

MT6339N5

60V/10A Complementary Enhancement Mode Field Effect Transistor



MT Semiconductor®

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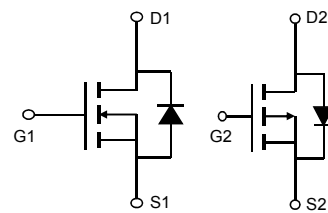
General Description

The MT6339N5 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in H-bridge, Inverters and other applications.

Features

N-channel	P-channel
V_{DS} (V) = 60V	-60V
$I_D = 10A$ ($V_{GS}=10V$)	-10A ($V_{GS} = -10V$)
$R_{DS(ON)}$	$R_{DS(ON)}$
=35m Ω ($V_{GS}=10V$)	=64m Ω ($V_{GS} = -10V$)
=40m Ω ($V_{GS}=4.5V$)	=75m Ω ($V_{GS} = -4.5V$)

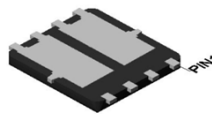
Simplified Schematic



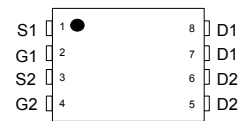
MARKING DIAGRAM & PIN ASSIGNMENT

100% Rg tested

DFN5X6-8L



Top View



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted				
Parameter	Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage	V_{DS}	60	-60	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current	I_D	10	-10	A
Current		10	-10	
Pulsed Drain Current	I_{DM}	30	-30	
Continuous Drain Current	I_{DSM}	8	-8	A
Current		6.5	-6.5	
Avalanche Current	I_{AS}	14	14	A
Avalanche energy	E_{AS}	24	14	mJ
Power Dissipation	P_D	12.5	10	W
		5	3	
Power Dissipation	P_{DSM}	3.5	2.8	W
		2.2	1.8	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ\text{C}$

Thermal Characteristics						
Parameter	Symbol	Typ Q1	Typ Q2	Max Q1	Max Q2	Units
Maximum Junction-to-Ambient	$R_{\theta JA}$	25	20	35	30	$^\circ\text{C/W}$
Maximum Junction-to-Ambient		Steady-State	50	48	70	65
Maximum Junction-to-Case	$R_{\theta JC}$	7	3.5	10	4.2	$^\circ\text{C/W}$

Q1 Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±20V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.0	1.4	2.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =5A		35	38	mΩ
		T _J =125°C		50	56	
		V _{GS} =4.5V, I _D =5A		40	43	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =5A		43		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.7	1	V
I _S	Maximum Body-Diode Continuous Current				10	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		760		pF
C _{oss}	Output Capacitance			125		pF
C _{rss}	Reverse Transfer Capacitance			70		pF
R _g	Gate resistance	f=1MHz	0.8	1.6	2.4	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =8A		14	20	nC
Q _g (4.5V)	Total Gate Charge			6.6	10	nC
Q _{gs}	Gate Source Charge			2.4		nC
Q _{gd}	Gate Drain Charge			3		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.25Ω, R _{GEN} =3Ω		4.4		ns
t _r	Turn-On Rise Time			9		ns
t _{D(off)}	Turn-Off DelayTime			17		ns
t _f	Turn-Off Fall Time			6		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =12A, di/dt=500A/μs		7		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =12A, di/dt=500A/μs		8		nC

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The Power dissipation P_{DSM} is based on R_{θJA} ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

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. Single 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 <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_{J(MAX)}=150° 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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

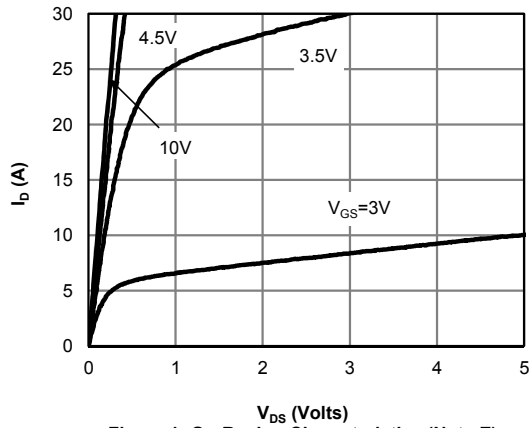


Figure 1: On-Region Characteristics (Note E)

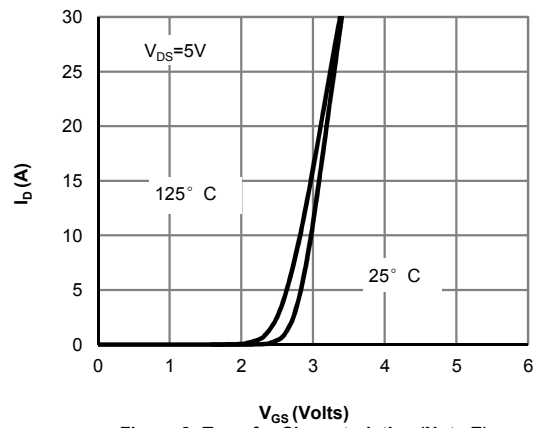


Figure 2: Transfer Characteristics (Note E)

