
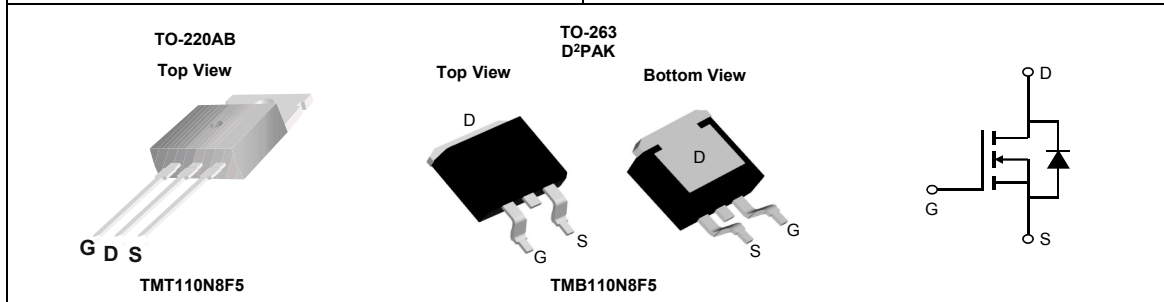


## TMT110N8F5 / TMB110N8F5 N-CHANNEL POWER MOSFET

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Trench Power AlphaSGT™ technology</li> <li>• Low <math>R_{DS(ON)}</math></li> <li>• Low Gate Charge</li> <li>• Optimized fast-switching applications</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Industrial</li> <li>• BMS battery protection</li> <li>• Synchronous Rectifiers in DC/DC and AC/DC Converters</li> </ul>	<p><b>Product Summary</b></p> <table border="0"> <tr> <td><math>V_{DS}</math></td> <td>90V</td> </tr> <tr> <td><math>I_D</math> (at <math>V_{GS}=10V</math>)</td> <td>120A</td> </tr> <tr> <td><math>R_{DS(ON)}</math> (at <math>V_{GS}=10V</math>)</td> <td>&lt; 4.2m<math>\Omega</math></td> </tr> <tr> <td><math>R_{DS(ON)}</math> (at <math>V_{GS}=6V</math>)</td> <td>&lt; 5.2m<math>\Omega</math></td> </tr> </table> <p>100% UIS Tested                  100% Rg Tested</p> 	$V_{DS}$	90V	$I_D$ (at $V_{GS}=10V$ )	120A	$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 4.2m $\Omega$	$R_{DS(ON)}$ (at $V_{GS}=6V$ )	< 5.2m $\Omega$
$V_{DS}$	90V								
$I_D$ (at $V_{GS}=10V$ )	120A								
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 4.2m $\Omega$								
$R_{DS(ON)}$ (at $V_{GS}=6V$ )	< 5.2m $\Omega$								



Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	90	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>	$I_D$	$T_C=25^\circ C$	120
		$T_C=100^\circ C$	80
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	425	A
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ C$	29
		$T_A=70^\circ C$	23
Avalanche Current <sup>C</sup>	$I_{AS}$	77	A
Avalanche energy	$E_{AS}$	296	mJ
$V_{DS}$ Spike <sup>I</sup>	$V_{SPIKE}$	120	V
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ C$	326
		$T_C=100^\circ C$	163
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ C$	8.3
		$T_A=70^\circ C$	5.3
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ C$

Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	12	15	$^\circ C/W$	
Maximum Junction-to-Ambient <sup>A,D</sup>		50	60	$^\circ C/W$	
Maximum Junction-to-Case	$R_{\theta JC}$	0.36	0.46	$^\circ C/W$	

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	90			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =90V, 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	2.3	2.75	3.3	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A T <sub>J</sub> =125°C		3.4 6.3	4.2 7.7	mΩ
		V <sub>GS</sub> =6V, I <sub>D</sub> =20A		3.9	5.2	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		90		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.68	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current <sup>G</sup>				120	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =50V, f=1MHz		7085		pF
C <sub>oss</sub>	Output Capacitance			605		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			32		pF
R <sub>g</sub>	Gate resistance	f=1MHz	0.7	1.5	2.3	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =50V, I <sub>D</sub> =20A		93	135	nC
Q <sub>gs</sub>	Gate Source Charge			23		nC
Q <sub>gd</sub>	Gate Drain Charge			16		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =50V, R <sub>L</sub> =2.5Ω, R <sub>GEN</sub> =3Ω		21		ns
t <sub>r</sub>	Turn-On Rise Time			22		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			58		ns
t <sub>f</sub>	Turn-Off Fall Time			20		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, di/dt=500A/μs		49		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, di/dt=500A/μs		460		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> t<sub>s</sub> ≤ 10s 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.

