
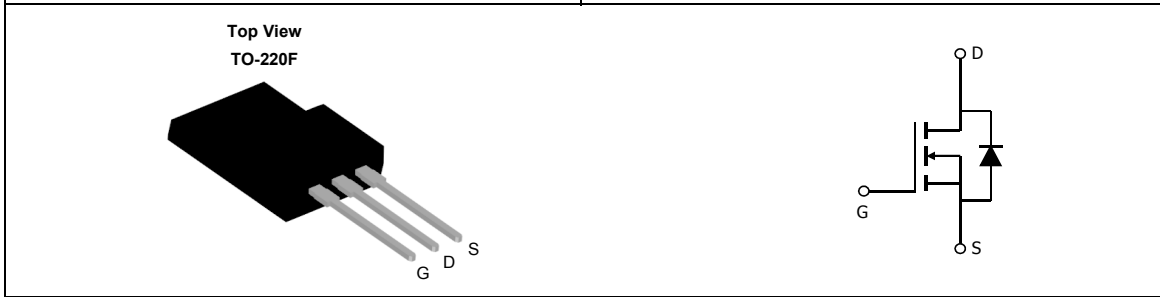


TMTF2N60 N-CHANNEL POWER MOSFET

<p>General Description</p> <p>The TMTF2N60 have been fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications. By providing low $R_{DS(on)}$, C_{iss} and C_{rss} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.</p>	<p>Product Summary</p> <table border="0"> <tr> <td>V_{DS}</td> <td>600V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>2A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 4.4 Ω</td> </tr> </table> <p>100% UIS Tested! 100% R_g Tested!</p> 	V_{DS}	600V	I_D (at $V_{GS}=10V$)	2A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 4.4 Ω
V_{DS}	600V						
I_D (at $V_{GS}=10V$)	2A						
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 4.4 Ω						



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current ^B	I_D	$T_C=25^\circ C$	2
		$T_C=100^\circ C$	1.4
Pulsed Drain Current ^C	I_{DM}	8	A
Avalanche Current ^C	I_{AR}	2	A
Repetitive avalanche energy ^C	E_{AR}	60	mJ
Single pulsed avalanche energy ^H	E_{AS}	120	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation ^B	P_D	$T_C=25^\circ C$	56.8
		Derate above $25^\circ C$	0.45
Junction and Storage Temperature Range	T_J, T_{STG}	-50 to 150	$^\circ C$
Maximum lead temperature for soldering purpose. 1/8" from case for 5 seconds	T_L	300	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient ^{A,G}	$R_{\theta JA}$	45	55	$^\circ C/W$
Maximum Case-to-sink ^A	$R_{\theta CS}$	-	0.5	$^\circ C/W$
Maximum Junction-to-Case ^{D,F}	$R_{\theta JC}$	1.8	2.2	$^\circ C/W$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V, T _J =25°C	600			V
BV _{DSS} /ΔT _J	Zero Gate Voltage Drain Current	I _D =250μA, V _{GS} =0V		0.56		V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =600V, V _{GS} =0V			1	μA
		V _{DS} =480V, T _J =125°C			10	
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±30V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =5V, I _D =250μA	3	4	4.5	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =1A		3.6	4.4	Ω
g _{FS}	Forward Transconductance	V _{DS} =40V, I _D =1A		3.5		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.79	1	V
I _S	Maximum Body-Diode Continuous Current				2	A
I _{SM}	Maximum Body-Diode Pulsed Current				8	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, f=1MHz	215	270	325	pF
C _{oss}	Output Capacitance		23	29	35	pF
C _{riss}	Reverse Transfer Capacitance		2.2	2.8	3.4	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	3.5	4.4	6.6	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =480V, I _D =2A		9.5	11	nC
Q _{gs}	Gate Source Charge		1.9	2	nC	
Q _{gd}	Gate Drain Charge		4.7	6	nC	
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =300V, I _D =2A, R _G =25Ω		17.2	21	ns
t _r	Turn-On Rise Time		14.3	17	ns	
t _{D(off)}	Turn-Off DelayTime		27	32	ns	
t _f	Turn-Off Fall Time		17	20	ns	
t _{rr}	Body Diode Reverse Recovery Time		I _F =2A, dI/dt=100A/μs, V _{DS} =100V		154	185
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =2A, dI/dt=100A/μs, V _{DS} =100V		0.8	0.96	μC

A. The value of R_{θJA} is measured with the device in a still air environment with T_A=25° C.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C in a TO252 package, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs 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_{J(MAX)}=150° C.

G. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

H. L=60mH, I_{AS}=2A, V_{DD}=150V, R_G=10Ω, Starting T_J=25° C

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

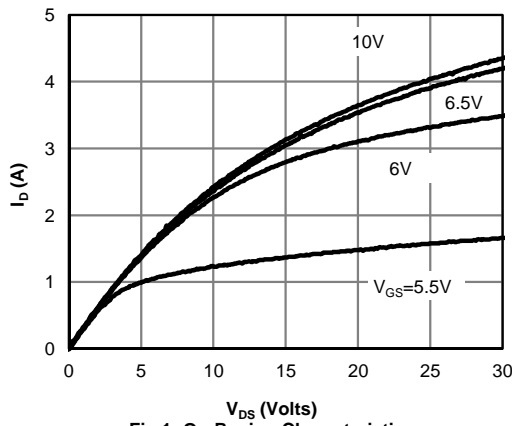


Fig 1: On-Region Characteristics

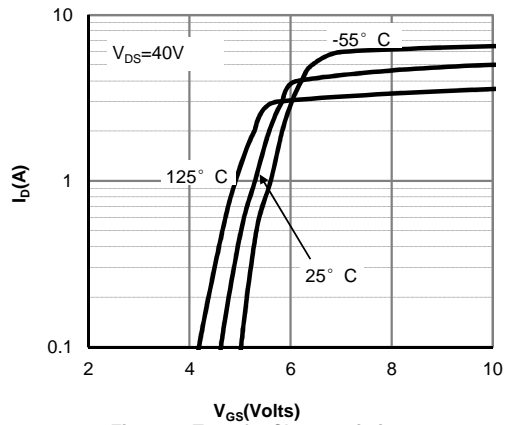


Figure 2: Transfer Characteristics

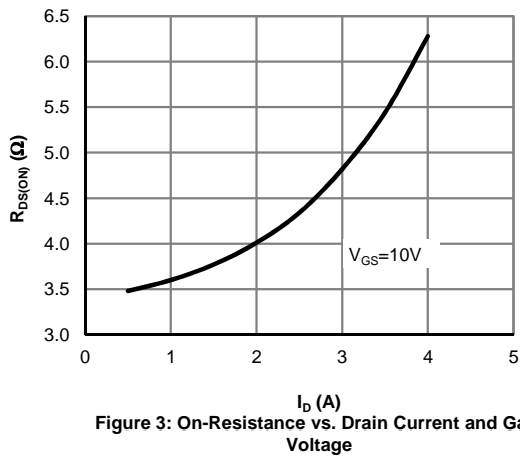


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

