

# 100V, 185A, 3.1mΩ N-channel Power SGT MOSFET

## JMSH1003PEQ

### Features

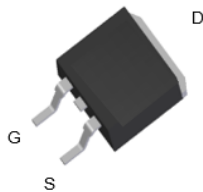
- Ultra-low ON-resistance,  $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

### Applications

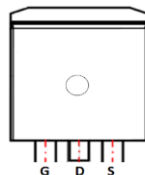
- Load Switch
- PWM Application
- General Automotive Application

### Product Summary

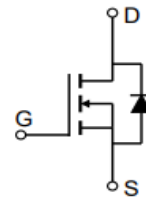
Parameters	Value	Unit
$V_{DSS}$	100	V
$V_{GS(th\_Typ)}$	3.0	V
$I_D(@V_{GS}=10V)$	185	A
$R_{DS(ON\_Typ)}(@V_{GS}=10V)$	3.1	mΩ



TO-263 -3L



Pin Assignment



Schematic Diagram

### Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH1003PEQ-13	SH1003PQ	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	$T_C = 25^\circ\text{C}$	185
		$T_C = 100^\circ\text{C}$	131
$I_{DM}$	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	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	34	$^\circ\text{C/W}$
$R_{\theta JC}$	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>						
$V_{(BR)DSS}$	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	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	2.1	3.0	3.9	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = 10\text{V}$ , $I_D = 20\text{A}$	-	3.1	4.0	m $\Omega$
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance	$f = 1\text{MHz}$	-	1.9	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$ , $V_{DS} = 50\text{V}$ , $f = 1\text{MHz}$	4421	6190	8356	pF
$C_{oss}$	Output Capacitance		739	1035	1397	pF
$C_{riss}$	Reverse Transfer Capacitance		25	35	48	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0$ to $10\text{V}$ $V_{DS} = 50\text{V}$ , $I_D = 20\text{A}$	69	97	131	nC
$Q_{gs}$	Gate Source Charge		21	30	41	nC
$Q_{gd}$	Gate Drain("Miller") Charge		17	24	32	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}$ , $V_{DD} = 50\text{V}$ $I_D = 20\text{A}$ , $R_{GEN} = 3\Omega$	-	24	-	ns
$t_r$	Turn-On Rise Time		-	27	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	56	-	ns
$t_f$	Turn-Off Fall Time		-	25	-	ns
<b>Body Diode Characteristics</b>						
$I_S$	Maximum Continuous Body Diode Forward Current		-	-	185	A
$I_{SM}$	Maximum Pulsed Body Diode Forward Current		-	-	738	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	$I_F = 15\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$	60	84	113	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	237	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
  2.  $E_{AS}$  condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 50\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\text{ohm}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 23.8\text{A}$ ,  $V_{DD} = 0\text{V}$  during time in avalanche.
  3.  $R_{\theta JA}$  is measured with the device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .