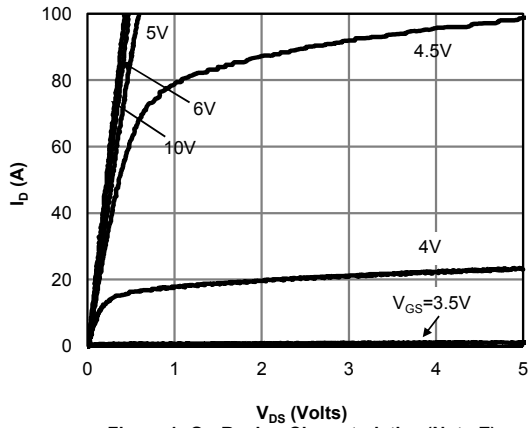
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=175° C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

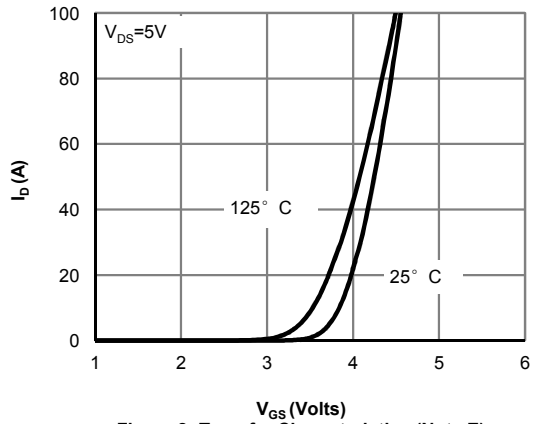
H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C.

I. The spike duty cycle 5% max, limited by junction temperature T<sub>J(MAX)</sub>=125° C.

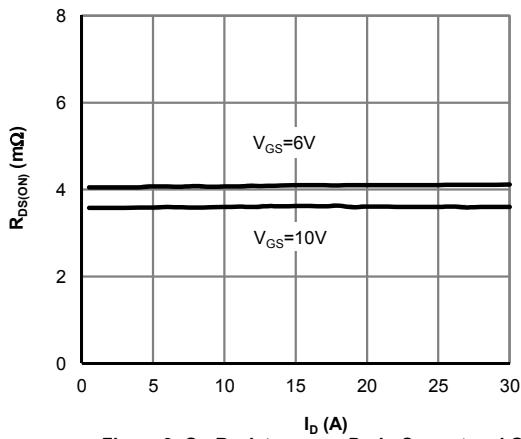
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



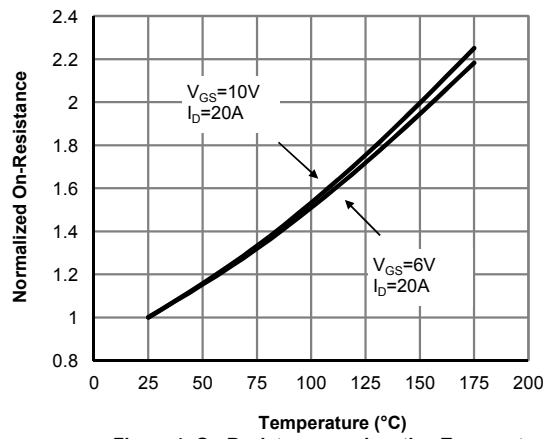
**Figure 1: On-Region Characteristics (Note E)**



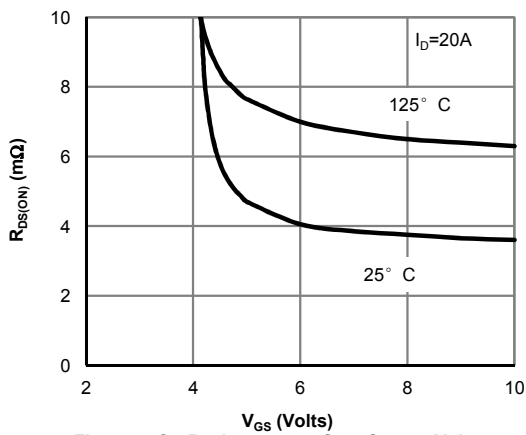
**Figure 2: Transfer Characteristics (Note E)**



