

60V, 184A, 2.5mΩ N-channel Power SGT MOSFET

JMSH0603PE

Features

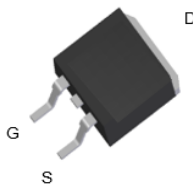
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant

Applications

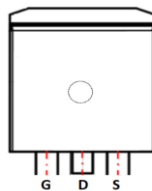
- Load Switch
- PWM Application
- Power Management

Product Summary

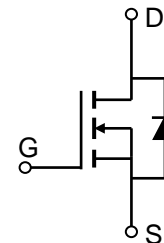
Parameters	Value	Unit
V_{DSS}	60	V
$V_{GS(th)}_{Typ}$	2.6	V
$I_D (@V_{GS}=10V)$	184	A
$R_{DS(ON)}_{Typ} (@V_{GS}=10V)$	2.5	mΩ



TO-263-3L



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH0603PE-13	SH0603P	3	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	60	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	184
		$T_C = 100^\circ\text{C}$	116
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	389	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	188
		$T_C = 100^\circ\text{C}$	75
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 ⁽³⁾	33	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.7	

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 = 250μA, V _{GS} = 0V	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 48V, V _{GS} = 0V	-	-	1.0	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = ±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1.8	2.6	3.4	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁴⁾	V _{GS} = 10V, I _D = 20A	-	2.5	3.3	mΩ
Dynamic Characteristics						
R _g	Gate Resistance	f = 1MHz	-	2.2	-	Ω
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 30V, f = 1MHz	2044	2862	3864	pF
C _{oss}	Output Capacitance		1082	1515	2045	pF
C _{rss}	Reverse Transfer Capacitance		56	79	106	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 10V V _{DS} = 30V, I _D = 20A	34	48	64	nC
Q _{gs}	Gate Source Charge		9	12	16	nC
Q _{gd}	Gate Drain("Miller") Charge		9	13	17	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 30V I _D = 20A, R _{GEN} = 3Ω	-	13	-	ns
t _r	Turn-On Rise Time		-	29	-	ns
t _{d(off)}	Turn-Off DelayTime		-	36	-	ns
t _f	Turn-Off Fall Time		-	16	-	ns
Body Diode Characteristics						
I _S	Maximum Continuous Body Diode Forward Current		-	-	184	A
I _{SM}	Maximum Pulsed Body Diode Forward Current		-	-	736	A
V _{SD}	Body Diode Forward Voltage	V _{GS} = 0V, I _S = 20A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I _F = 20A, di/dt = 100A/us	36	51	69	ns
Qrr	Body Diode Reverse Recovery Charge		-	60	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 16.1\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. $R_{\theta JA}$ is measured with the device mounted on a 1inch² 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

