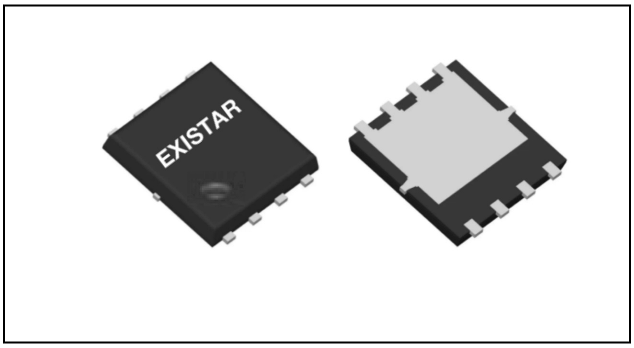
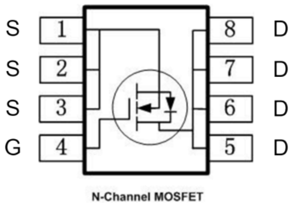
N-Channel 60V MOSFET

E060N5P4HL1

V_{DS} (V)	$R_{DS(on),max}$ (mΩ)	I_D (A)
60V	5.4@ V_{GS} = 10V	110

PDFN5X6





Pb-free
RoHS
COMPLIANT
HALOGEN
FREE

Features

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

Applications

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

Package And Ordering Information

Ordering code	Package	Marking
E060N5P4HL1	PDFN5X6	E060N5P4HL1

Ordering Information

Package	Units/ Reel	Reels/ Inner Box	Units/ Inner Box
PDFN5X6	5000	1	5000

Key Performance Parameters

Parameter	Value	Unit
VDS, min @ Tj(max)	60	V
ID, pulse	320	A
RDS(ON), max @ VGS=10V	5.4	mΩ
Qg	30	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	110	A
	T_C=100°C		-	
Pulsed drain current		$I_{D,pulse}$	320	
Avalanche energy, single pulse		E_{AS}	66	mJ
Power dissipation	T_C=25°C	P_D	87	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	$R_{θJC}$	1.44	°C/W
Thermal resistance, junction-to-ambient	Steady state	$R_{θJA}$	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)		3.8	5.4	mΩ	V_{GS} = 10 V, I_D = 20 A
Drain-source on-resistance	R_{DS}(on)		5.0	6.2	mΩ	V_{GS} = 4.5 V, I_D = 10 A

Forward transconductance	gfs		-		S	V_{DS} = 5 V, I_D = 20 A
Gate resistance	Rg		2.8		Ω	f=1MHz
Gate Charge						
Total gate charge	Qg		30		nC	V_{DS} = 50 V, I_D = 25 A, V_{GS} = 10 V
Gate-source charge	Qgs		5.8			
Gate-drain charge	Qgd		6.1			
Dynamic						
Turn-on delay time	$t_{d(on)}$		22.9		ns	V_{DS} = 50 V, I_D =25 A, V_{GS} = 10 V, R_{GEN} = 2 Ω
Rise time	t_r		6.5			
Turn-off delay time	$t_{d(off)}$		45.7			
Fall time	t_f		20.4			
Input capacitance	C_{iss}		1750		pF	V_{DS} =50 V, V_{GS} = 0 V, f = 100kHz
Output capacitance	C_{oss}		332			
Reverse transfer capacitance	C_{rss}		10.6			
Body Diode						
Diode forward voltage	V_{SD}			1.3	V	V_{GS} = 0 V, I_F = 20 A
Reverse recovery time	t_{rr}		50.3		ns	V_R= 50 V, I_S =25 A, di/dt = 100 A/μs
Reverse recovery charge	Q_{rr}		45.1		nC	

