



**TM12N06D**

**N-Channel Enhancement Mosfet**

**General Description**

- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

**Applications**

- Load switch
- PWM

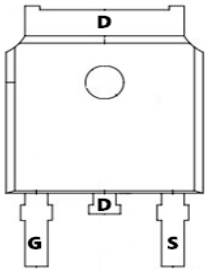
**General Features**

$V_{DS} = 60V$   $I_D = 12 A$

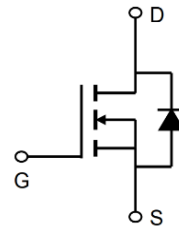
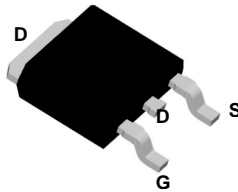
$R_{DS(ON)} = 58 m\Omega$  (typ.) @  $V_{GS} = -10V$

100% UIS Tested

100%  $R_g$  Tested



TO-252-3L



Marking : 12N06

**Absolute Maximum Ratings** ( $T_A=25^\circ C$  unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-source Voltage		$V_{DS}$	60	V
Gate-source Voltage		$V_{GS}$	$\pm 20$	V
Drain Current	$T_A=25^\circ C$	$I_D$	12	A
	$T_A=100^\circ C$		8	
Pulsed Drain Current <sup>A</sup>		$I_{DM}$	18	A
Total Power Dissipation <sup>B</sup>	$T_A=25^\circ C$	$P_D$	1.2	W
	$T_A=100^\circ C$		0.45	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~+150	$^\circ C$

**Thermal resistance**

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient <sup>C</sup>	Steady-State	$R_{\theta JA}$	85	105	$^\circ C/W$

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**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>Static Parameter</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C	-	-	100	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> =0V	-	-	±100	nA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	0.9	1.35	2	V
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =3A	-	58	70	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	-	65	82	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =3A, V <sub>GS</sub> =0V	-	0.85	1.2	V
Gate resistance	R <sub>G</sub>	f=1MHz, Open drain	-	2	-	Ω
Maximum Body-Diode Continuous Current	I <sub>S</sub>		-	-	12	A
<b>Dynamic Parameters</b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz	-	500	-	pF
Output Capacitance	C <sub>oss</sub>		-	28	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	22	-	
<b>Switching Parameters</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =3A	-	10	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	1.7	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	2.1	-	
Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> =3A, di/dt=100A/us	-	7	-	nC
Reverse Recovery Time	t <sub>rr</sub>		-	33	-	ns
Turn-on Delay Time	t <sub>D(on)</sub>	V <sub>GS</sub> =10V, V <sub>DD</sub> =30V, R <sub>L</sub> =20Ω R <sub>GEN</sub> =3Ω	-	3.6	-	ns
Turn-on Rise Time	t <sub>r</sub>		-	17.6	-	
Turn-off Delay Time	t <sub>D(off)</sub>		-	13	-	
Turn-off fall Time	t <sub>f</sub>		-	23	-	

A. Repetitive rating; pulse width limited by max. junction temperature.

B. P<sub>d</sub> is based on max. junction temperature, using junction-case thermal resistance.

C. The value of R<sub>θJA</sub> is measured with the device mounted on the minimum recommend pad size, in the still air environment with T<sub>A</sub> =25°C. The maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.



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Typical Electrical and Thermal Characteristics Diagrams

