TMD7N65 / TMI7N65
N-CHANNEL POWER MOSFET

General Description

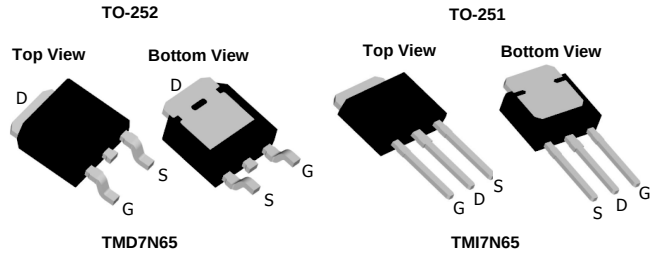
The 7N65 have been fabricated using the advanced αMOS™ high voltage process that is designed to deliver high levels of performance and robustness in switching applications. By providing low $R_{DS(on)}$, Q_g and E_{OSS} along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

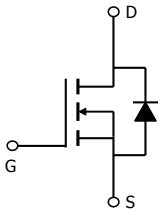
Product Summary

V_{DS}	650V
I_{DM}	30A
$R_{DS(ON),max}$	0.65Ω

100% UIS Tested
100% R_g Tested

Green Product





Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	T_C=25℃	I_D	7	A
	T_C=100℃		5	
Pulsed Drain Current [C]		I_{DM}	30	
Avalanche Current [C]		I_{AR}	1.7	A
Repetitive avalanche energy [C]		E_{AR}	43	mJ
Single pulsed avalanche energy [H]		E_{AS}	86	mJ
Power Dissipation [B]	T_C=25℃	P_D	89	W
	Derate above 25°C		0.7	W/ °C
MOSFET dv/dt ruggedness		dv/dt	100	V/ns
Peak diode recovery dv/dt			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 [K]		T_L	300	℃

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient [A,D]	$R_{\theta JA}$	45	55	℃/W
Maximum Case-to-sink [A]	$R_{\theta CS}$	--	0.5	℃/W
Maximum Junction-to-Case [D,F]	$R_{\theta JC}$	1.1	1.4	℃/W

Electrical Characteristics (T_J=25℃ 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℃	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V	-	-	1	μA
		V_{DS}=520V, T_J=150℃	-	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	2.6	3.3	4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=3.5A, T_J=25℃	-	0.54	0.65	Ω
		V_{GS}=10V, I_D=3.5A, T_J=150℃	-	1.48	1.64	Ω
V_{SD}	Diode Forward Voltage	I_S=3.5A,V_{GS}=0V, T_J=25℃	-	0.82	-	V
I_S	Maximum Body-Diode Continuous Current		-	-	7	A
I_{SM}	Maximum Body-Diode Pulsed Current[C]		-	-	30	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz	-	434	-	pF
C_{oss}	Output Capacitance		-	30	-	pF
$C_{o(er)}$	Effective output capacitance, energy related[I]	VGS=0V, V_{DS}=0 to 480V, f=1MHz	-	23	-	pF
$C_{o(tr)}$	Effective output capacitance, time related[J]		-	80	-	pF
C_{rss}	Reverse Transfer Capacitance	VGS=0V, V_{DS}=100V, f=1MHz	-	1	-	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	-	17.5	-	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=480V, I_D=3.5A	-	9.2	-	nC
Q_{gs}	Gate Source Charge		-	2.5	-	nC
Q_{gd}	Gate Drain Charge		-	2.7	-	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=400V, I_D=3.5A, R_G=25Ω	-	21	-	ns
t_r	Turn-On Rise Time		-	14	-	ns
$t_{D(off)}$	Turn-Off DelayTime		-	55	-	ns
t_f	Turn-Off Fall Time		-	15	-	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=3.5A,dI/dt=100A/μs,V_{DS}=400V	-	224	-	ns
I_{rm}	Peak Reverse Recovery Current	I_F=3.5A,dI/dt=100A/μs,V_{DS}=400V	-	19	-	A
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=3.5A,dI/dt=100A/μs,V_{DS}=400V	-	2.8	-	μC

A. The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A=25℃.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150℃, 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℃, Ratings are based on low frequency and duty cycles to keep initial T_J =25℃.