# Typical Performance Characteristics

Figure 1: Power De-rating

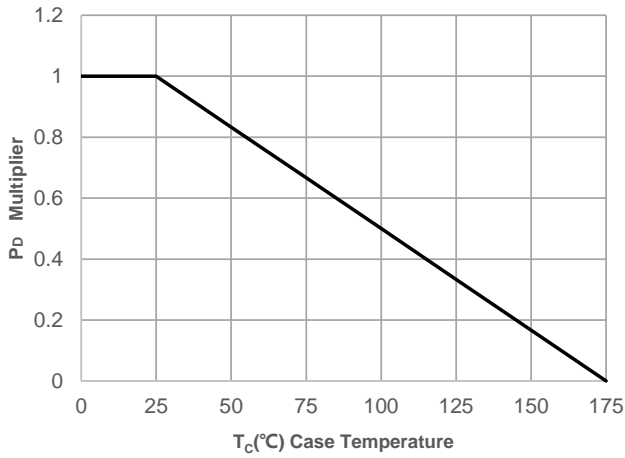


Figure 2: Current De-rating

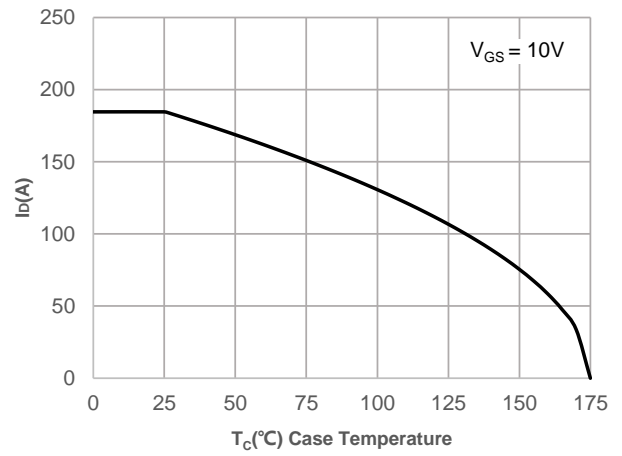


