
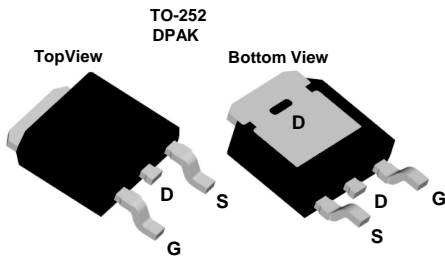


## TMD70N03 N-CHANNEL POWER MOSFET

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Latest Trench Power MOSFET technology</li> <li>• Very Low RDS(on) at 10VGS</li> <li>• Low Gate Charge</li> <li>• High Current Capability</li> </ul> <p><b>Application</b></p> <ul style="list-style-type: none"> <li>• DC/DC Converters in Computing</li> <li>• Isolated DC/DC Converters in Telecom and Industrial</li> </ul>	<p><b>Product Summary</b></p> <table border="0"> <tr> <td><math>V_{DS}</math></td> <td>30V</td> </tr> <tr> <td><math>I_D</math> (at <math>V_{GS}=10V</math>)</td> <td>68A</td> </tr> <tr> <td><math>R_{DS(ON)}</math> (at <math>V_{GS}=10V</math>)</td> <td>&lt; 8.5m<math>\Omega</math></td> </tr> <tr> <td><math>R_{DS(ON)}</math> (at <math>V_{GS} = 4.5V</math>)</td> <td>&lt; 13.0m<math>\Omega</math></td> </tr> </table> <p>100% UIS Tested                  100% <math>R_g</math> Tested</p> 	$V_{DS}$	30V	$I_D$ (at $V_{GS}=10V$ )	68A	$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 8.5m $\Omega$	$R_{DS(ON)}$ (at $V_{GS} = 4.5V$ )	< 13.0m $\Omega$
$V_{DS}$	30V								
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**Absolute Maximum Ratings**  $T_A=25^\circ\text{C}$  unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>		$T_C=25^\circ\text{C}$	68
		$T_C=100^\circ\text{C}$	44.5
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	272	A
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ\text{C}$	22
		$T_A=70^\circ\text{C}$	18
Avalanche Current <sup>C</sup>	$I_{AS}$	37	A
Avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AS}$	68	mJ
$V_{DS}$ Spike	$V_{SPIKE}$	36	V
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	50
		$T_C=100^\circ\text{C}$	25
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	2.5
		$T_A=70^\circ\text{C}$	1.6
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	16	20	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient <sup>A D</sup> Steady-State		41	50	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case	$R_{\theta JC}$	2.1	3	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.2	1.8	2.2	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A		7.4	8.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A		10.8	13.0	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		105		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.7	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current <sup>G</sup>				58	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		2010		pF
C <sub>oss</sub>	Output Capacitance			898		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			124		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	0.9	1.8	2.7	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A		36	49	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge			17	23	nC
Q <sub>gs</sub>	Gate Source Charge			6		nC
Q <sub>gd</sub>	Gate Drain Charge			8		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		7.5		ns
t <sub>r</sub>	Turn-On Rise Time			4.0		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			37.0		ns
t <sub>f</sub>	Turn-Off Fall Time			7.5		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=500A/μs		14		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=500A/μs		20.3		nC

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=175° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Single pulse width limited by junction temperature T<sub>J(MAX)</sub>=175° C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

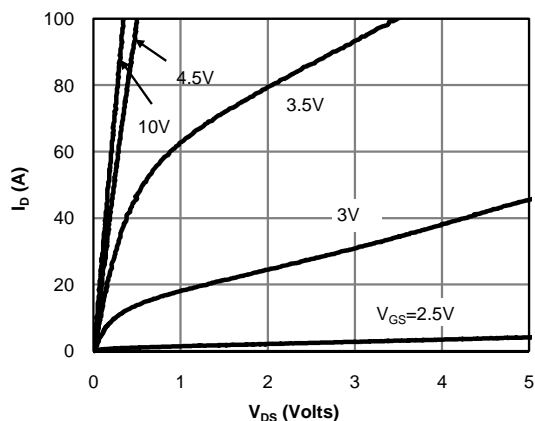
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=175° C. The SOA curve provides a single pulse rating.

