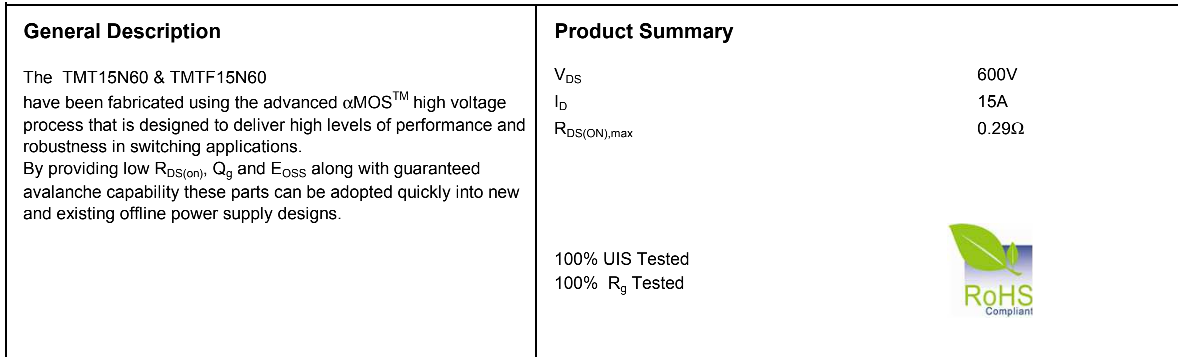
TMT15N60 / TMTF15N60
N-CHANNEL POWER MOSFET



General Description

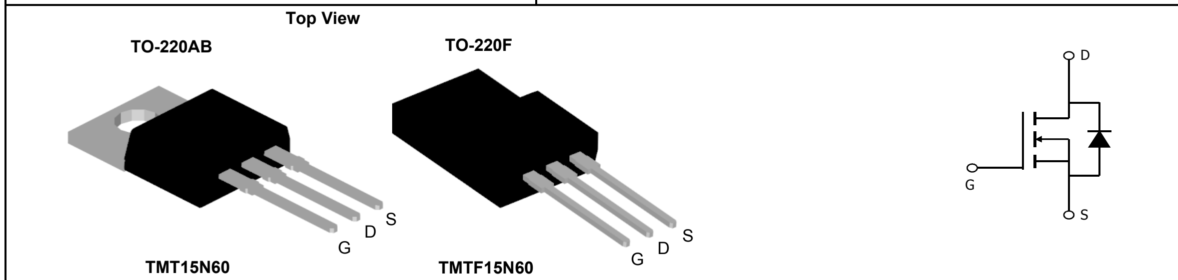
The TMT15N60 & TMTF15N60 have been fabricated using the advanced αMOS™ high voltage process that is designed to deliver high levels of performance and robustness in switching applications.
By providing low $R_{DS(on)}$, Q_g and E_{OSS} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

Product Summary

V_{DS}	600V
I_D	15A
$R_{DS(ON),max}$	0.29Ω

100% UIS Tested
100% R_g Tested

Top View



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	TMT15N60	TMTF15N60	Units
Drain-Source Voltage		V_{DS}	600		V
Gate-Source Voltage		V_{GS}	±30		V
Continuous Drain Current	T_C=25°C	I_D	15	15*	A
	T_C=100°C		10	10*	
Pulsed Drain Current [C]		I_{DM}	63		
Avalanche Current [C]		I_{AR}	2.4		A
Repetitive avalanche energy [C]		E_{AR}	86		mJ
Single pulsed avalanche energy [G]		E_{AS}	173		mJ
Power Dissipation [B]	T_C=25°C	P_D	208	70	W
	Derate above 25°C		1.67	0.22	W/ °C
MOSFET dv/dt ruggedness		dv/dt	100		V/ns
Peak diode recovery dv/dt [H]			20		
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds [J]		T_L	300		°C

Thermal Characteristics

Parameter	Symbol	TMT15N60	TMTF15N60	Units
Maximum Junction-to-Ambient [A,D]	$R_{θJA}$	65	65	°C/W
Maximum Case-to-sink [A]	$R_{θCS}$	0.5	--	°C/W
Maximum Junction-to-Case	$R_{θJC}$	0.6	4.5	°C/W

* Drain current limited by maximum junction temperature.