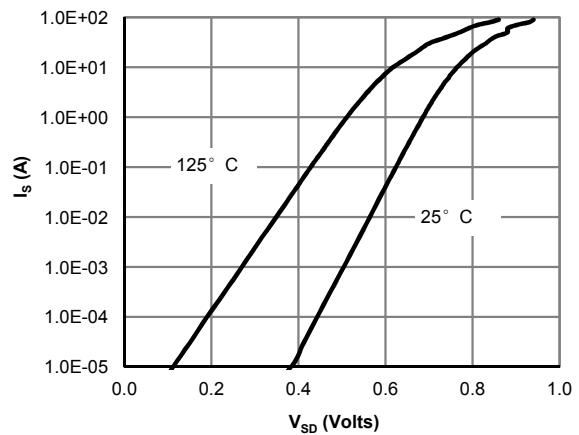
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



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

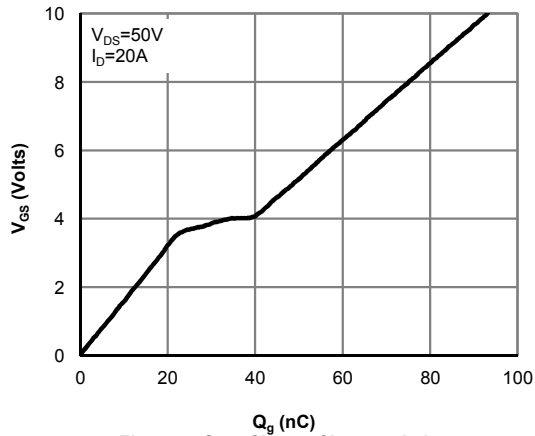


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

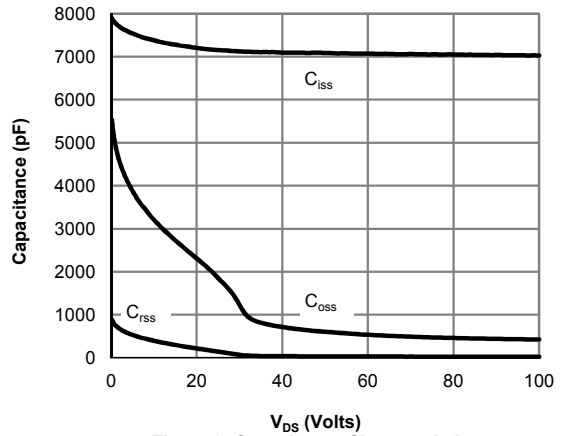


**Figure 6: Body-Diode Characteristics (Note E)**

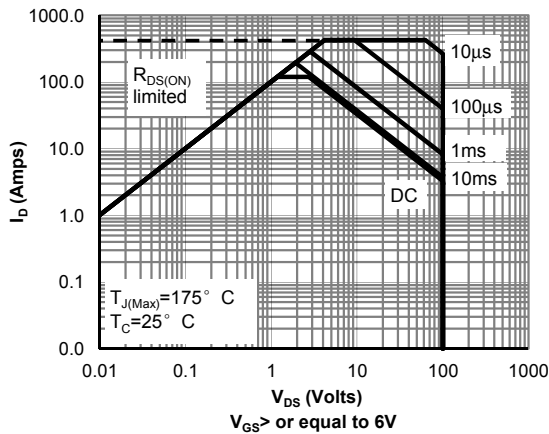
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



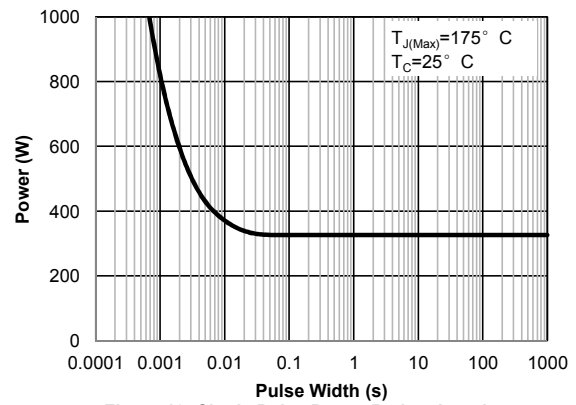
**Figure 7: Gate-Charge Characteristics**