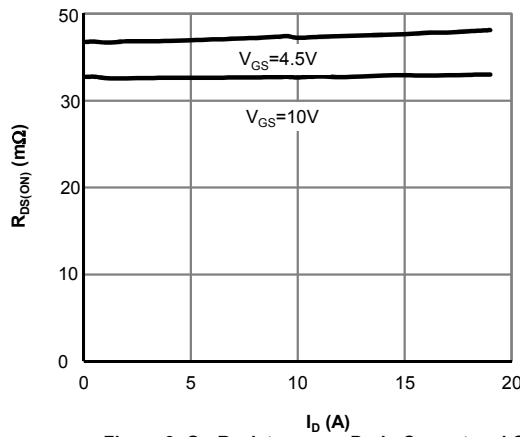


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

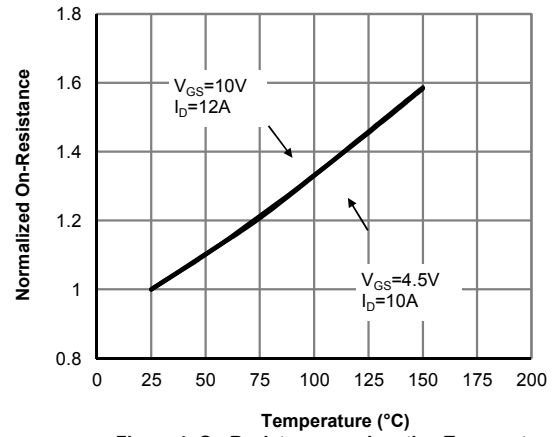


Figure 4: On-Resistance vs. Junction Temperature (Note E)

