

-30V, -90A, 4.2mΩ P-channel Power Trench MOSFET

JMTK060P03A

Features

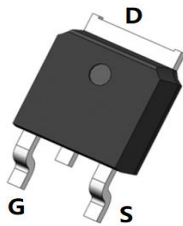
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS TESTED
- 100% ΔV_{ds} TESTED
- Halogen-free; RoHS-compliant
- Pb-free plating

Applications

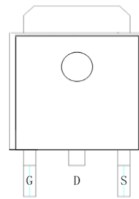
- Load Switch
- PWM Application
- Power Management

Product Summary

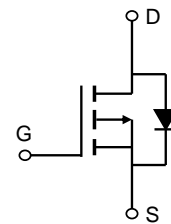
Parameters	Value	Unit
V_{DSS}	-30	V
$V_{GS(th_Typ)}$	-1.8	V
$I_D(@V_{GS}=-10V)$	-90	A
$R_{DS(ON_Typ)}(@V_{GS}=-10V)$	4.2	mΩ
$R_{DS(ON_Typ)}(@V_{GS}=-4.5V)$	6.3	mΩ



TO-252-3L Top View



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMTK060P03A	JMTK060P03A	3	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	-30	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	-90
		$T_C = 100^\circ\text{C}$	-57
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	398	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	46
		$T_C = 100^\circ\text{C}$	19
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⁾	40	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.7	



**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	$I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$	-30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -30\text{V}$, $V_{GS} = 0\text{V}$	-	-	-1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$	-1.3	-1.8	-2.5	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = -10\text{V}$, $I_D = -30\text{A}$	-	4.2	6.4	$\text{m}\Omega$
		$V_{GS} = -4.5\text{V}$, $I_D = -20\text{A}$	-	6.3	10.5	$\text{m}\Omega$
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	2.4	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = -15\text{V}$, $f = 1\text{MHz}$	4688	6563.7	8861	pF
C_{oss}	Output Capacitance		488	684	923	pF
C_{rss}	Reverse Transfer Capacitance		405	567	766	pF
Q_g	Total Gate Charge	$V_{GS} = 0$ to -10V $V_{DS} = -15\text{V}$, $I_D = -30\text{A}$	78	110	148	nC
Q_{gs}	Gate Source Charge		15	22	29	nC
Q_{gd}	Gate Drain ("Miller") Charge		15	21	28	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = -10\text{V}$, $V_{DD} = -15\text{V}$ $I_D = -30\text{A}$, $R_{GEN} = 3\Omega$	-	12	-	ns
t_r	Turn-On Rise Time		-	10	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	88	-	ns
t_f	Turn-Off Fall Time		-	53	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	-90	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	-359	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = -30\text{A}$	-		1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F = -15\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$	23	32	43	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	22.4	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = -15\text{V}$, $V_G = -10\text{V}$, $R_G = 25\text{ohm}$, $L = 0.5\text{mH}$, $I_{AS} = -32.76\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
3. $R_{\theta JA}$ is measured with the device mounted on a 1inch^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

