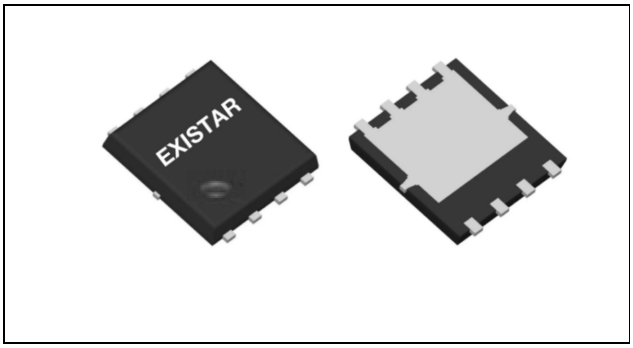
N-Channel 60V MOSFET

E060N2P3HL1

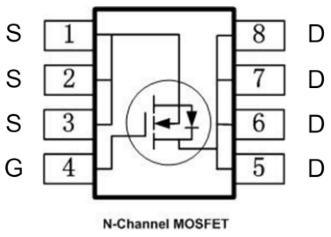
V_{DS} (V)	$R_{DS(on),max}$ (mΩ)	I_D (A)
60V	2.3 @ V_{GS} = 10V	180

PDFN5X6



Features

- Low $R_{DS(on)}$ trench technology
- Low thermal impedance
- Fast switching speed
- 100% avalanche tested



Pb-free
RoHS COMPLIANT
HALOGEN FREE

Applications

- DC/DC conversion
- Power switch
- PD charger
- Moto driver

Package And Ordering Information

Ordering code	Package	Marking
E060N2P3HL1	PDFN5x6	E060N2P3HL1

Ordering Information

Package	Units/ Reel	Reels/ Inner Box	Units/ Inner Box
PDFN5x6	5000	2	10000

Key Performance Parameters

Parameter	Value	Unit
VDS, min @ Tj(max)	60	V
ID, pulse	720	A
RDS(ON), max @ VGS=10V	2.3	mΩ
Qg	103.5	nC

Absolute Maximum Ratings at Tj=25°C Unless Otherwise Noted

Parameter		Symbol	Limit	Unit
Drain-source voltage		V_{DS}	60	V
Gate-source voltage		V_{GS}	±20	
Continuous drain current	T_C=25°C	I_D	180	A
	T_C=100°C		-	
Pulsed drain current		$I_{D,pulse}$	720	
Avalanche energy, single pulse		E_{AS}	240	mJ
Power dissipation	T_C=25°C	P_D	132	W
	T_A=25°C		-	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Max.	Unit
Thermal resistance, junction-to-case	Steady state	$R_{\theta JC}$	0.95	°C/W
Thermal resistance, junction-to-ambient	Steady state	$R_{\theta JA}$	62	

Electrical Characteristics at Tj=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions
Static						
Drain to source breakdown voltage	$V_{(BR)DSS}$	60			V	V_{GS} = 0, I_D = 250 μA
Gate-source threshold voltage	$V_{GS(th)}$	1.0		2.5	V	V_{DS} = V_{GS}, I_D = 250 μA
Gate-body leakage	I_{GSS}			±100	nA	V_{DS} = 0 V, V_{GS} = ±20 V
Zero gate voltage drain current	I_{DSS}			1	μA	V_{DS} = 60 V, V_{GS} = 0 V
Drain-source on-resistance	$R_{DS(on)}$		2.0	2.3	mΩ	V_{GS} = 10 V, I_D = 30 A
Drain-source on-resistance	$R_{DS(on)}$		2.8	3.5	mΩ	V_{GS} = 4.5 V, I_D = 30 A

