

-60V, -22A, 48mΩ P-channel Power SGT MOSFET
JMPL0648PKQ
Features

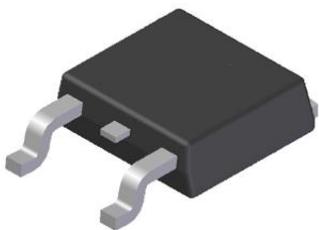
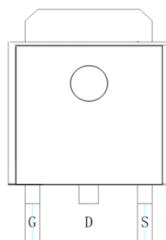
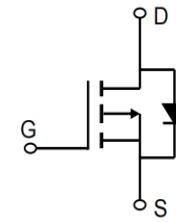
- Low ON-resistance $R_{DS(ON)}$
- Excellent Gate Charge
- 100% UIS Tested
- 100% ΔV_{ds} Tested
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

Product Summary

Parameters	Value	Unit
V_{DSS}	-60	V
$V_{GS(th)}_{Typ}$	-1.9	V
$I_D(@V_{GS}=-10V)$	-22	A
$R_{DS(ON)}_{Typ}(@V_{GS}=-10V)$	35	mΩ
$R_{DS(ON)}_{Typ}(@V_{GS}=-4.5V)$	48	mΩ

Applications

- Load Switch
- PWM Application
- General Automotive Application


TO-252-3L

Pin Assignment

Schematic Diagram
Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMPL0648PKQ-13	PL0648PQ	1	Tape&Reel	TO-252-3L	2500	25000

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	$T_C = 25^\circ\text{C}$	-22	A
		$T_C = 100^\circ\text{C}$	-16	
I_{DM}	Pulsed Drain Current ⁽¹⁾		Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾		74	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	44	W
		$T_C = 100^\circ\text{C}$	22	
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 ⁽³⁾	50	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.4	

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$	-60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -48\text{V}, V_{GS} = 0\text{V}$	-	-	-1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\mu\text{A}$	-1.3	-1.9	-2.5	V
$R_{\text{DS}(\text{ON})}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = -10\text{V}, I_D = -7\text{A}$	-	35	46	$\text{m}\Omega$
		$V_{GS} = -4.5\text{V}, I_D = -5\text{A}$	-	48	62	$\text{m}\Omega$
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	8.7	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = -30\text{V}, f = 1\text{MHz}$	570	951	1284	pF
C_{oss}	Output Capacitance		104	174	234	pF
C_{rss}	Reverse Transfer Capacitance		-	9	-	pF
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } -10\text{V}$ $V_{DS} = -30\text{V}, I_D = -7\text{A}$	9	14	19	nC
Q_{gs}	Gate Source Charge		-	4.8	-	nC
Q_{gd}	Gate Drain("Miller") Charge		-	2	-	nC
Switching Characteristics						
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{GS} = -10\text{V}, V_{DD} = -30\text{V}$ $I_D = -7\text{A}, R_{\text{GEN}} = 3\Omega$	-	6.4	-	ns
t_r	Turn-On Rise Time		-	2	-	ns
$t_{d(\text{off})}$	Turn-Off Delay Time		-	21	-	ns
t_f	Turn-Off Fall Time		-	4.4	-	ns
Body Diode Characteristics						
I_s	Maximum Continuous Body Diode Forward Current	-	-	-	-22	A
I_{SM}	Maximum Pulsed Body Diode Forward Current	-	-	-	-89	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}, I_s = -7\text{A}$	-	-	-1.2	V
trr	Body Diode Reverse Recovery Time	$I_F = -7\text{A}, di/dt = -100\text{A/us}$	20	33	44	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	47	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. E_{AS} condition: Starting $T_J=25^\circ\text{C}$, $V_{DD}=-30\text{V}$, $V_G=-10\text{V}$, $R_G=25\text{ohm}$, $L=3\text{mH}$, $I_{AS}=-7\text{A}$, $V_{DD}=0\text{V}$ 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