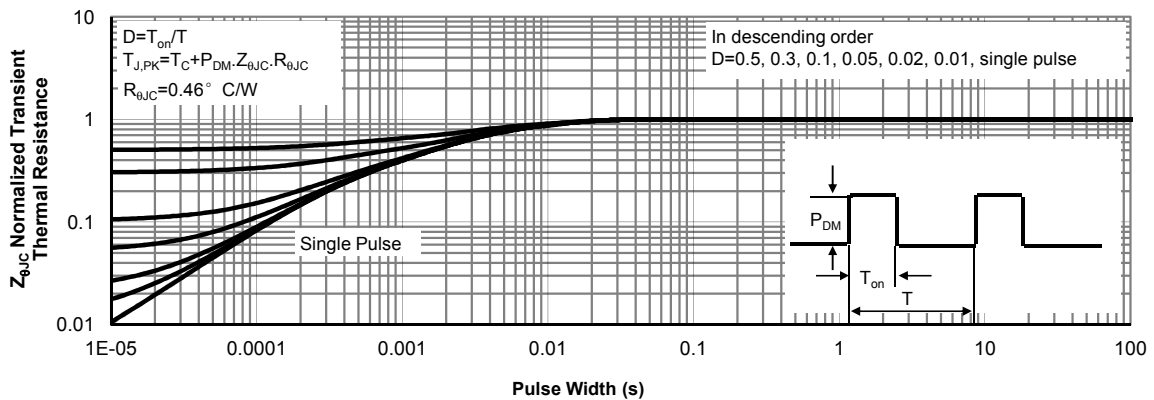
**Figure 8: Capacitance Characteristics**



**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**

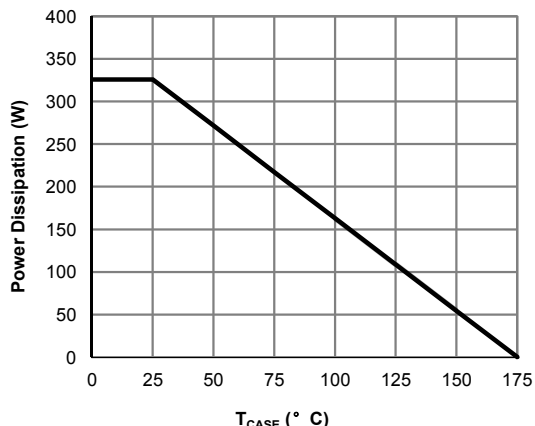


Figure 12: Power De-rating (Note F)

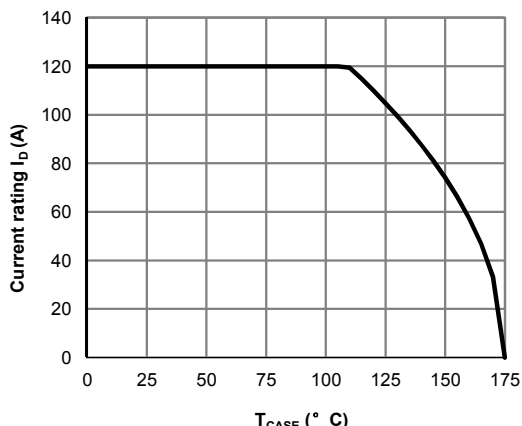


Figure 13: Current De-rating (Note F)