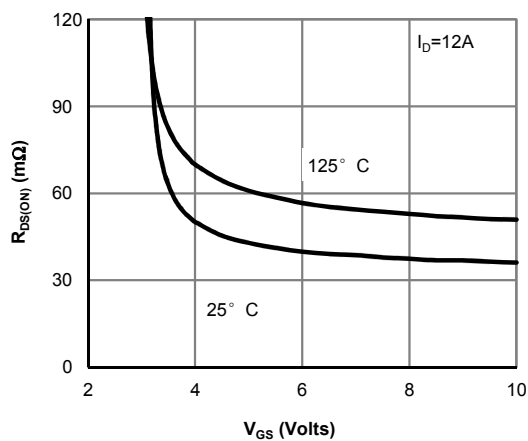


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

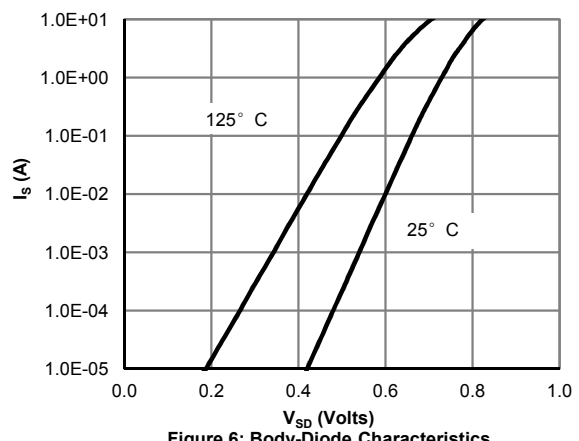


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

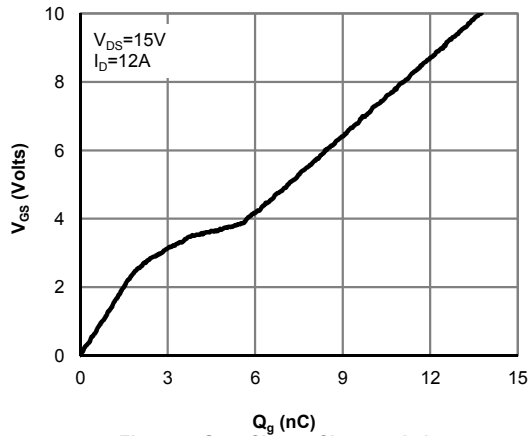


Figure 7: Gate-Charge Characteristics

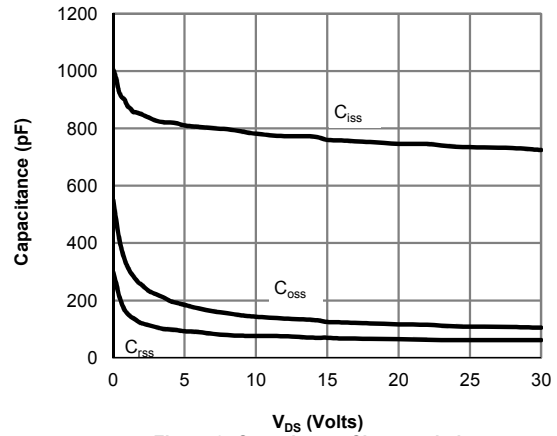


Figure 8: Capacitance Characteristics

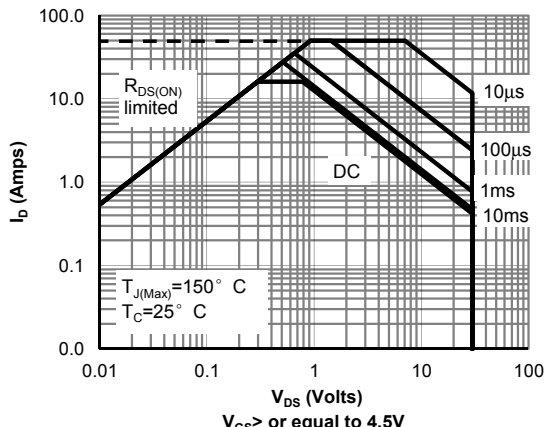


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

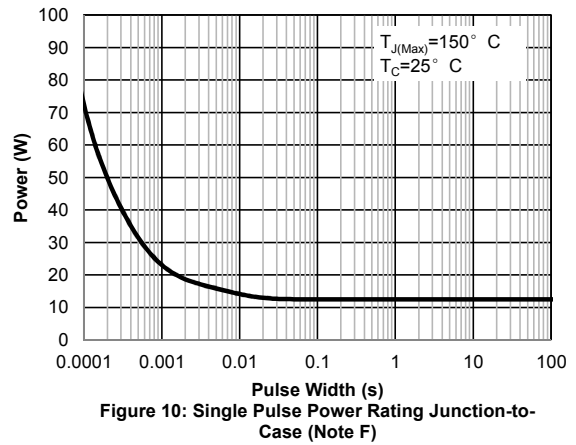


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

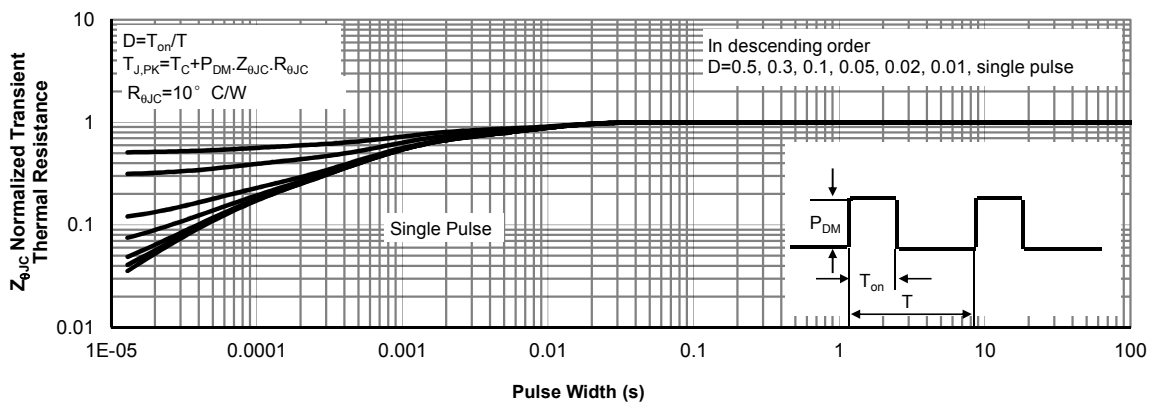


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

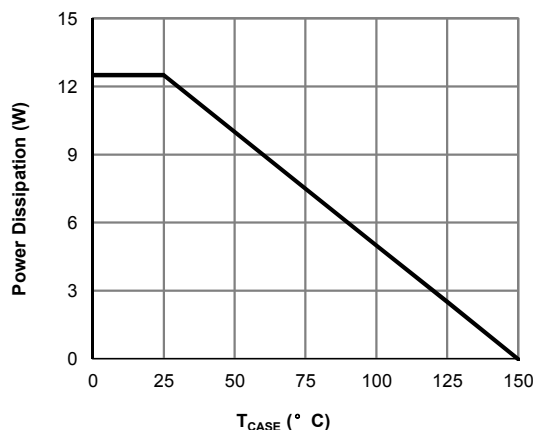


Figure 12: Power De-rating (Note F)

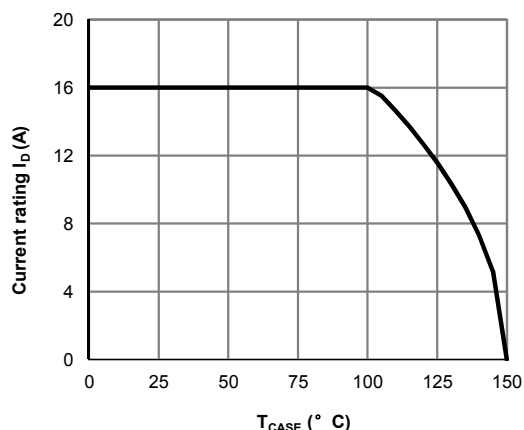


Figure 13: Current De-rating (Note F)