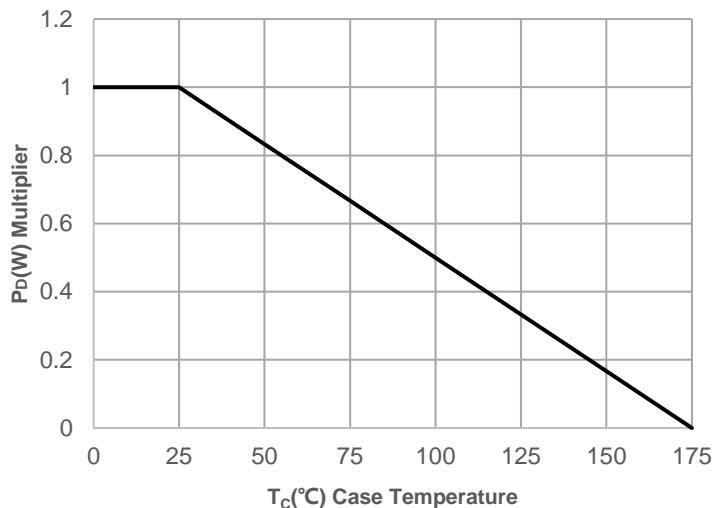


Figure 2: Current De-rating

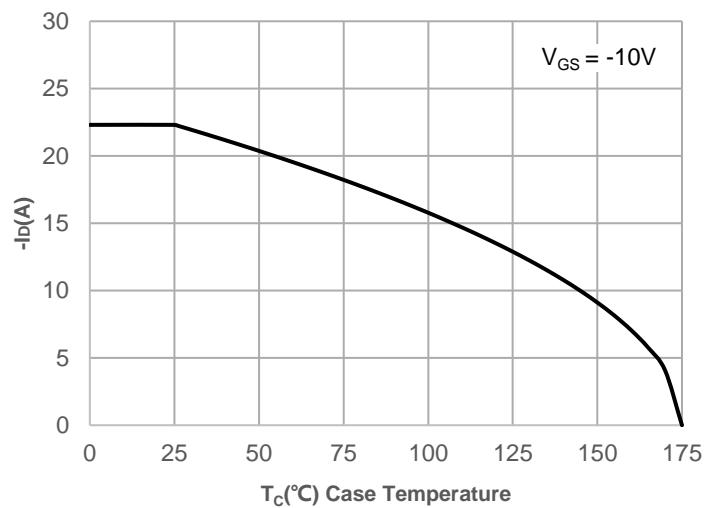