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℃. The SOA curve provides a single pulse ratin g.

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

H. L=60mH, I_{AS}=1.7A, V_{DD}=150V, Starting T_J=25℃

I. $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.

J. $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$.

K. Wave soldering only allowed at leads.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

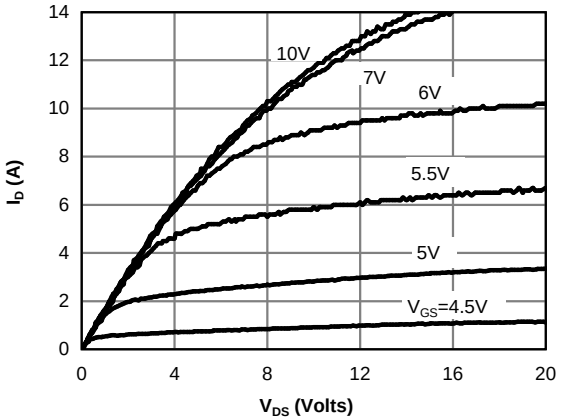


Figure 1: On-Region Characteristics@25℃

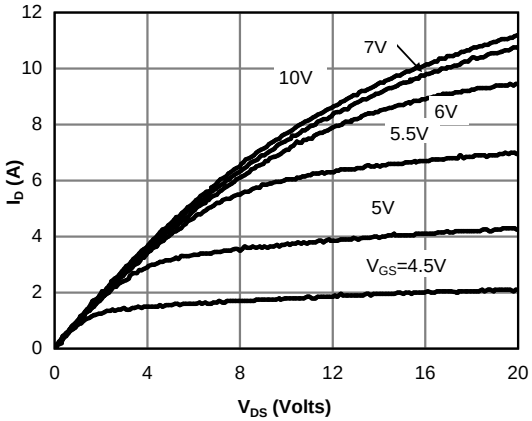