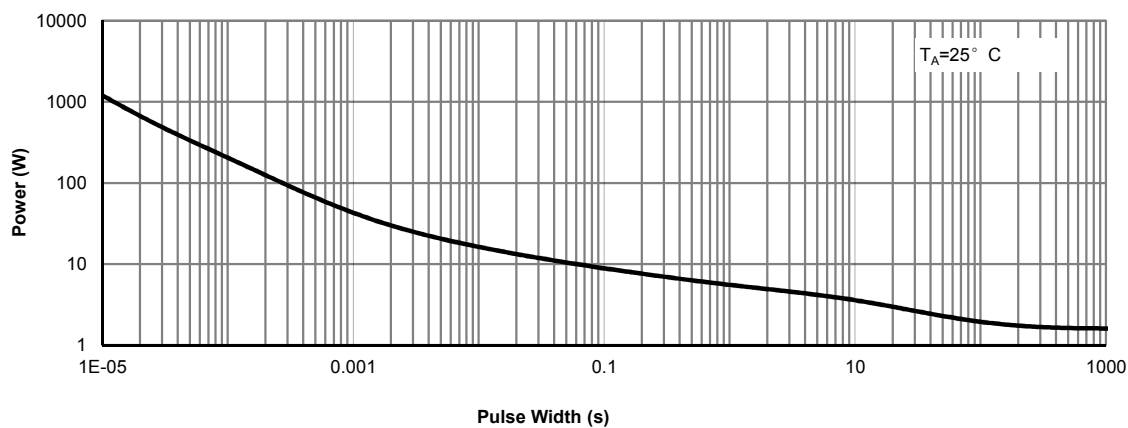


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

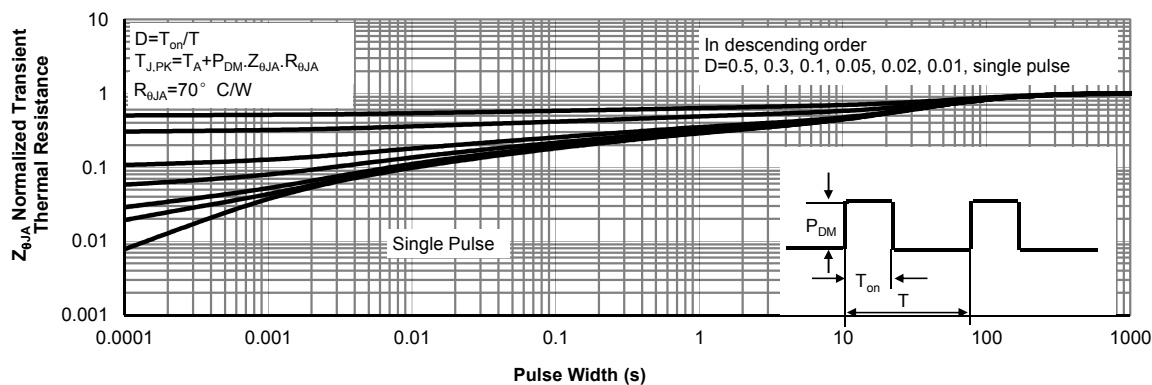


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Q2 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	-60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-48V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±25V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1.0	-1.3	-2.0V	
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-5A T _J =125°C		64 75	67 82	mΩ
		V _{GS} =-4.5V, I _D =-5A		75	78	
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-5A		43		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.7	-1.3	V
I _S	Maximum Body-Diode Continuous Current ^G				-16	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		1995		pF
C _{oss}	Output Capacitance			300		pF
C _{rss}	Reverse Transfer Capacitance			260		pF
R _g	Gate resistance	f=1MHz		4.5	9	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-8A		35	50	nC
Q _g (4.5V)	Total Gate Charge			17	25	nC
Q _{gs}	Gate Source Charge			5.7		nC
Q _{gd}	Gate Drain Charge			8.8		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =0.9Ω, R _{GEN} =3Ω		11		ns
t _r	Turn-On Rise Time			7.5		ns
t _{D(off)}	Turn-Off DelayTime			43.5		ns
t _f	Turn-Off Fall Time			17.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-16A, di/dt=500A/μs		13.3		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-16A, di/dt=500A/μs		20		nC

A. The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C. The Power dissipation P_{DSM} is based on R_{θJA} t_s ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

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. Single 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 <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_{J(MAX)}=150° 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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

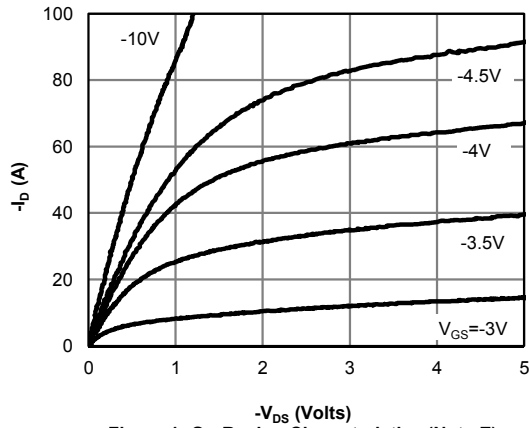


Figure 1: On-Region Characteristics (Note E)

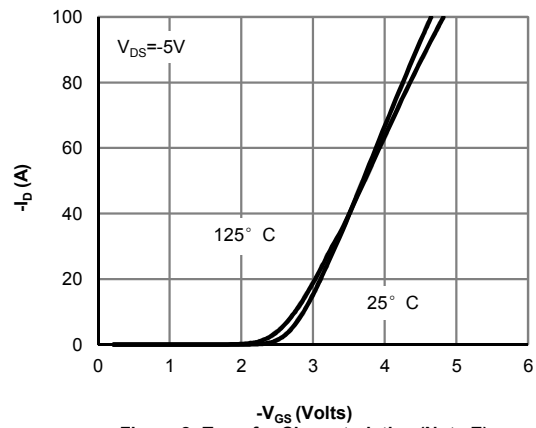


Figure 2: Transfer Characteristics (Note E)

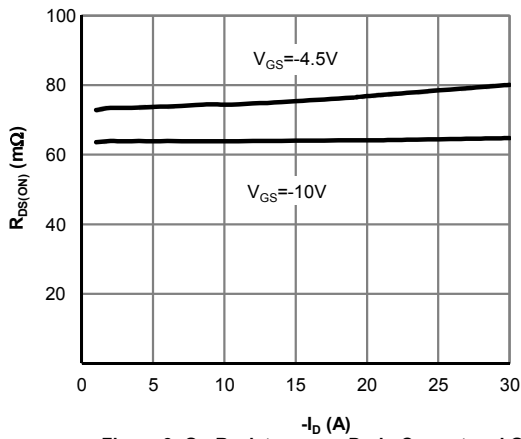


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

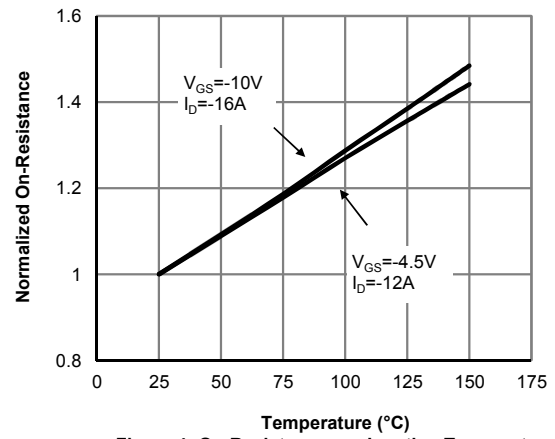


Figure 4: On-Resistance vs. Junction Temperature (Note E)