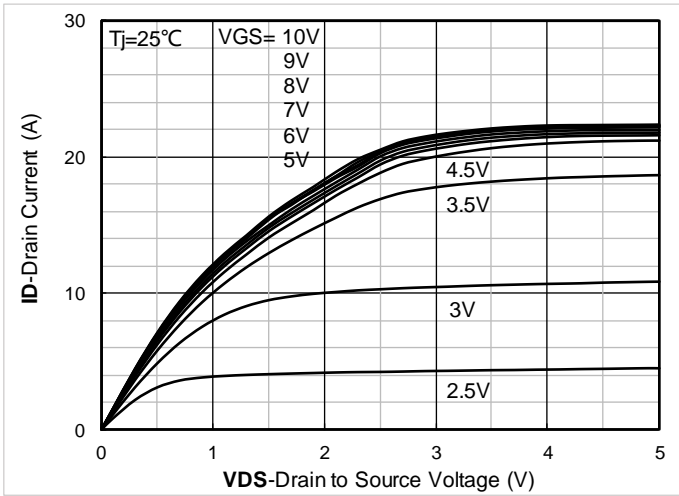


Figure 1. Output Characteristics

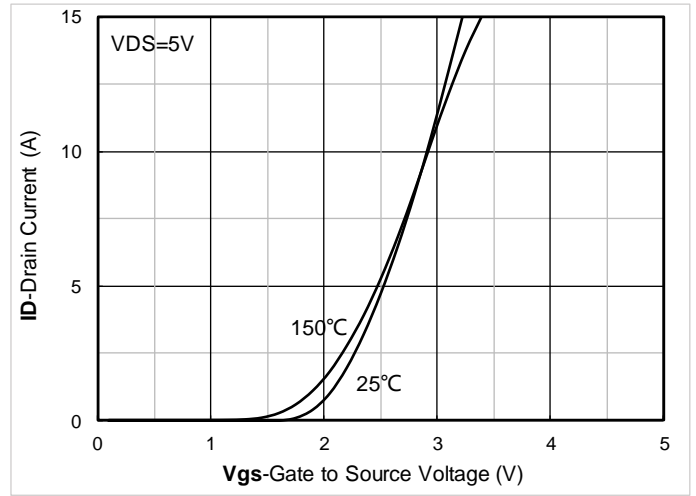


Figure 2. Transfer Characteristics

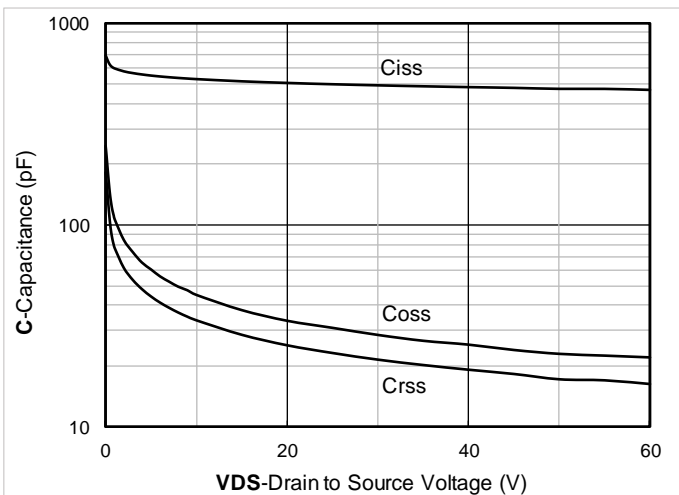


Figure 3. Capacitance Characteristics

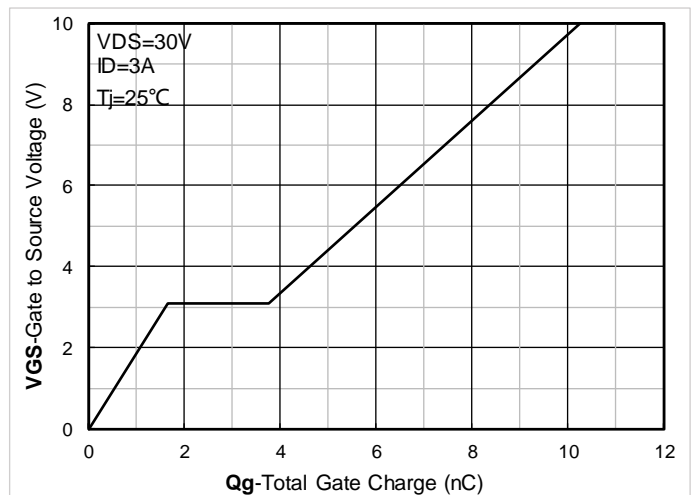