Electrical Characteristics Diagrams

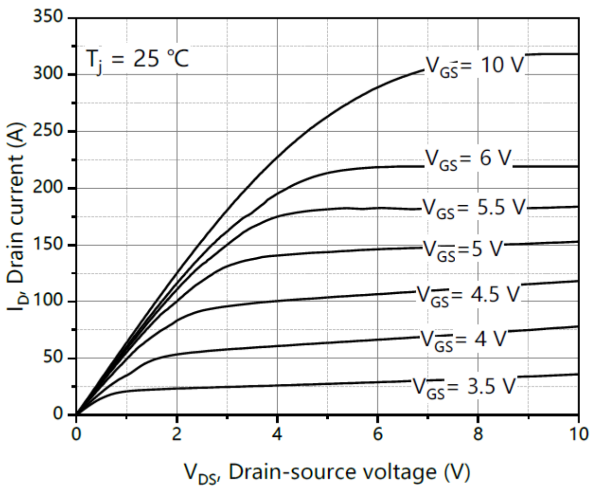


Figure 1. Typ. output characteristics

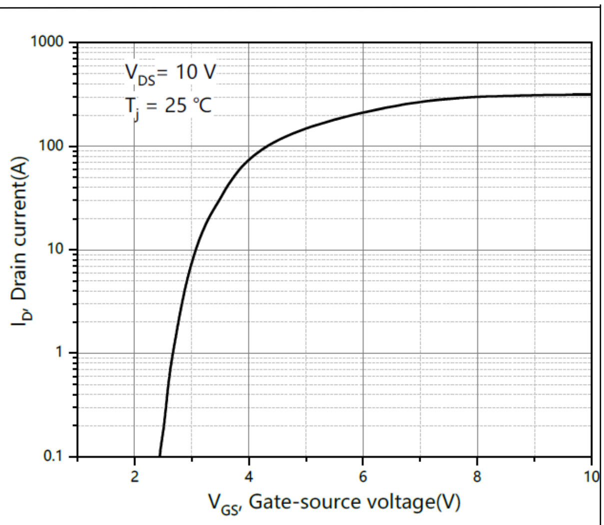


Figure 2. Typ. transfer characteristics

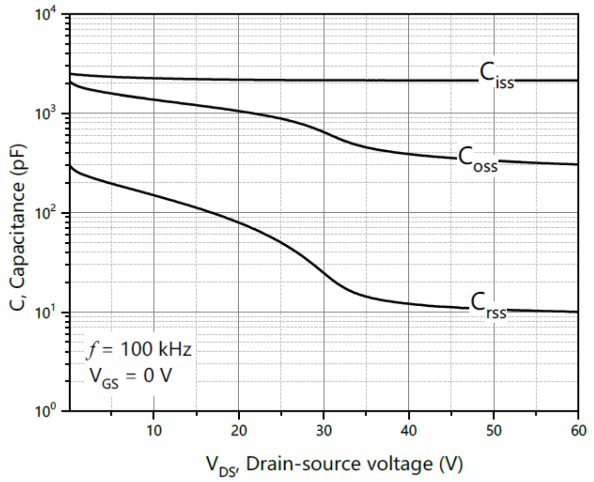


Figure 3. Typ. capacitances

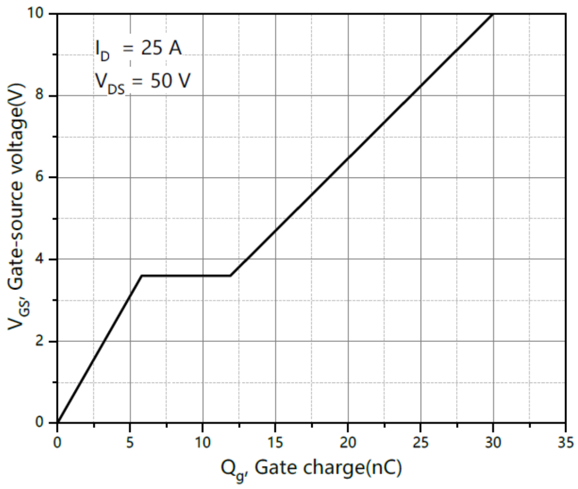


Figure 4. Typ. gate charge

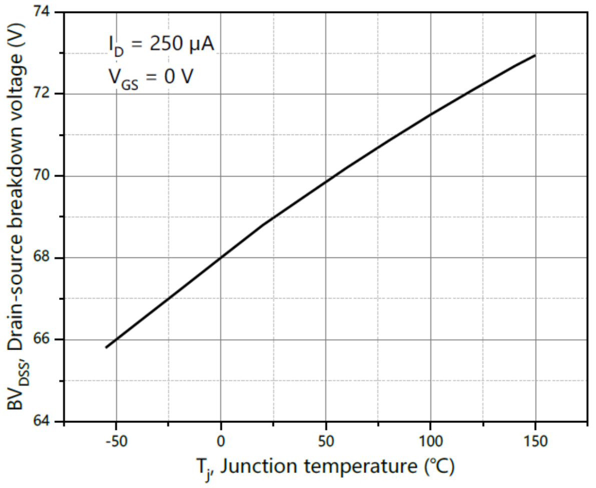