Forward transconductance	gfs		-		S	V_{DS} = 5 V, I_D = 30 A
Gate resistance	Rg		2.4		Ω	f=1MHz
Gate Charge						
Total gate charge	Qg		104		nC	V_{DS} = 50 V, I_D = 50 A, V_{GS} = 10 V
Gate-source charge	Qgs		17			
Gate-drain charge	Qgd		16.8			
Dynamic						
Turn-on delay time	$t_{d(on)}$		32.2		ns	V_{DS} = 50 V, I_D =50 A, V_{GS} = 10 V, R_{GEN} = 2 Ω
Rise time	t_r		53.3			
Turn-off delay time	$t_{d(off)}$		93.2			
Fall time	t_f		25.3			
Input capacitance	C_{iss}		6638		pF	V_{DS} =25 V, V_{GS} = 0 V, f = 100kHz
Output capacitance	C_{oss}		1275			
Reverse transfer capacitance	C_{rss}		58.1			
Body Diode						
Diode forward voltage	V_{SD}			1.3	V	V_{GS} = 0 V, I_F = 20 A
Reverse recovery time	t_{rr}		86.8		ns	V_R= 50 V, I_S =50 A, di/dt = 100 A/μs
Reverse recovery charge	Q_{rr}		130		nC	

Electrical Characteristics Diagrams

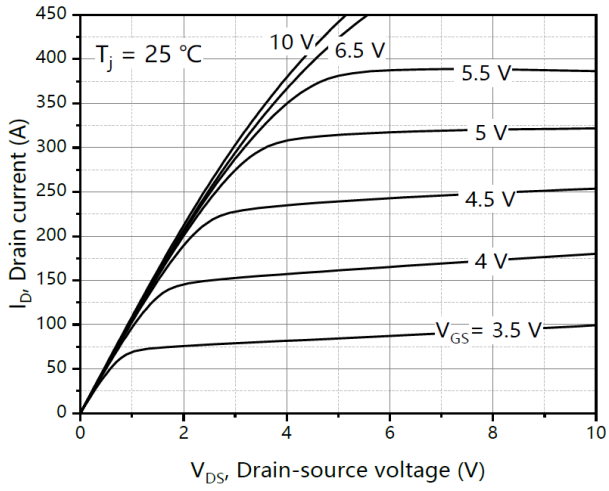


Figure 1. Typ. output characteristics

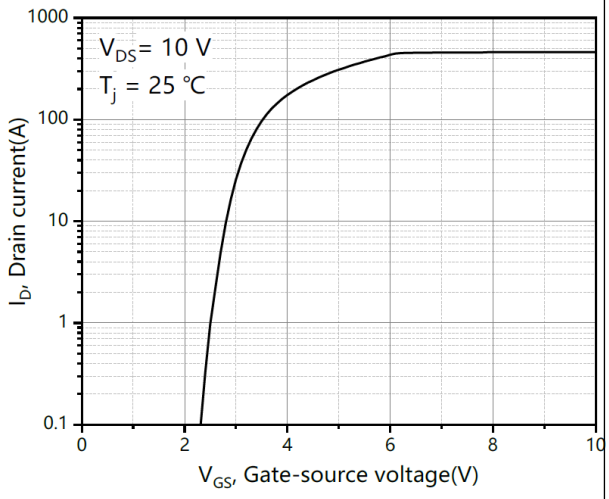


Figure 2. Typ. transfer characteristics