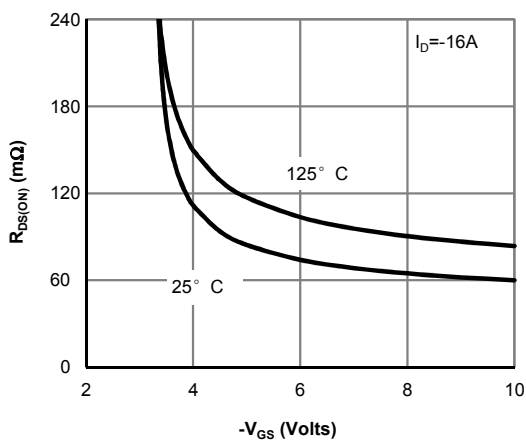


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

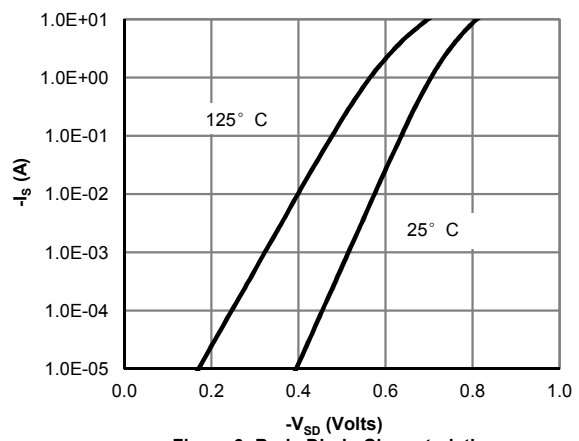


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

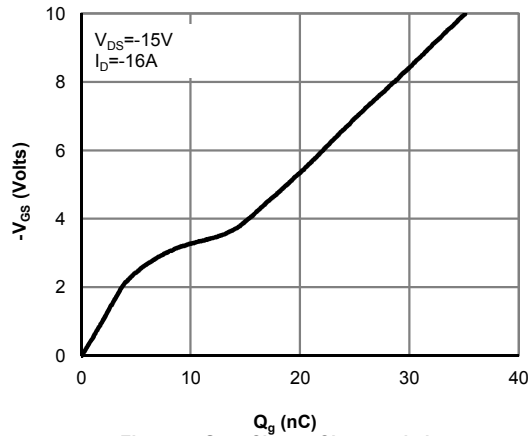


Figure 7: Gate-Charge Characteristics

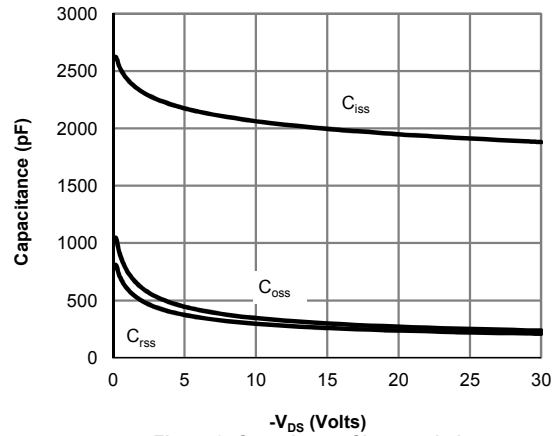


Figure 8: Capacitance Characteristics

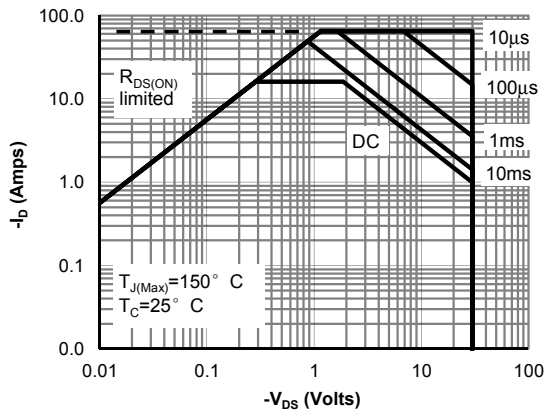


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

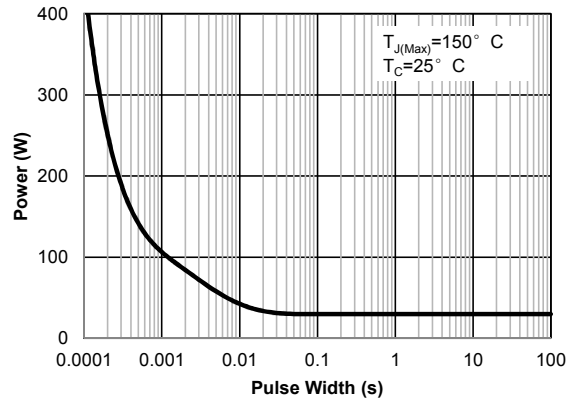


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

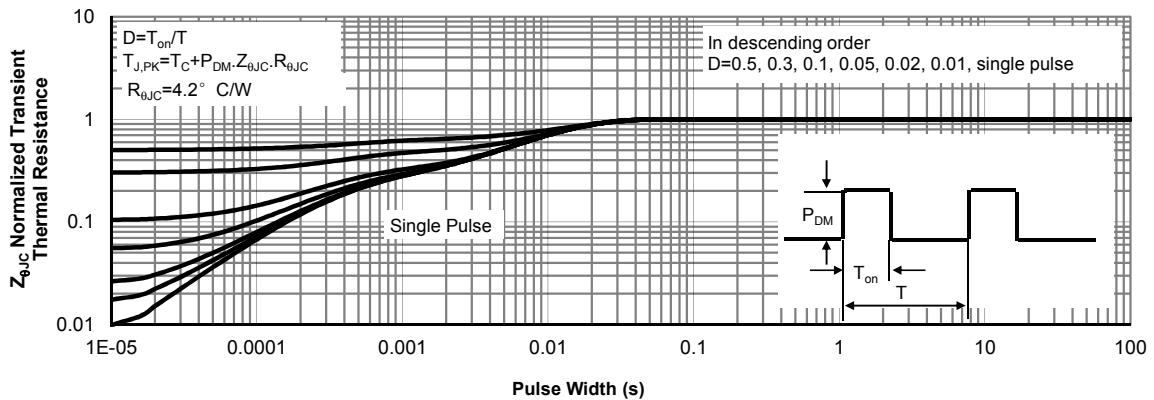


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

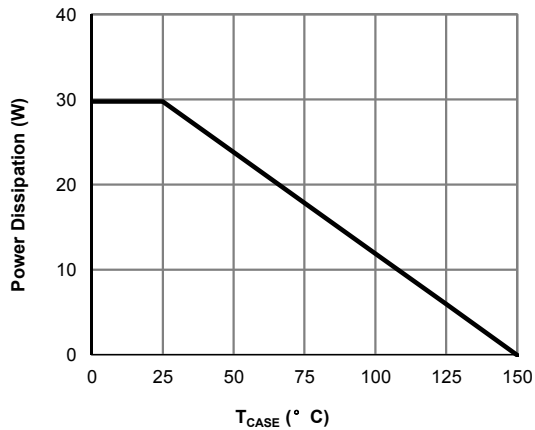


Figure 12: Power De-rating (Note F)