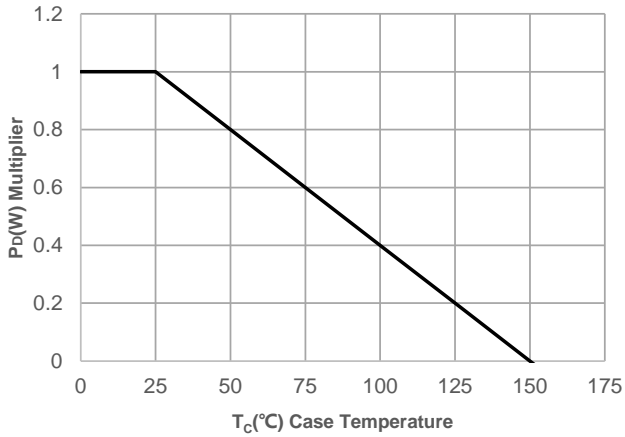


Figure 2: Current De-rating

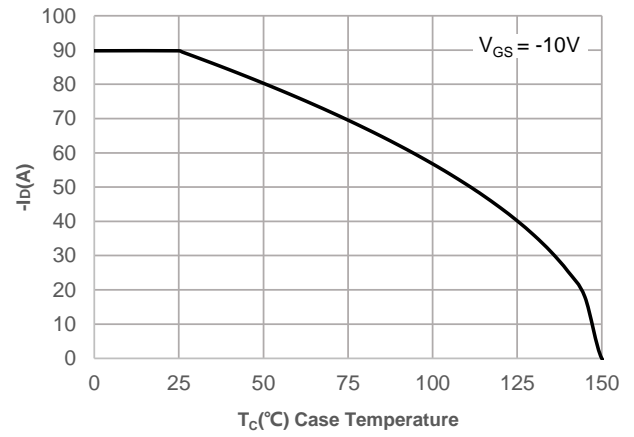


Figure 3: Normalized Maximum Transient Thermal Impedance

