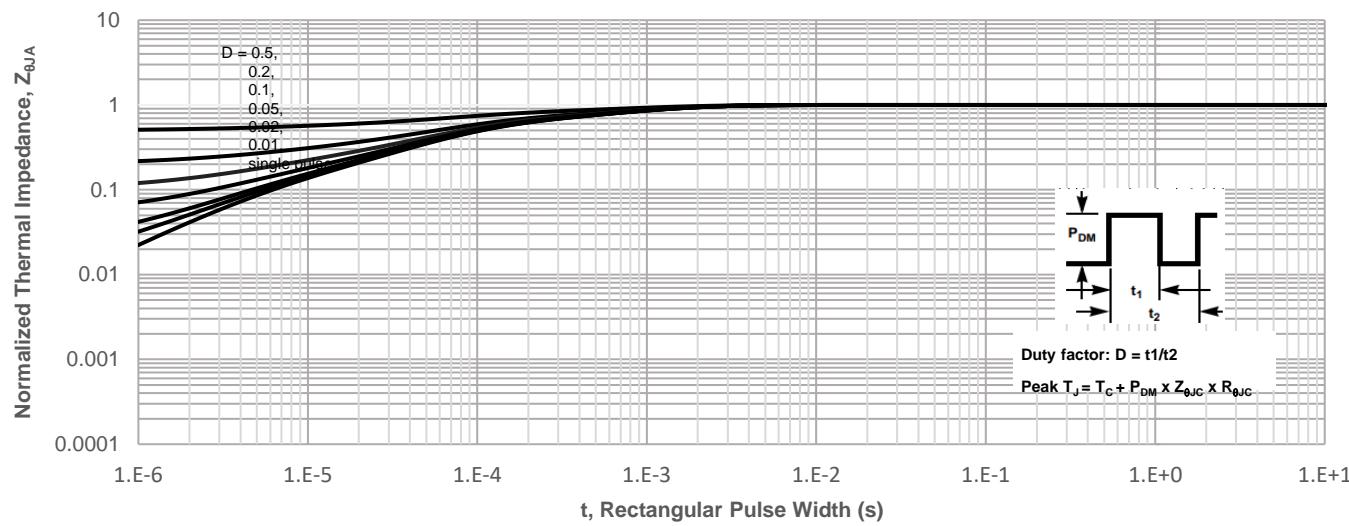
**Figure 1: Power De-rating**



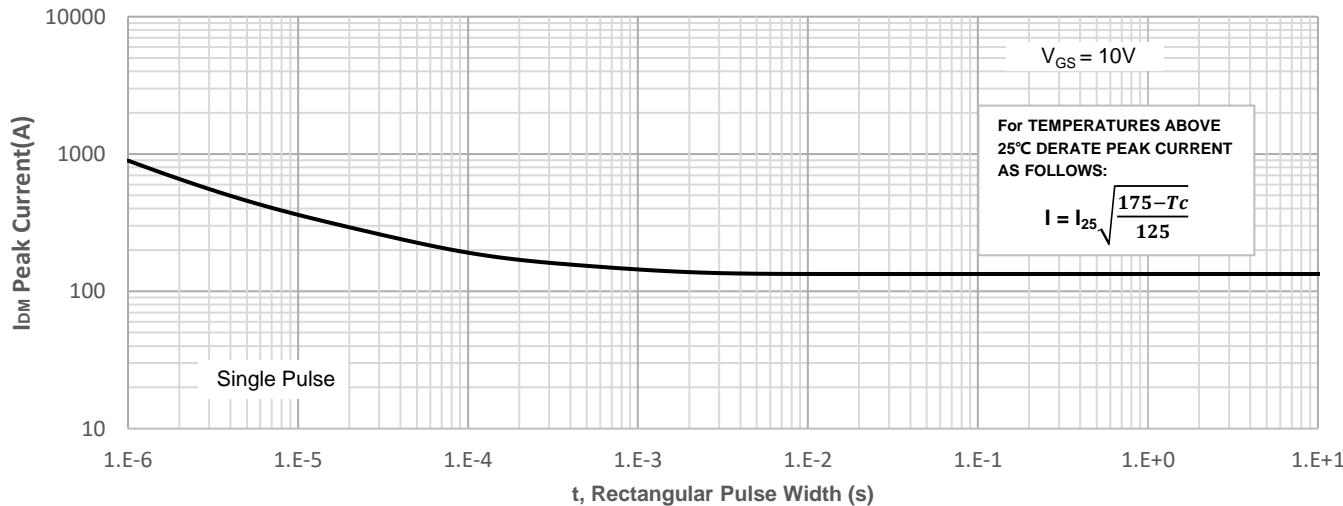
**Figure 2: Current De-rating**



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

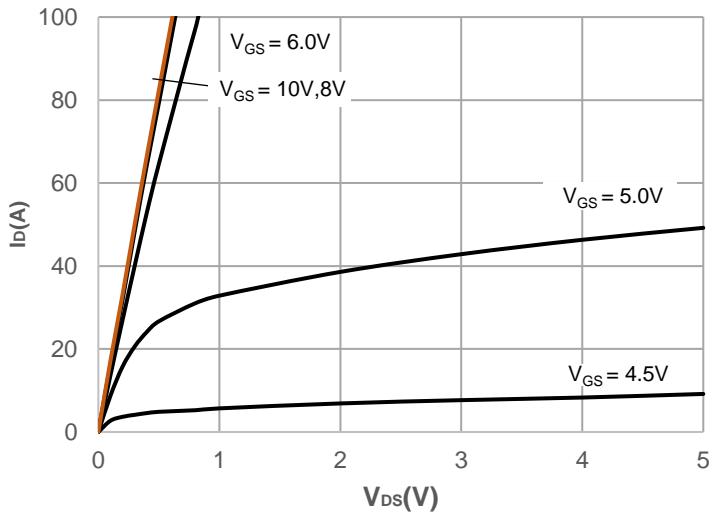