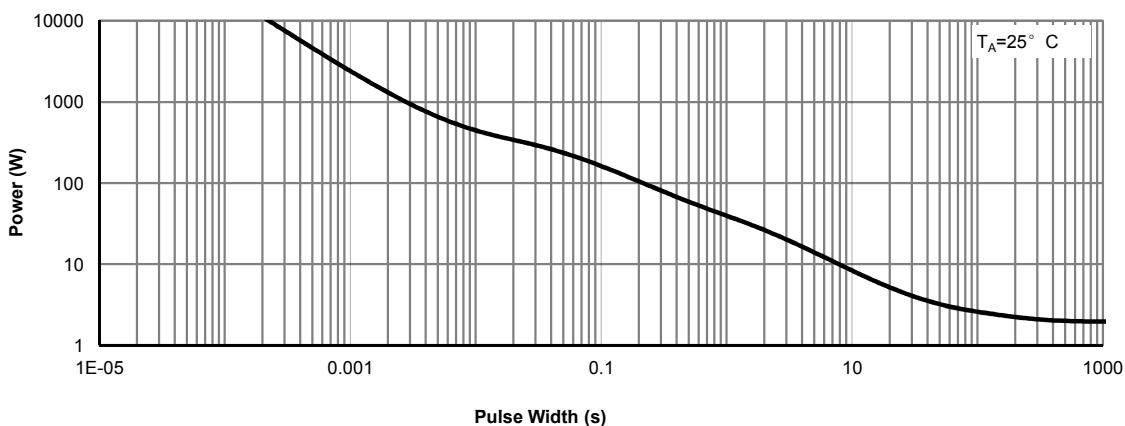


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

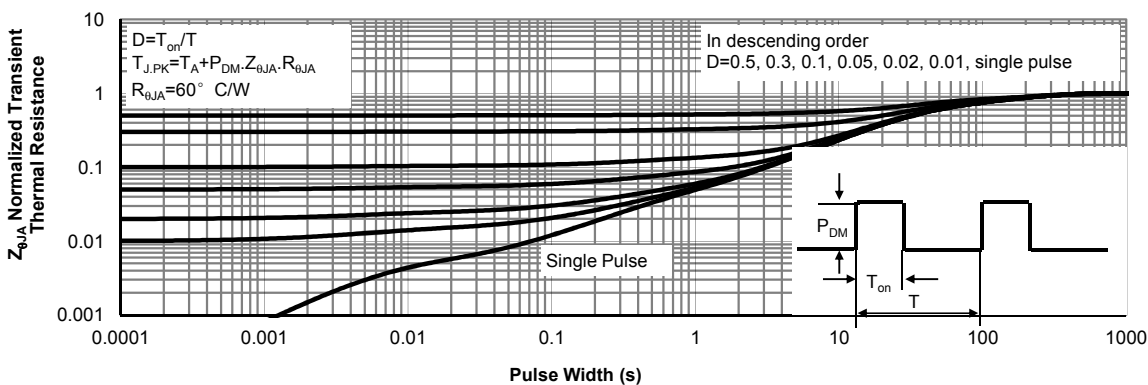


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

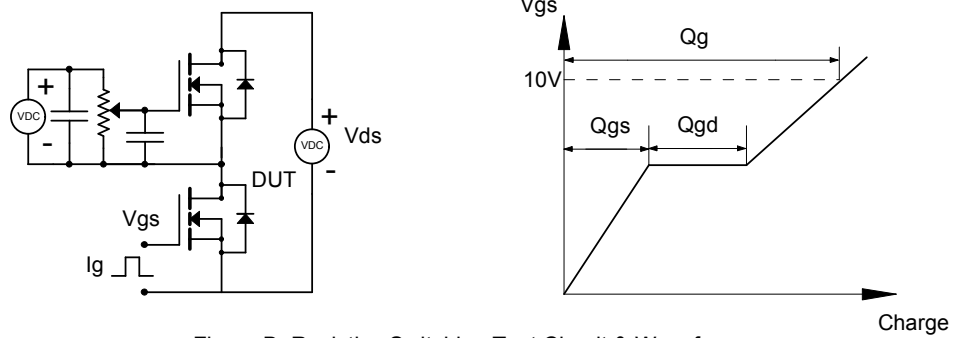