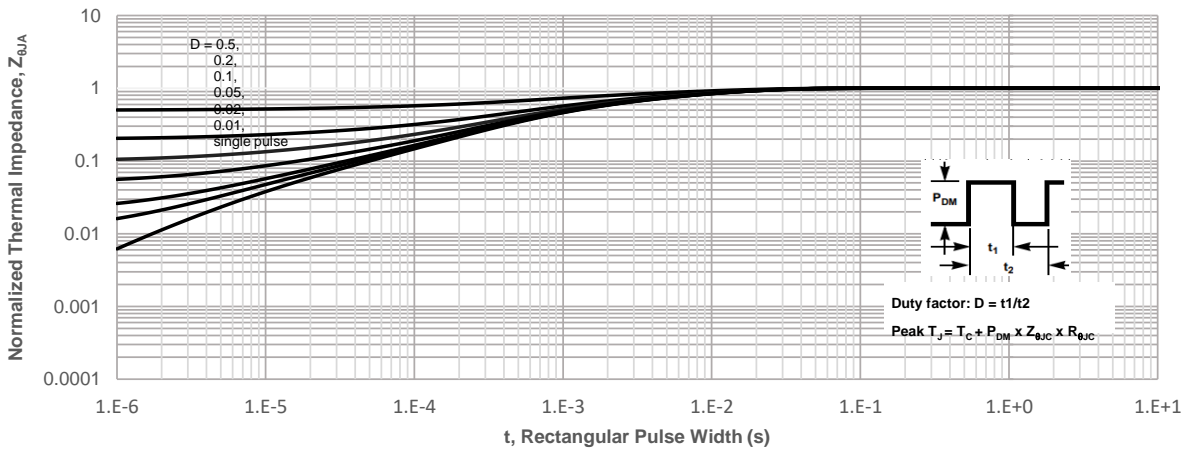
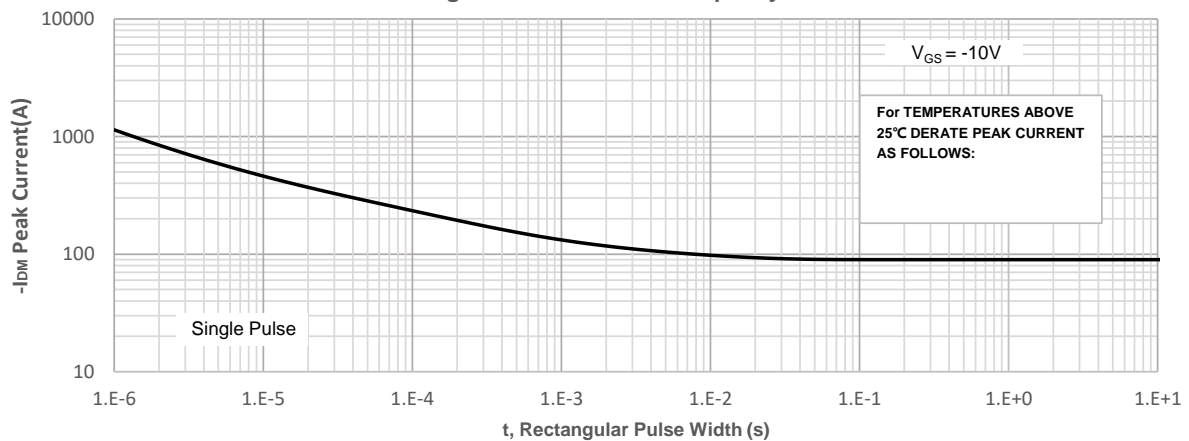
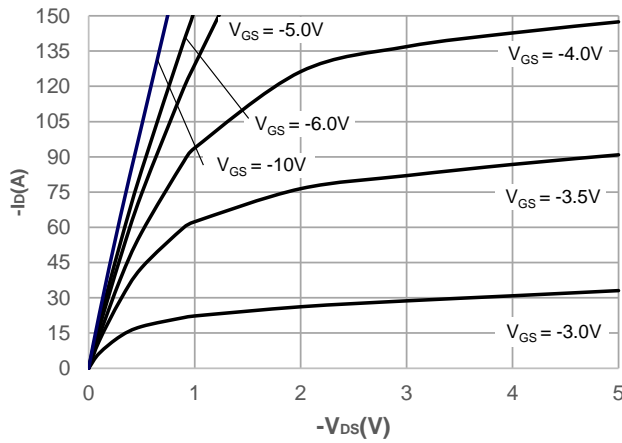
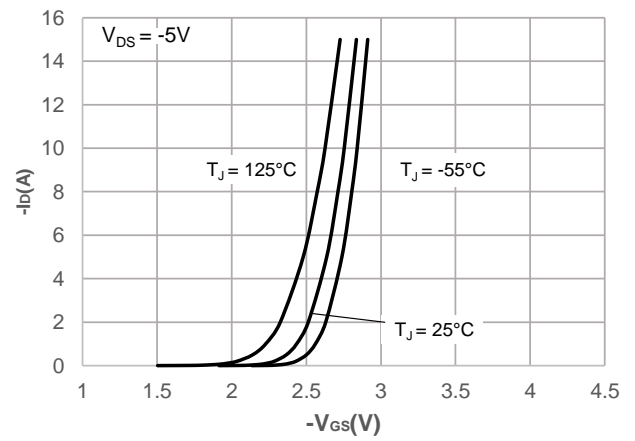