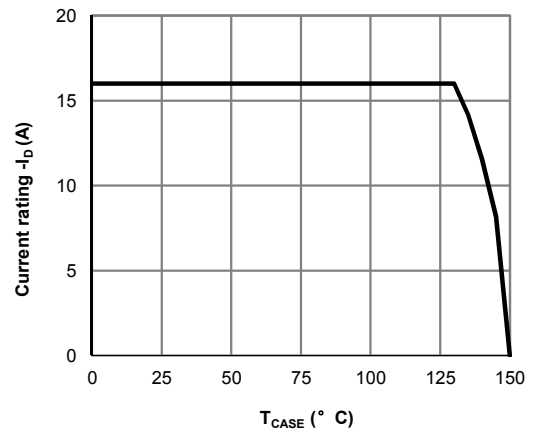


Figure 13: Current De-rating (Note F)

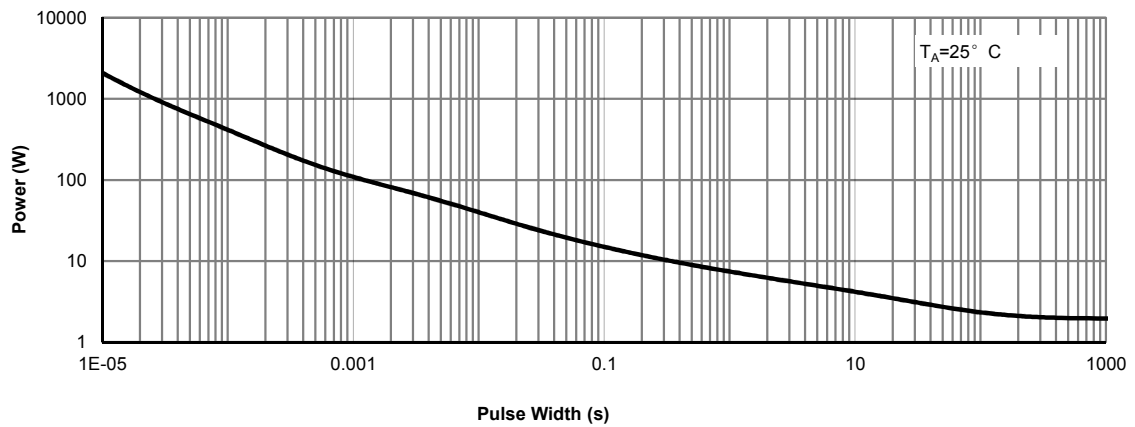


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

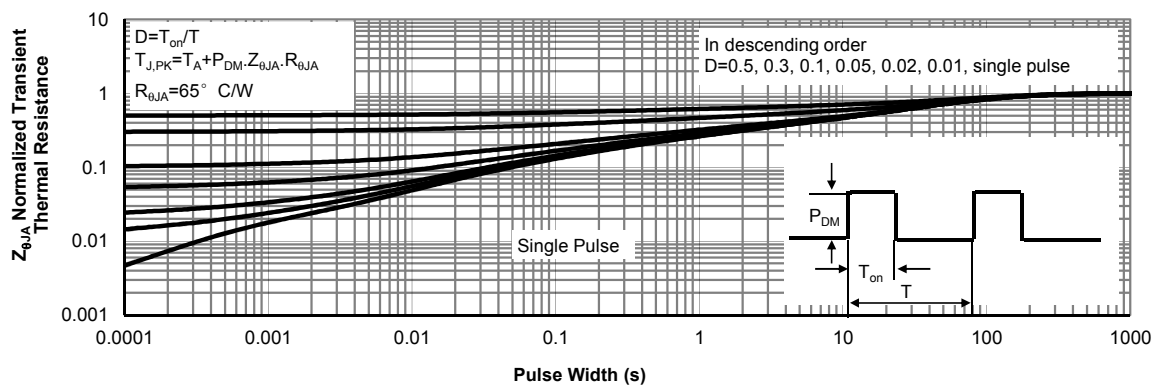


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

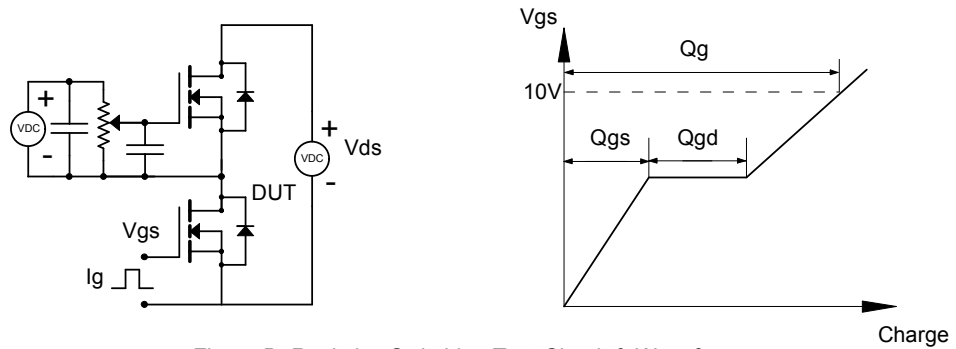