Figure B: Resistive Switching Test Circuit & Waveforms

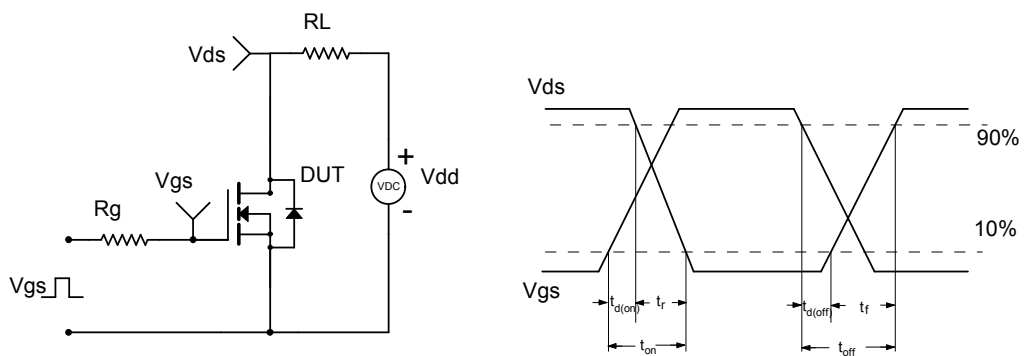


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

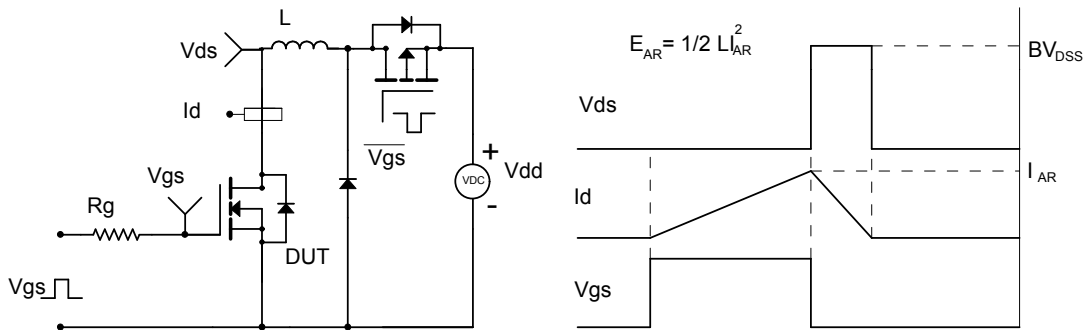
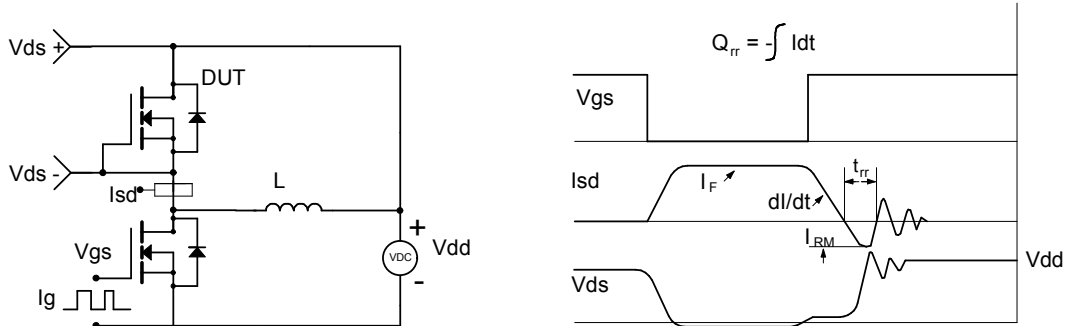
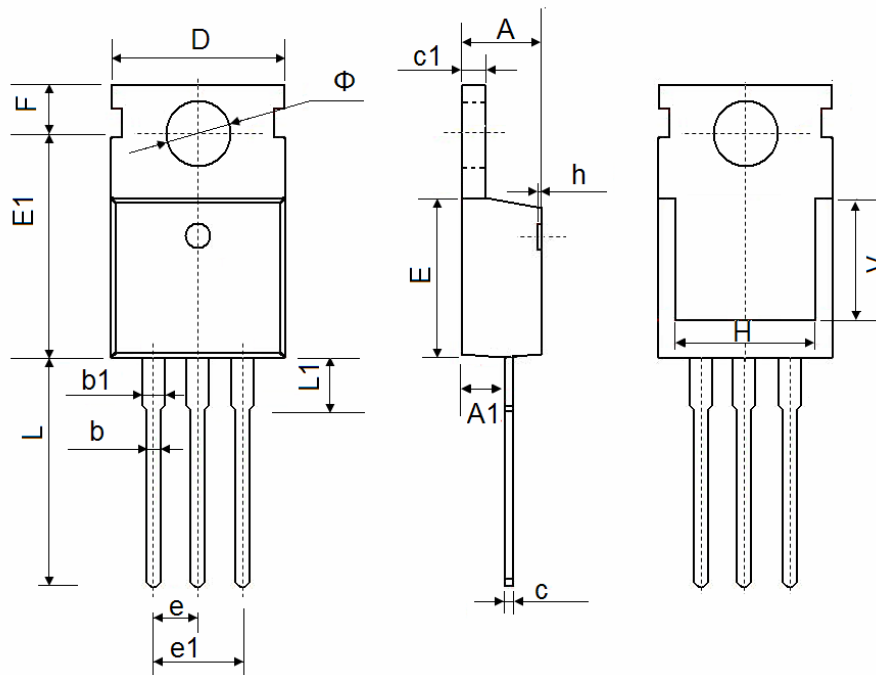


