

# MT8306N3

## N-Channel Enhancement Mode Field Effect Transistor



**MT Semiconductor®**

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### Product Summary

- $V_{DS} = 30V$
- $I_D = 20A$
- $R_{DS(ON)} \leq 6\text{ m}\Omega @ V_{GS}=10V$
- $R_{DS(ON)} \leq 8\text{ m}\Omega @ V_{GS}=4.5V$

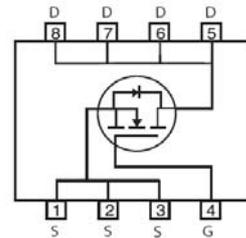
### Features

- Advanced Trench Process Technology.
- High Density Cell Design for Ultra Low
- On-Resistance.
- Lead free product is acquired.
- RoHS Compliant.

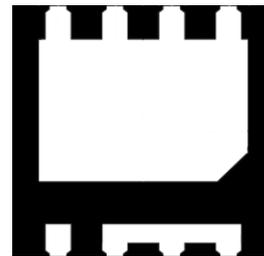
### Applications

- Notebook Computer
- Portable Battery Pack

### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT



DFN3X3-8L

PIN1

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted					
Parameter	Symbol	Maximum	Units		
Drain-Source Voltage	$V_{DS}$	30	V		
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V		
Continuous Drain Current <sup>AF</sup>	$I_{DSM}$	$T_A=25^\circ\text{C}$	20		
		$T_A=70^\circ\text{C}$	15		
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	120	A		
Avalanche Current <sup>C</sup>	$I_{AR}$	32	A		
Repetitive avalanche energy $L=0.3\text{mH}^C$	$E_{AR}$	75	mJ		
Power Dissipation	$P_{DSM}$	$T_A=25^\circ\text{C}$	2.8		
		$T_A=70^\circ\text{C}$	1.6		
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$		
Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10\text{s}$	32	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	60	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$	

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=1\text{mA}, V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$ $T_J=85^\circ\text{C}$			1 100	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	1.3	3.0	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=1.5\text{A}$		6.0	7.0	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=1.5\text{A}$		8.0	9.0	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		66		S
$V_{SD}$	Diode Forward Voltage	$I_S=1.5\text{A}, V_{GS}=0\text{V}$	0.1		1.3	V
$I_S$	Maximum Body-Diode + Schottky Continuous Current				50	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		1840	2200	pF
$C_{oss}$	Output Capacitance			720		pF
$C_{riss}$	Reverse Transfer Capacitance			63		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		0.8	1.2	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$		27	33	nC
$Q_g(4.5\text{V})$	Total Gate Charge			12	15	nC
$Q_{gs}$	Gate Source Charge			4.2		nC
$Q_{gd}$	Gate Drain Charge			4.2		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=1.2\Omega,$ $R_{GEN}=3\Omega$		5.5		ns
$t_r$	Turn-On Rise Time			5.5		ns
$t_{D(off)}$	Turn-Off DelayTime			25		ns
$t_f$	Turn-Off Fall Time			4.3		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, di/dt=500\text{A}/\mu\text{s}$		14	17	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, di/dt=500\text{A}/\mu\text{s}$		30	36	nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ .

C: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  pulses, duty cycle 0.5% max.

E: 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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

F: The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

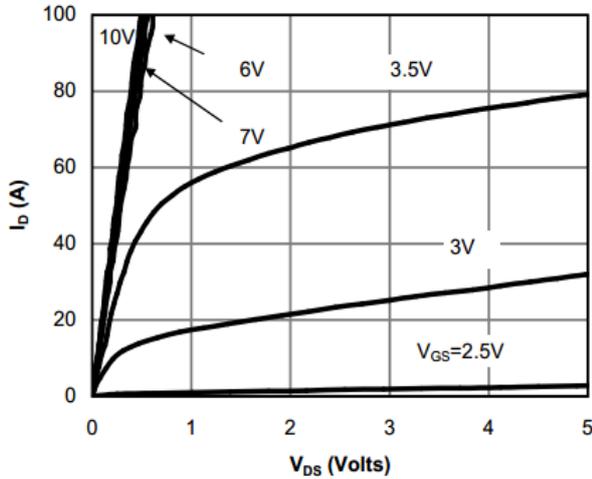


Fig 1: On-Region Characteristics (Note E)