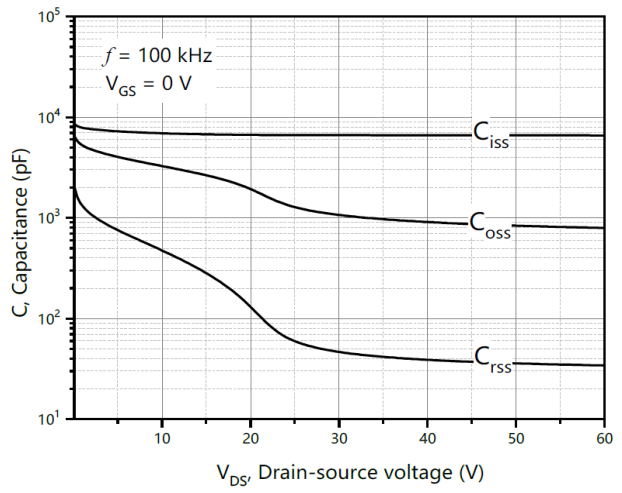


Figure 3. Typ. capacitances

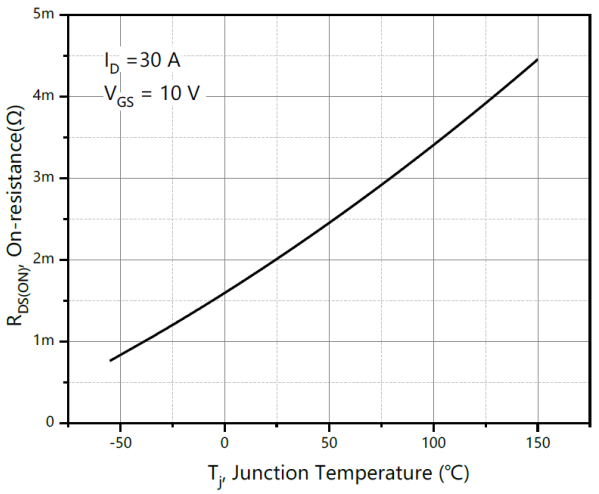


Figure 4. Drain-source on-state resistance

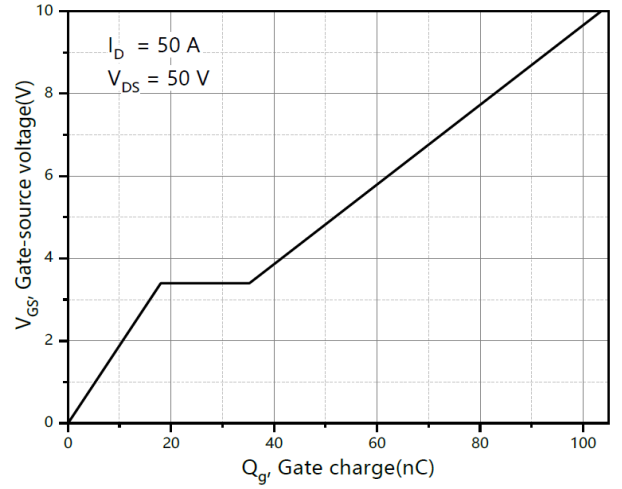


Figure 5. Typ. gate charge

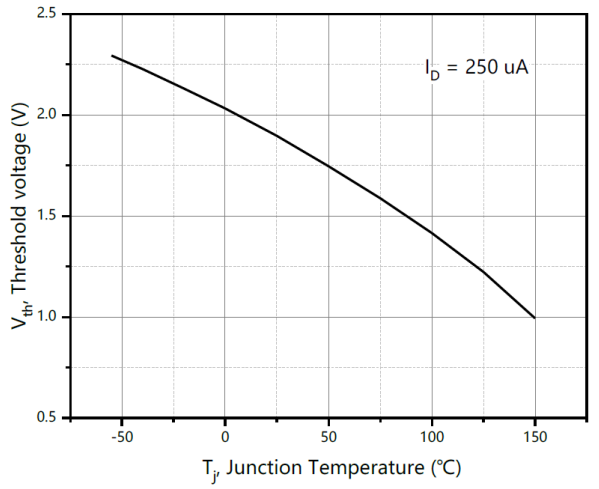


Figure 6. Threshold voltage

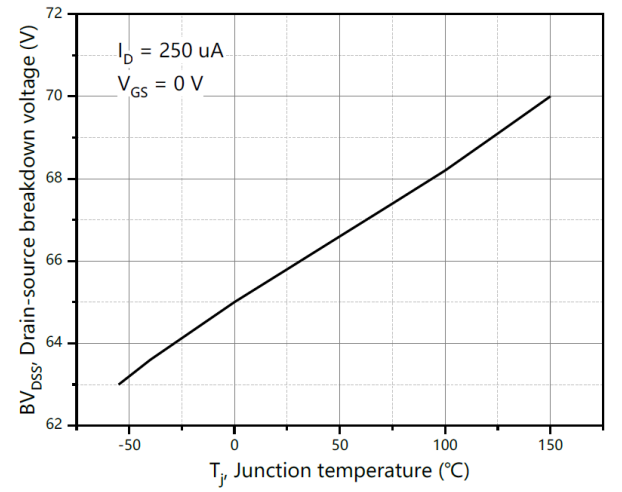


Figure 7. Drain-source breakdown voltage

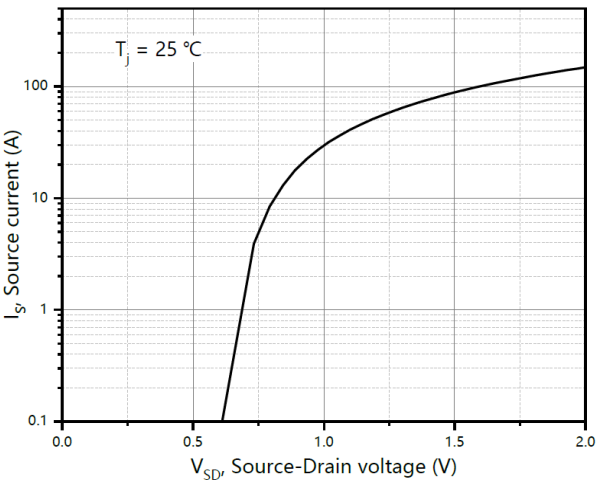


Figure 8. Forward characteristic of body diode

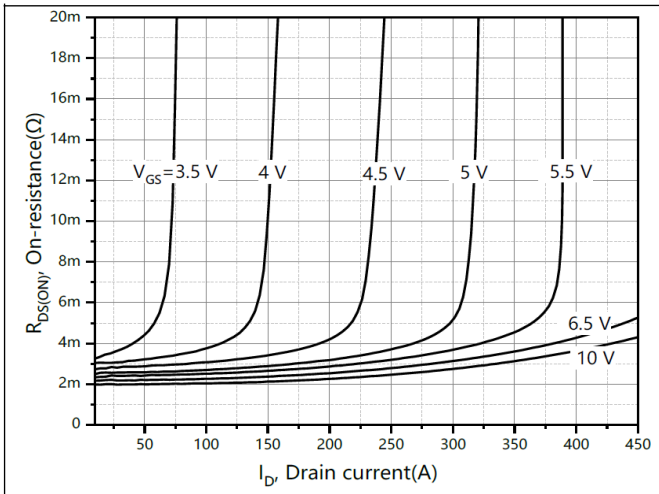