**Figure 4: Peak Current Capacity**

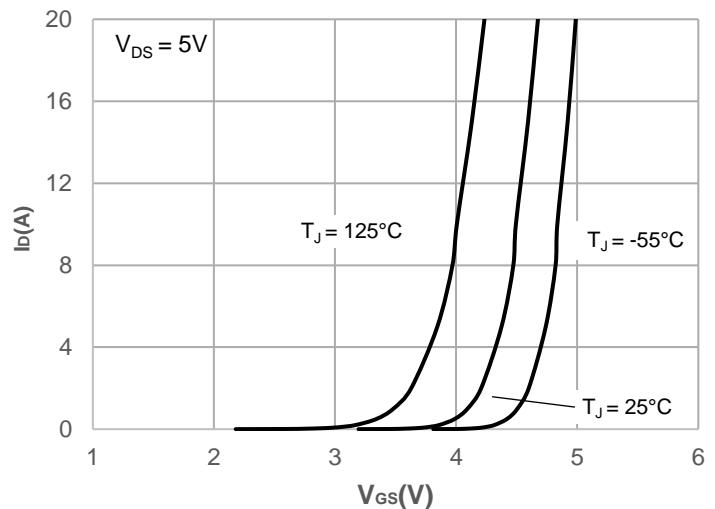


## Typical Performance Characteristics

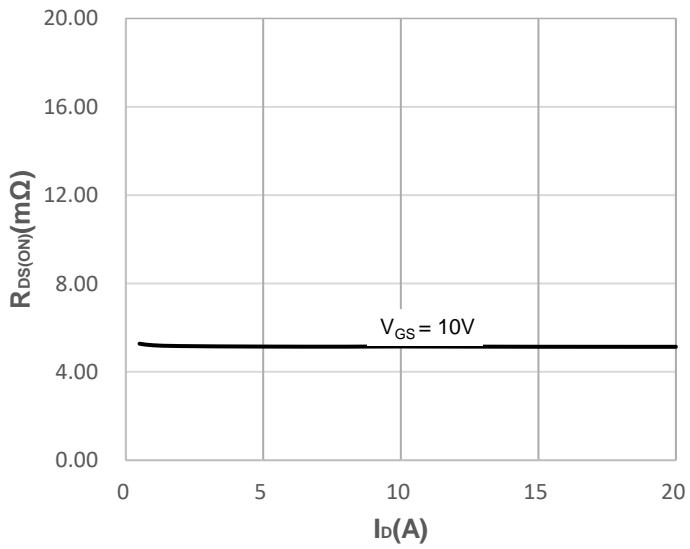
**Figure 5: Output Characteristics**



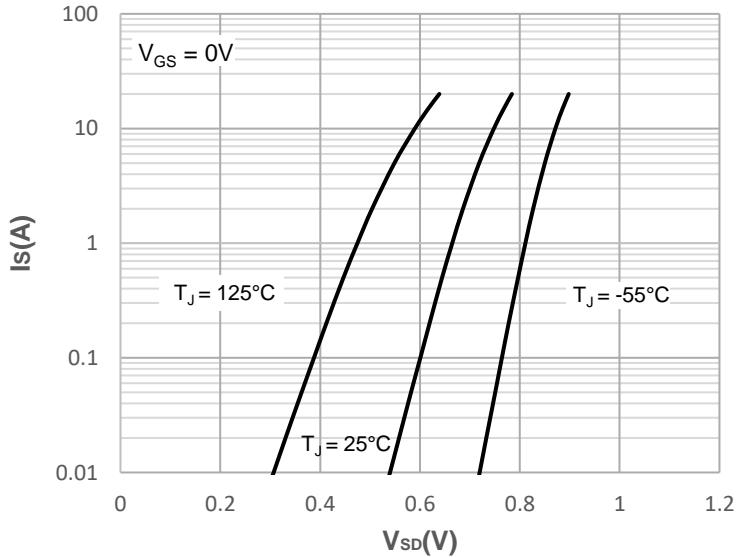