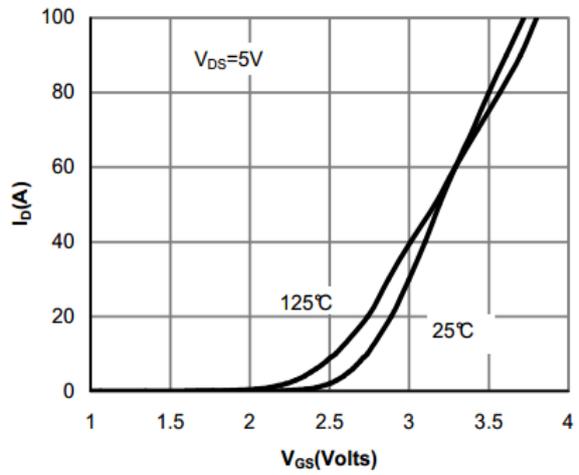


Figure 2: Transfer Characteristics (Note E)

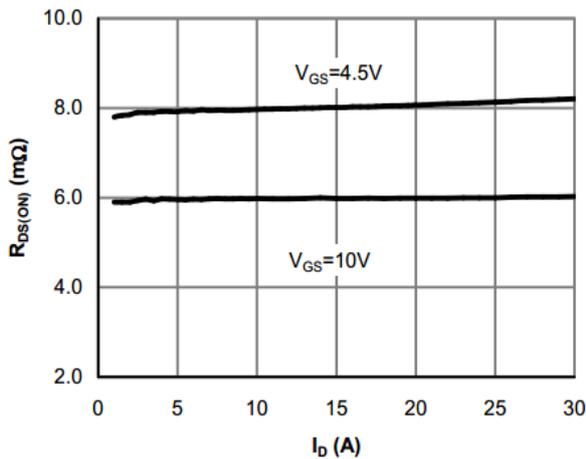


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

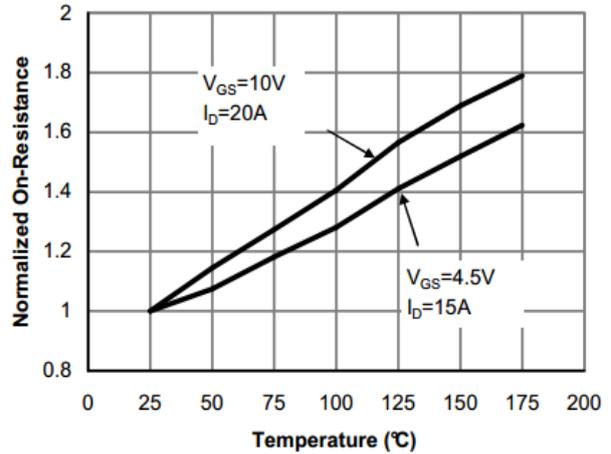


Figure 4: On-Resistance vs. Junction Temperature (Note E)

