

## 12V P-Channel Enhancement Mode MOSFET

### Description

The PECN1216DR uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

### General Features

- ◆  $V_{DS} = -12V$ ,  $I_D = -16A$   
 $R_{DS(ON)}(Typ.) = 18m\Omega$  @  $V_{GS} = -2.5V$   
 $R_{DS(ON)}(Typ.) = 13m\Omega$  @  $V_{GS} = -4.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

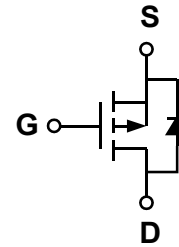
### Application

- ◆ PWM applications
- ◆ Load switch

### Package

- ◆ DFN2\*2-6L-B

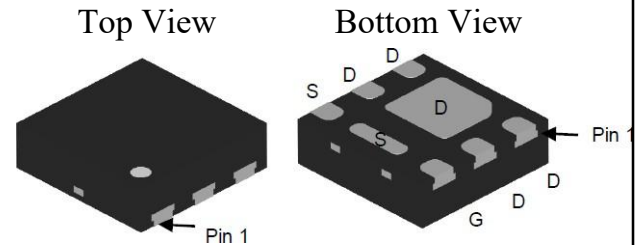
### Schematic diagram



### Marking and pin assignment

**DFN2\*2-6L-B**

(Thickness 0.55mm)



PECN Natlinear Power  
1216----NP1216



### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
PECN1216DR-G	-55°C to +150°C	DFN2*2-6L-B	4000

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit	
Drain-source voltage	$V_{DS}$	-18	V	
Gate-source voltage	$V_{GS}$	±12	V	
Drain current-continuous	$I_D$	$T_C = 25^\circ C$	-16 <sup>a</sup>	A
		$T_C = 70^\circ C$	-16 <sup>a</sup>	
		$T_A = 25^\circ C$	-16 <sup>a,b,c</sup>	
		$T_A = 70^\circ C$	-12 <sup>b,c</sup>	
Drain-source Diode forward current	$I_S$	$T_C = 25^\circ C$	-16 <sup>a</sup>	A
		$T_A = 25^\circ C$	-2.9 <sup>b,c</sup>	
Maximum power dissipation	$P_D$	18	W	

	T <sub>C</sub> =70°C		12	
	T <sub>A</sub> =25°C		3.5 <sup>b,c</sup>	
	T <sub>A</sub> =70°C		2.2 <sup>b,c</sup>	
Operating junction Temperature range		T <sub>J</sub>	-55—150	°C

## Thermal Resistance Ratings

Parameter	Symbol	Typ.	Max.	Unit
Maximum junction-to-ambient <sup>b,d</sup>	t ≤ 5 s	R <sub>thJA</sub>	28	°C/W
Maximum junction-to-case (drain)	Steady state	R <sub>thJC</sub>	5.3	

### Notes:

- a. Package limited; b. Surface mounted on 1" x 1" FR4 board  
 c. t = 5 s; d. Maximum under steady state conditions is 80 °C/W

## Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-12	-18	-	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =-12V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-body leakage	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V	-	-	±100	nA
<b>ON Characteristics</b>						
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-0.5	-0.75	-1.2	V
Drain-source on-state resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-8A	-	13	15	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-6A	-	18	23	
Forward transconductance	gfs	V <sub>DS</sub> =-6V, I <sub>D</sub> =-7A	-	32	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-6V, V <sub>GS</sub> =0V f=1.0MHz	-	1300	-	pF
Output capacitance	C <sub>OSS</sub>		-	380	-	
Reverse transfer capacitance	C <sub>RSS</sub>		-	280	-	
<b>Switching Characteristics</b>						
Turn-on delay time	t <sub>D(ON)</sub>	V <sub>DD</sub> =-10V I <sub>D</sub> =-5A V <sub>GEN</sub> =-4.5V R <sub>L</sub> =1.0 2ohm R <sub>GEN</sub> =1ohm	-	11	-	ns
Rise time	t <sub>r</sub>		-	35	-	
Turn-off delay time	t <sub>D(OFF)</sub>		-	30	-	
Fall time	t <sub>f</sub>		-	10	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> =-6V, I <sub>D</sub> =-9A V <sub>GS</sub> =-4.5V	-	13	-	nC
Gate-source charge	Q <sub>gs</sub>		-	3	-	
Gate-drain charge	Q <sub>gd</sub>		-	5	-	
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode forward voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1.25A	-	-0.7	-1.2	V