Figure 9. Drain-source on-state resistance

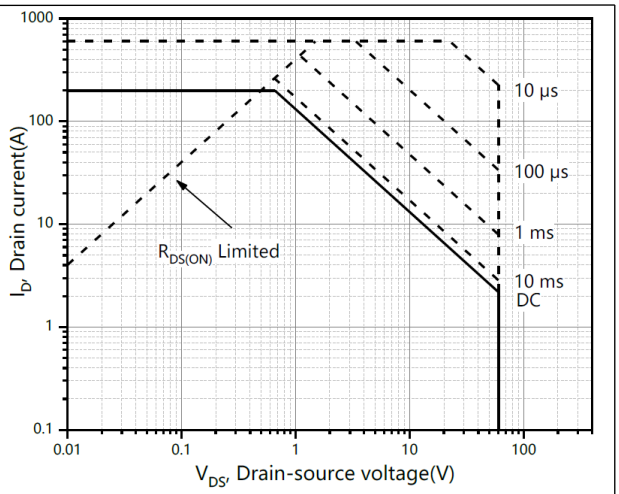


Figure 10. Safe operation area for T_C=25 °C

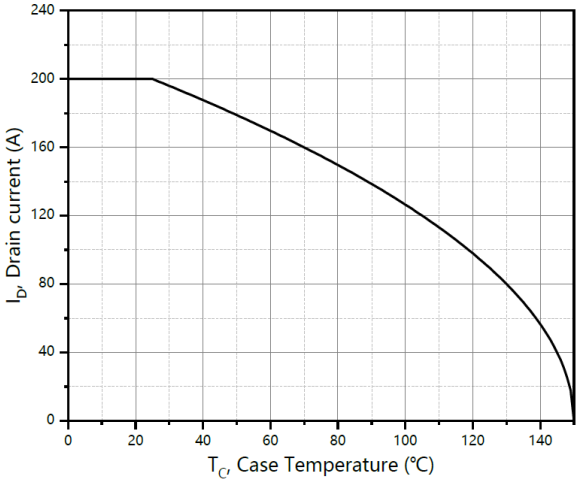


Figure 11. Drain current

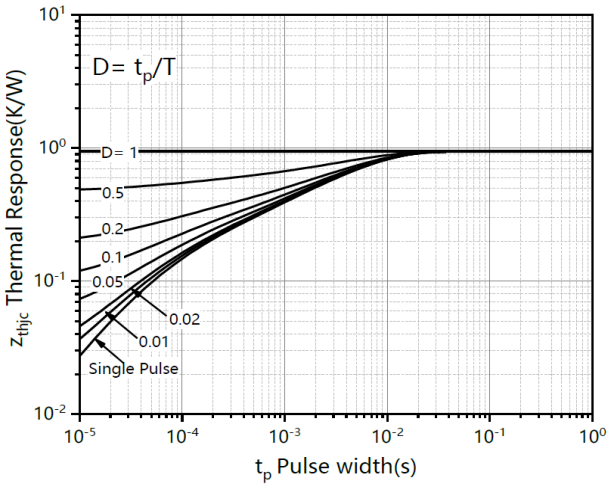


Figure 12. Max transient thermal impedance

Test circuits and waveforms

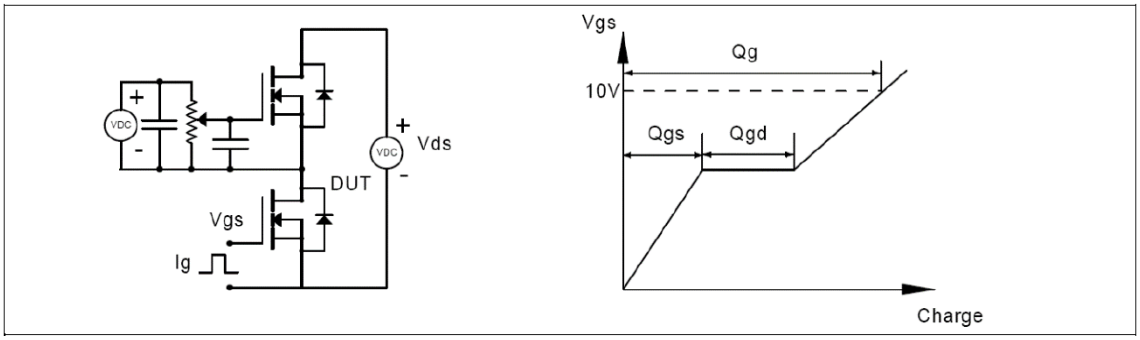


Figure 1. Gate charge test circuit & waveform

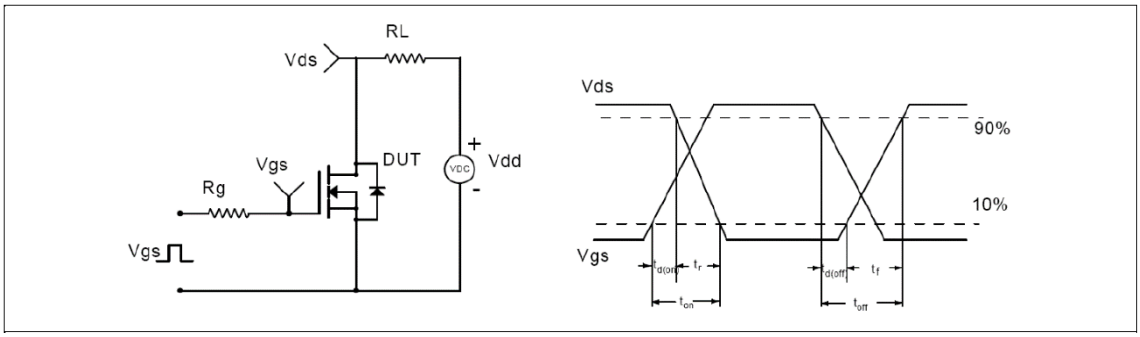


Figure 2. Switching time test circuit & waveforms