Figure 3: Normalized Maximum Transient Thermal Impedance

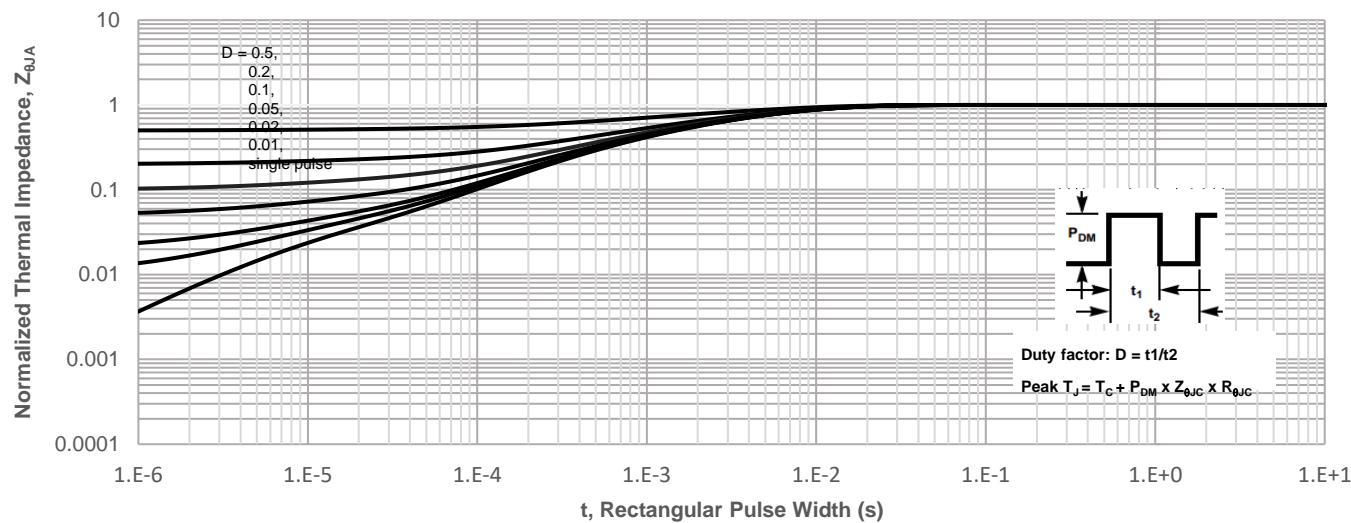
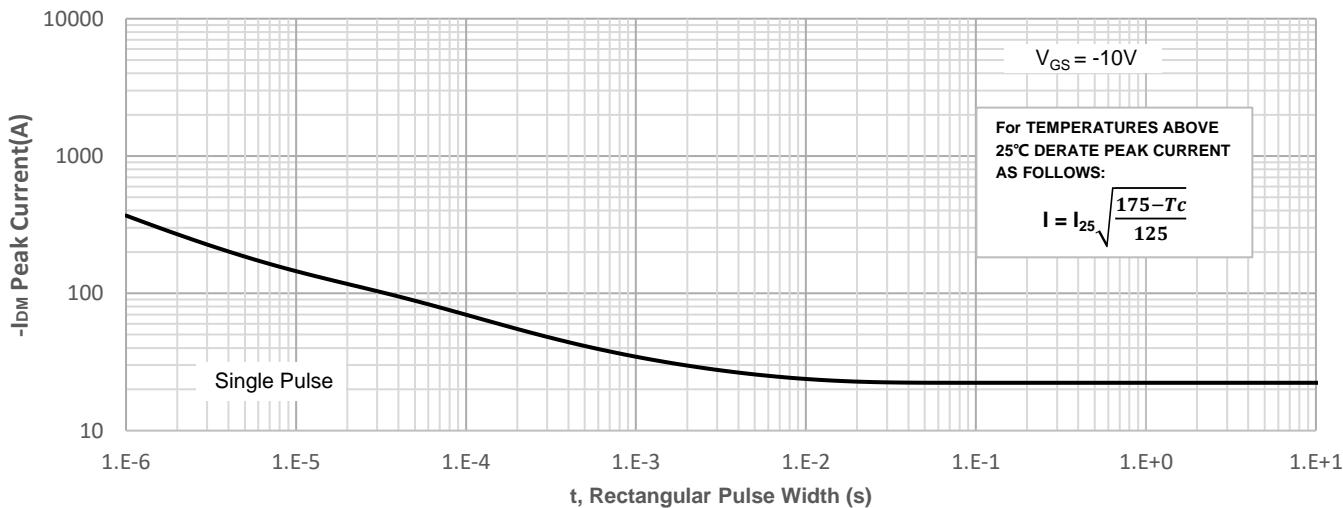