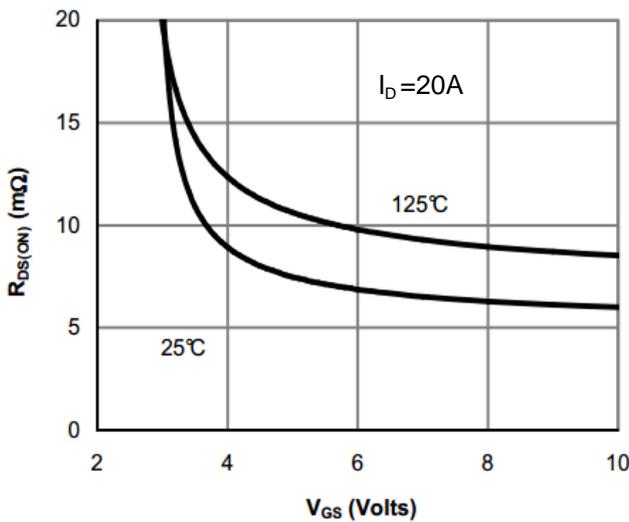


Figure 5: On-Resistance vs. Gate-Source Voltage

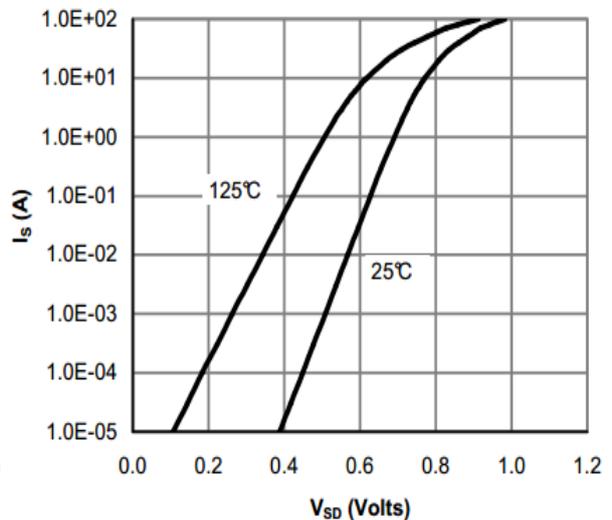


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

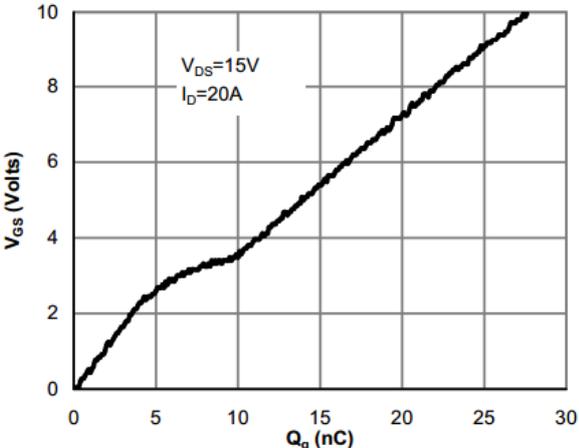


Figure 7: Gate-Charge Characteristics

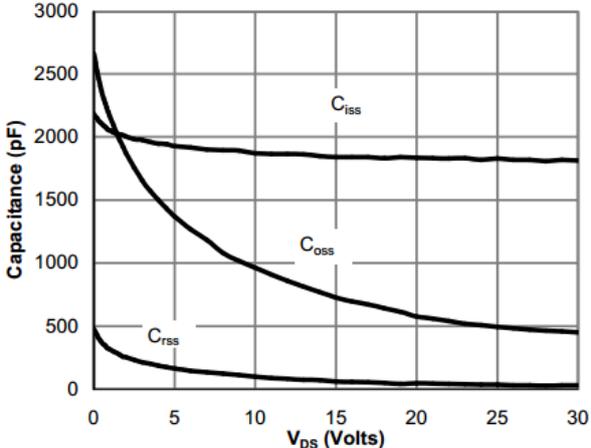


Figure 8: Capacitance Characteristics