Figure B: Resistive Switching Test Circuit & Waveforms

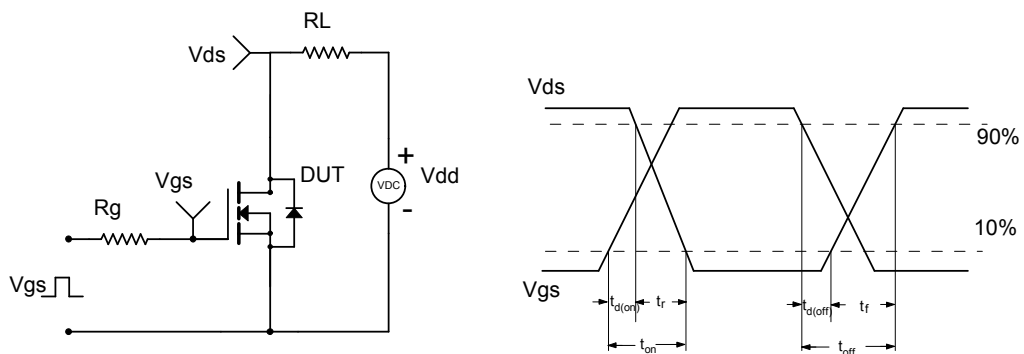


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

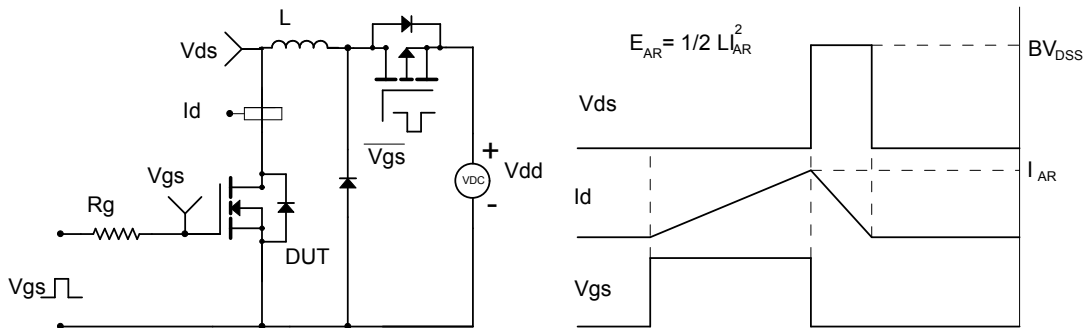
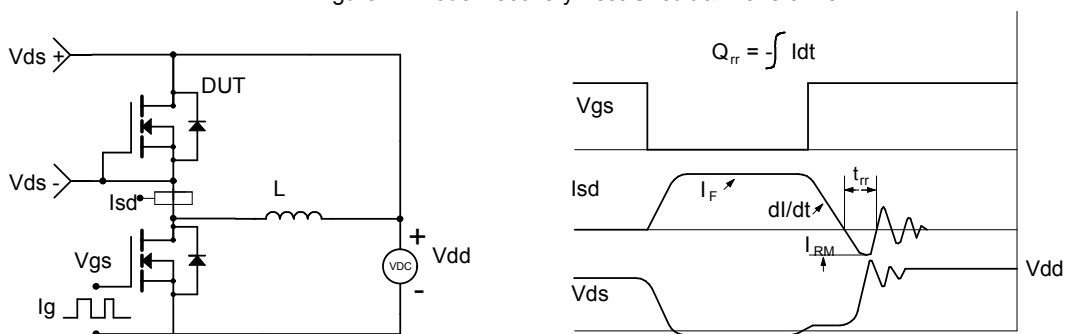
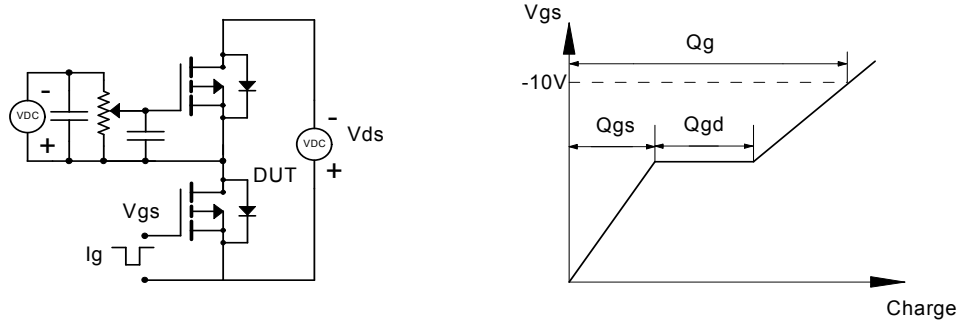


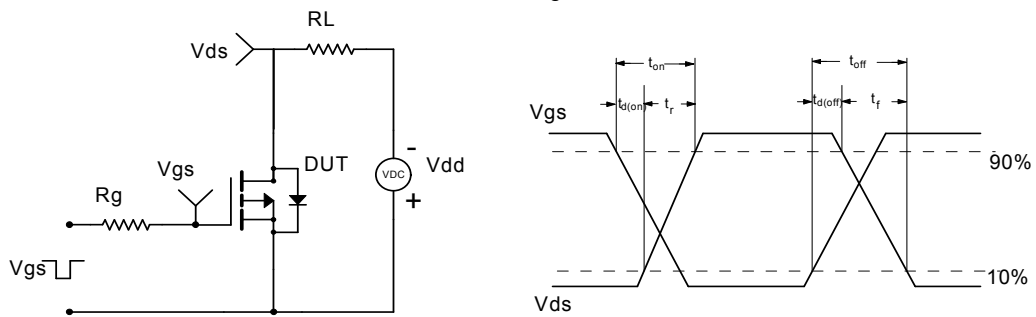
Figure D: Diode Recovery Test Circuit & Waveforms