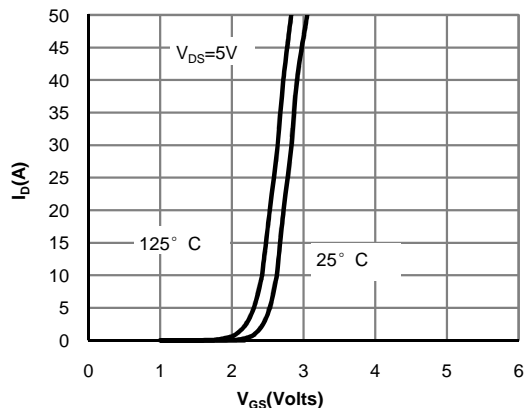
G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C.

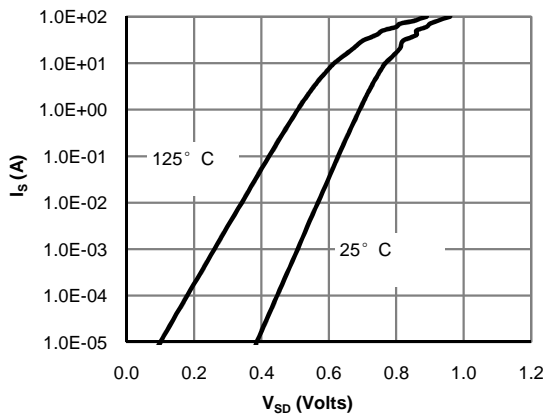
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



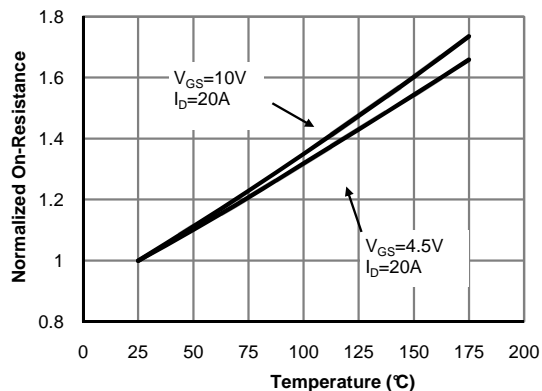
**Fig 1: On-Region Characteristics (Note E)**



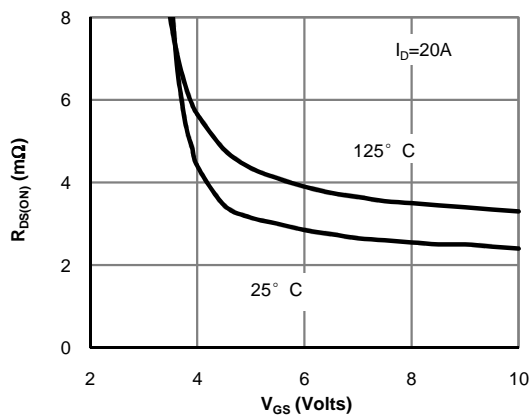
**Figure 2: Transfer Characteristics (Note E)**