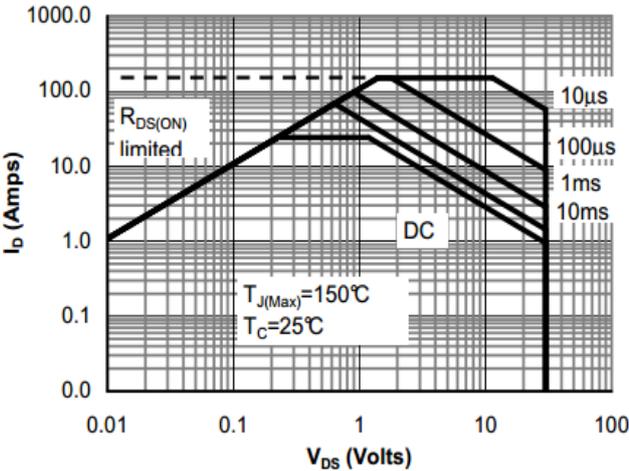


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

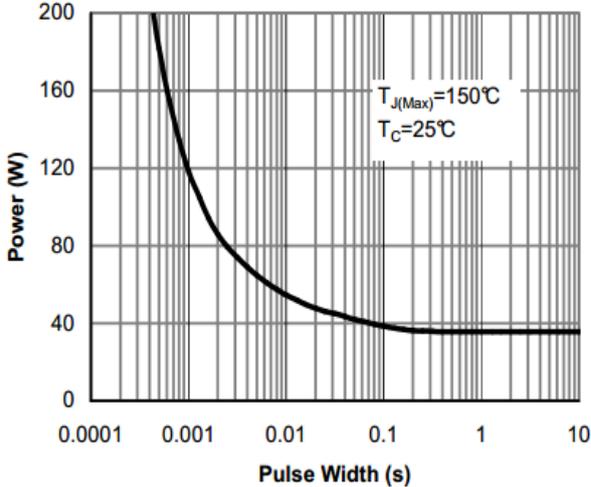


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

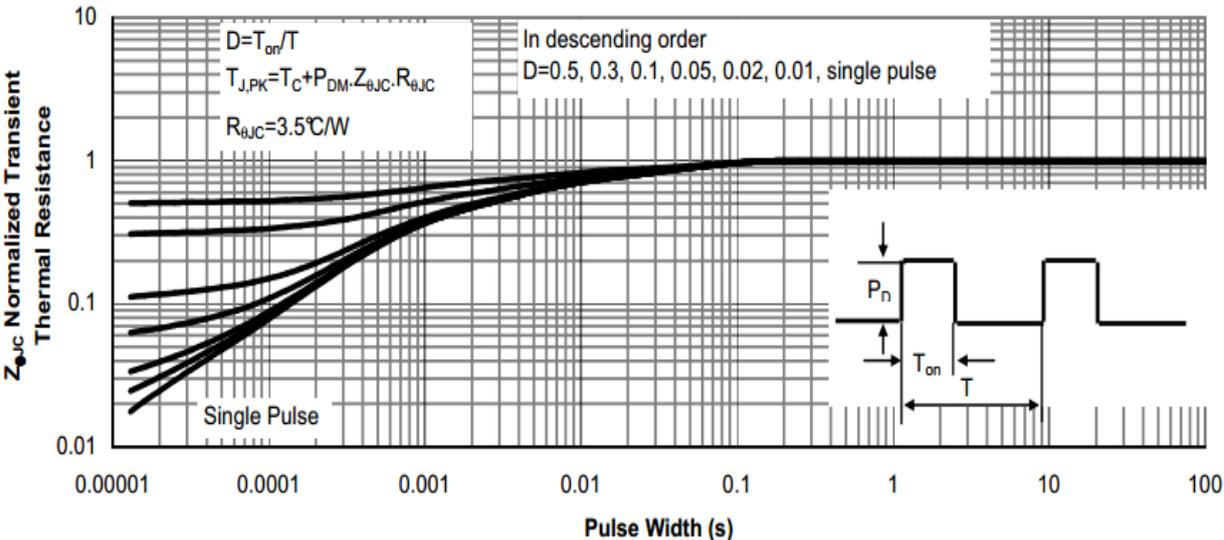
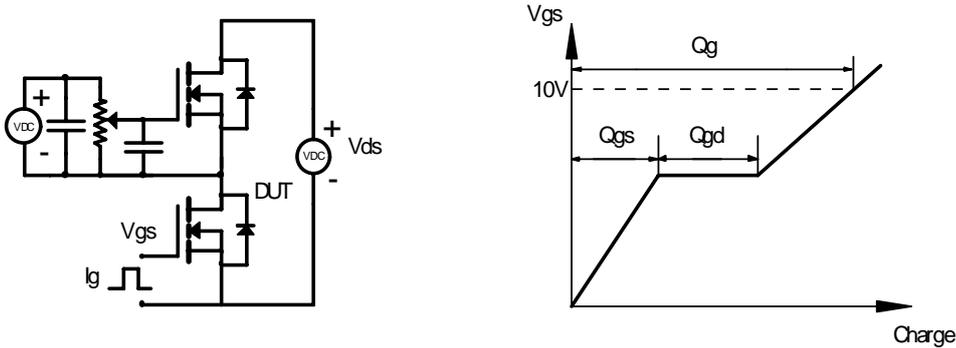
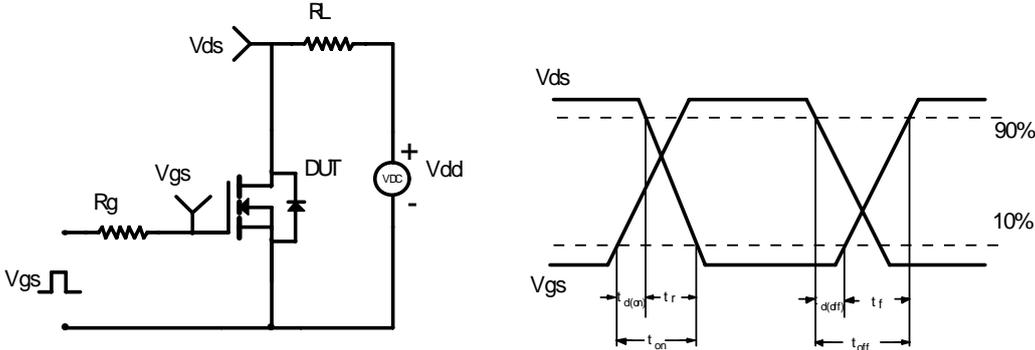