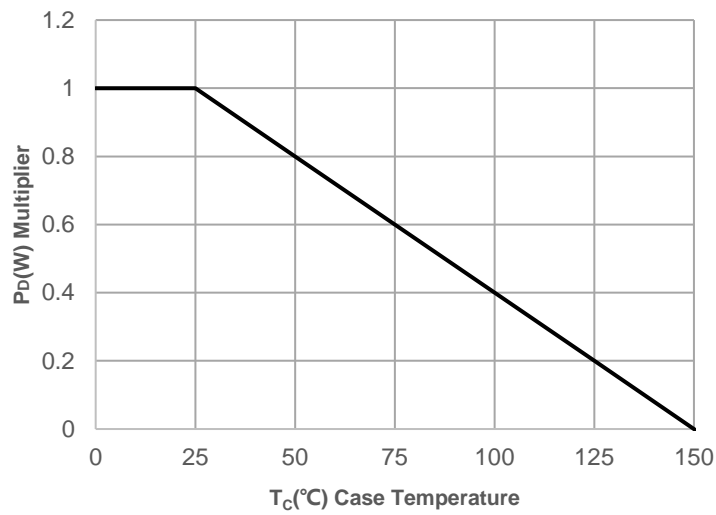


Figure 2: Current De-rating

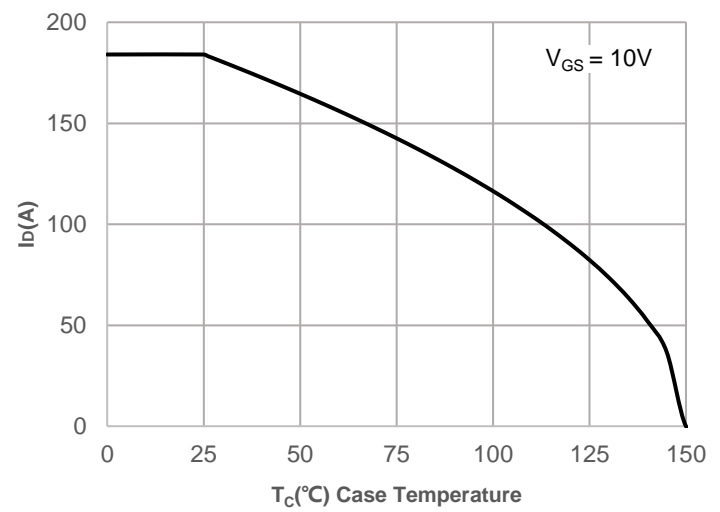