**Figure 6: Body-Diode Characteristics (Note E)**

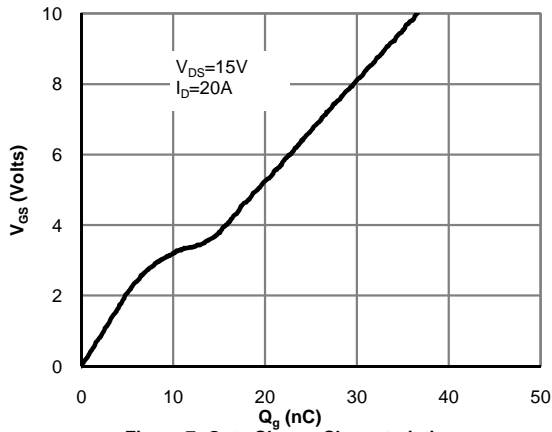


**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

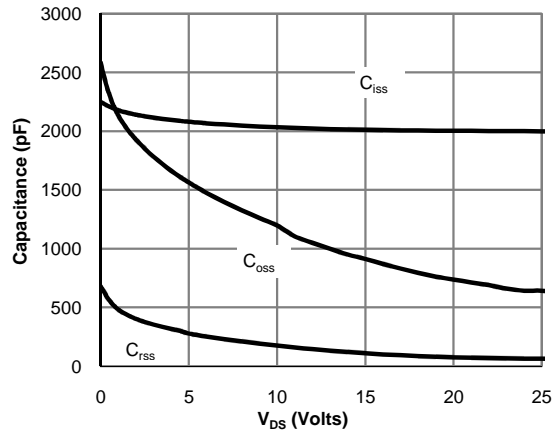


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

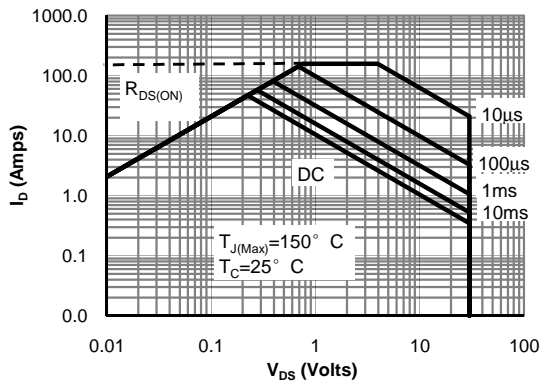
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



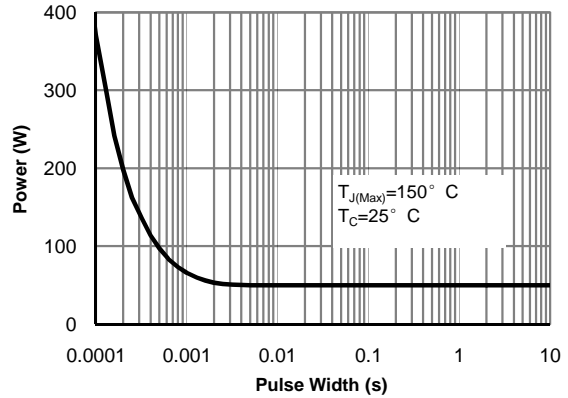
**Figure 7: Gate-Charge Characteristics**



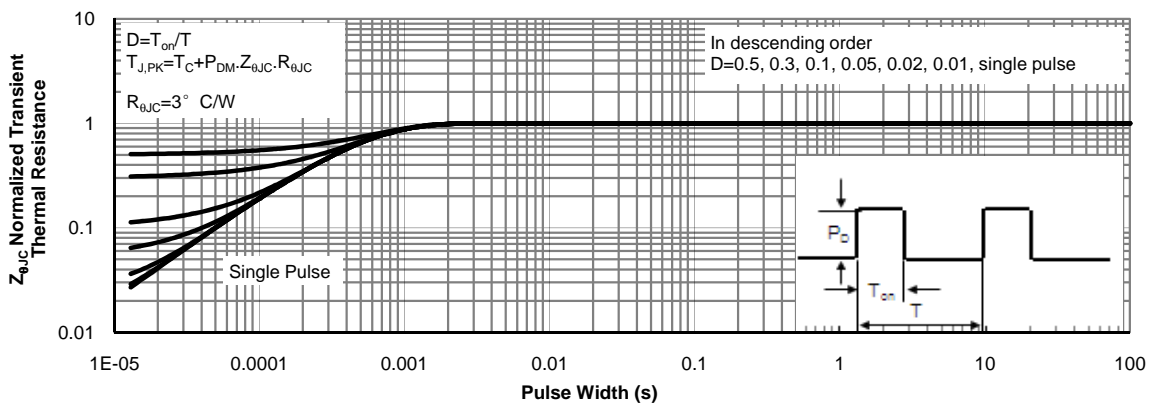
**Figure 8: Capacitance Characteristics**