**Figure 6: Typical Transfer Characteristics**



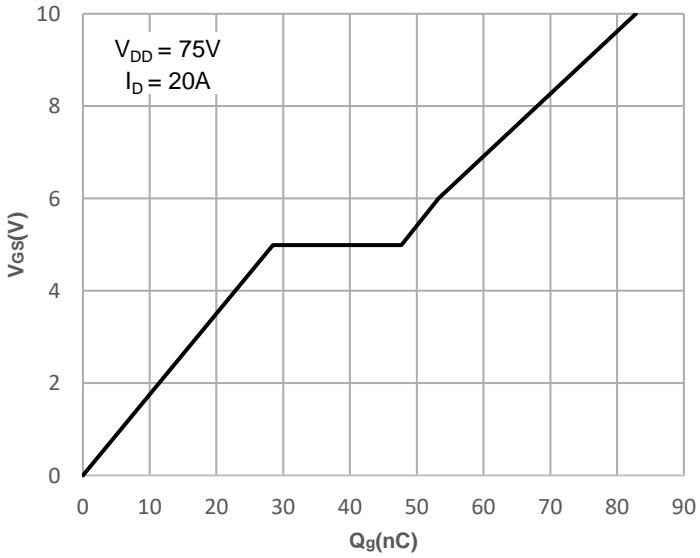
**Figure 7: On-resistance vs. Drain Current**



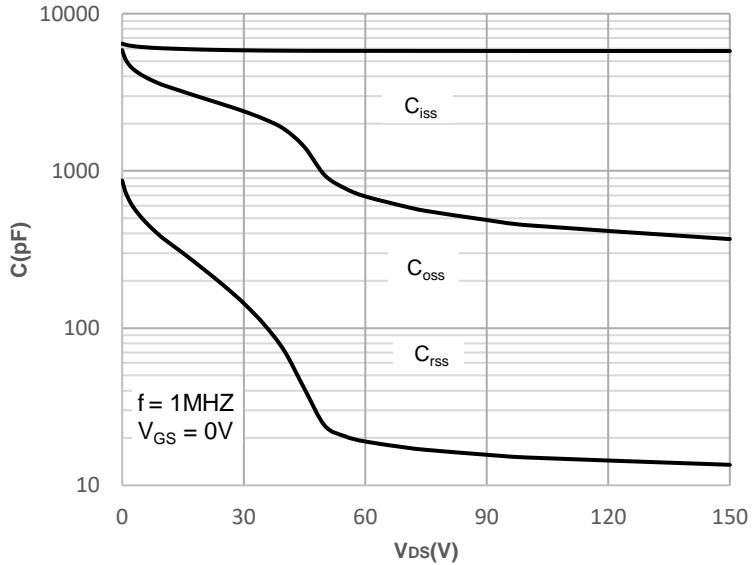
**Figure 8: Body Diode Characteristics**