Figure 3: Normalized Maximum Transient Thermal Impedance

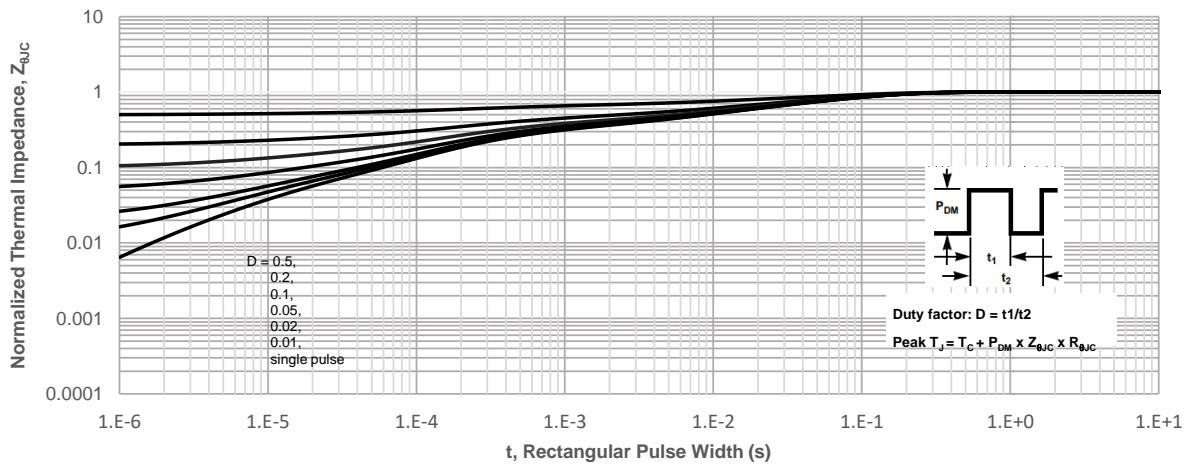
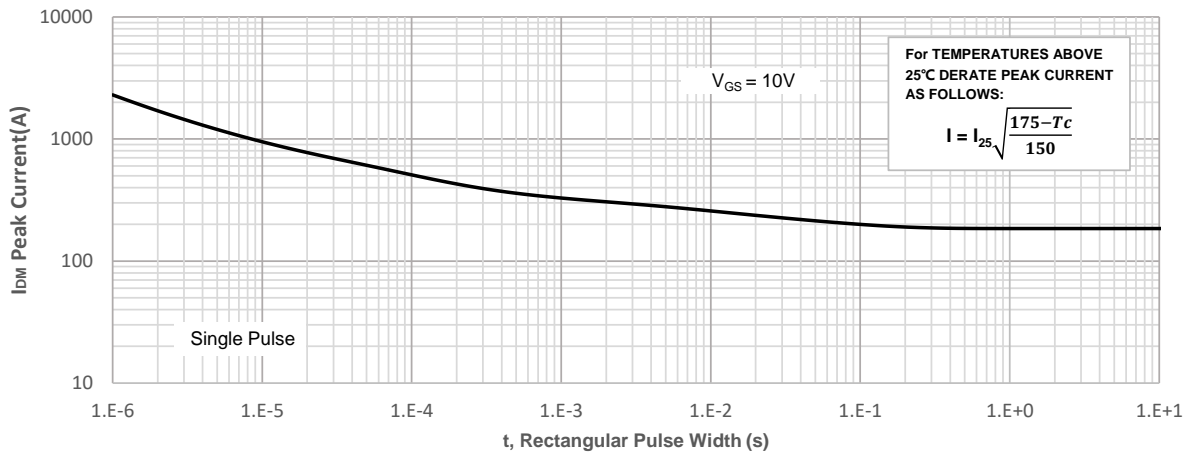
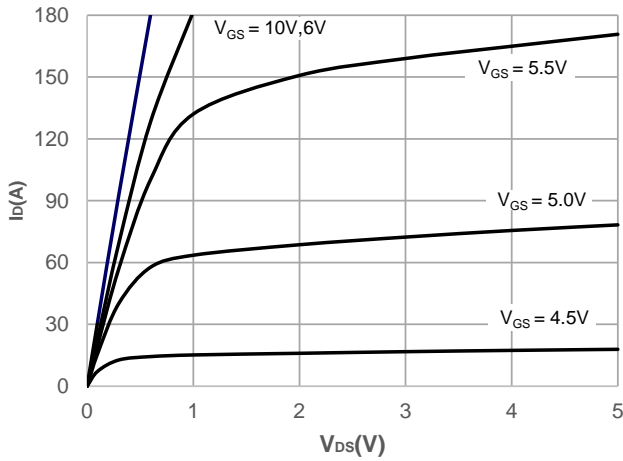