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

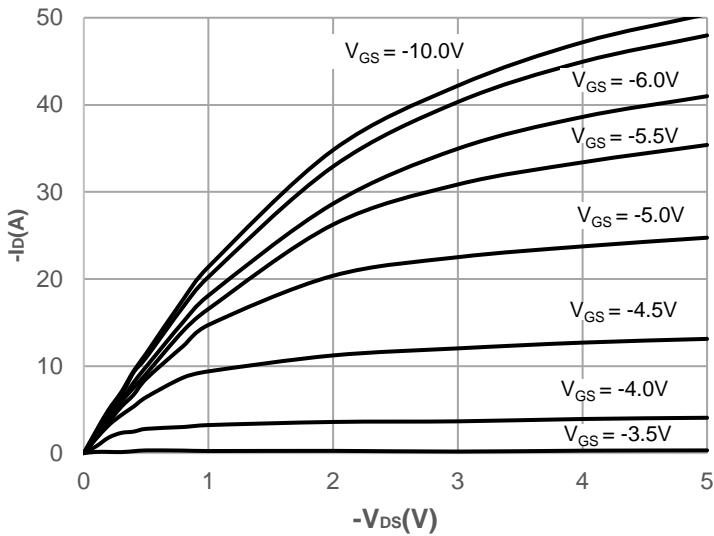


Figure 6: Typical Transfer Characteristics

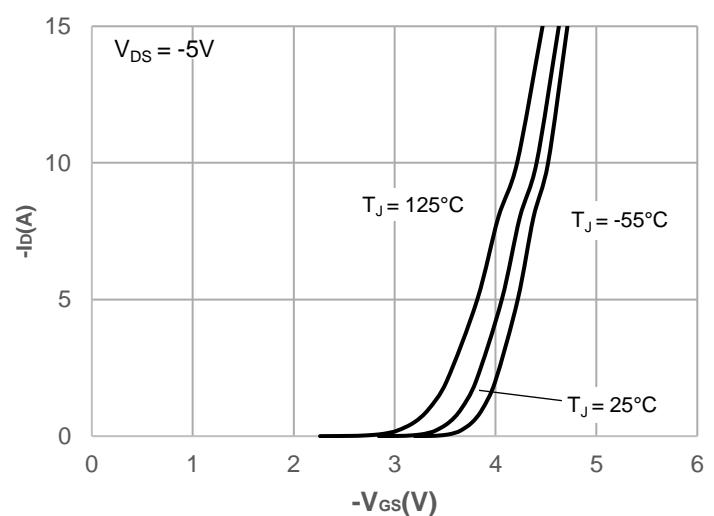


Figure 7: On-resistance vs. Drain Current