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

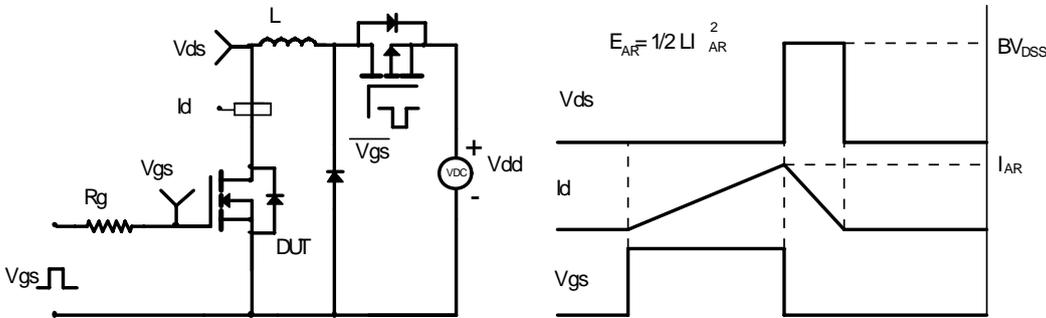
Gate Charge Test Circuit & Waveform



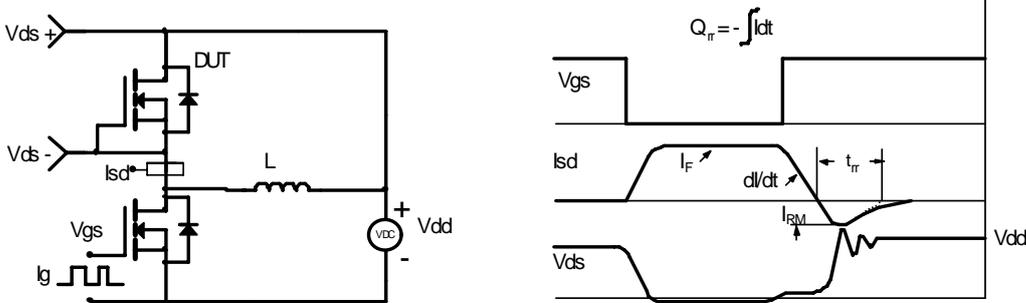
Resistive Switching Test Circuit & Waveforms