Figure 3: Normalized Maximum Transient Thermal Impedance

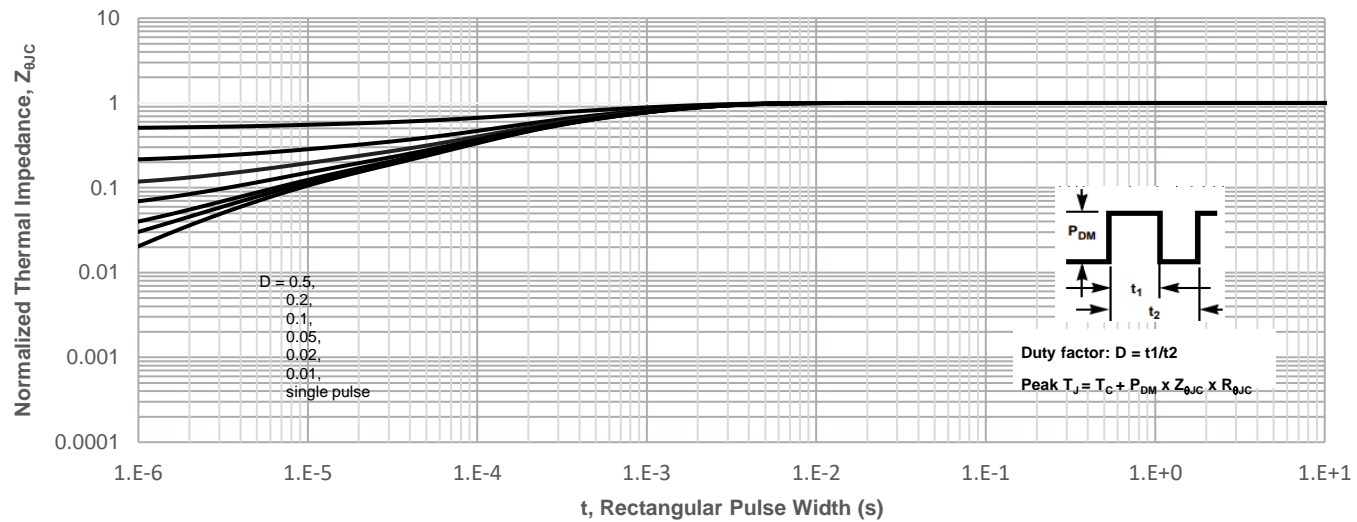
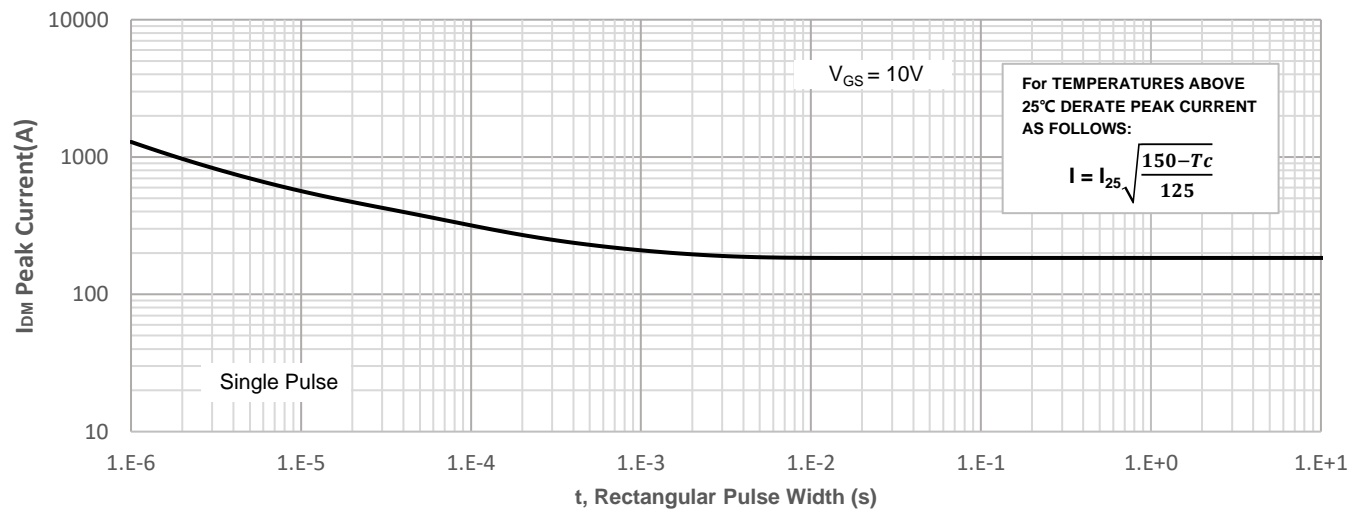