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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
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=600V, V_{GS}=0V	-	-	1	µA
		V_{DS}=480V, T_J=150°C	-	10	-	µA
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	2.5	3.2	3.8	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=7.5A, T_J=25°C	-	0.254	0.29	Ω
		V_{GS}=10V, I_D=7.5A, T_J=150°C	-	0.68	0.78	Ω
V_{SD}	Diode Forward Voltage	I_S=7.5A,V_{GS}=0V, T_J=25°C	-	0.83	-	V
I_S	Maximum Body-Diode Continuous Current		-	-	15	A
I_{SM}	Maximum Body-Diode Pulsed Current[C]		-	-	63	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz	-	717	-	pF
C_{oss}	Output Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz	-	58	-	pF
$C_{o(er)}$	Effective output capacitance, energy related [H]	V_{GS}=0V, V_{DS}=0 to 480V, f=1MHz	-	41.2	-	pF
$C_{o(tr)}$	Effective output capacitance, time related [I]	V_{GS}=0V, V_{DS}=0 to 480V, f=1MHz	-	125.2	-	pF
C_{rss}	Reverse Transfer Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz	-	1.3	-	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	-	13.4	-	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=480V, I_D=7.5A	-	15.6	-	nC
Q_{gs}	Gate Source Charge	V_{GS}=10V, V_{DS}=480V, I_D=7.5A	-	3.5	-	nC
Q_{gd}	Gate Drain Charge	V_{GS}=10V, V_{DS}=480V, I_D=7.5A	-	6.0	-	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=400V, I_D=7.5A, R_G=25Ω	-	24.5	-	ns
t_r	Turn-On Rise Time	V_{GS}=10V, V_{DS}=400V, I_D=7.5A, R_G=25Ω	-	22	-	ns
$t_{D(off)}$	Turn-Off DelayTime	V_{GS}=10V, V_{DS}=400V, I_D=7.5A, R_G=25Ω	-	84	-	ns
t_f	Turn-Off Fall Time	V_{GS}=10V, V_{DS}=400V, I_D=7.5A, R_G=25Ω	-	24	-	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=7.5A,dI/dt=100A/µs,V_{DS}=400V	-	282	-	ns
I_{rm}	Peak Reverse Recovery Current	I_F=7.5A,dI/dt=100A/µs,V_{DS}=400V	-	26	-	A
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=7.5A,dI/dt=100A/µs,V_{DS}=400V	-	4.5	-	µC

A. The value of $R_{\theta JA}$ 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, 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, Ratings are based on low frequency and duty cycles to keep initial T_J =25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ 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. The SOA curve provides a single pulse rating.
G. L=60mH, I_{AS}=2.4A, V_{DD}=150V, Starting T_J=25° C
H. $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.
I. $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.
J. Wavesoldering only allowed at leads.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