## Typical Performance Characteristics

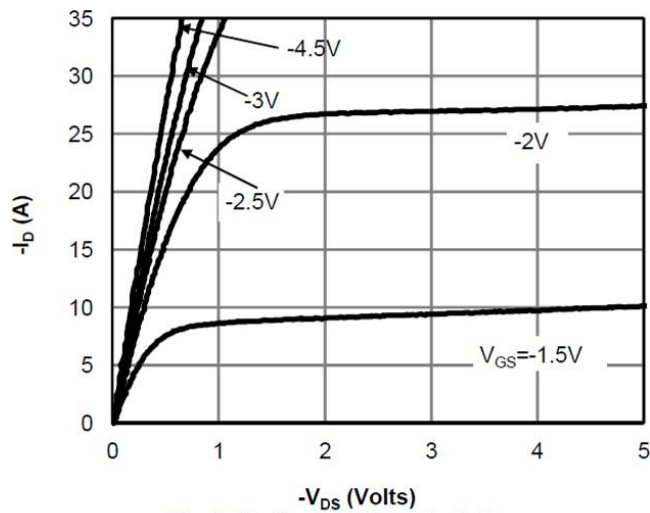


Fig 1: On-Region Characteristics

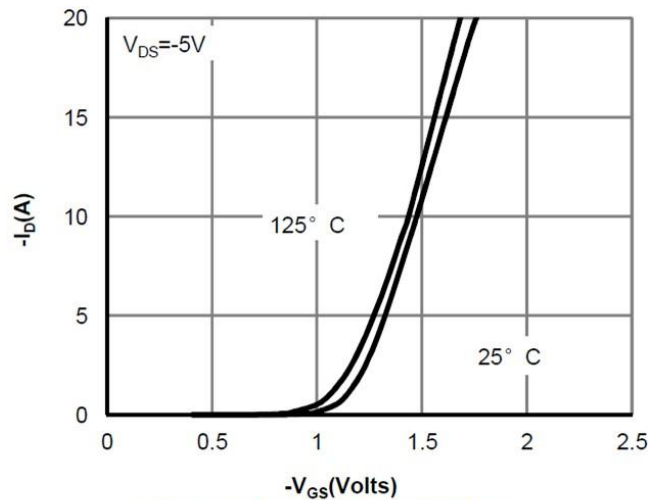


Figure 2: Transfer Characteristics

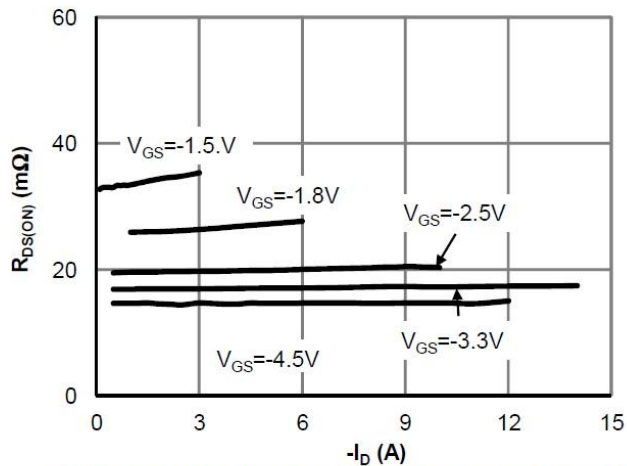


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

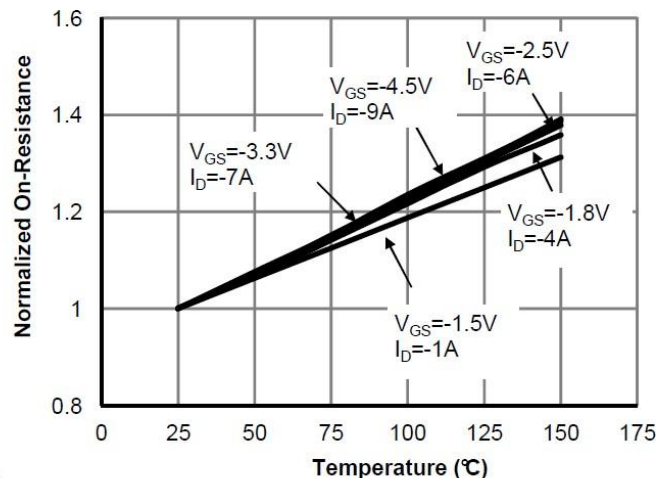