Figure 4. Gate Charge

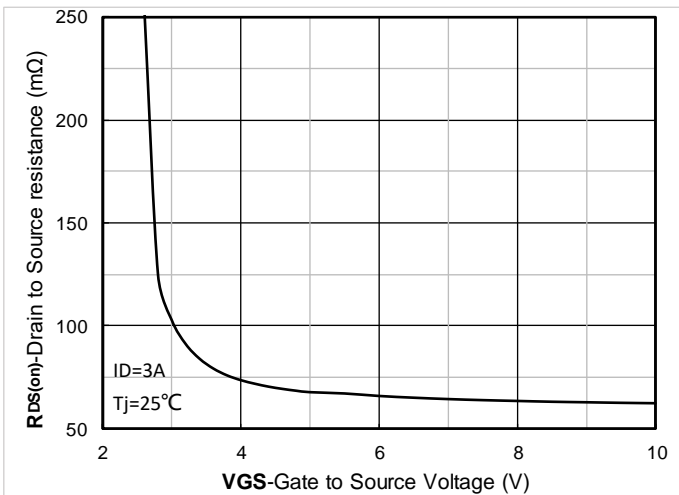


Figure 5. On-Resistance vs Gate to Source Voltage

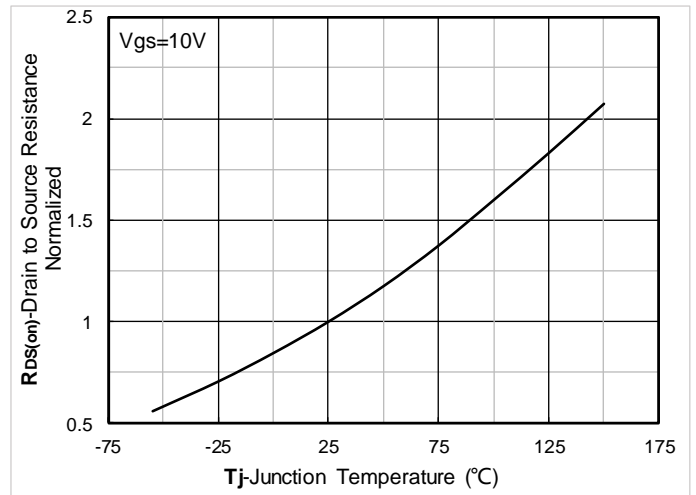


Figure 6. Normalized On-Resistance



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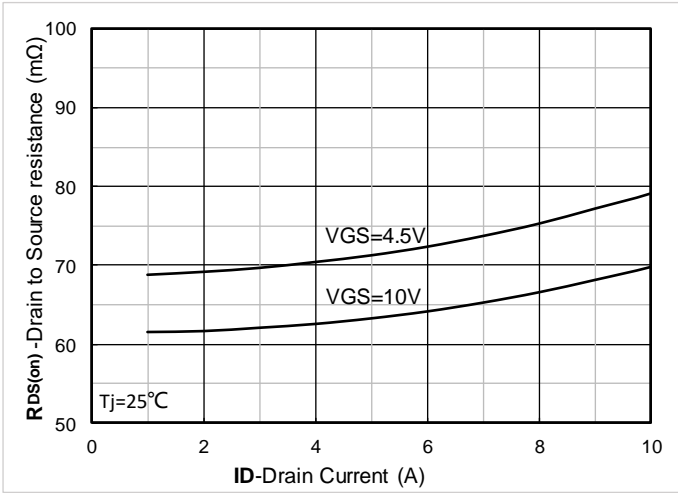