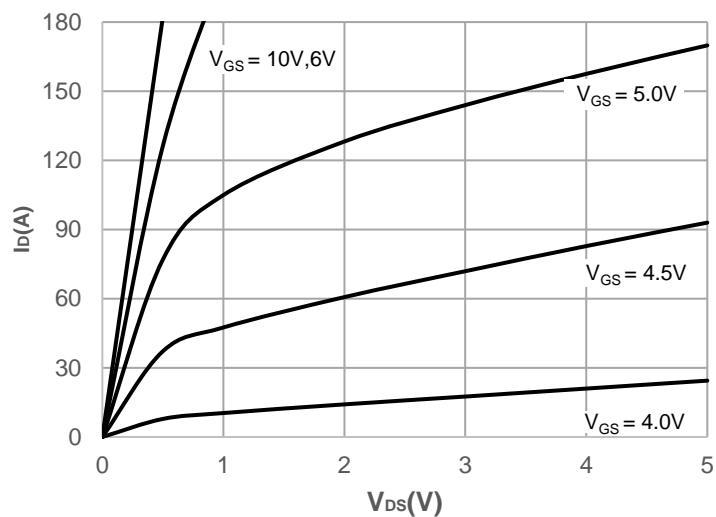
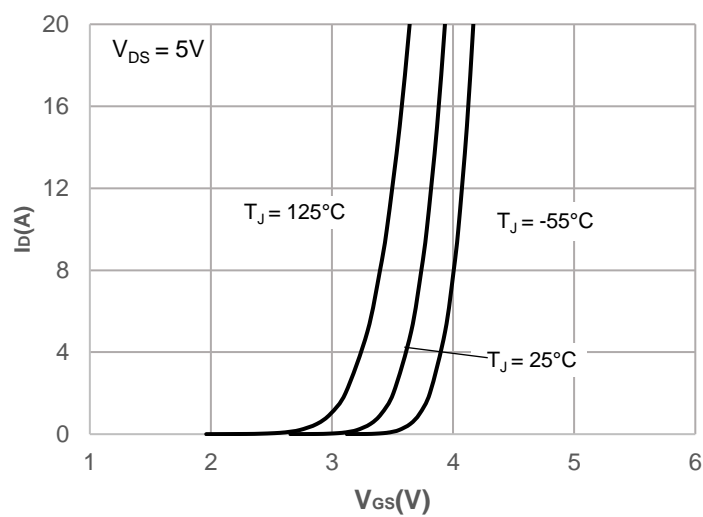
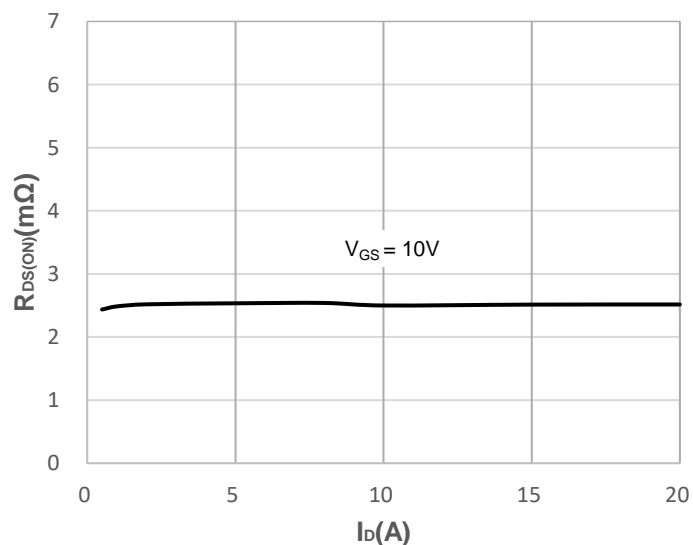