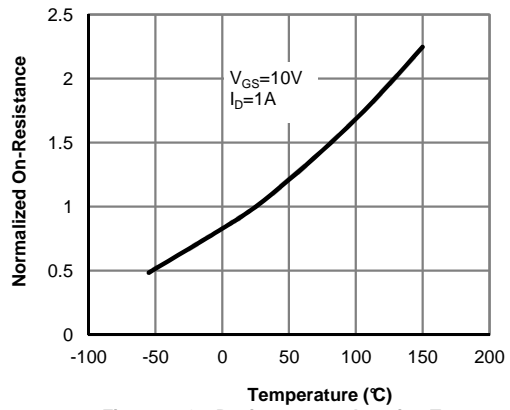


Figure 4: On-Resistance vs. Junction Temperature

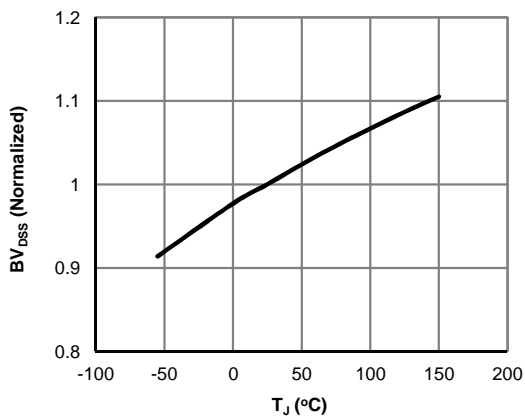


Figure 5: Break Down vs. Junction Temperature

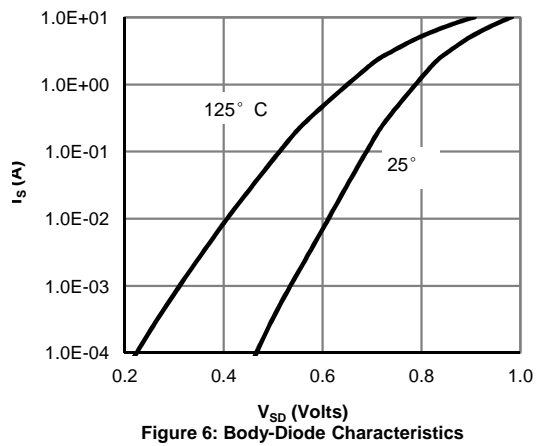


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

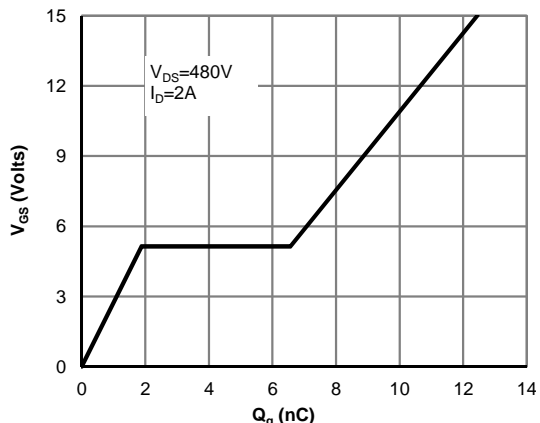


Figure 7: Gate-Charge Characteristics

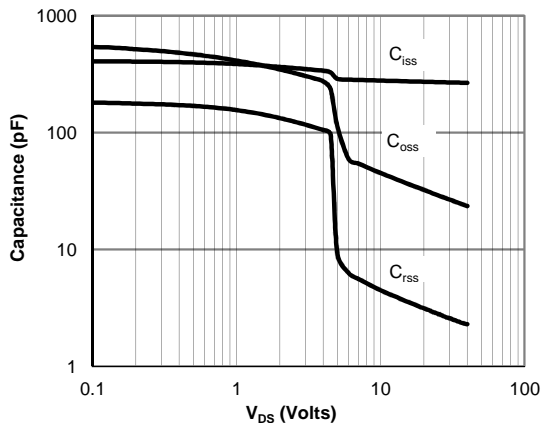


Figure 8: Capacitance Characteristics