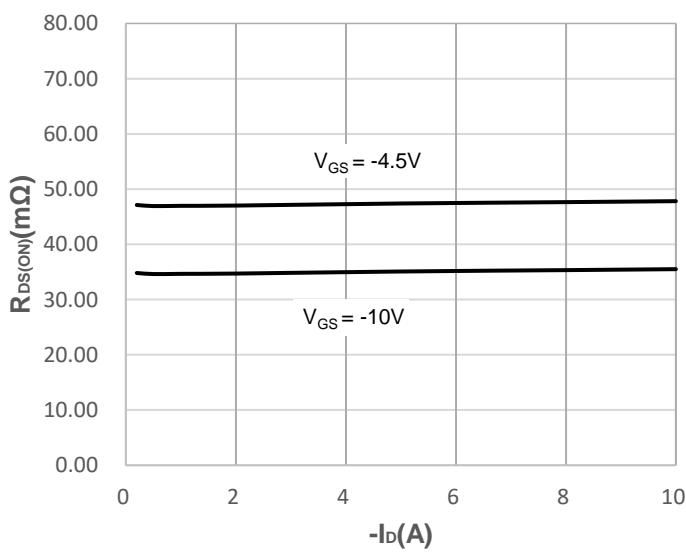


Figure 8: Body Diode Characteristics

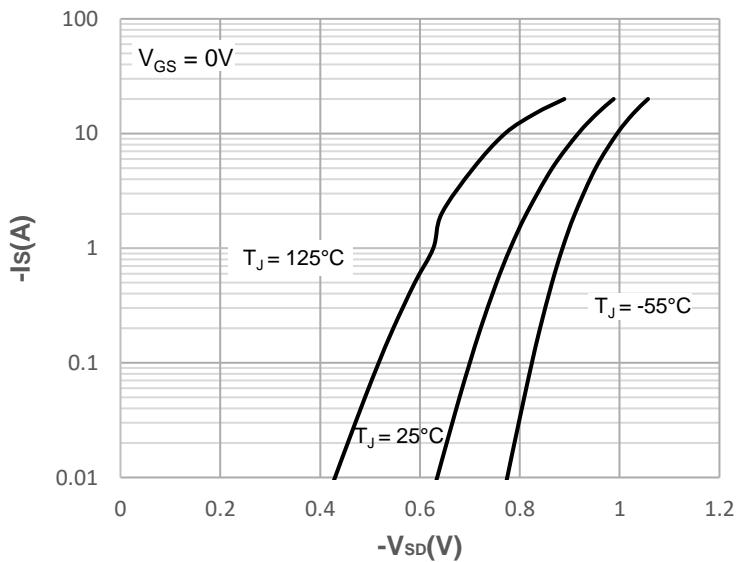


Figure 9: Gate Charge Characteristics

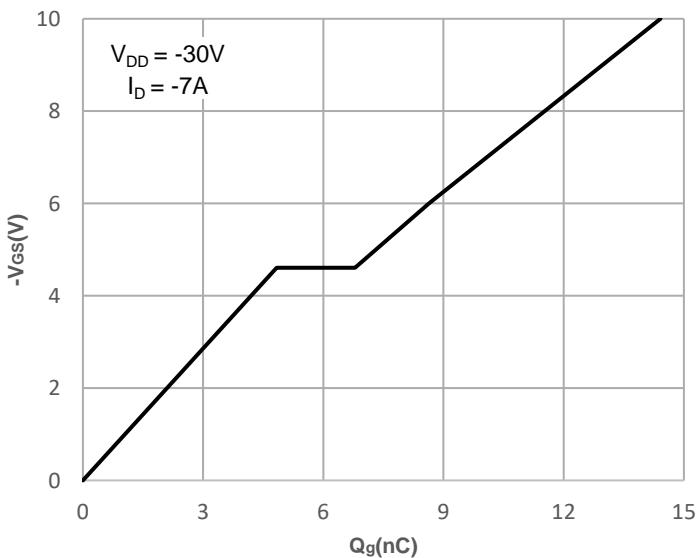
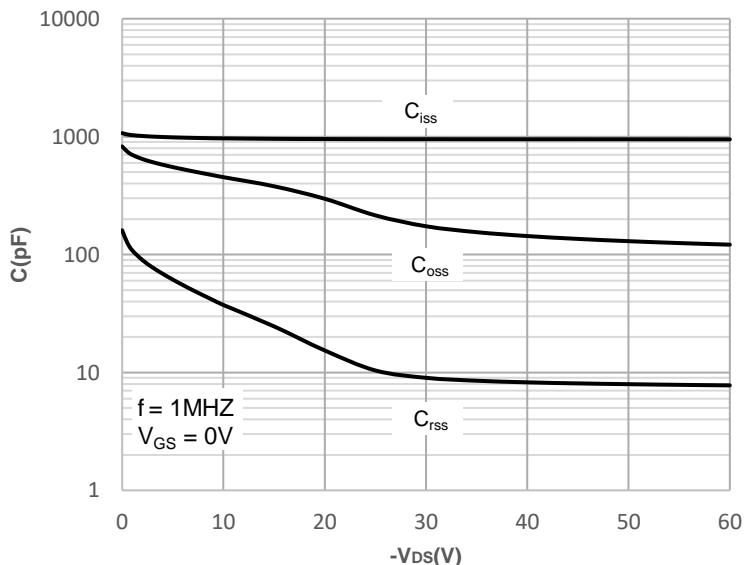