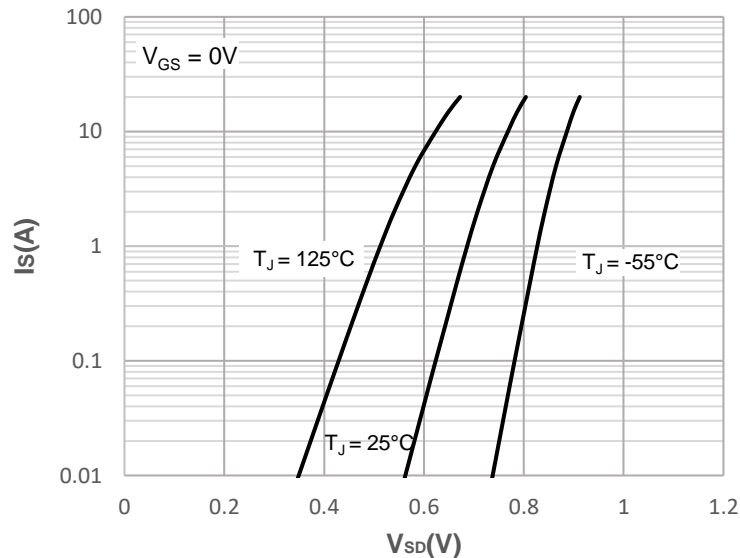
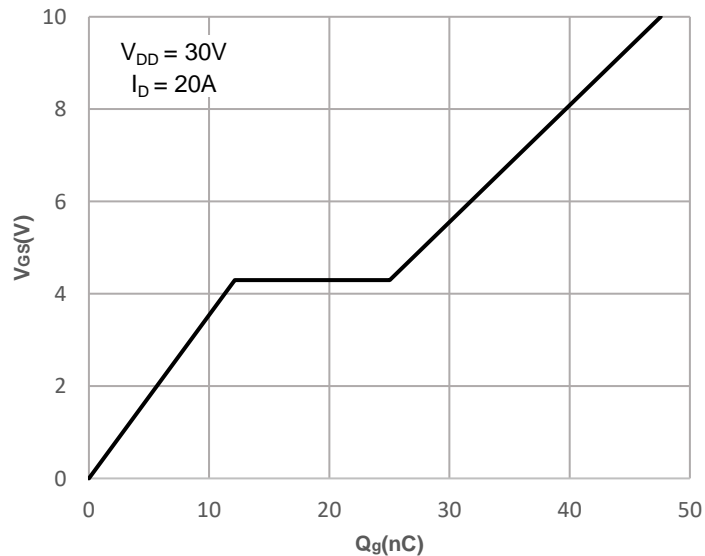
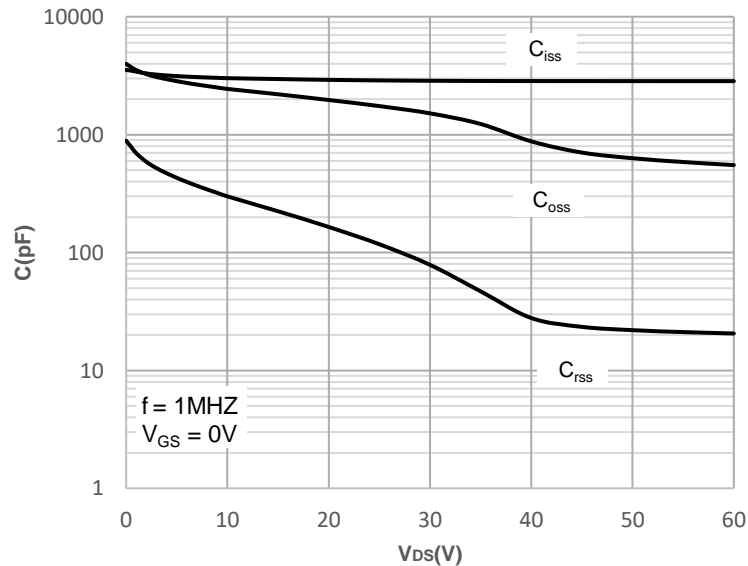