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**



**Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)**



**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

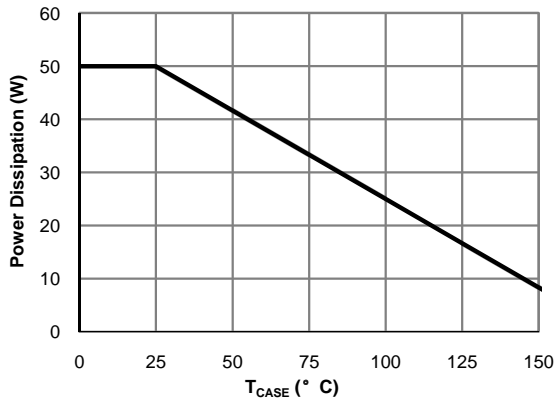


Figure 12: Power De-rating (Note F)

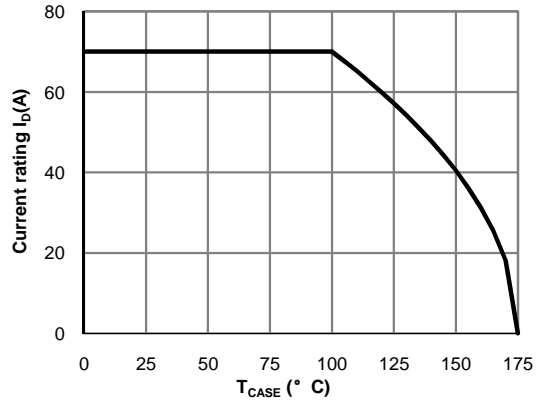


Figure 13: Current De-rating (Note F)