**Figure 9: Gate Charge Characteristics**

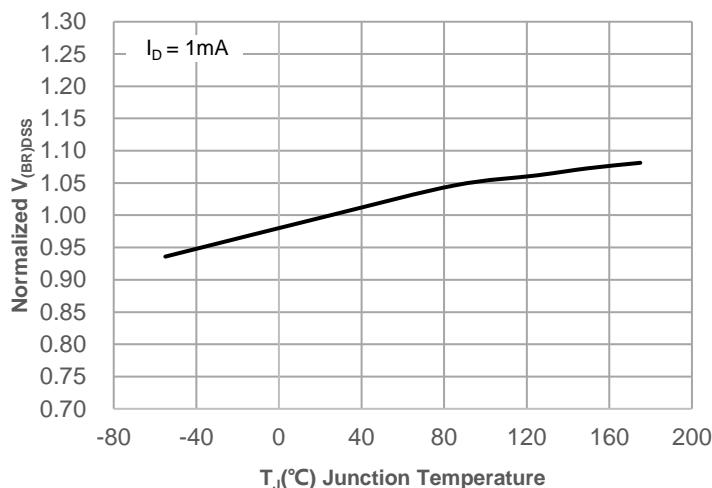


**Figure 10: Capacitance Characteristics**

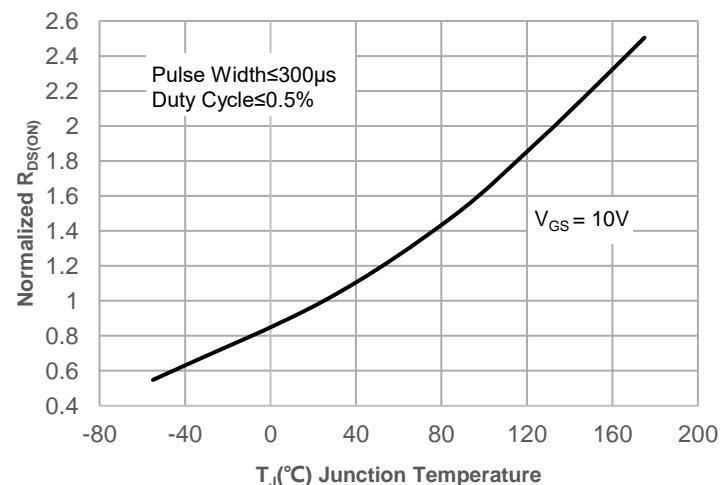


## Typical Performance Characteristics

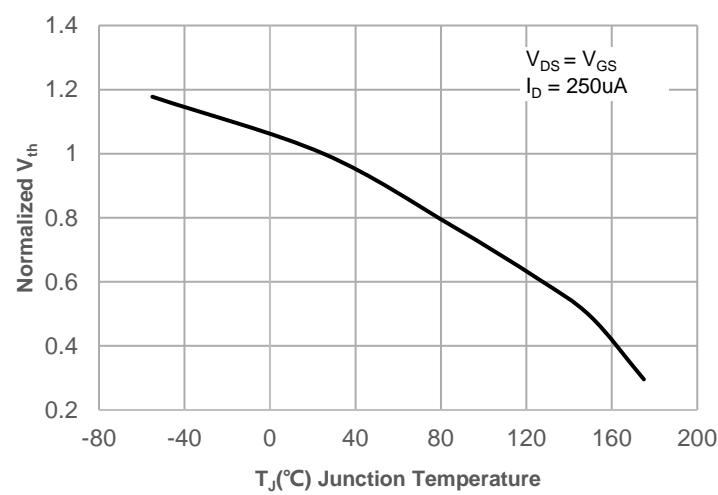
**Figure 11: Normalized Breakdown voltage vs. Junction Temperature**



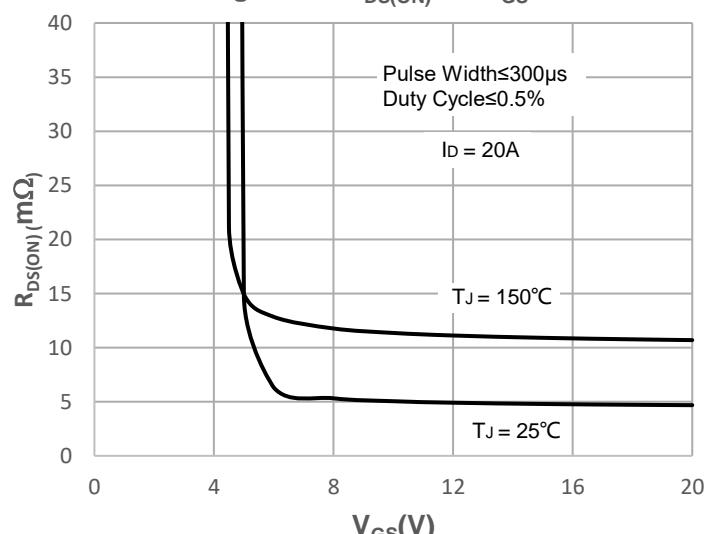
**Figure 12: Normalized on Resistance vs. Junction Temperature**