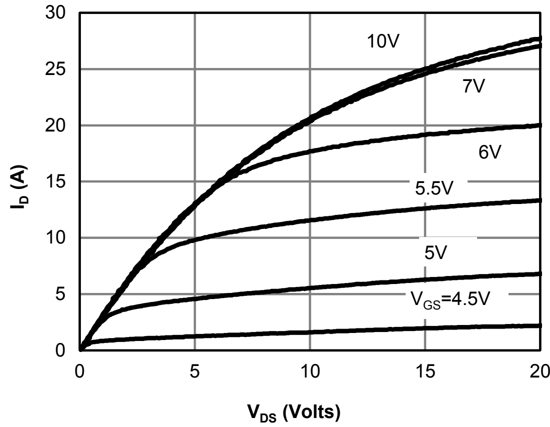

Figure 1: On-Region Characteristics@25° C

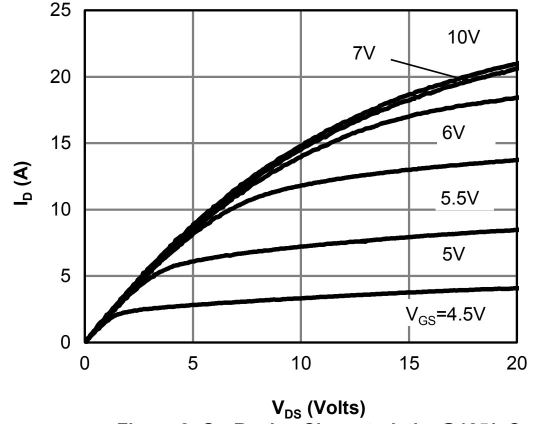

Figure 2: On-Region Characteristics@125° C

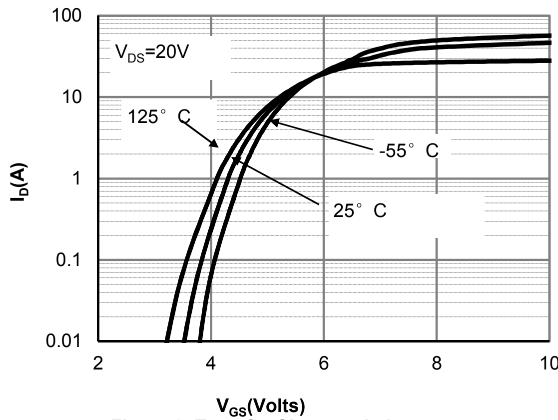

Figure 3: Transfer Characteristics

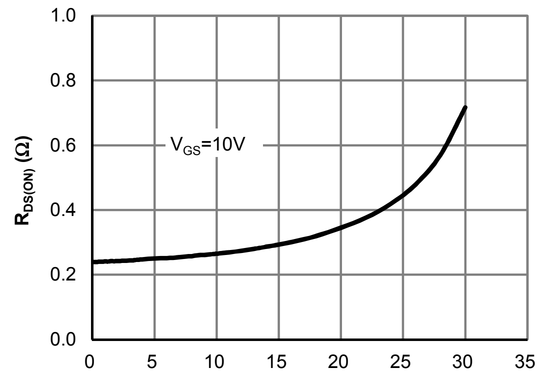

Figure 4: On-Resistance vs. Drain Current and Gate Voltage

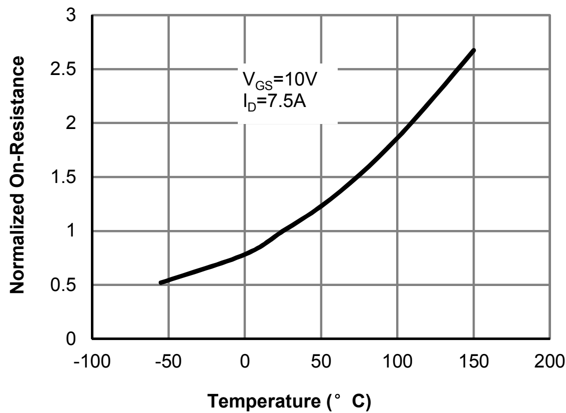

Figure 5: On-Resistance vs. Junction Temperature

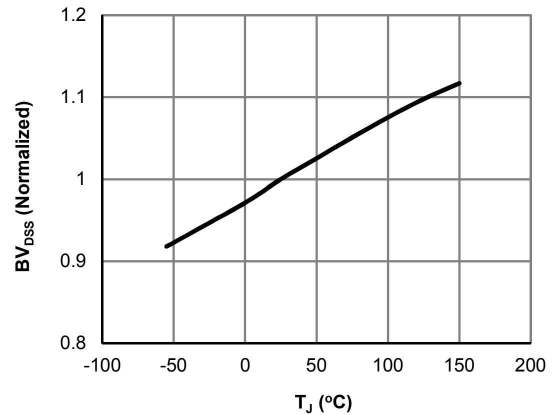

Figure 6: Break Down vs. Junction Temperature

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

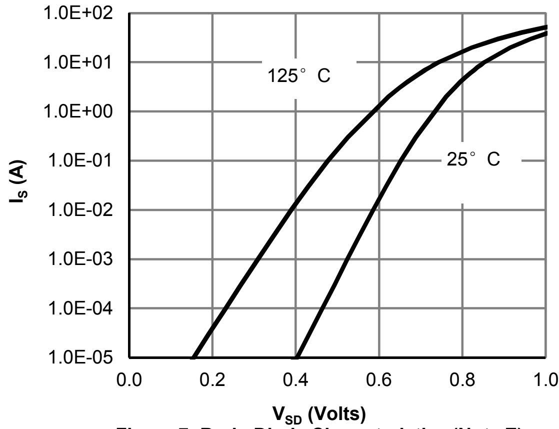

Figure 7: Body-Diode Characteristics (Note E)