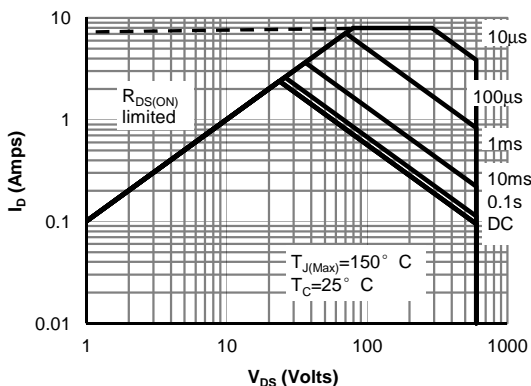


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

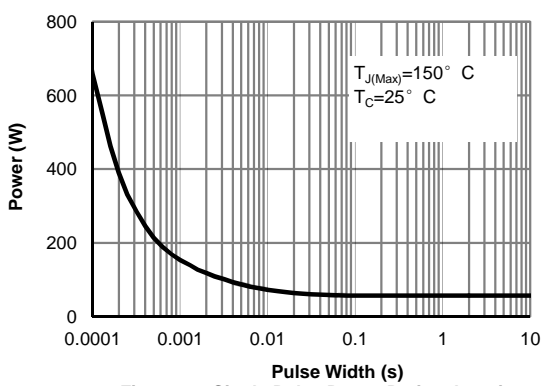


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

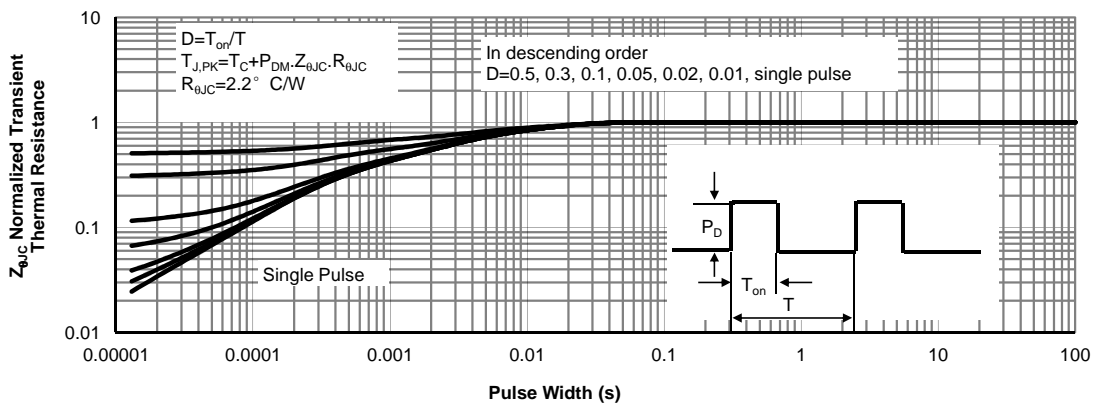


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

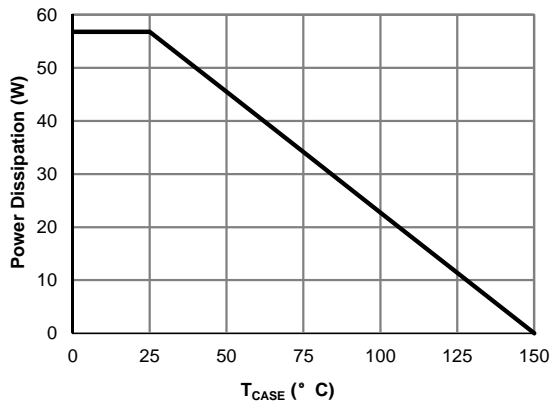


Figure 12: Power De-rating (Note B)

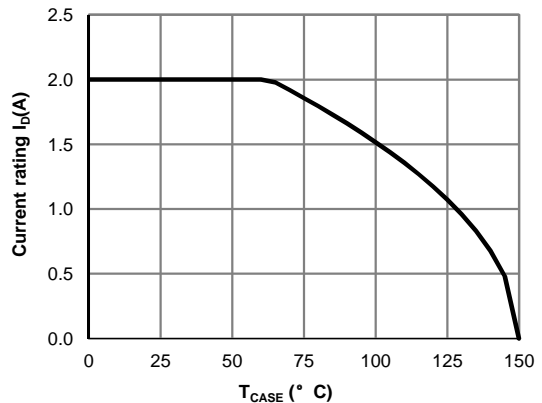


Figure 13: Current De-rating (Note B)