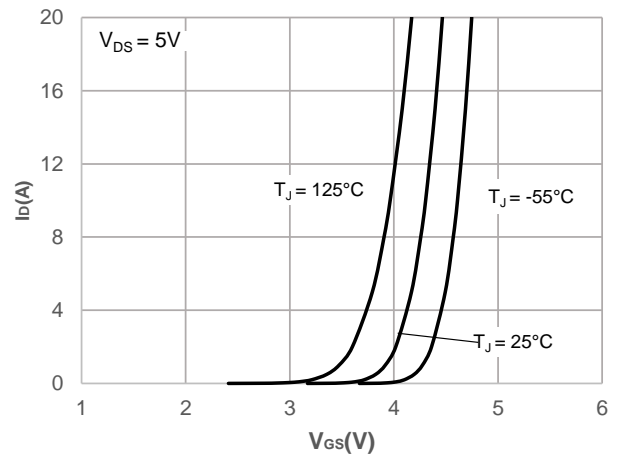
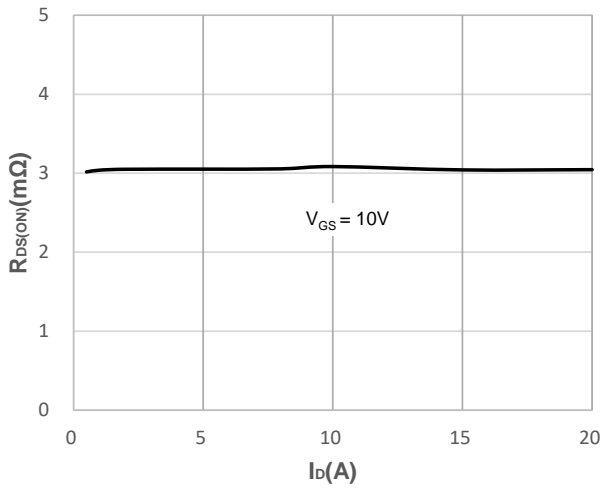
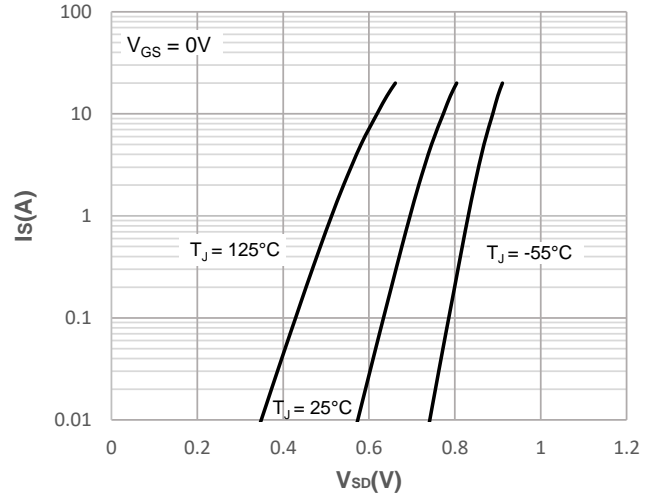
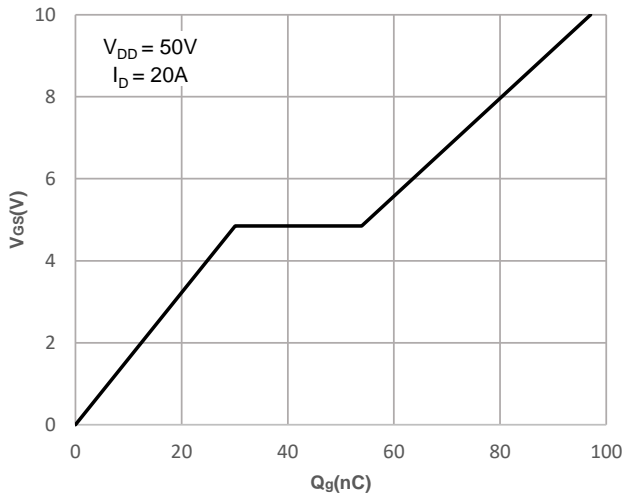
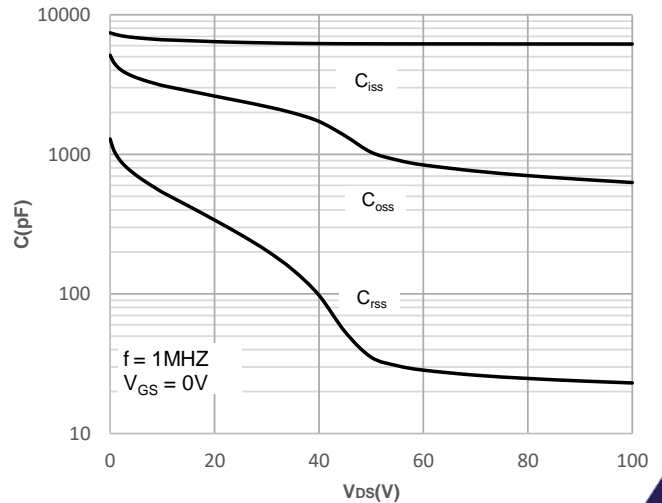