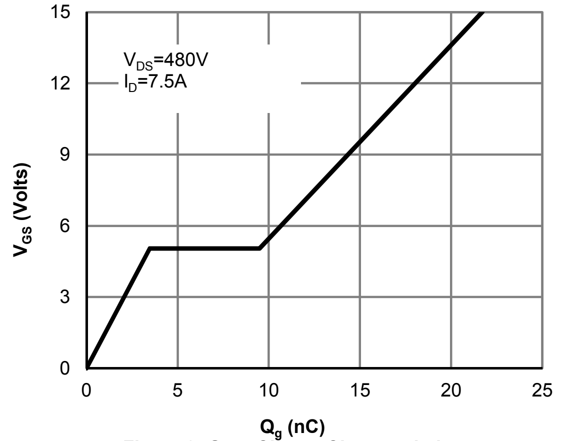

Figure 8: Gate-Charge Characteristics

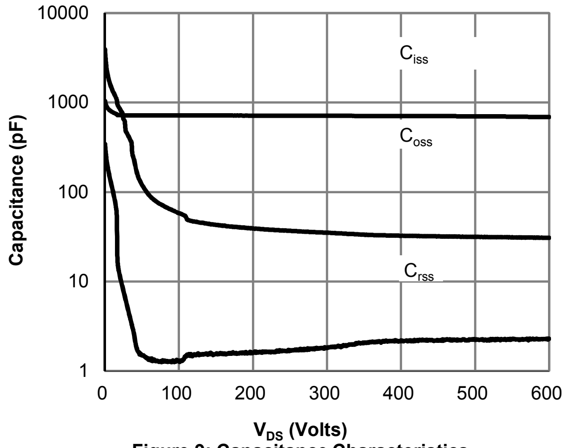

Figure 9: Capacitance Characteristics

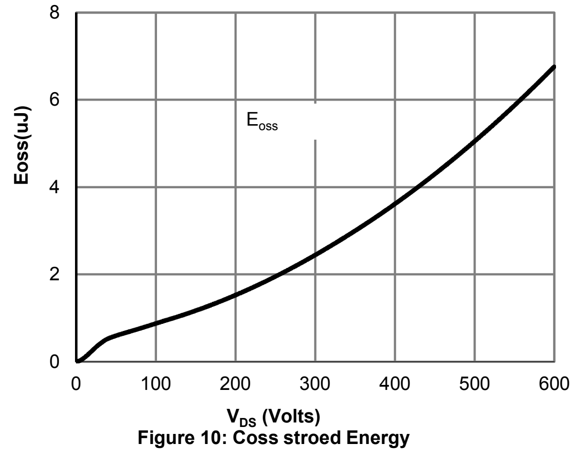

Figure 10: Coss stroed Energy

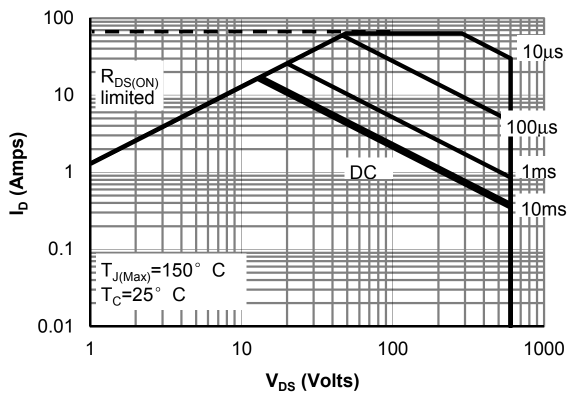

Figure 11: Maximum Forward Biased Safe Operating Area for AOT(B)15S60L (Note F)