Figure 4: Peak Current Capacity



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

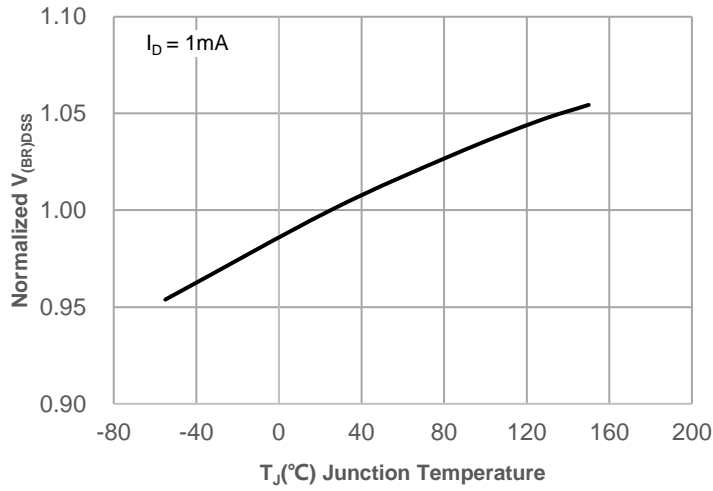


Figure 12: Normalized on Resistance vs. Junction Temperature

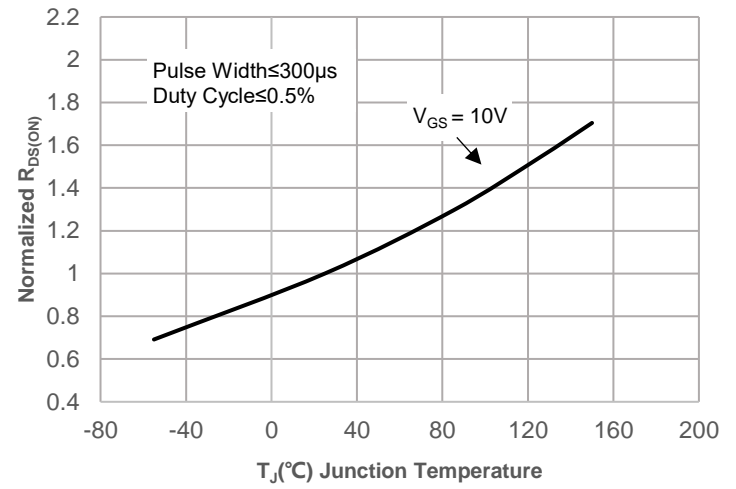


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

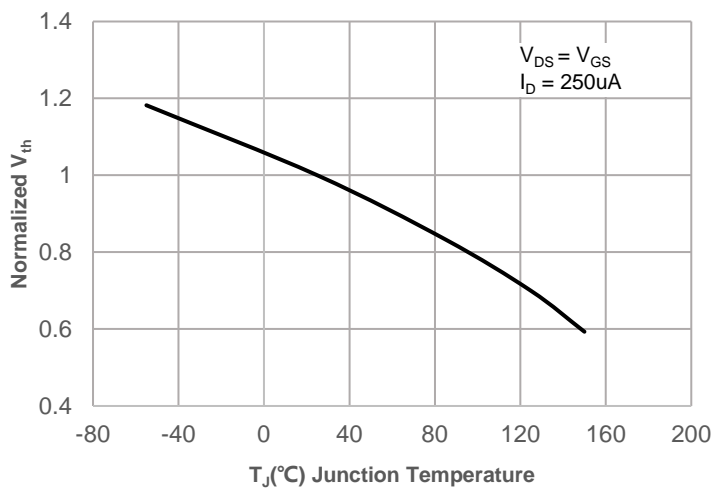


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

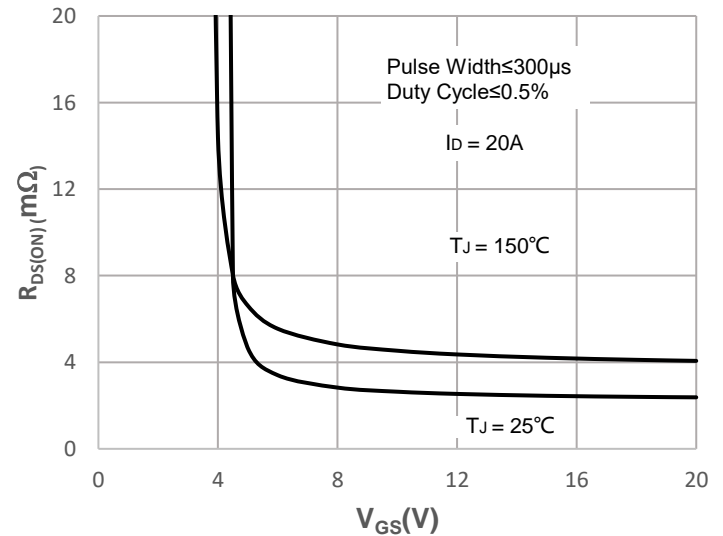
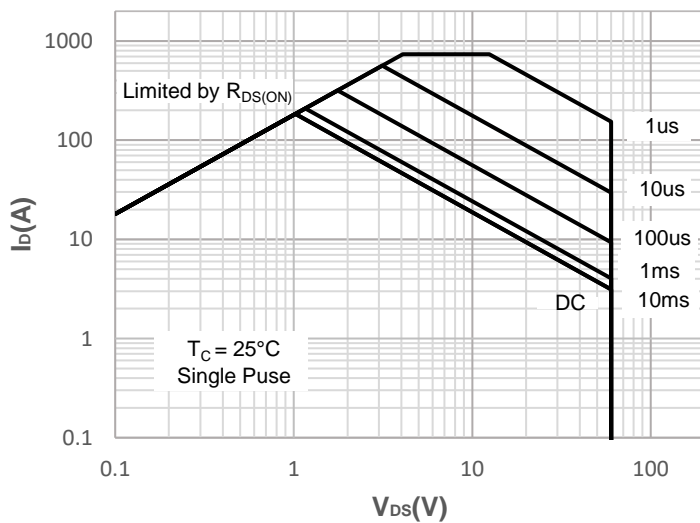