Figure 2: On-Region Characteristics@125℃

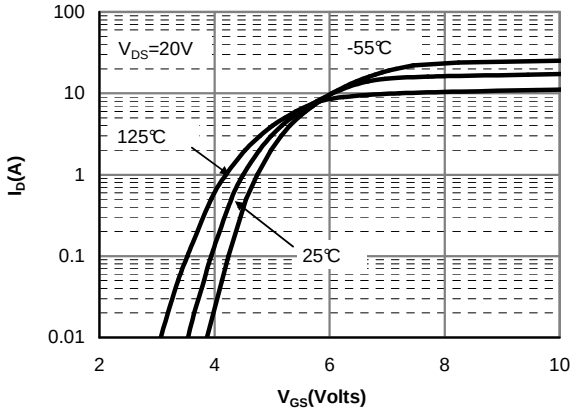


Figure 3: Transfer Characteristics

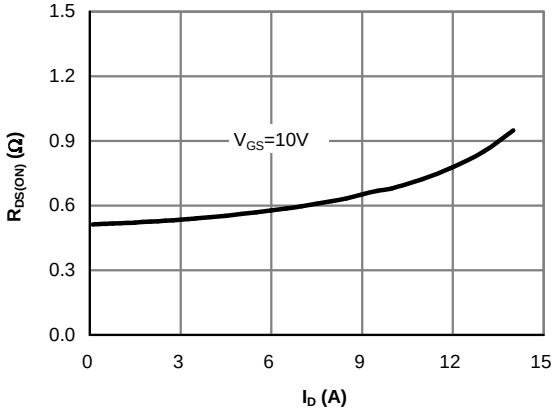


Figure 4: On-Resistance vs. Drain Current and Gate Voltage

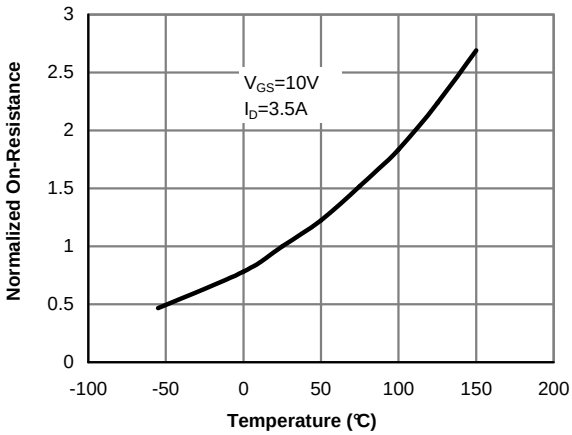


Figure 5: On-Resistance vs. Junction Temperature

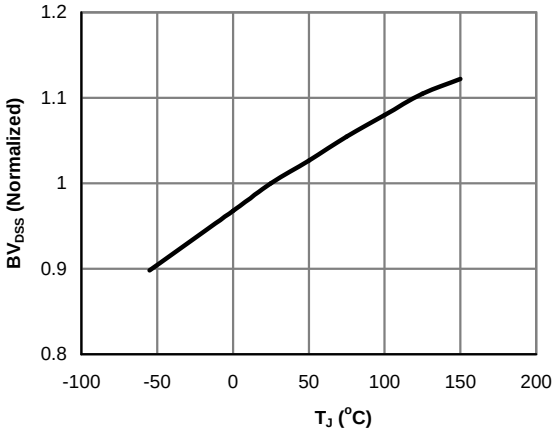


Figure 6: Break Down vs. Junction Temperature

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

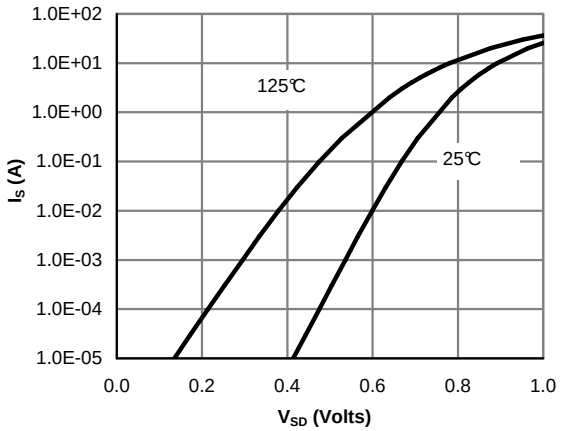


Figure 7: Body-Diode Characteristics (Note E)