Figure 5. Drain-source breakdown voltage

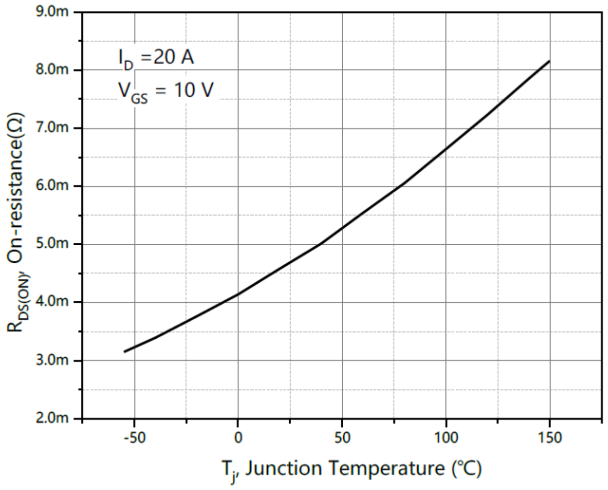


Figure 6. Drain-source on-state resistance

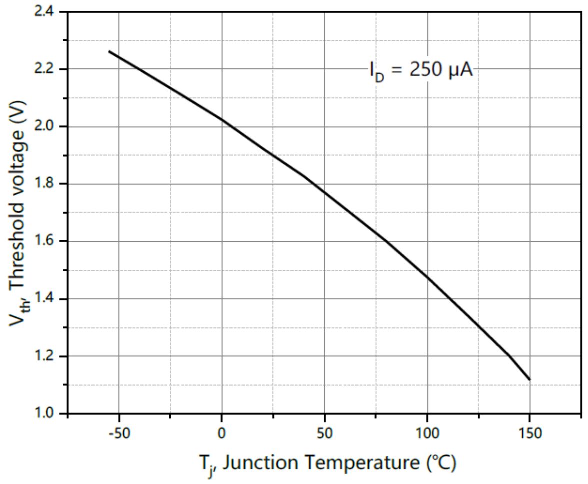


Figure 7. Threshold voltage

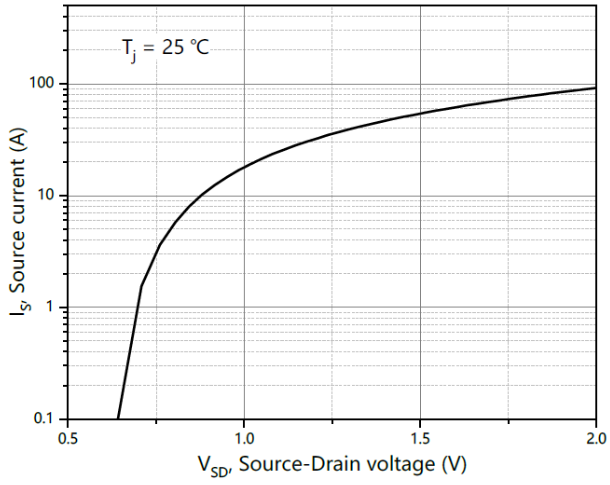


Figure 8. Forward characteristic of body diode

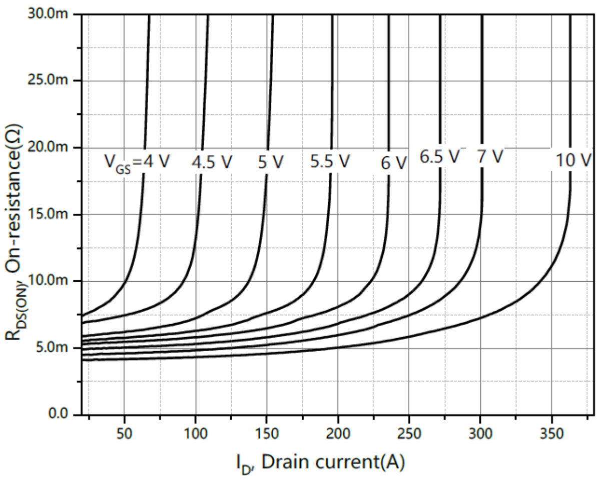


Figure 9. Drain-source on-state resistance