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

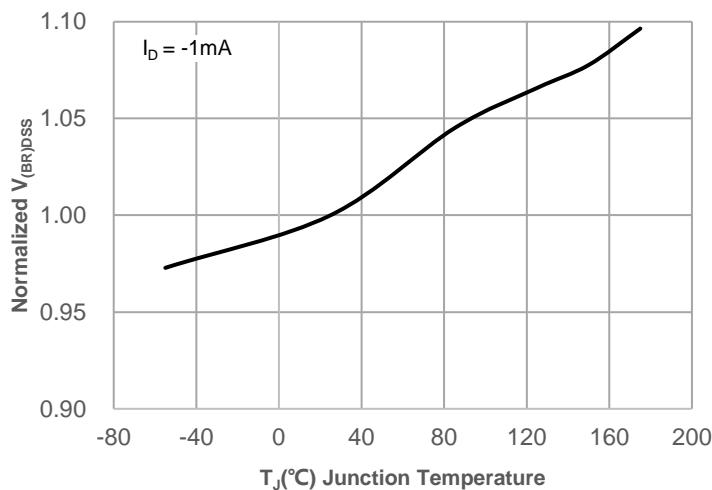


Figure 12: Normalized on Resistance vs. Junction Temperature

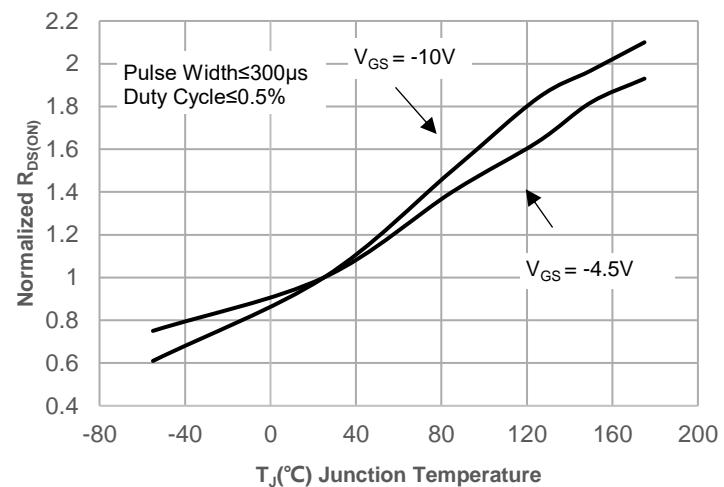


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

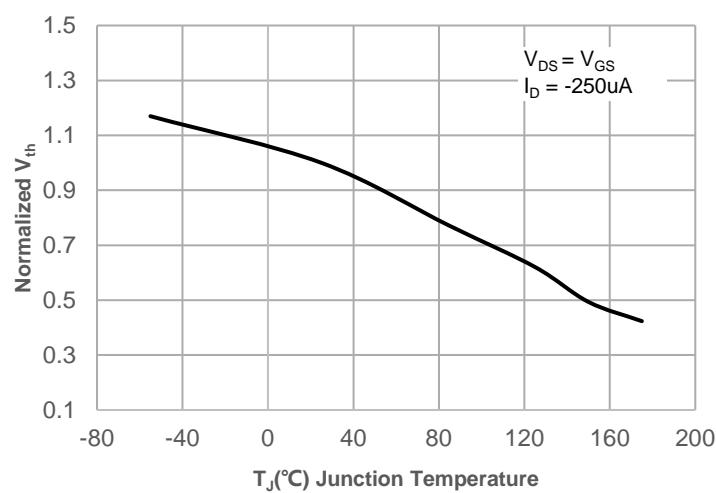


Figure 14: R_{D_S(on)} vs. V_{GS}

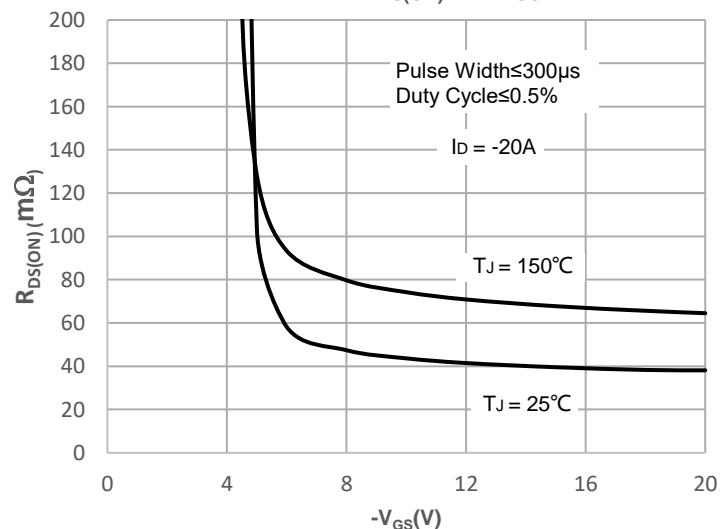
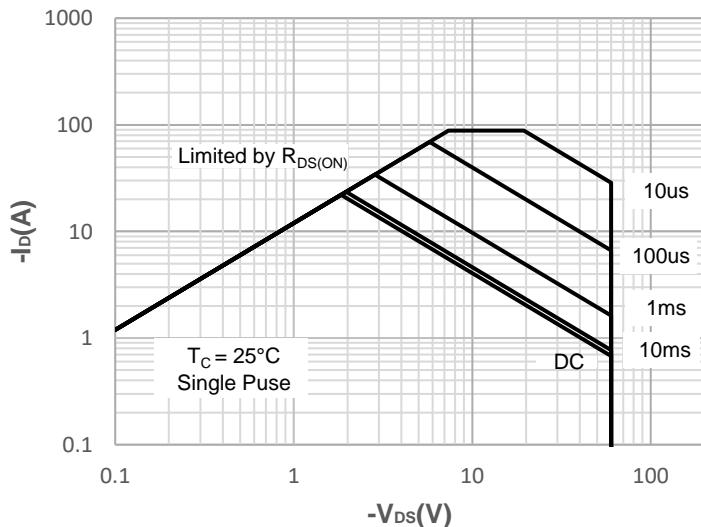