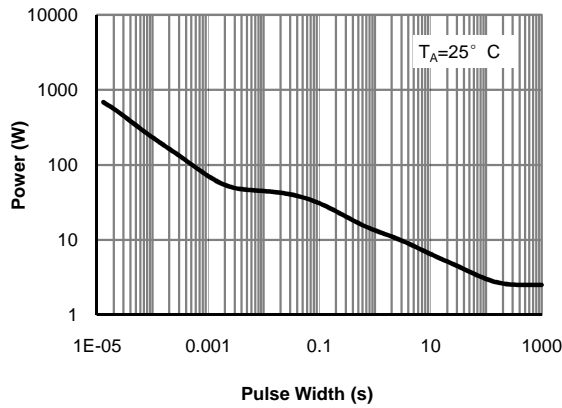


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

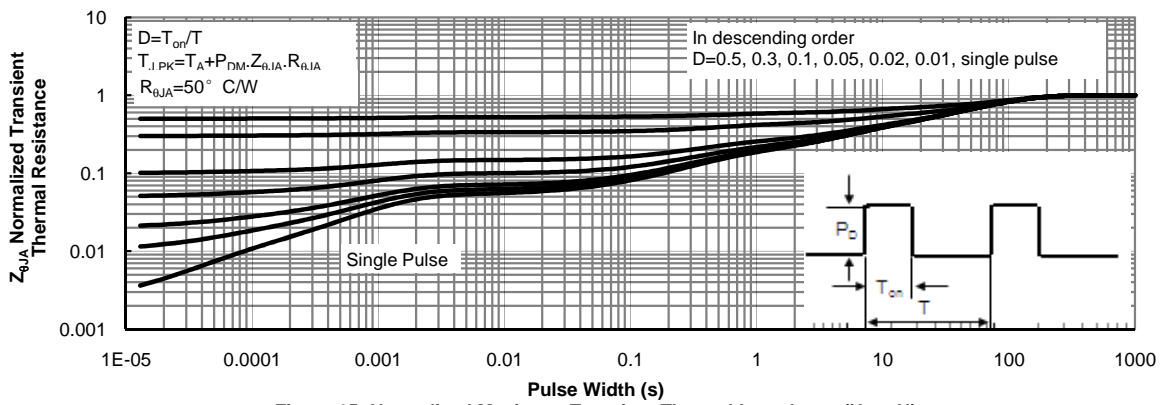
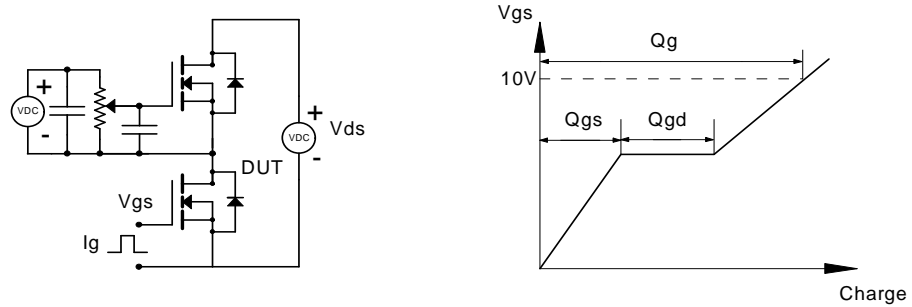
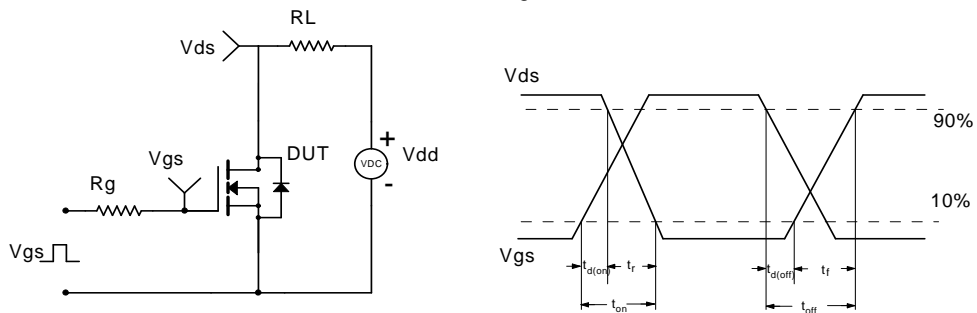