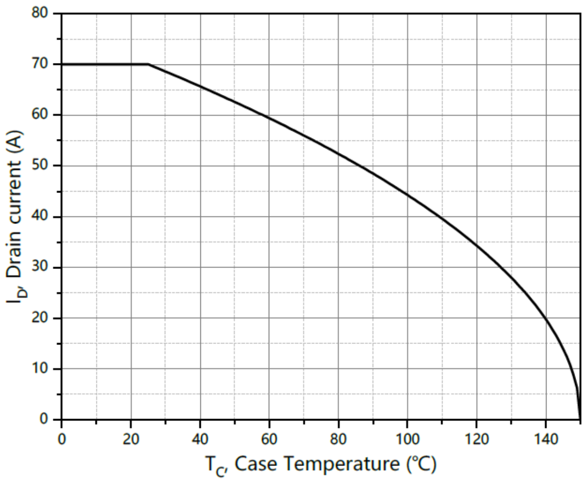


Figure 10. Drain current

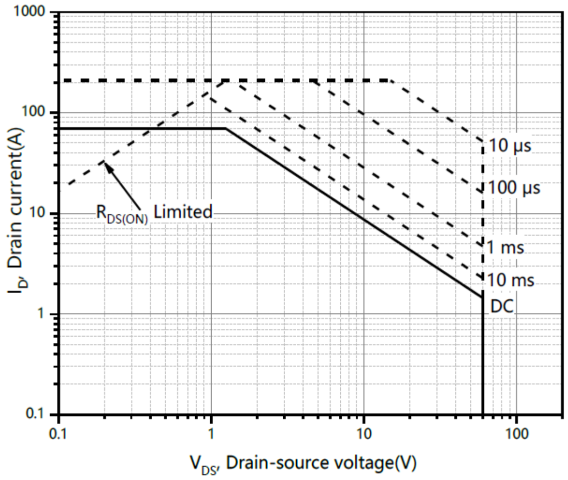


Figure 11. Safe operation area T_C=25 °C

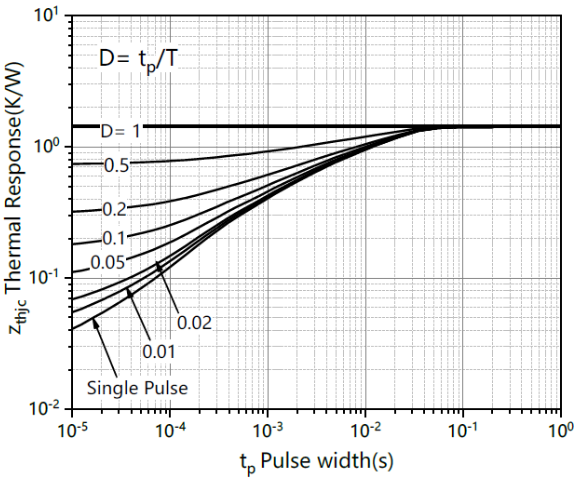


Figure 12. Max. transient thermal impedance

Test circuits and waveforms

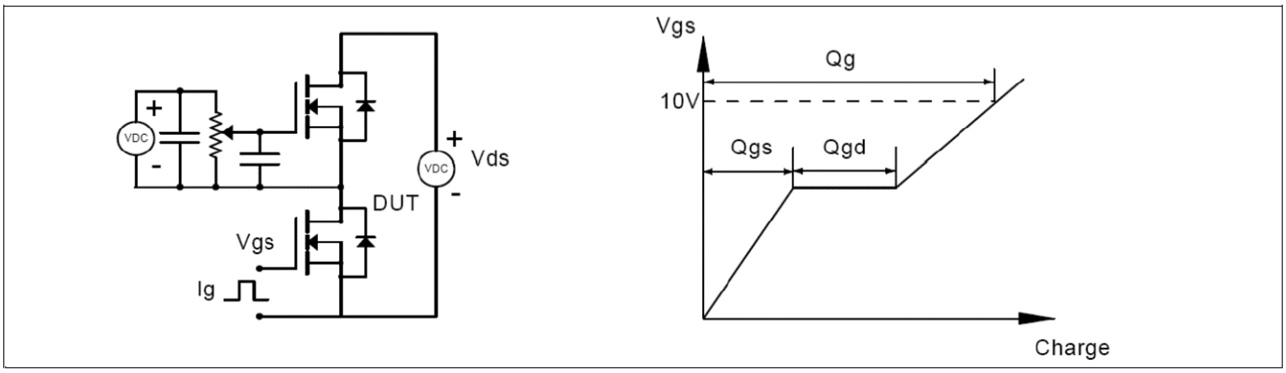


Figure 1. Gate charge test circuit & waveform

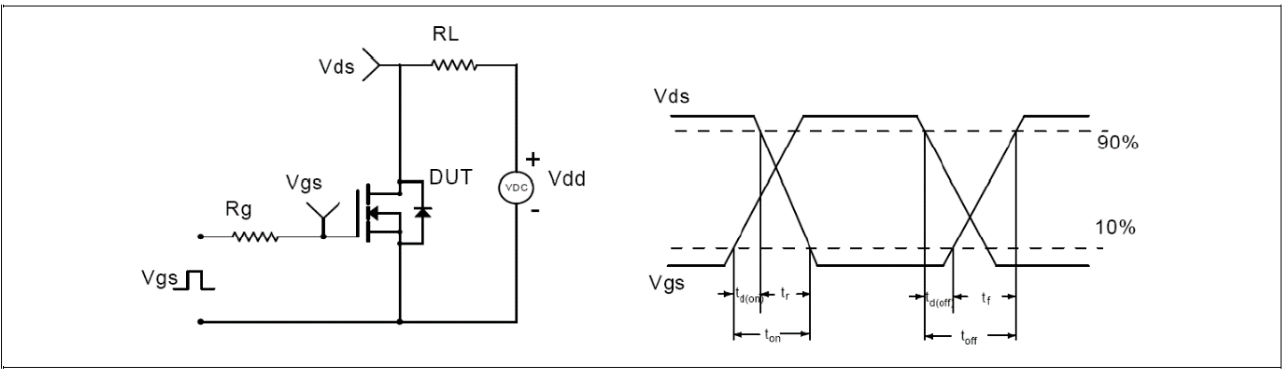