Figure 15: Maximum Safe Operating Area



Test Circuit

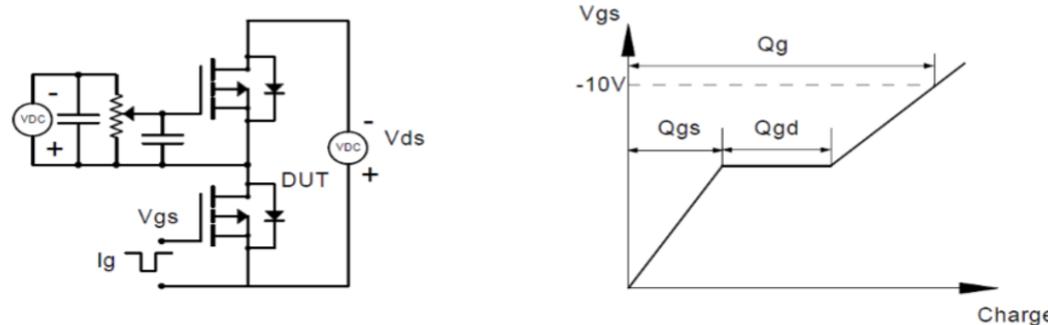


Figure 1: Gate Charge Test Circuit & Waveform

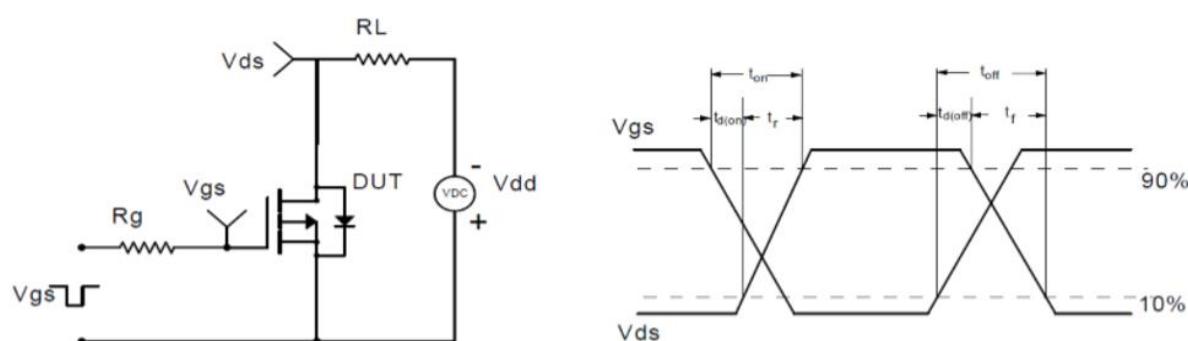


Figure 2: Resistive Switching Test Circuit & Waveform

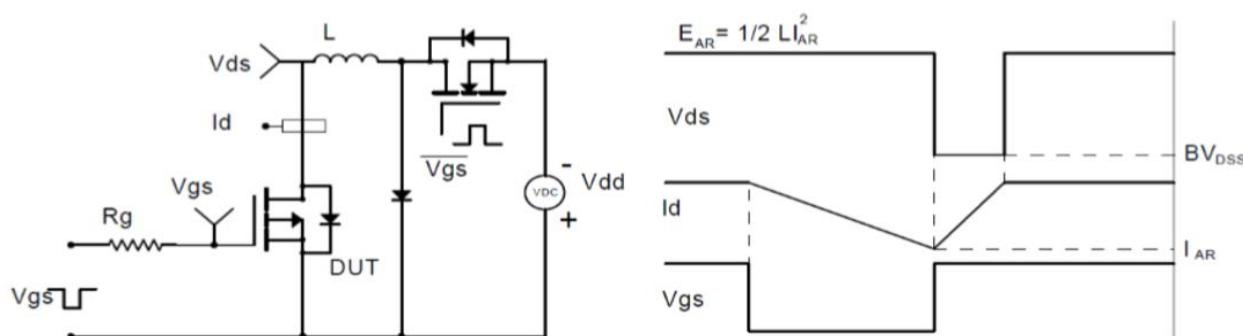


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