Figure 7.  $R_{DS(on)}$  VS Drain Current

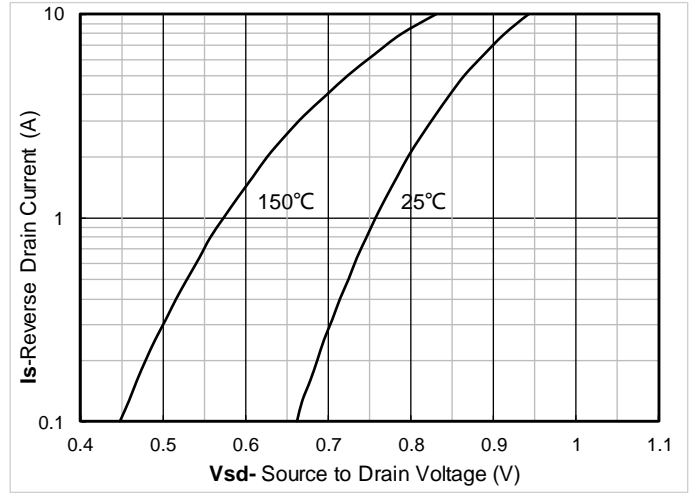


Figure 8. Forward characteristics of reverse diode

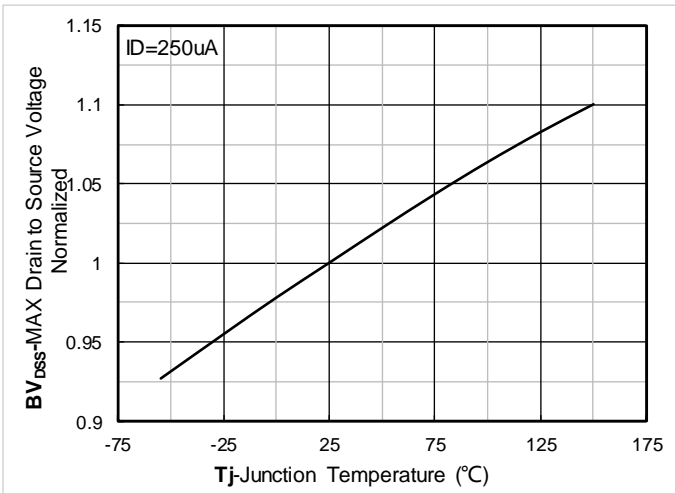


Figure 9. Normalized breakdown voltage

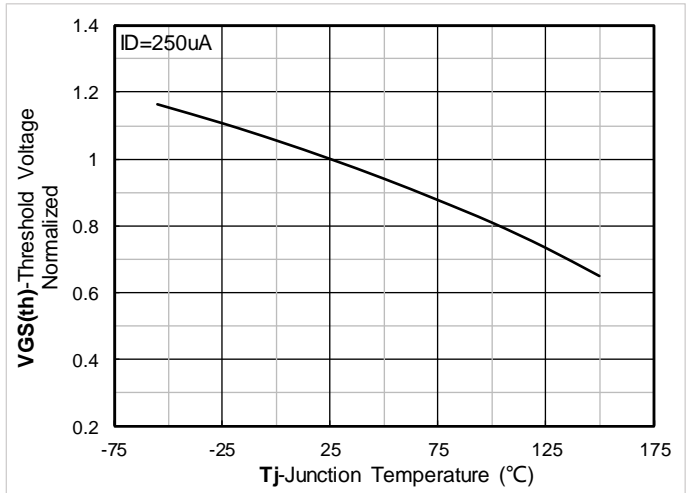