Figure 4: Peak Current Capacity



## 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

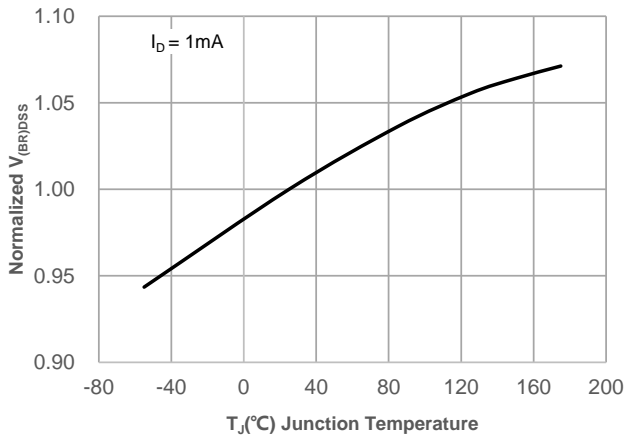


Figure 12: Normalized on Resistance vs. Junction Temperature

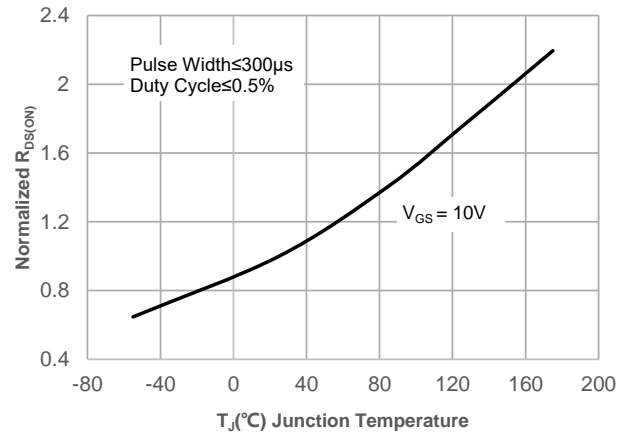


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

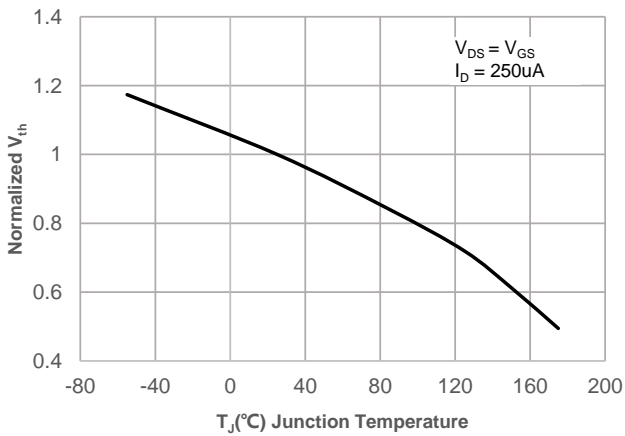


Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$

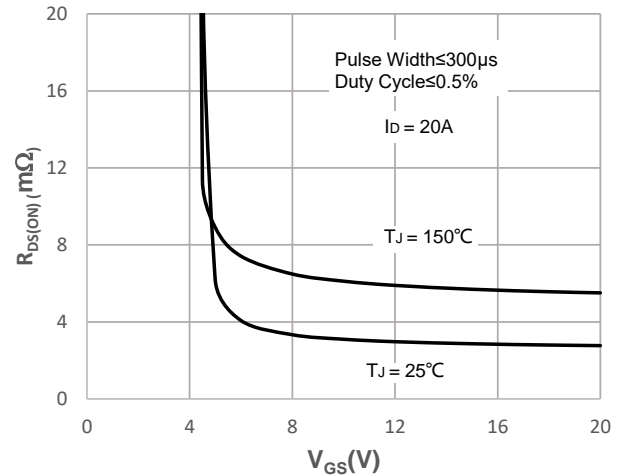
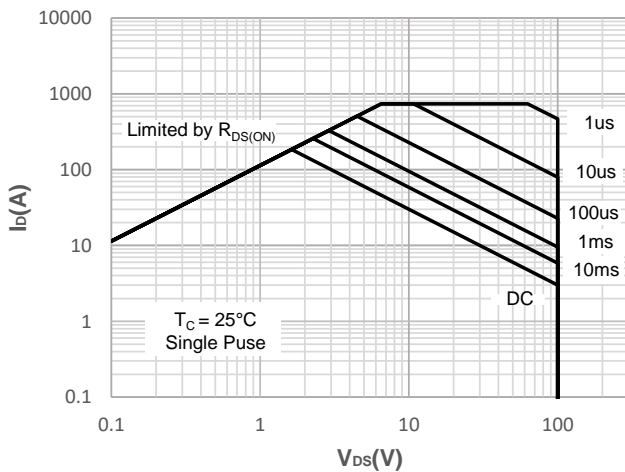