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

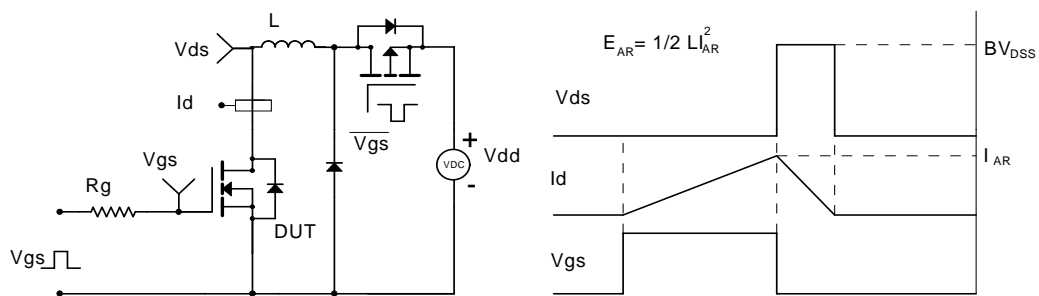
### Gate Charge Test Circuit & Waveform



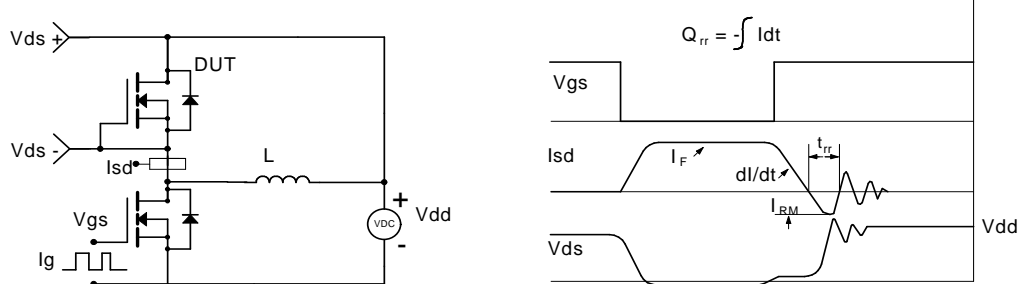
### Resistive Switching Test Circuit & Waveforms



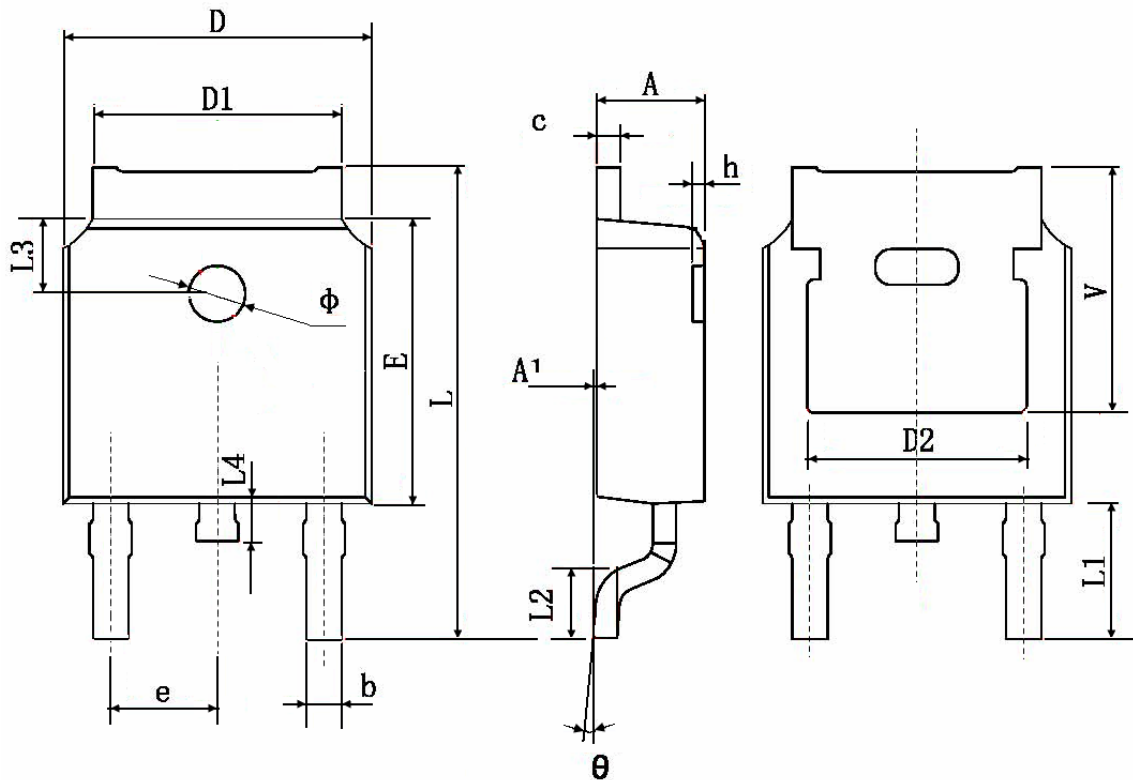
### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms



## TO-252 Package Information



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
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	