Figure 10. Normalized Threshold voltage

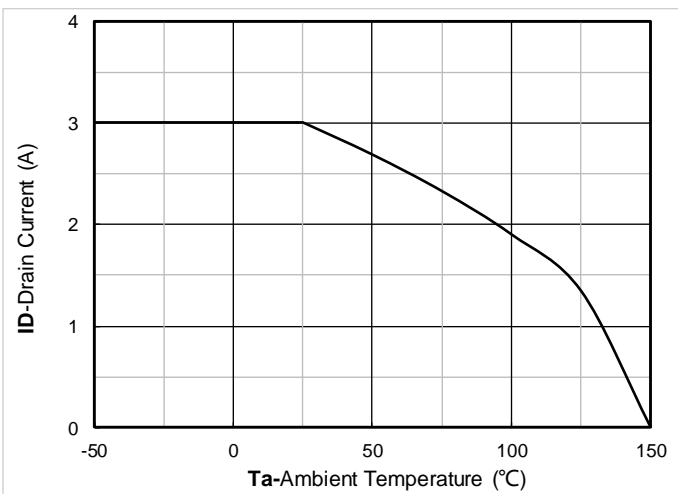


Figure 11. Current dissipation

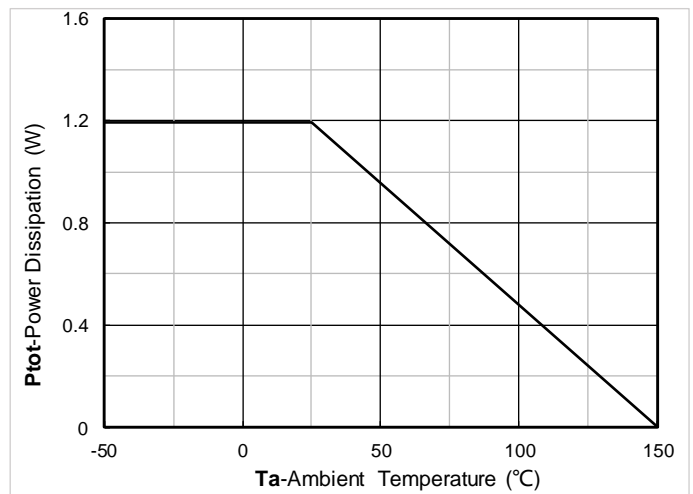


Figure 12. Power dissipation





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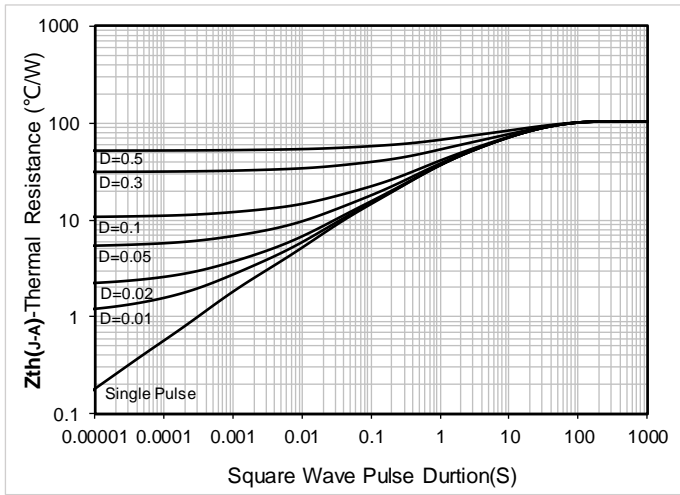