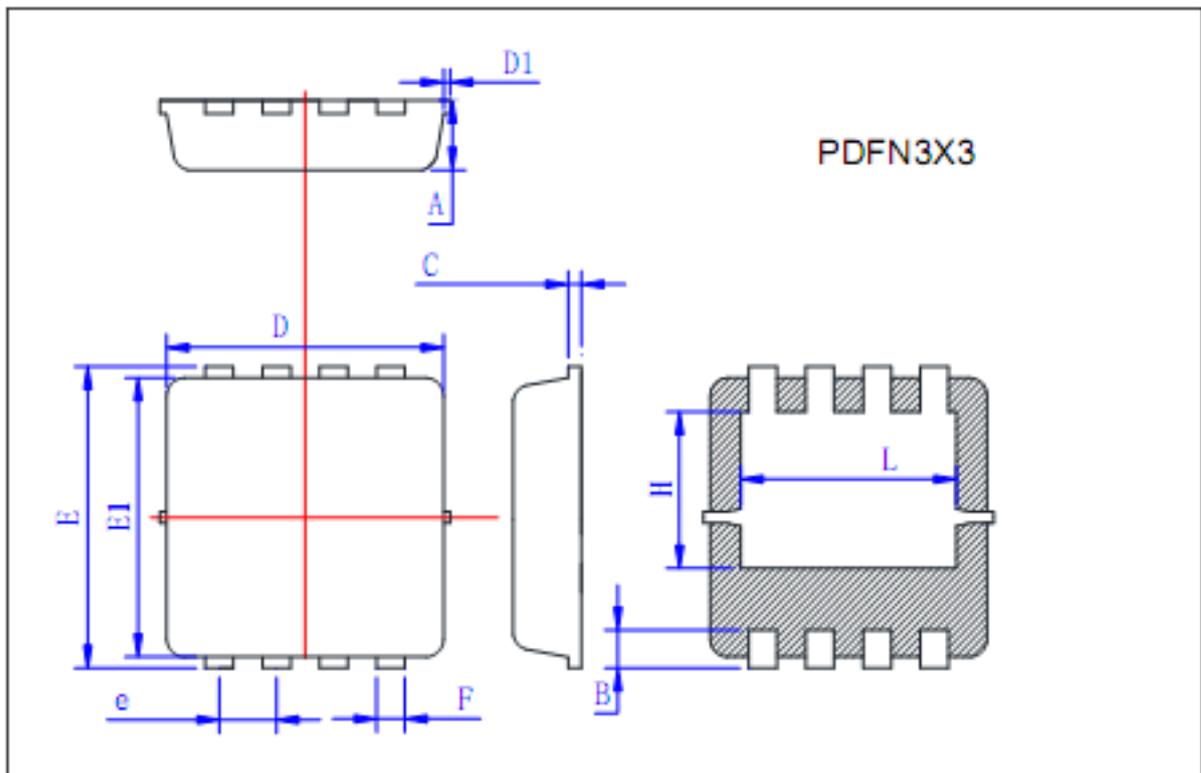
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## PACKAGE OUTLINE DIMENSIONS



Symbol	Min	Typ	Max
A	0.725	0.775	0.825
B	0.28	0.38	0.48
C	0.13	0.15	0.20
D	3.05	3.15	3.25
D1			0.10
E	3.25	3.35	3.45
E1	3.0	3.1	3.2
e	0.60	0.65	0.70
F	0.27	0.32	0.37
H	1.63	1.73	1.83
L	2.35	2.45	2.55

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