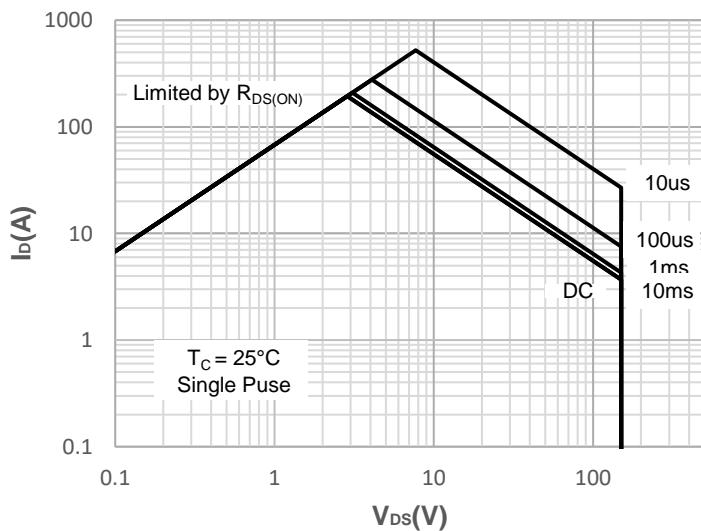
**Figure 13: Normalized Threshold Voltage vs. Junction Temperature**



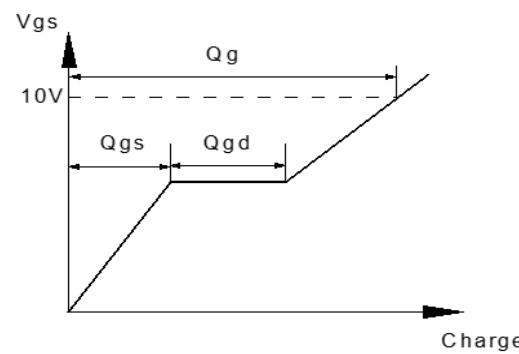
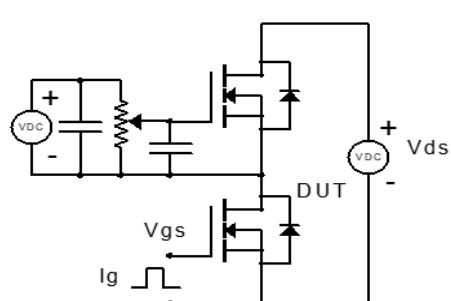
**Figure 14: R<sub>D<sub>S</sub>(ON)</sub> vs. V<sub>GS</sub>**



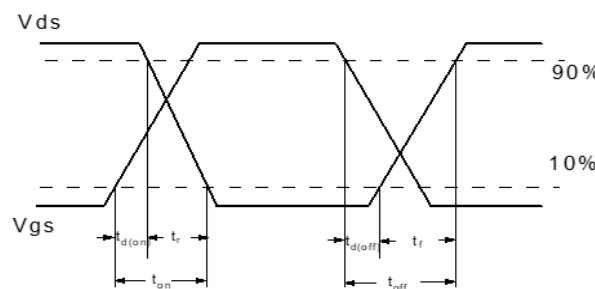
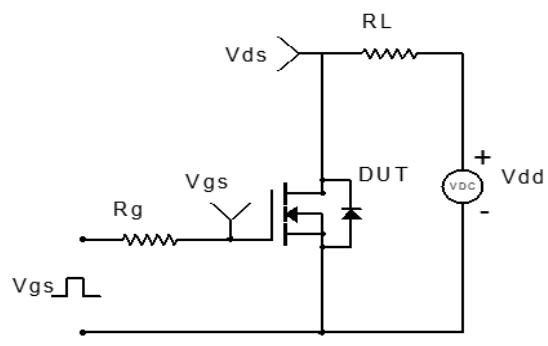
**Figure 15: Maximum Safe Operating Area**