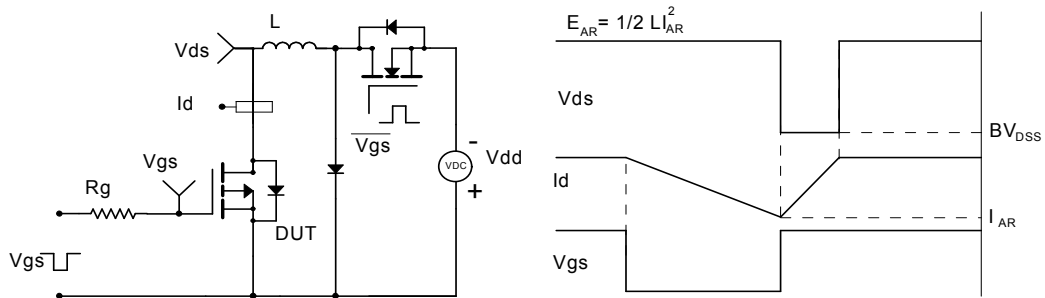
Gate Charge Test Circuit & Waveform



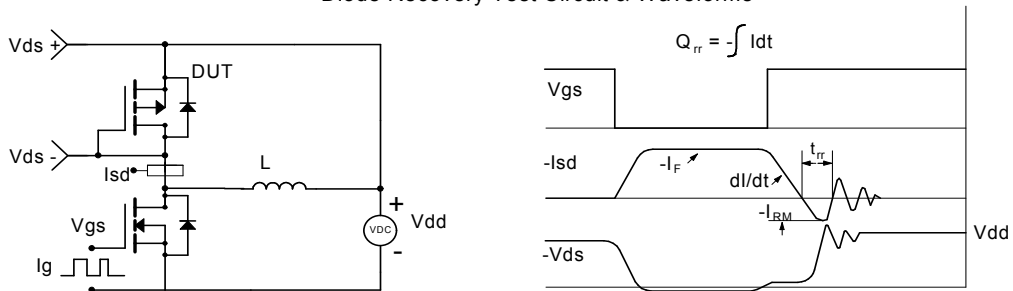
Resistive Switching Test Circuit & Waveforms



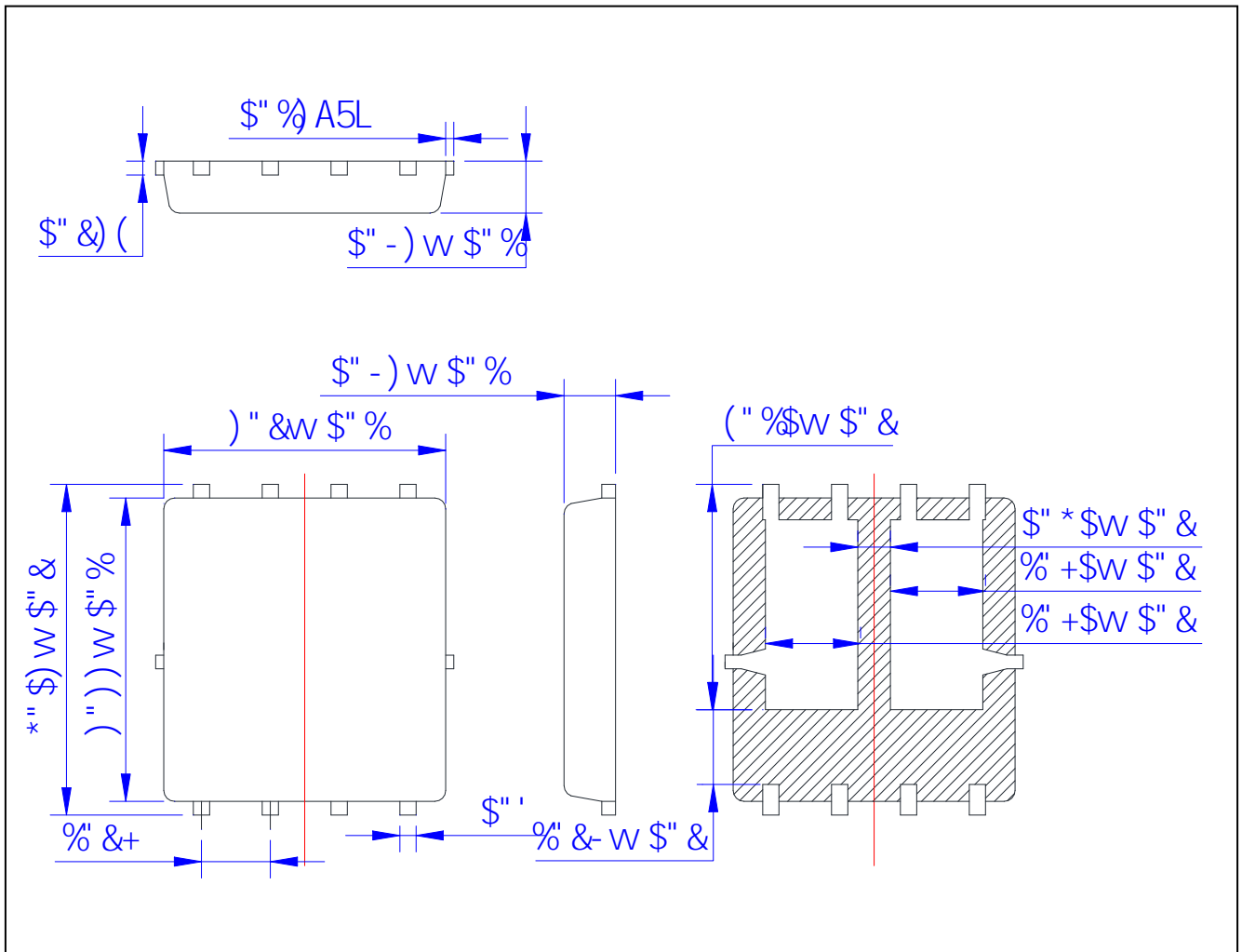
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



8: B) y * OUTLINE



Notes regarding these materials

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