Figure 15: Maximum Safe Operating Area



Test Circuit

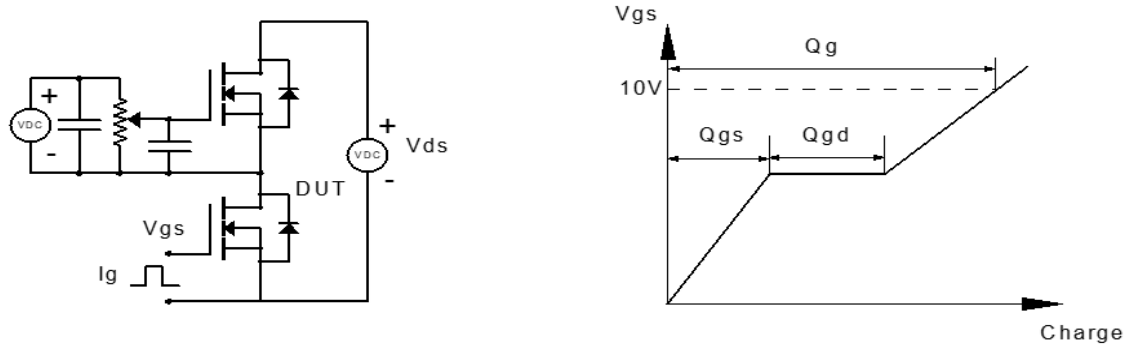


Figure 1: Gate Charge Test Circuit & Waveform

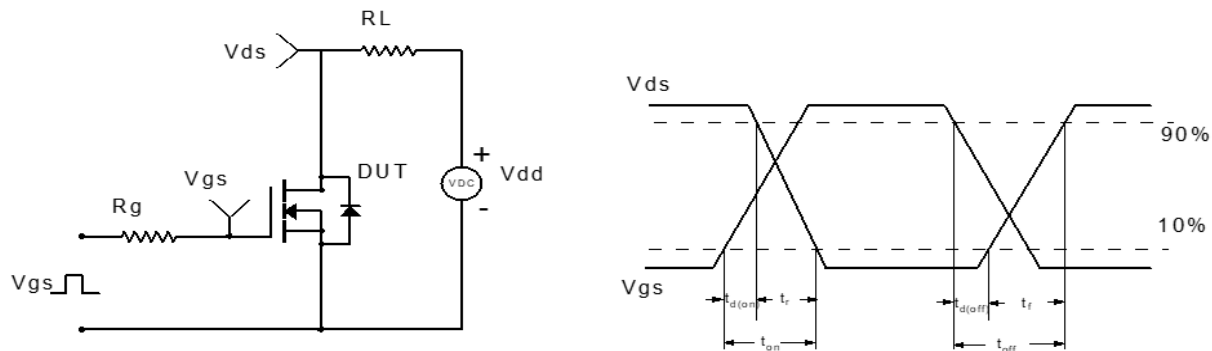


Figure 2: Resistive Switching Test Circuit & Waveform

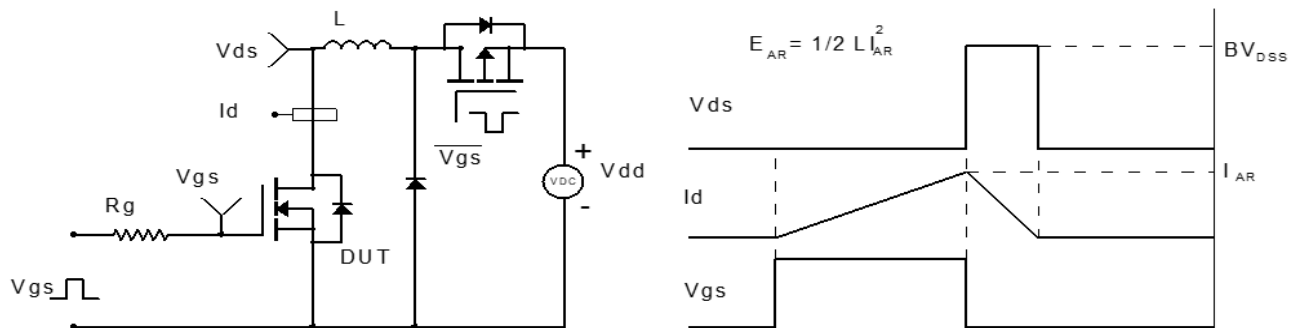