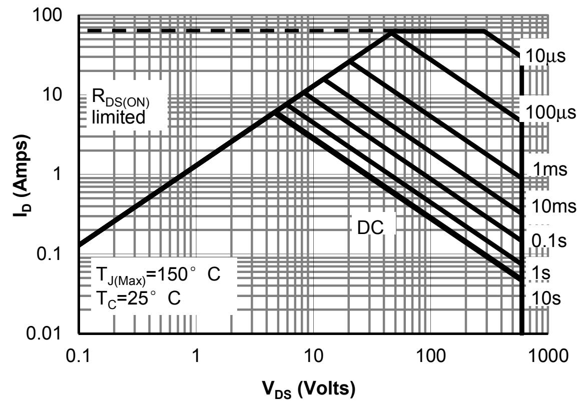

Figure 12: Maximum Forward Biased Safe Operating Area for AOTF15S60L(Note F)

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

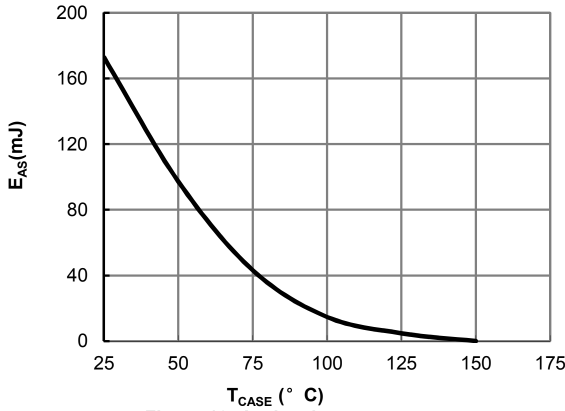

Figure 13: Avalanche energy

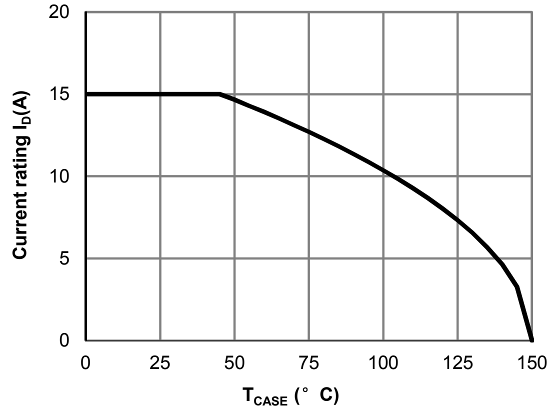

Figure 14: Current De-rating (Note B)