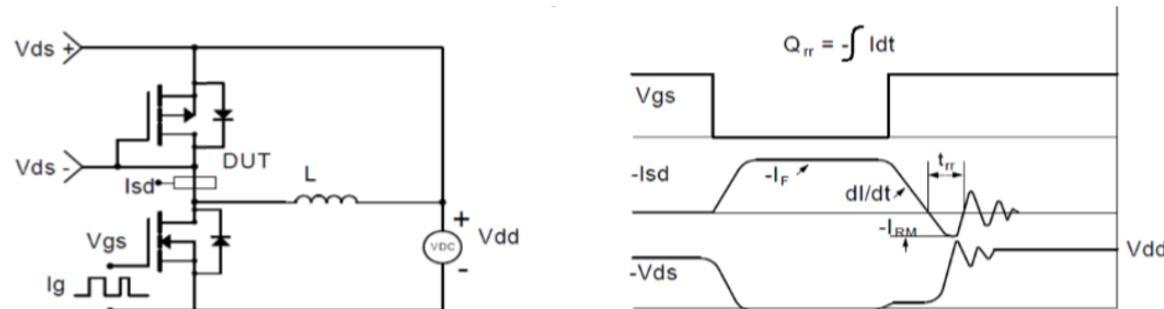
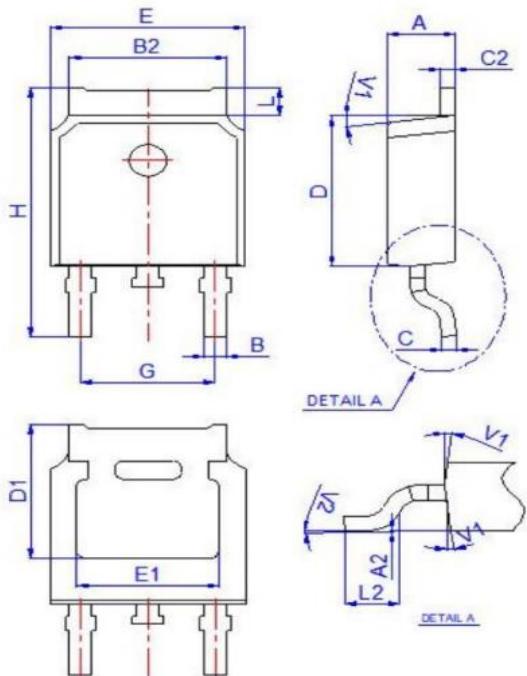


Figure 4: Diode Recovery Test Circuit & Waveform

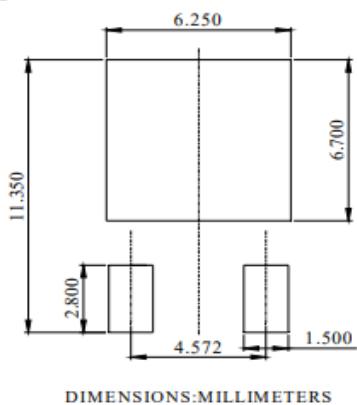


Package Mechanical Data(TO-252-3L)



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1	7°			7°		
V2	0°			6°		

Recommended Soldering Footprint



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