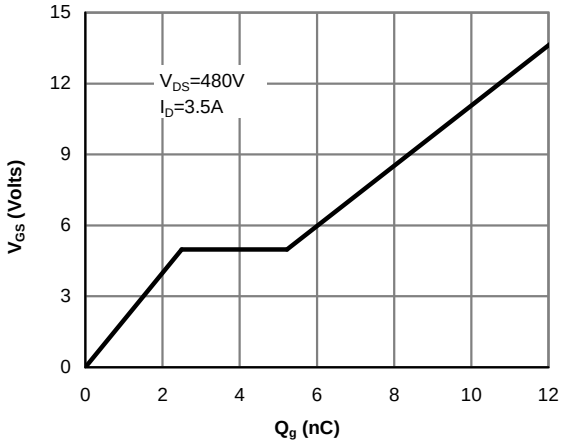


Figure 8: Gate-Charge Characteristics

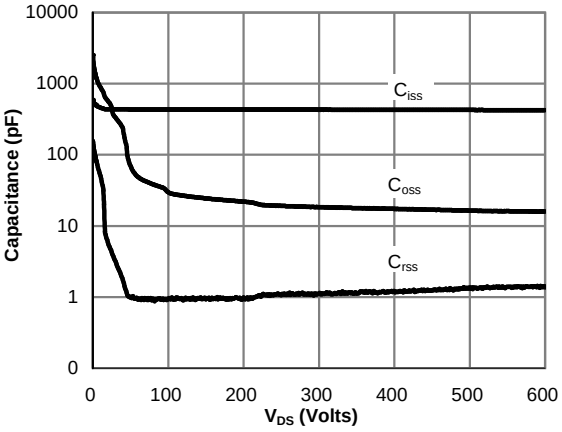


Figure 9: Capacitance Characteristics

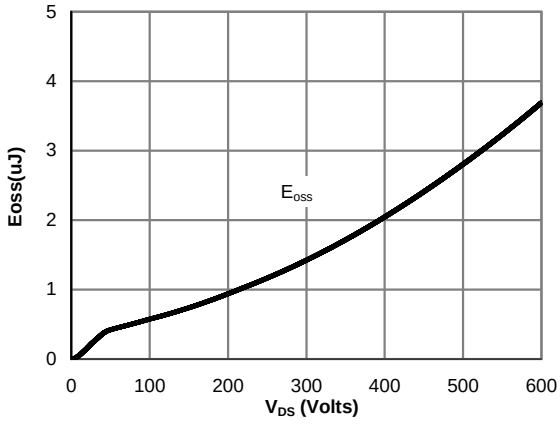


Figure 10: Coss stored Energy

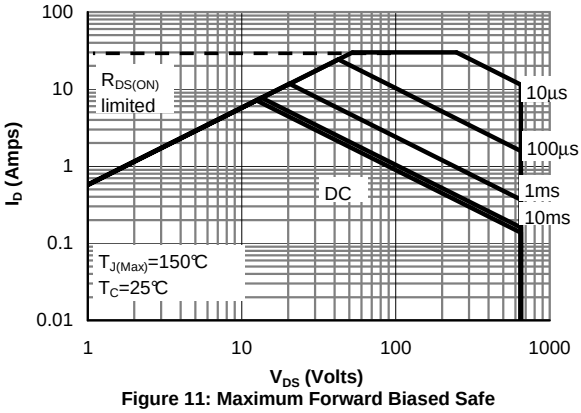


Figure 11: Maximum Forward Biased Safe Operating Area (Note F)

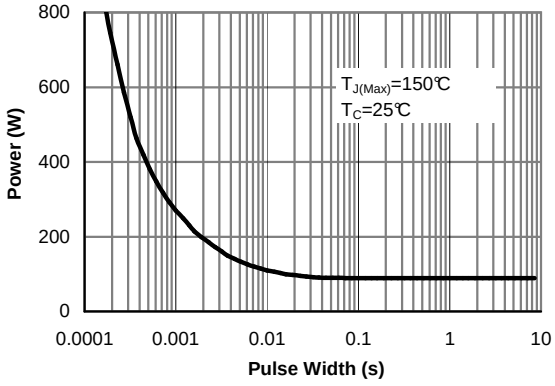


Figure 12: Single Pulse Power Rating Junction-to-Case (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