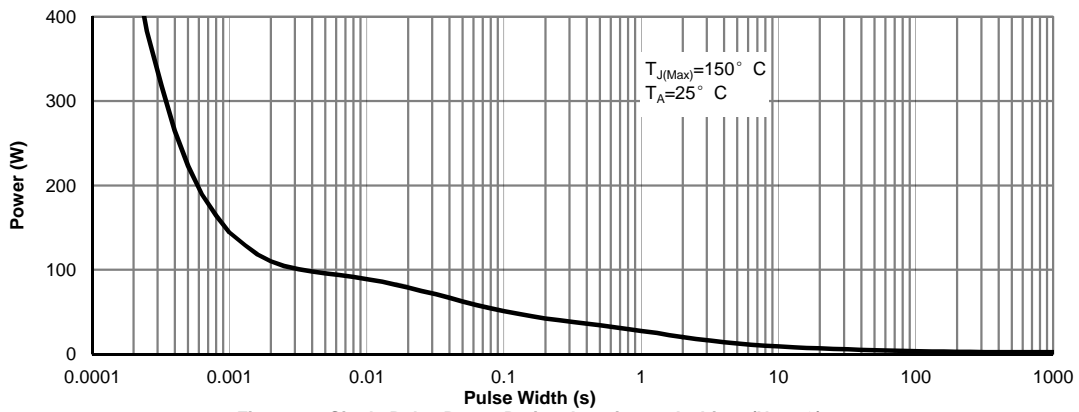


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

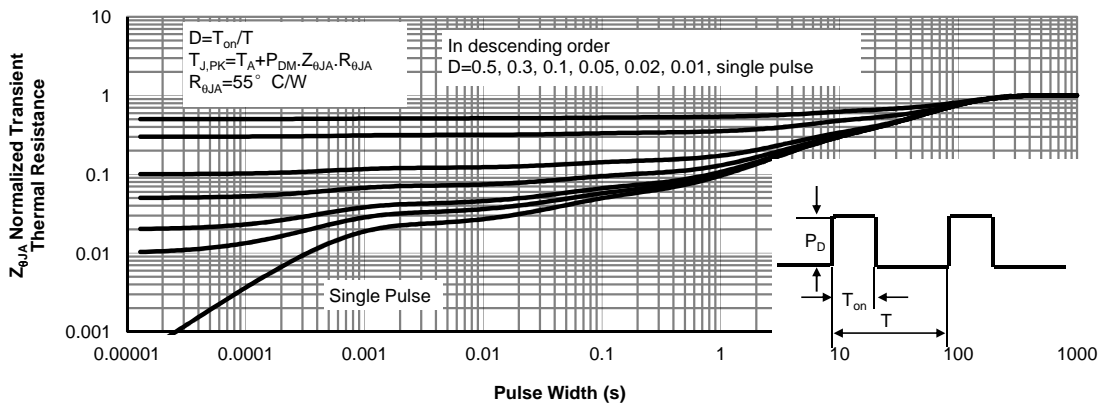
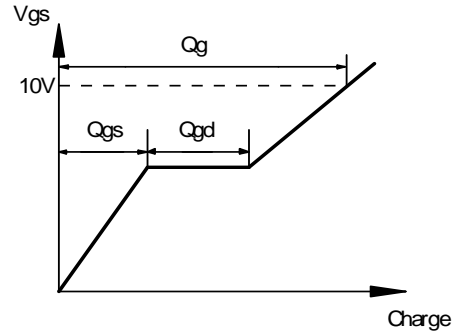
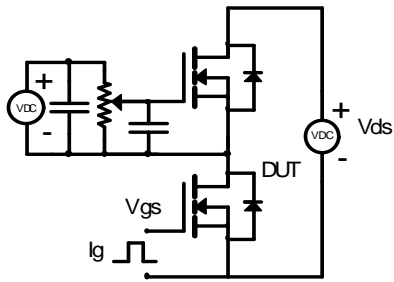
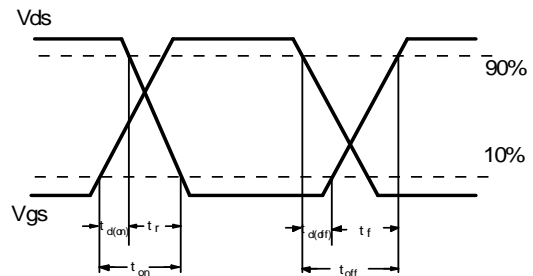
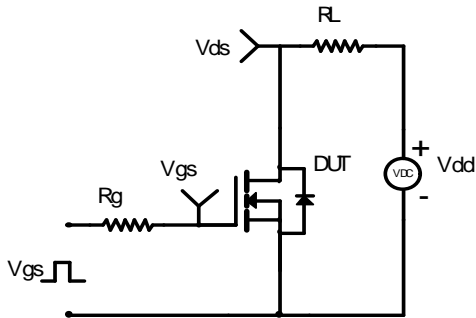


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

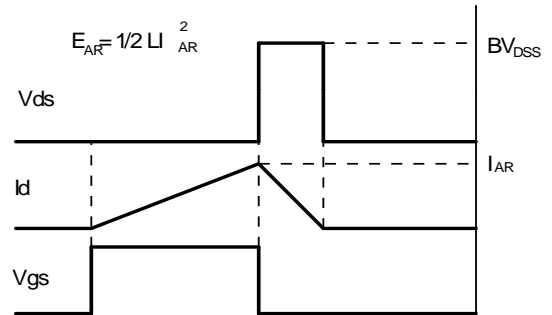
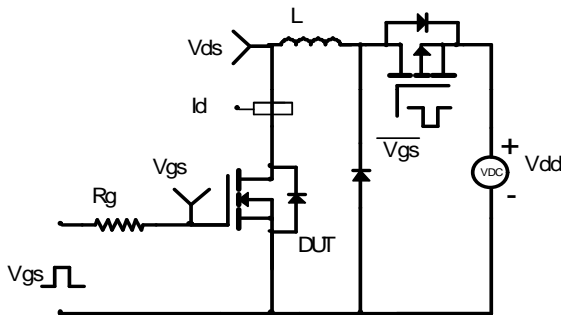
Gate Charge Test Circuit & Waveform