Figure 2. Switching time test circuit & waveforms

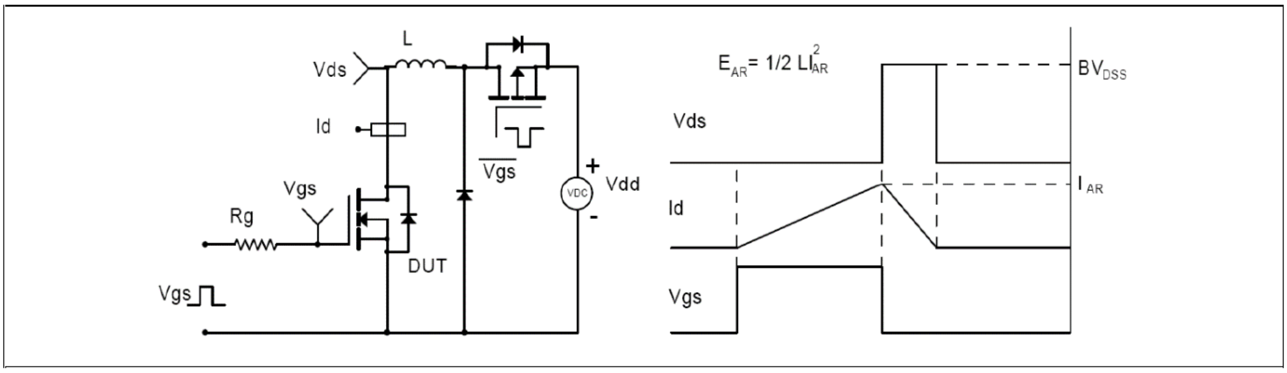


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

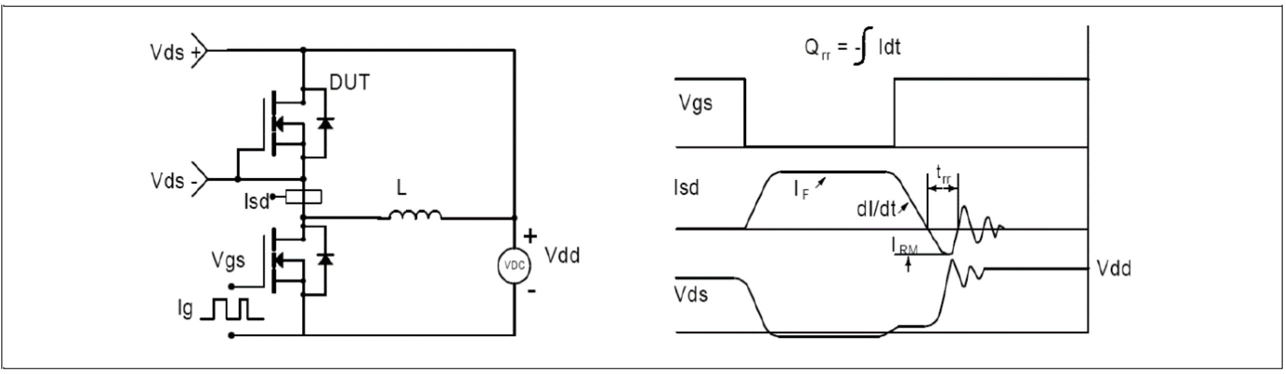
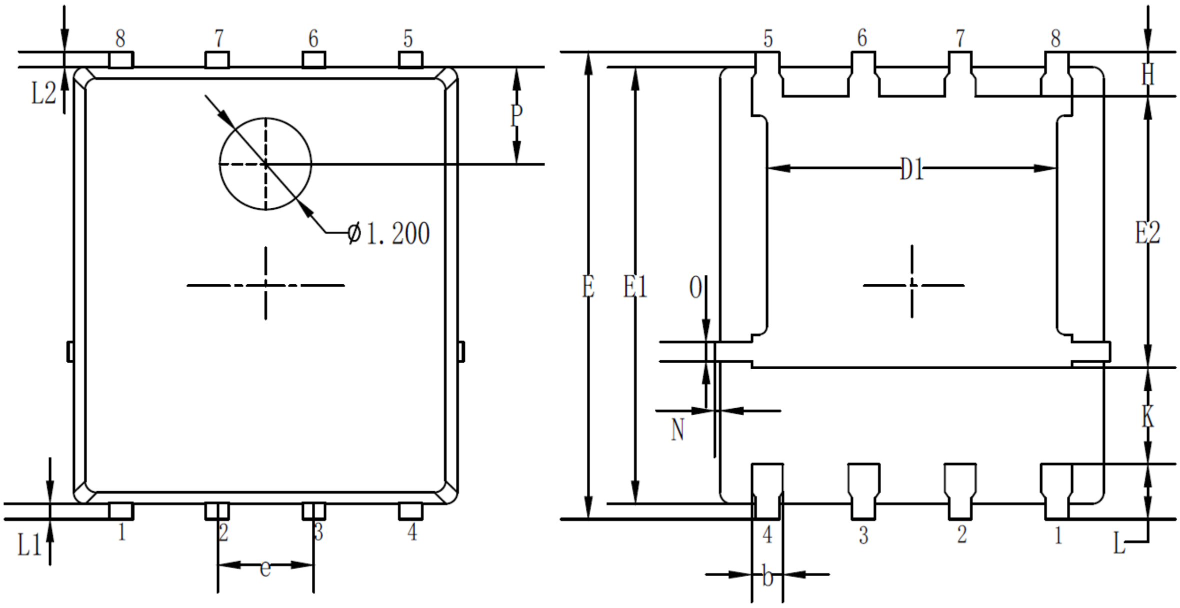
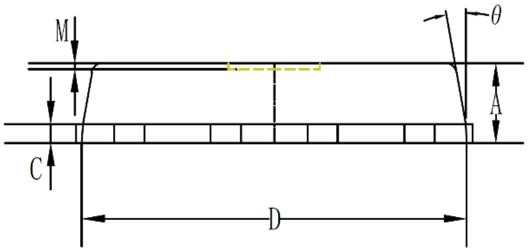


Figure 4. Diode reverse recovery test circuit & waveforms

Package Outline Dimensions





Symbols	Millimeters		
	MIN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.35	0.40	0.50
C	0.20	0.25	0.35
D	4.90	5.05	5.10
D1	3.72	3.82	3.92
E	6.00	6.15	6.25
E1	5.60	5.75	5.90
E2	3.47	3.57	3.67
e	1.27 BSC.		
H	0.48	0.58	0.68
K	1.17	1.27	1.37
L	0.64	0.69	0.75
L1/L2	0.10 ~ 0.20		
θ	8°	10°	12°
M	0.08 REF.		
N	0	–	0.15
O	0.25 REF.		
P	1.28 REF.		

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