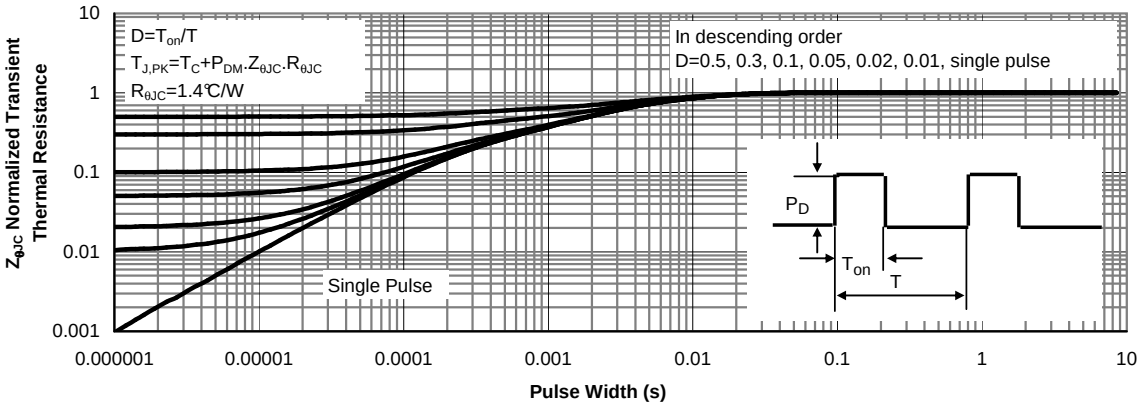


Figure 13: Normalized Maximum Transient Thermal Impedance (Note F)

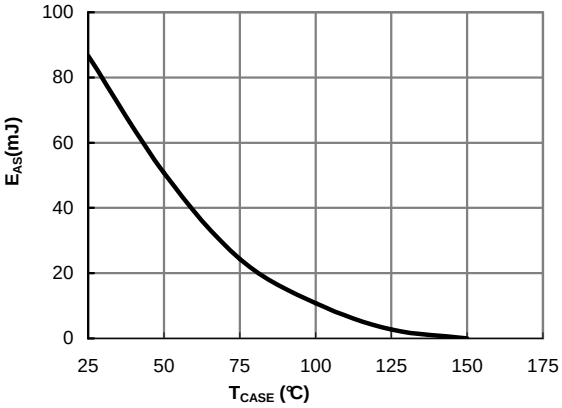


Figure 14: Avalanche energy

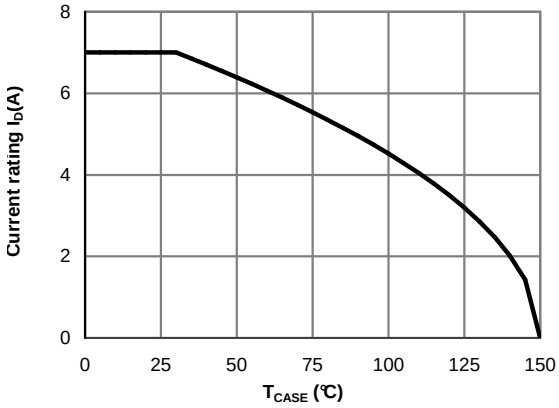


Figure 15: Current De-rating (Note B)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

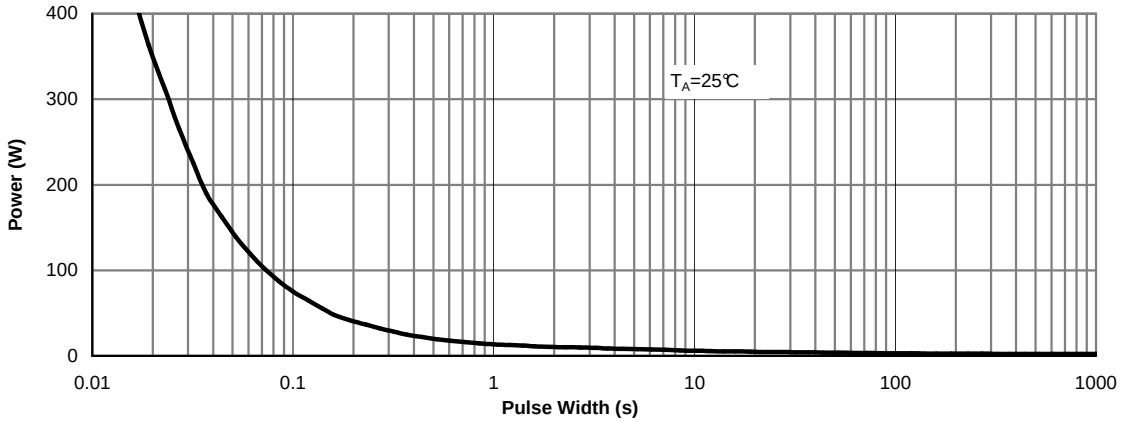


Figure 16: Single Pulse Power Rating Junction-to-Ambient (Note G)