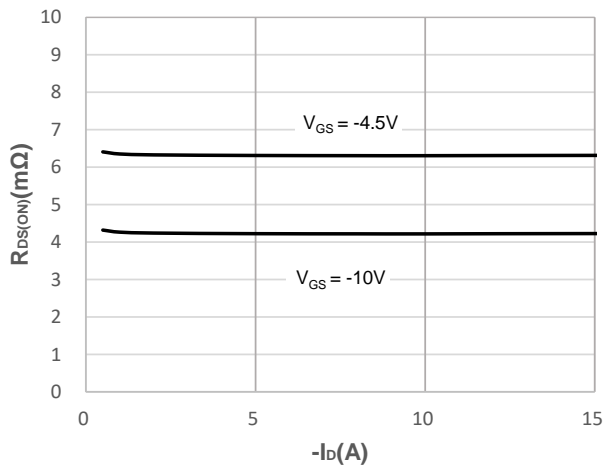
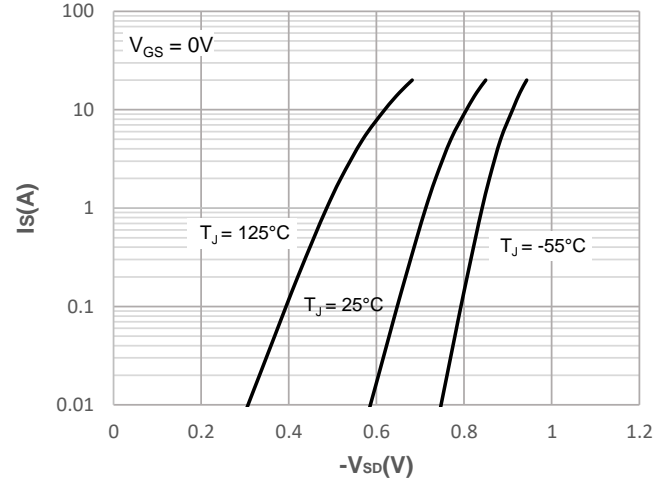
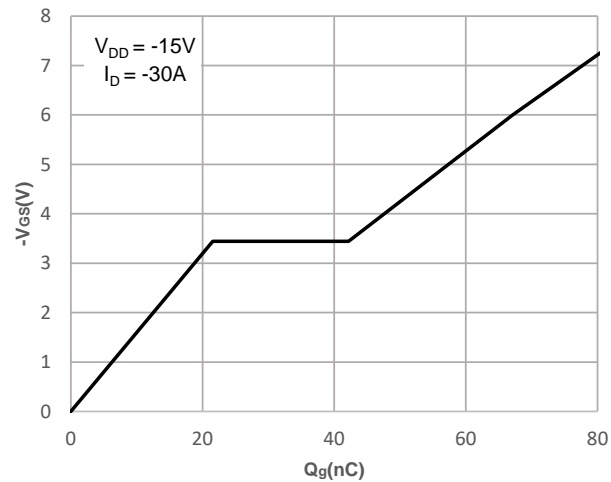
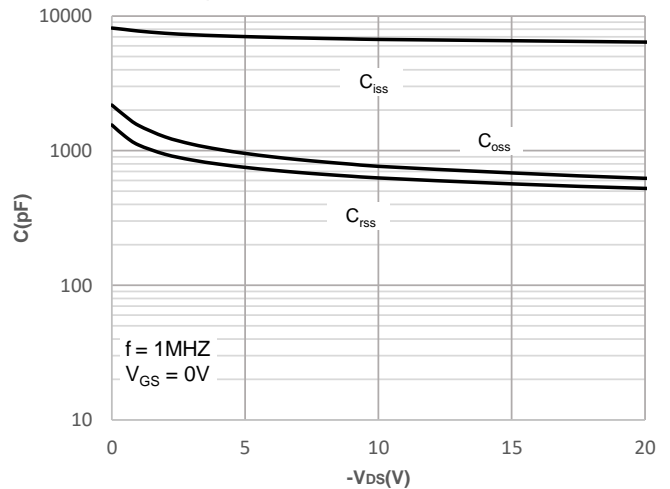