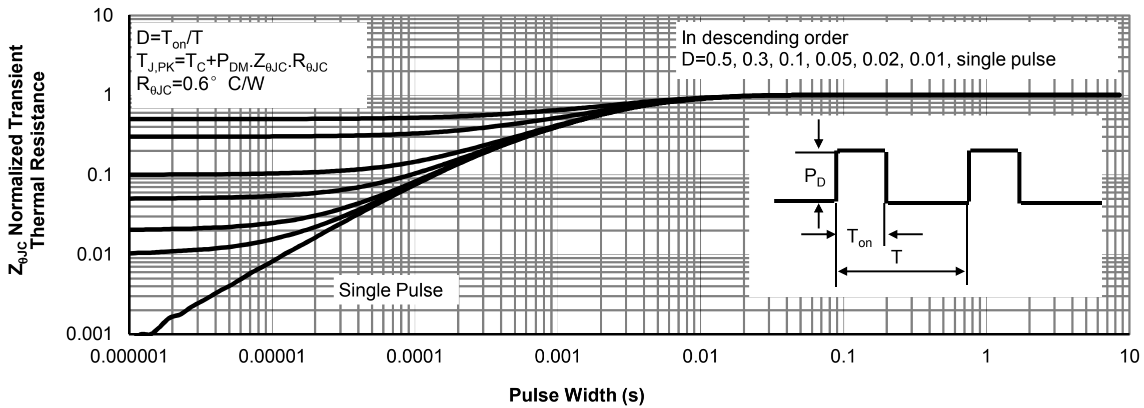

Figure 15: Normalized Maximum Transient Thermal Impedance for AOT(B)15S60 (Note F)

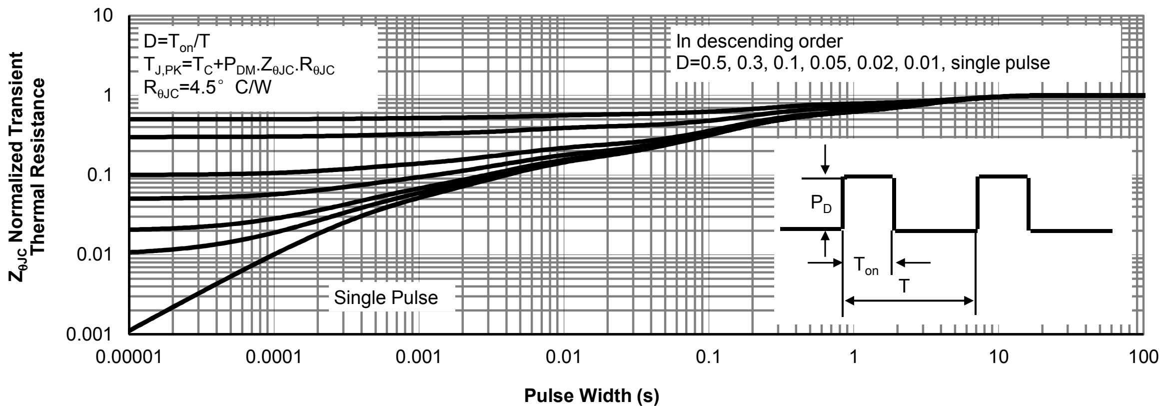

Figure 16: Normalized Maximum Transient Thermal Impedance for AOTF15S60L (Note F)