Figure 13. Maximum Transient Thermal Impedance

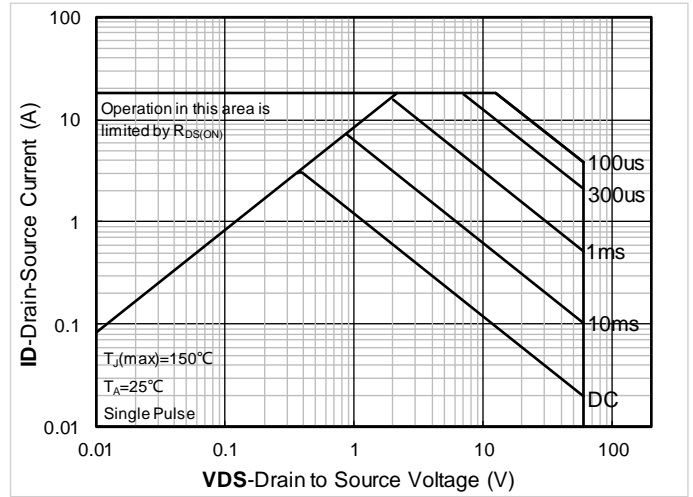


Figure 14. Safe Operation Area

Test Circuits & Waveforms

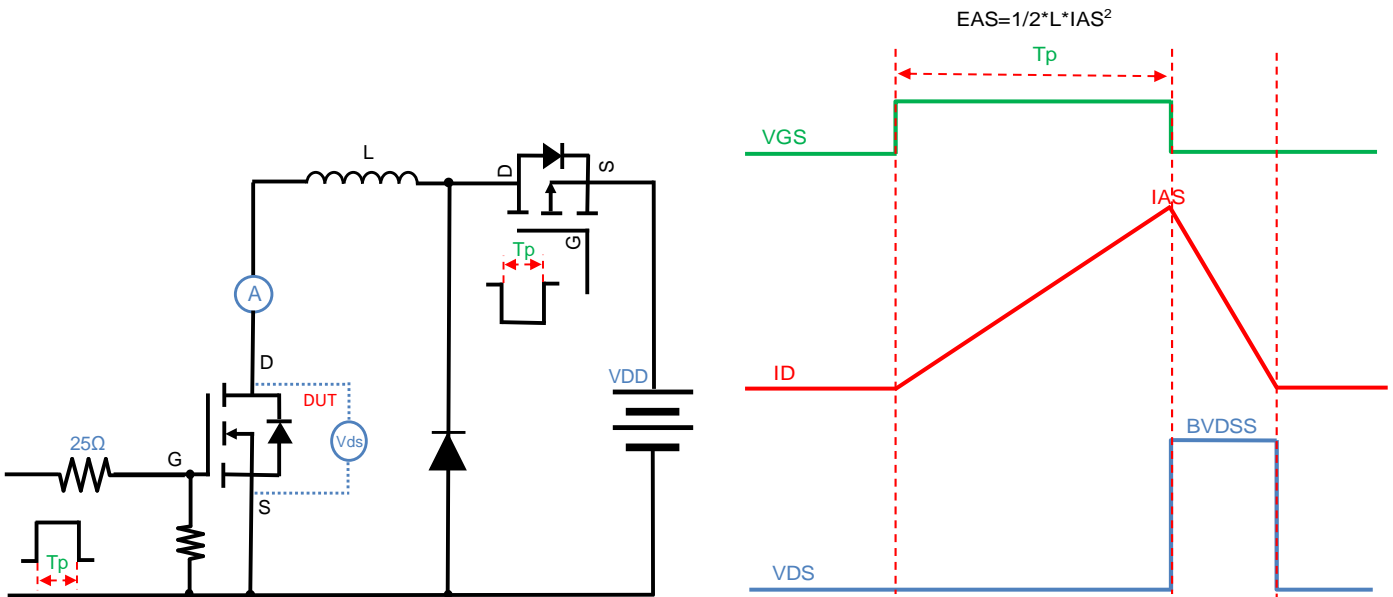


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform



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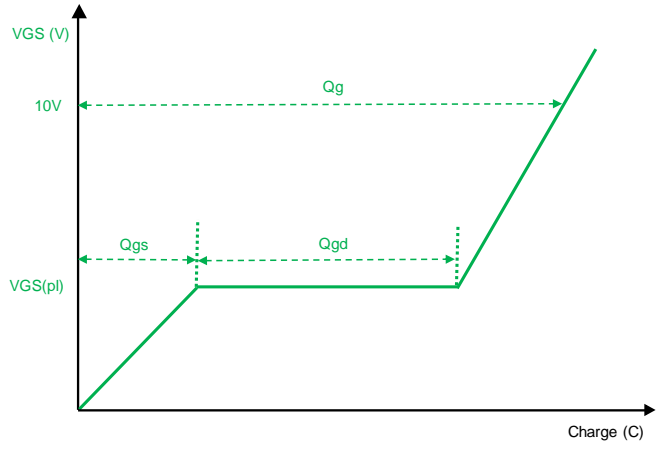
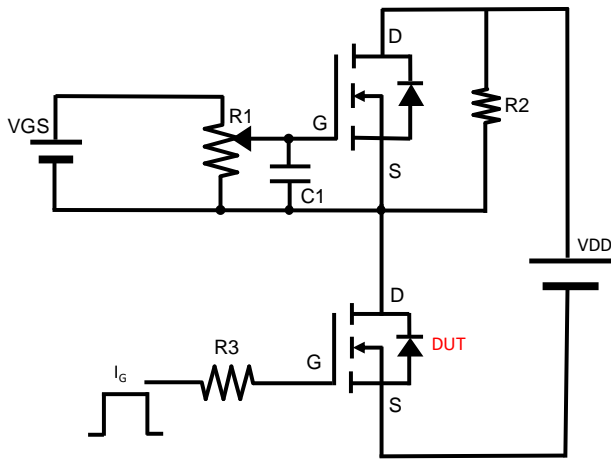


Figure B. Gate Charge Test Circuit & Waveform

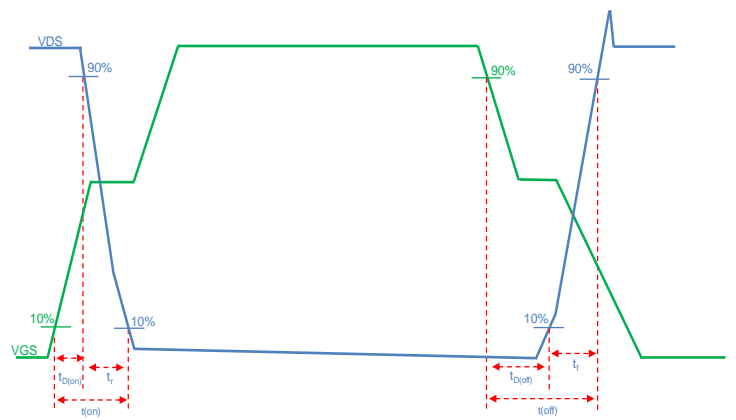
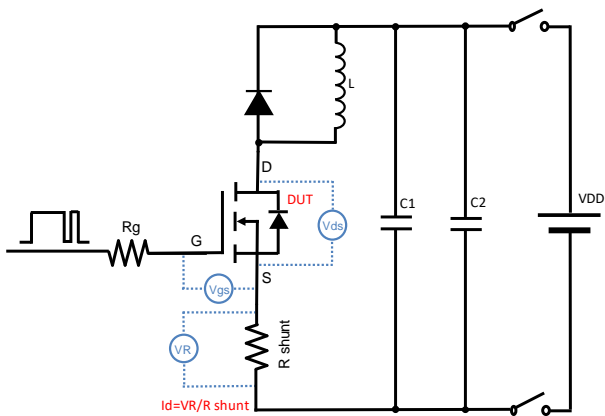