Figure D: Diode Recovery Test Circuit & Waveforms

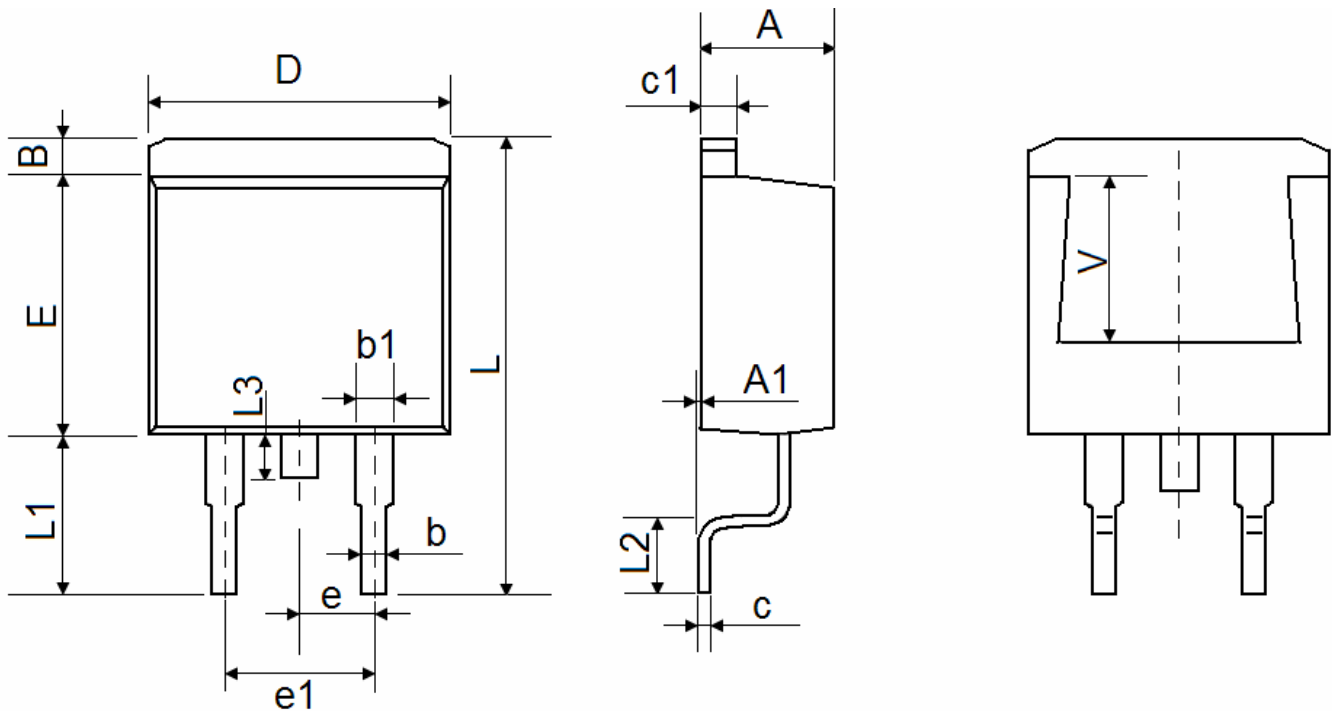


## TO-220AB Package Information



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

## TO-263 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.170	1.370	0.046	0.054
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
L	15.050	15.450	0.593	0.608
L1	5.080	5.480	0.200	0.216
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF		0.220 REF	