Figure 4: Peak Current Capacity



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

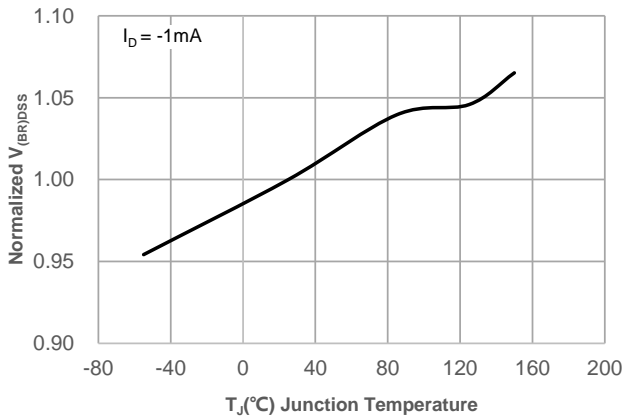


Figure 12: Normalized on Resistance vs. Junction Temperature

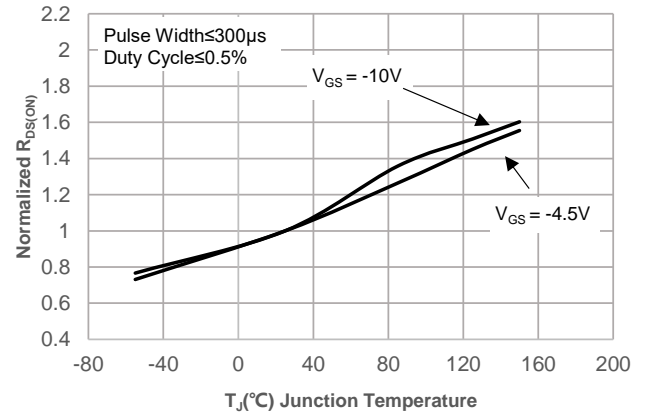


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

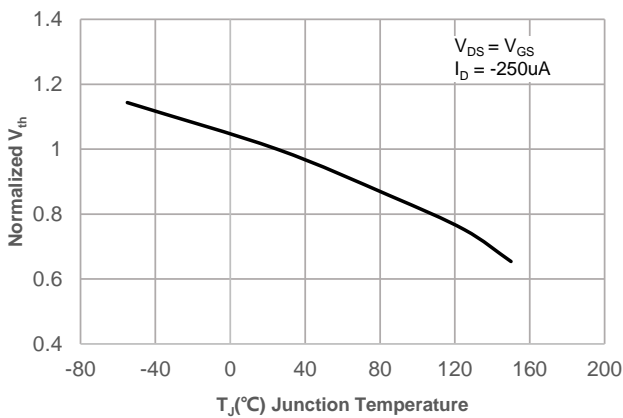


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

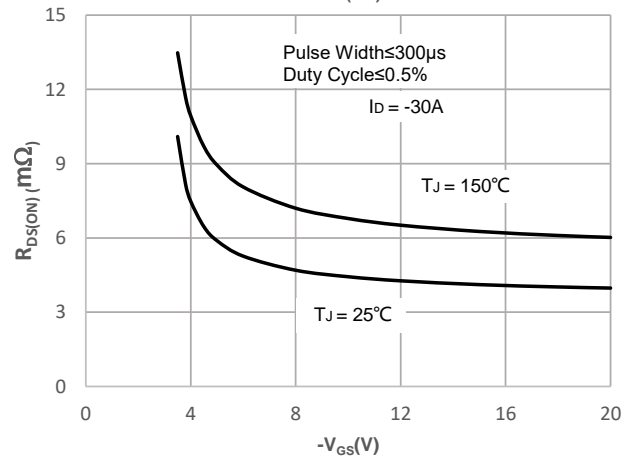
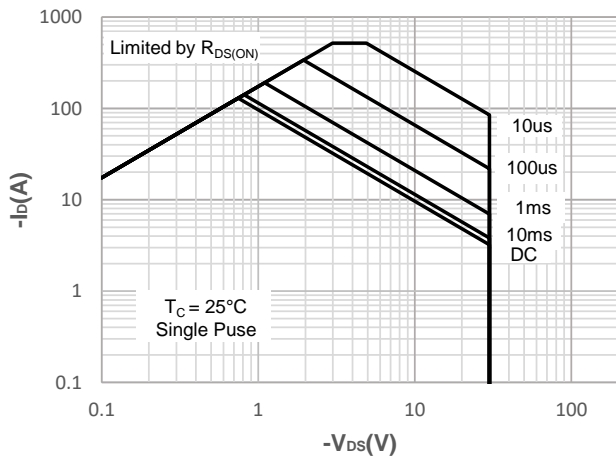