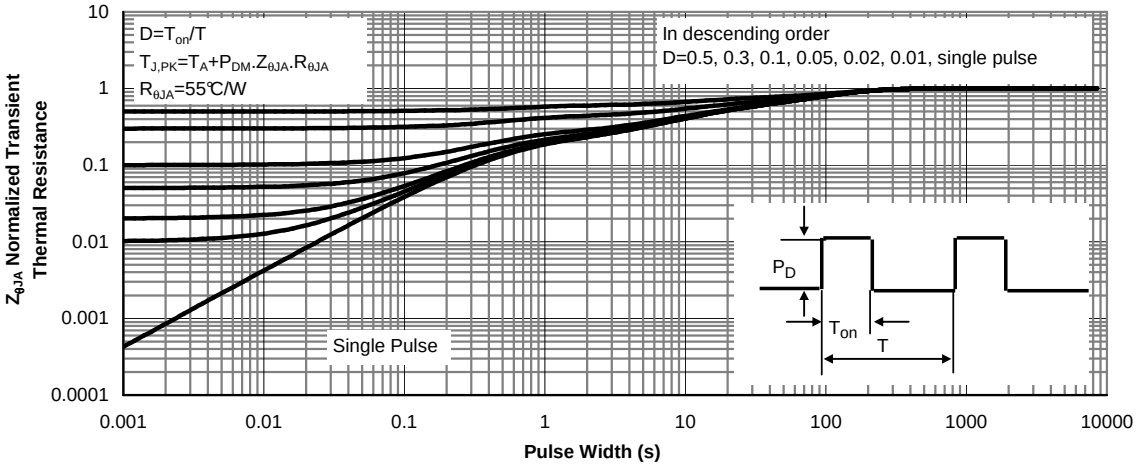
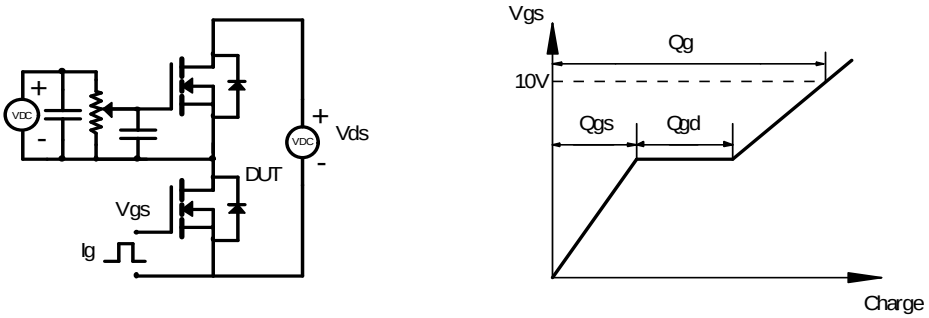
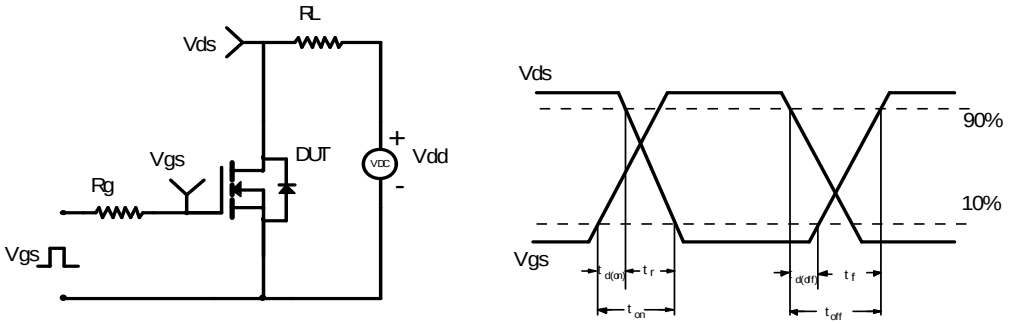