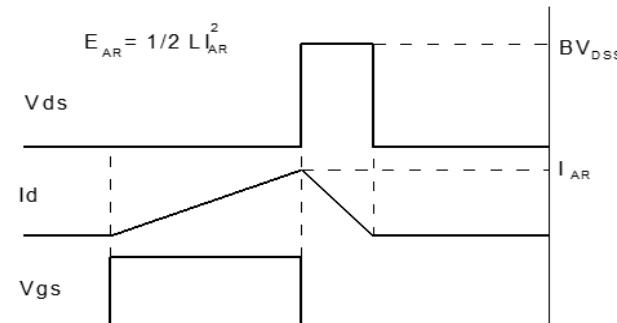
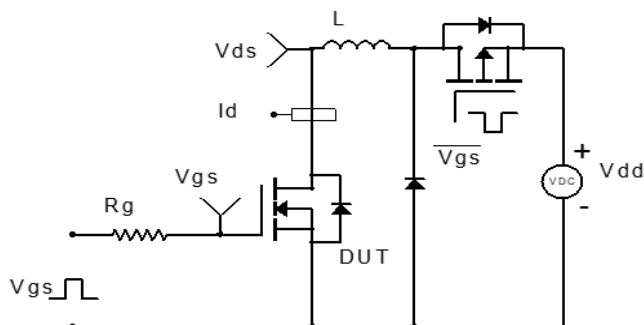
## Test Circuit



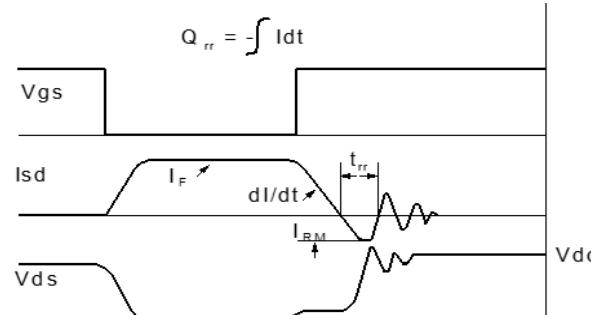
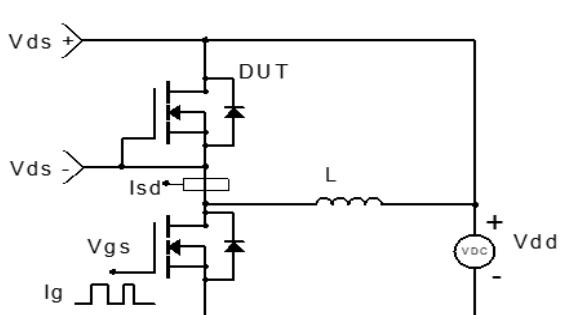
**Figure 1: Gate Charge Test Circuit & Waveform**



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



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

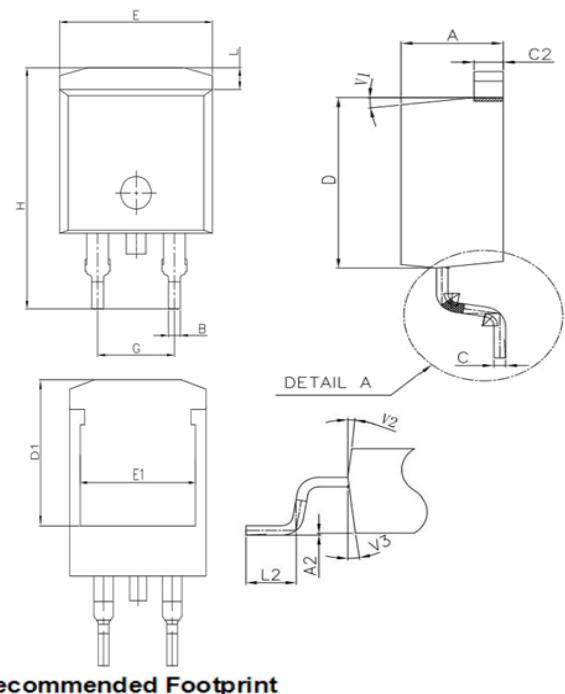


**Figure 4: Diode Recovery Test Circuit & Waveform**



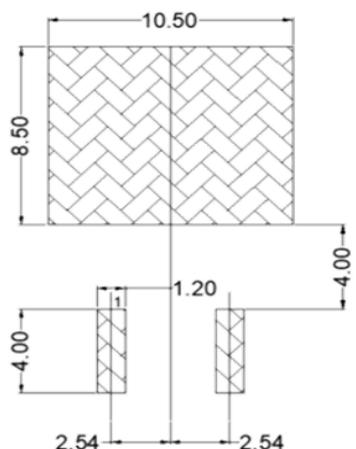
## Package Mechanical Data(TO-263 -3L)

### Package Outline



Recommended Footprint

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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