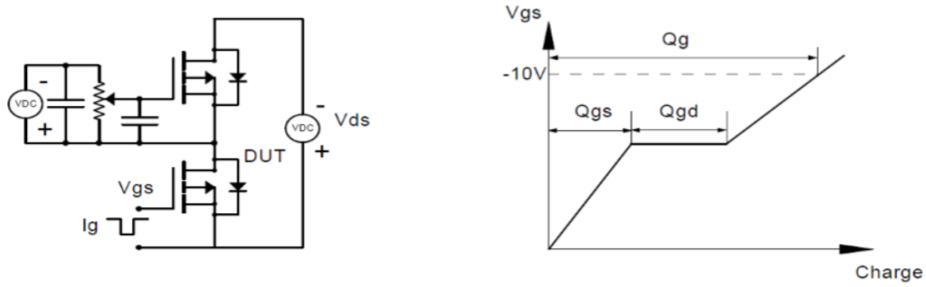
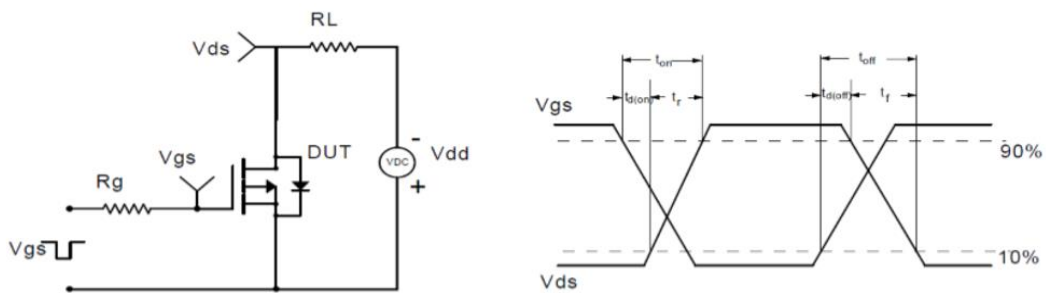
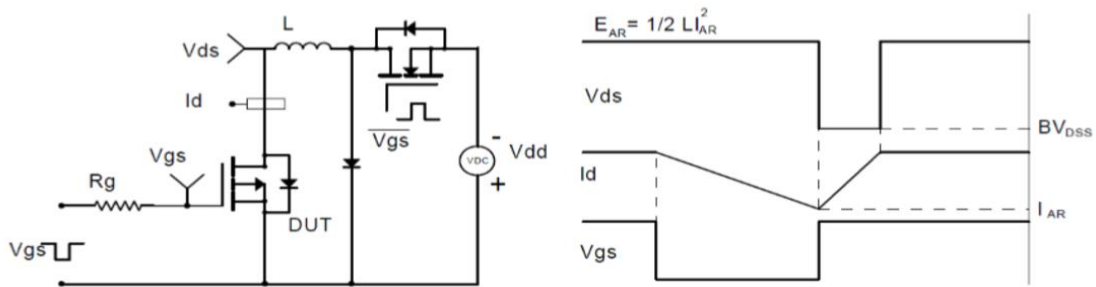
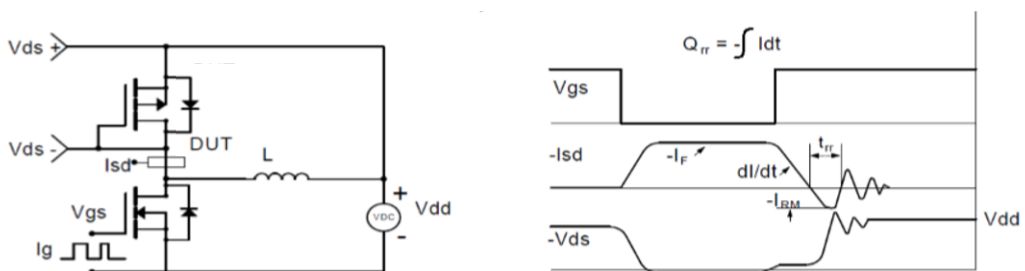
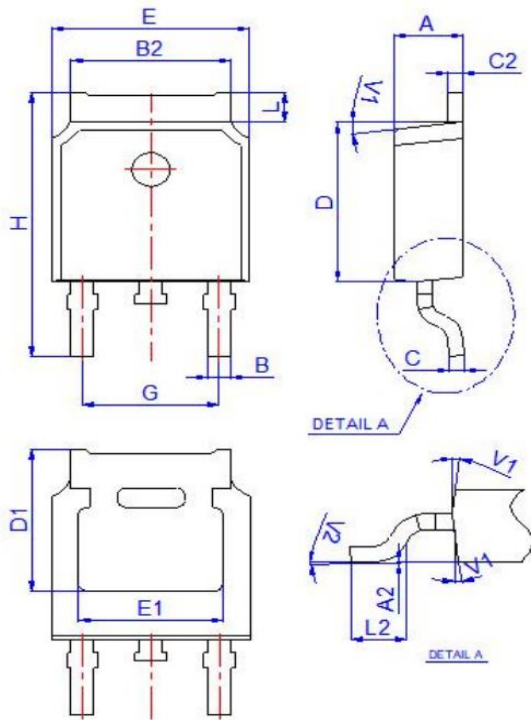


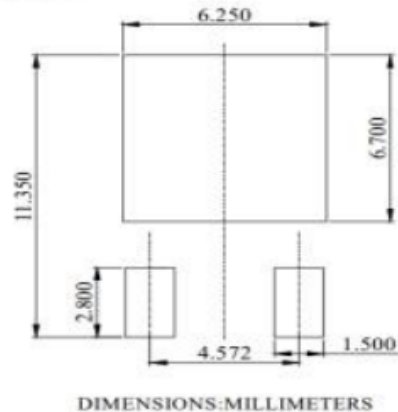
Figure 15: Maximum Safe Operating Area



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-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°	0°		6°

Recommended Soldering Footprint


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