Figure 17: Normalized Maximum Transient Thermal Impedance (Note G)

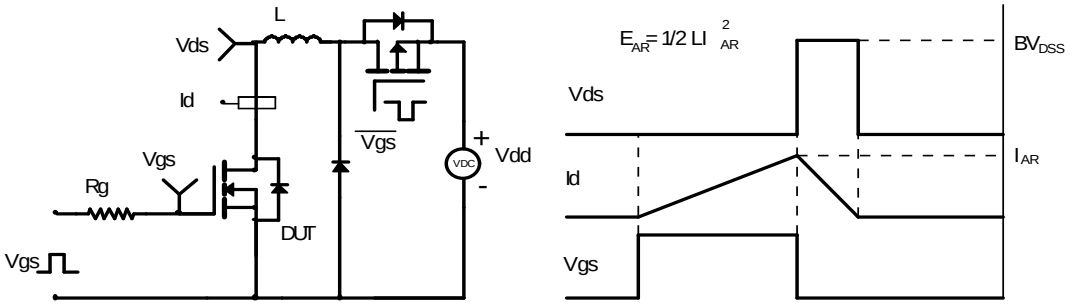
Gate Charge Test Circuit & Waveform



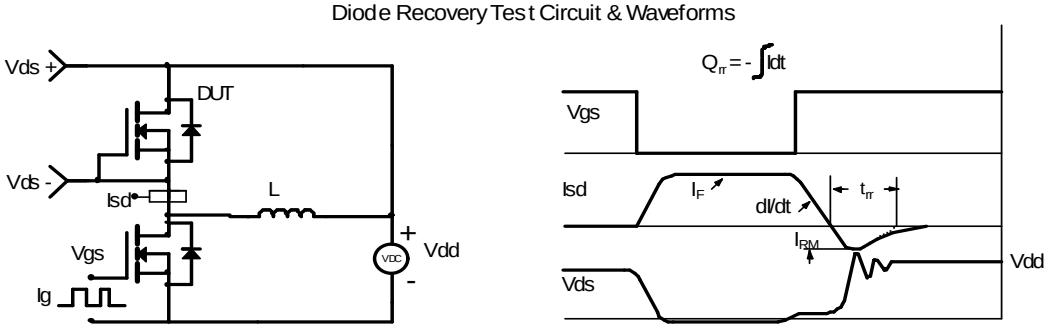
Resistive Switching Test Circuit & Waveforms