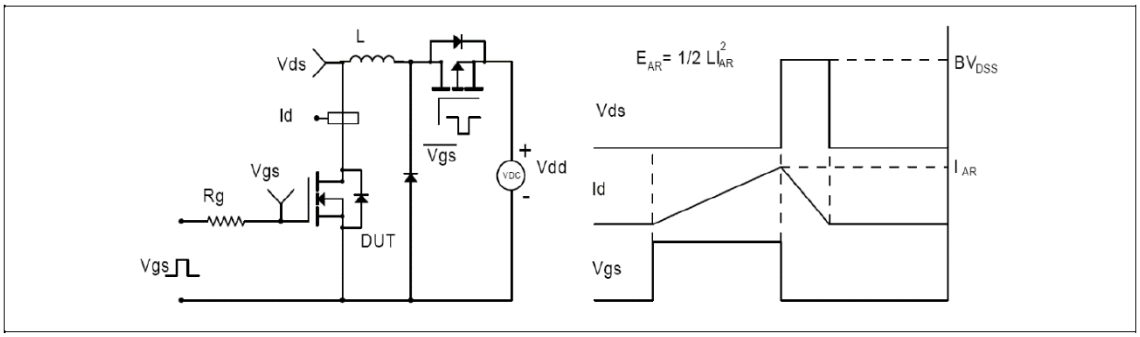


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

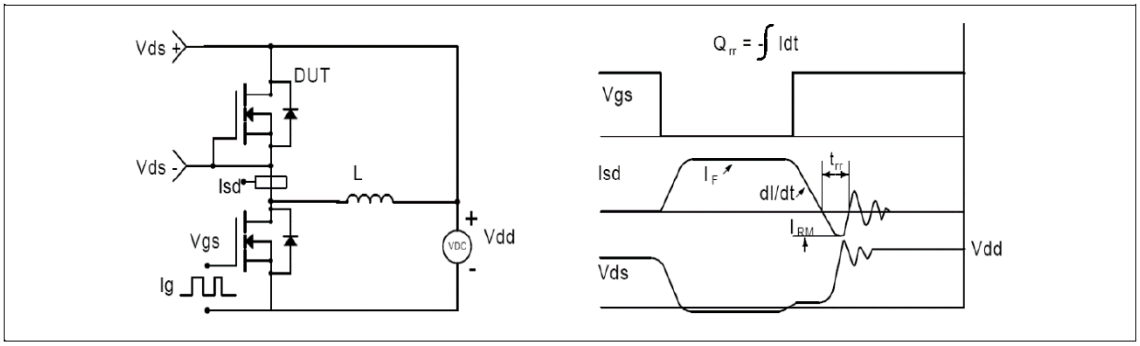
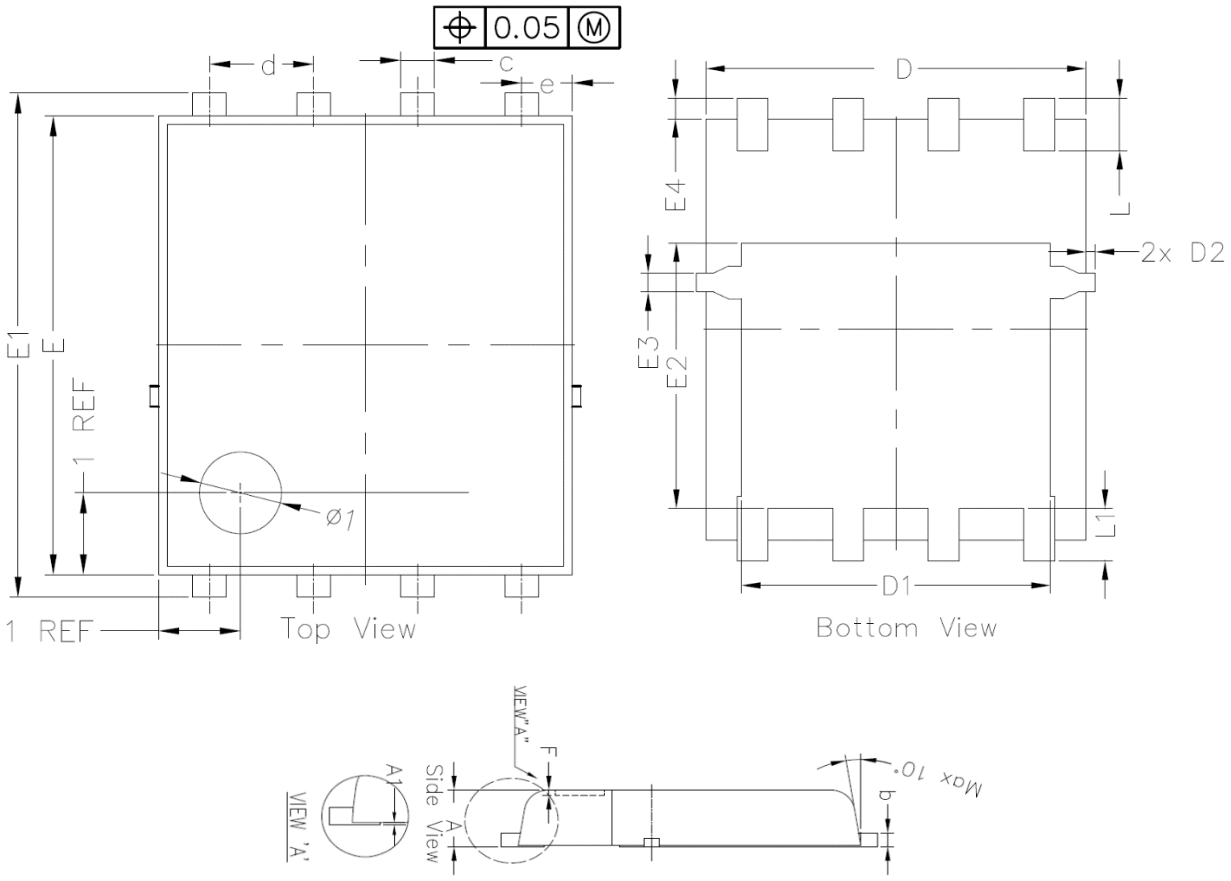


Figure 4. Diode reverse recovery test circuit & waveforms

Package Outline Dimensions



SYMBOLS	DIMENSION IN MM			DIMENSION IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
* A	0.900	1.000	1.100	0.035	0.039	0.043
A1	0.000	---	0.050	0.000	----	0.002
b	0.246	0.254	0.312	0.010	0.010	0.012
* c	0.310	0.410	0.510	0.012	0.016	0.020
d		1.27 BSC			0.050 BSC	
* D	4.950	5.050	5.150	0.195	0.199	0.203
D1	4.000	4.100	4.200	0.157	0.161	0.165
* D2	---	---	0.125	---	---	0.005
e		0.62 BSC			0.024 BSC	
* E	5.500	5.600	5.700	0.217	0.220	0.224
* E1	6.050	6.150	6.250	0.238	0.242	0.246
E2	3.425	3.525	3.625	0.135	0.139	0.143
E3	0.150	0.250	0.350	0.006	0.010	0.014
* E4	0.175	0.275	0.375	0.007	0.011	0.015
F	-	-	0.100	-	-	0.004
* L	0.500	0.600	0.700	0.02	0.02	0.03
L1	0.600	0.700	0.800	0.02	0.03	0.03

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