Figure C. Resistive Switching Test Circuit & Waveform

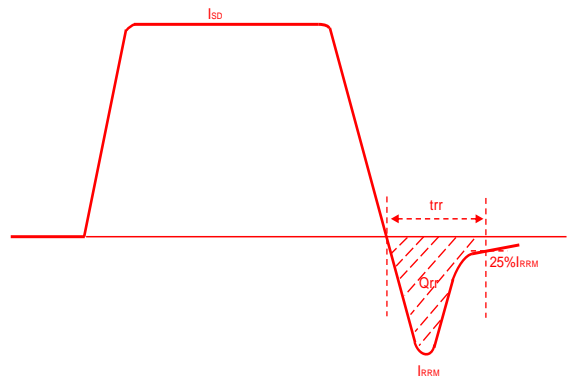
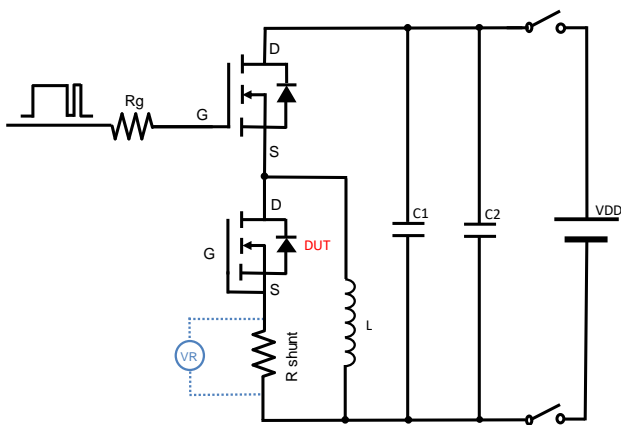
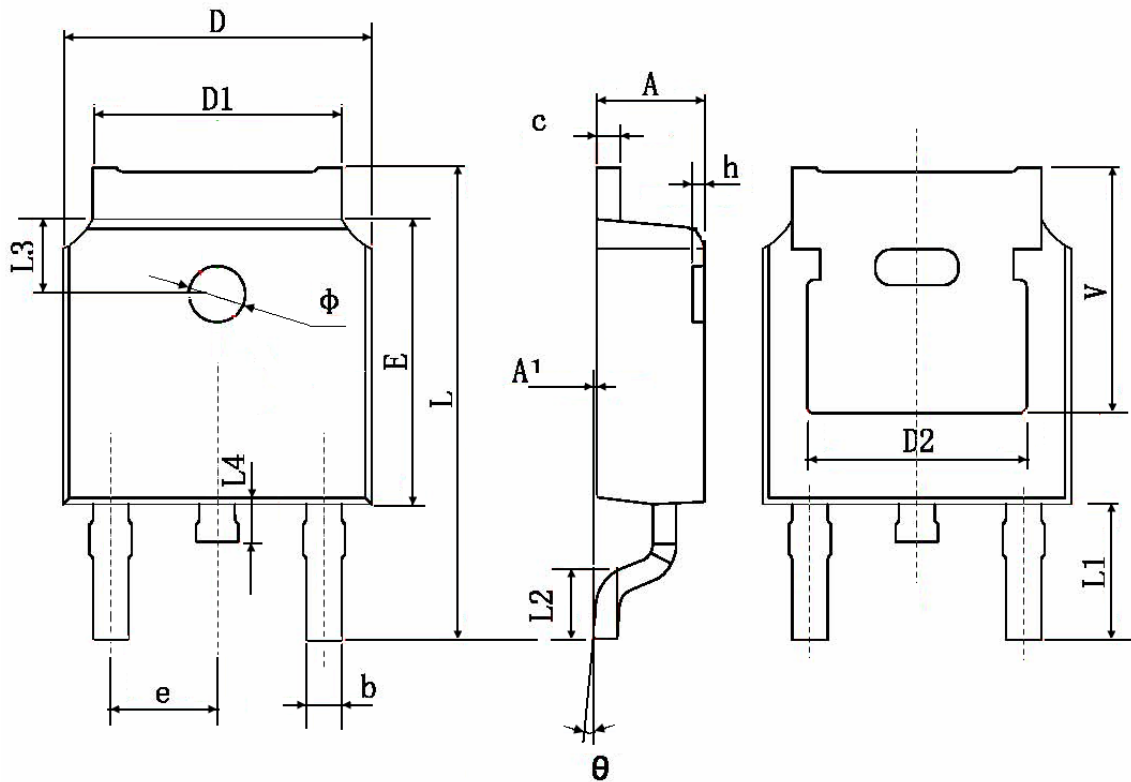


Figure D. Diode Recovery Test Circuit & Waveform

**Package Information:TO-252-3L**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
phi	1.100	1.300	0.043	0.051
theta	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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