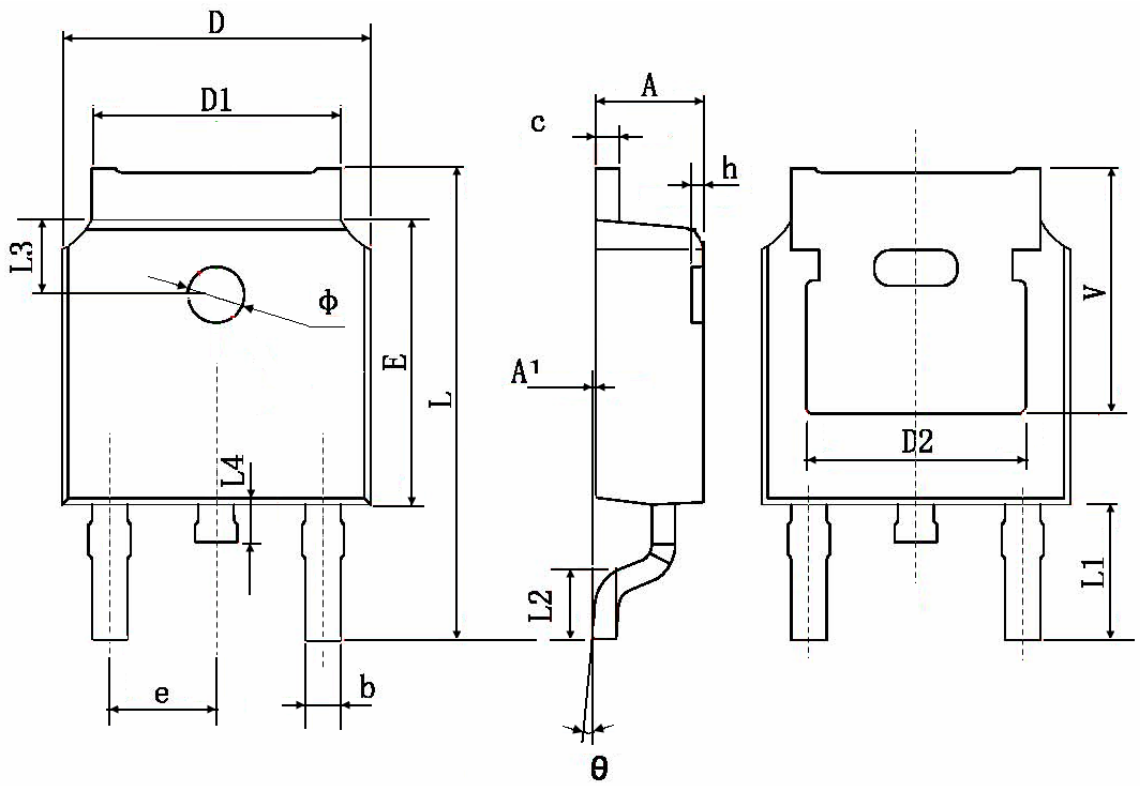
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

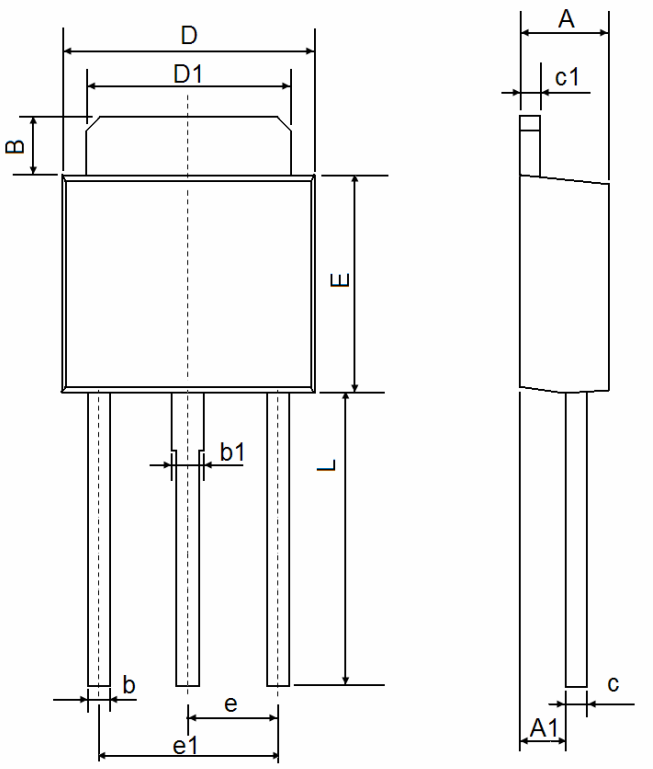


TO-252 Package Information



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.	

TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	1.050	1.350	0.042	0.054
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311

Notes

1. All dimensions are in millimeters.
2. Tolerance ±0.10mm (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exac