Figure 15: Maximum Safe Operating Area



### Test Circuit

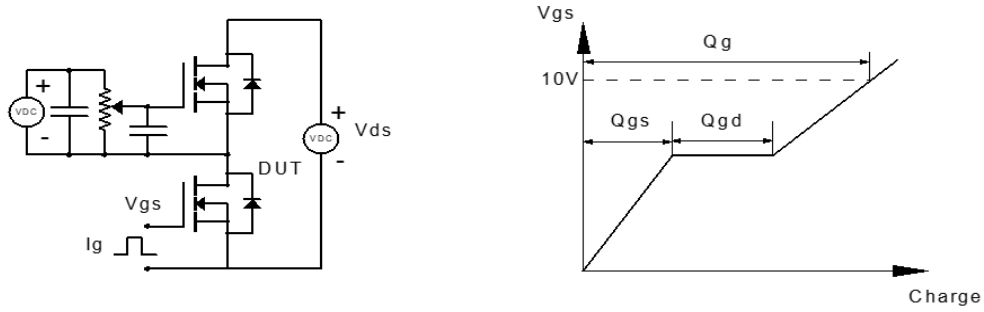


Figure 1: Gate Charge Test Circuit & Waveform

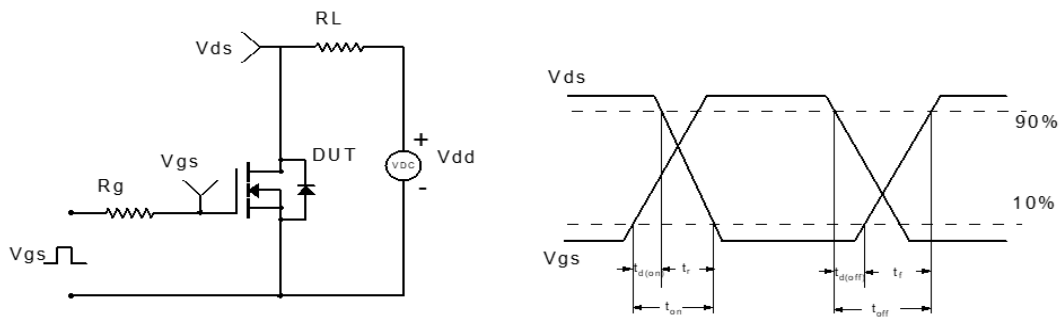


Figure 2: Resistive Switching Test Circuit & Waveform



Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

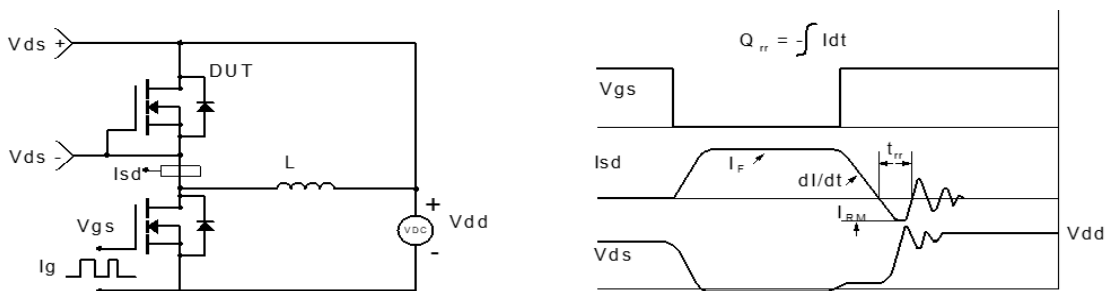
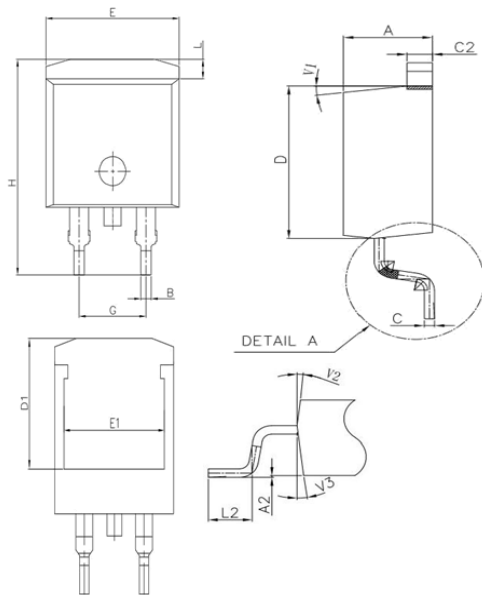


Figure 4: Diode Recovery Test Circuit & Waveform



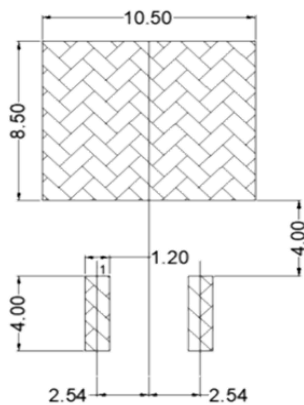
## Package Mechanical Data(TO-263 -3L )

### 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

### Recommended Footprint



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