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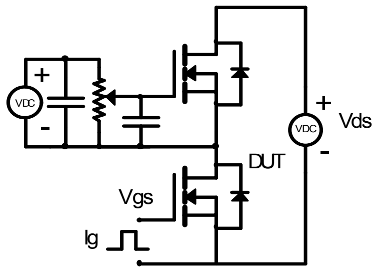
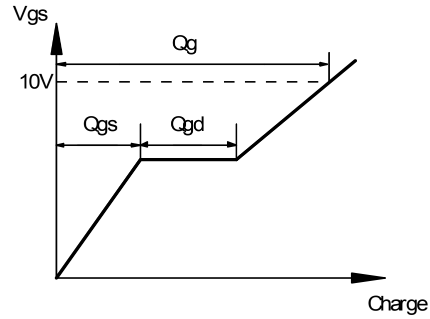
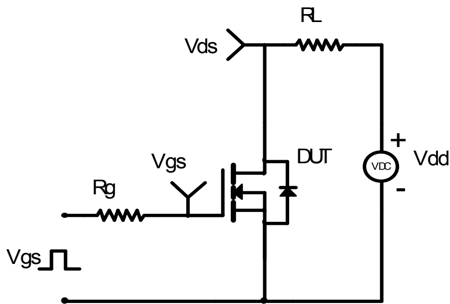
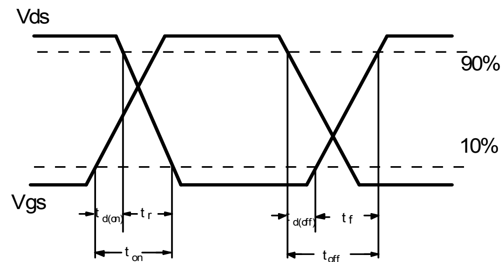
Gate Charge Test Circuit & Waveform



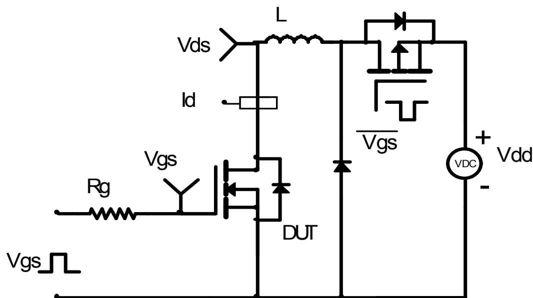


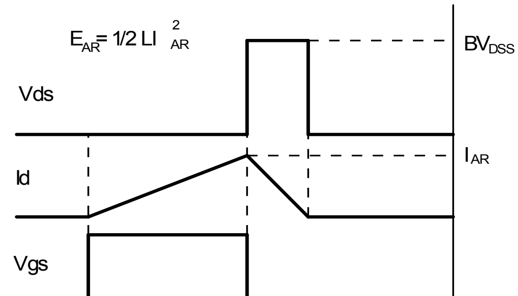
Resistive Switching Test Circuit & Waveforms



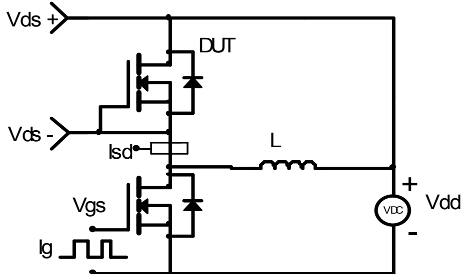


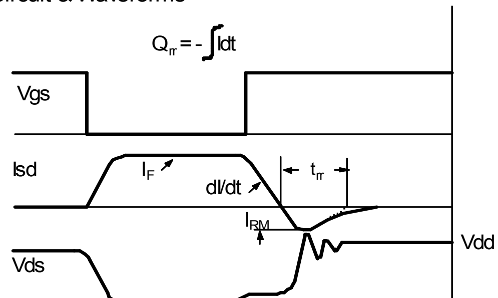
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms





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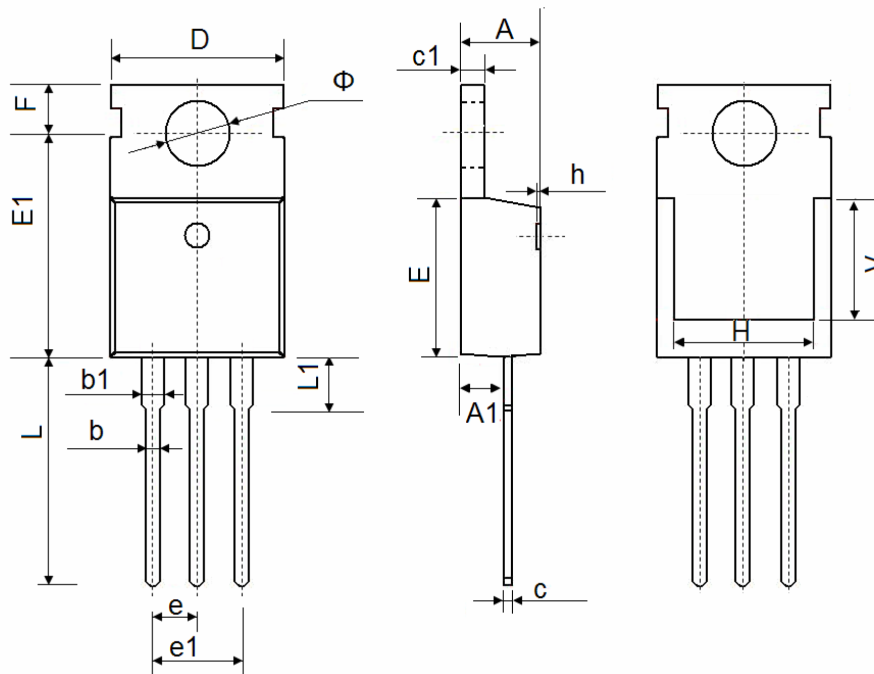
TO-220AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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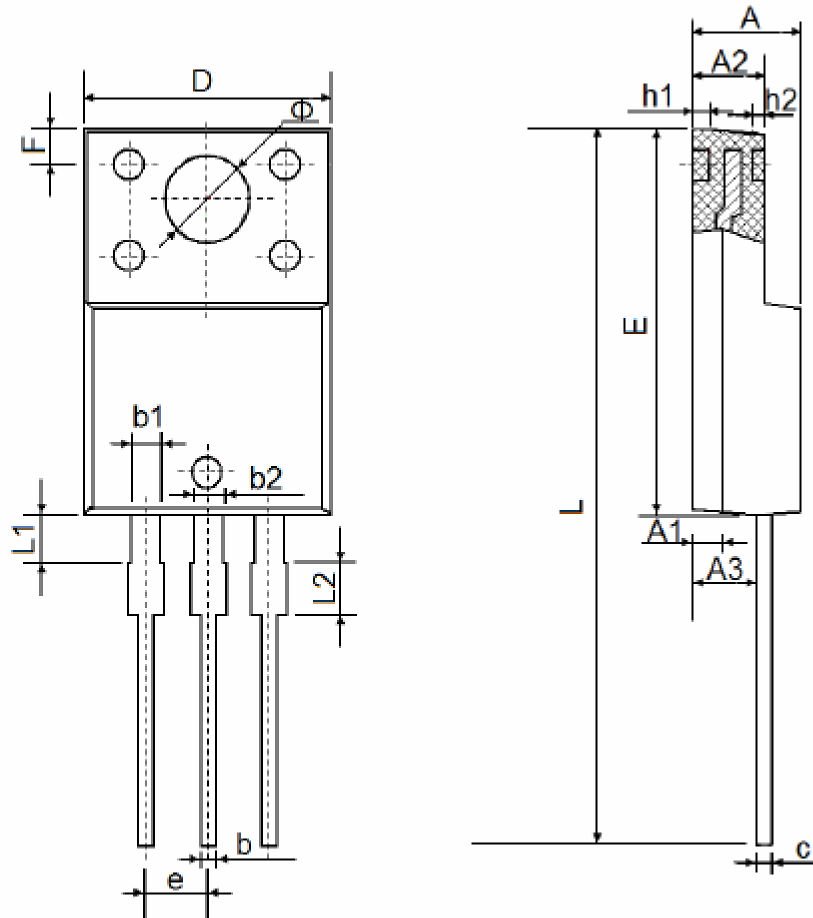
TO-220F Package Information



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

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