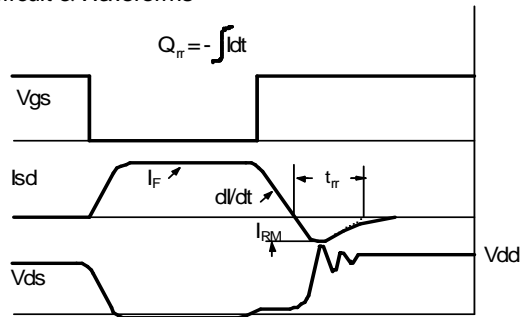
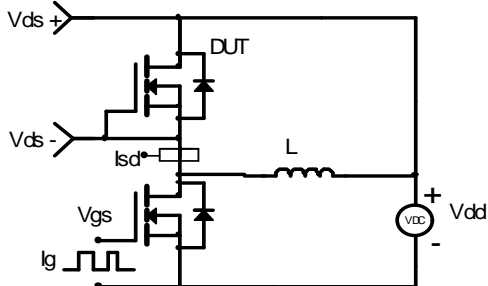
Resistive Switching Test Circuit & Waveforms



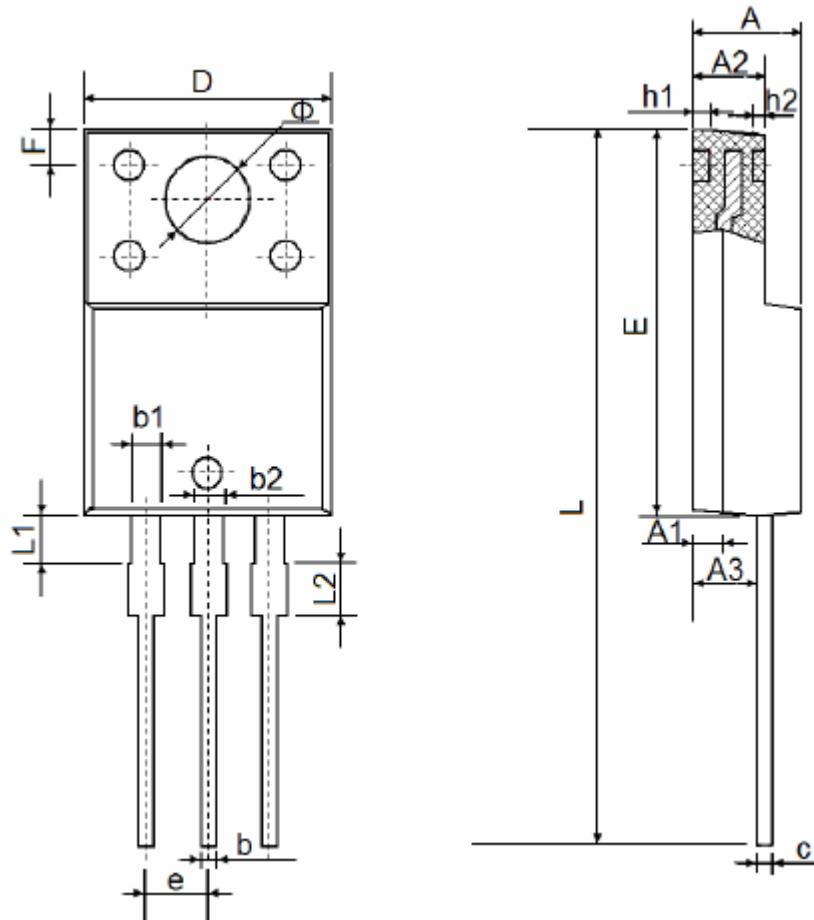
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



TO-220F Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	1.300REF		0.051REF	
A2	2.800	3.200	0.110	0.126
A3	2.500	2.900	0.098	0.114
b	0.500	0.750	0.020	0.030
b1	1.100	1.350	0.043	0.053
b2	1.500	1.750	0.059	0.069
c	0.500	0.750	0.020	0.030
D	9.960	10.360	0.392	0.408
E	14.800	15.200	0.583	0.598
e	2.540TYP.		0.100TYP	
F	2.700REF		0.106REF	
Φ	3.500REF		0.138REF	
h1	0.800REF		0.031REF	
h2	0.500REF		0.020REF	
L	28.000	28.400	1.102	1.118
L1	1.700	1.900	0.067	0.075
L2	1.900	2.100	0.075	0.083