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

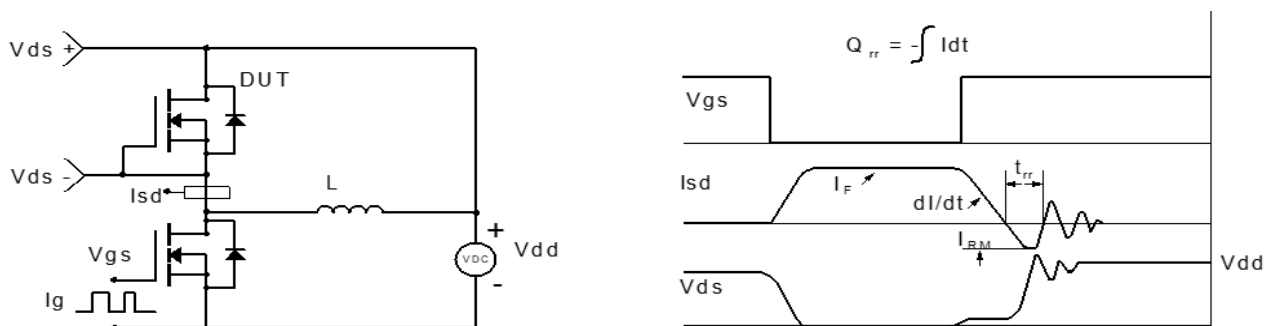
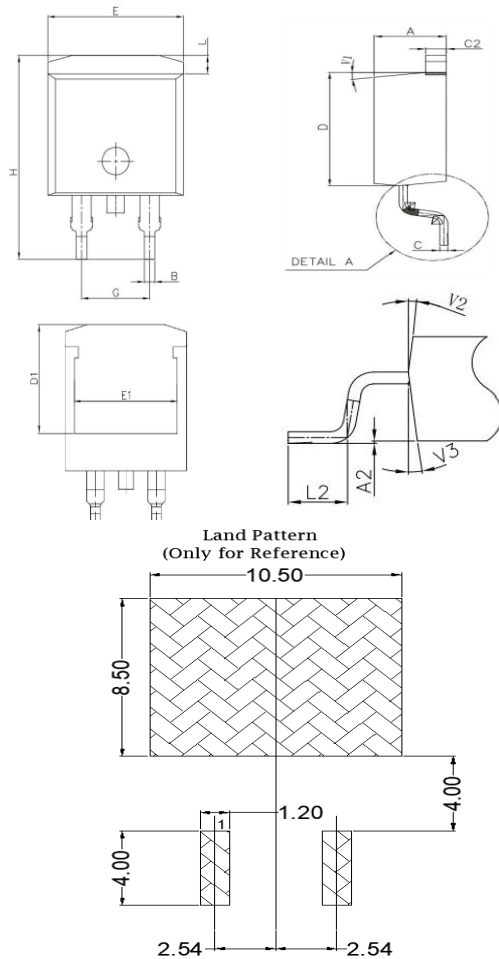


Figure 4: Diode Recovery Test Circuit & Waveform

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

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