Figure 4: On-Resistance vs. Junction Temperature

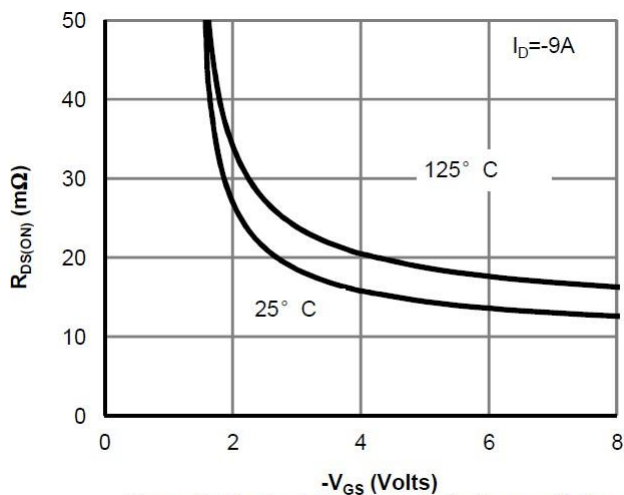


Figure 5: On-Resistance vs. Gate-Source Voltage

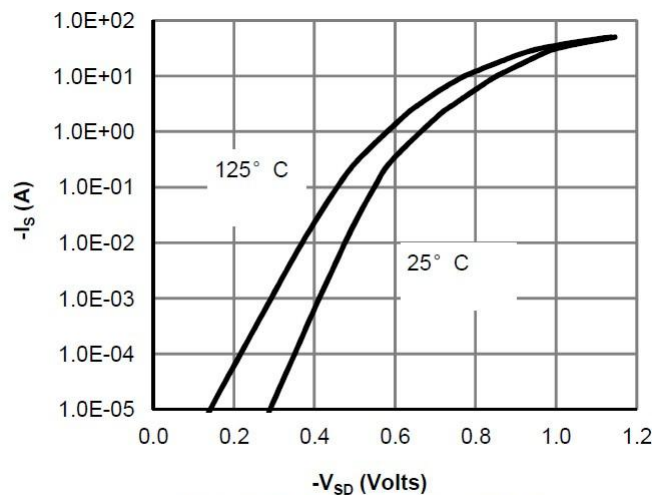


Figure 6: Body-Diode Characteristics

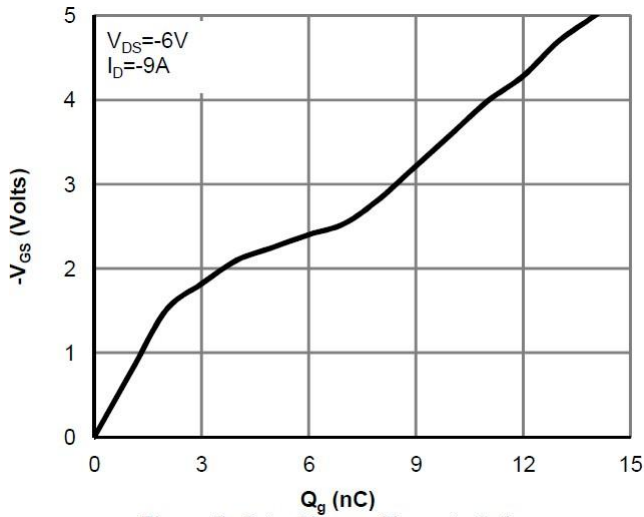


Figure 7: Gate-Charge Characteristics

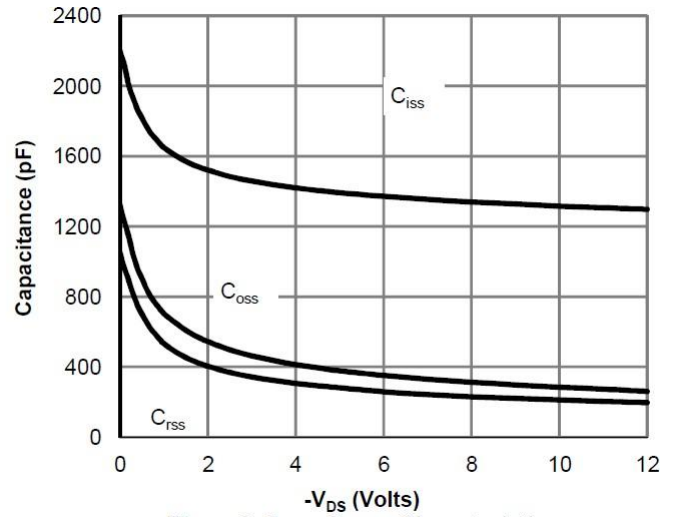


Figure 8: Capacitance Characteristics

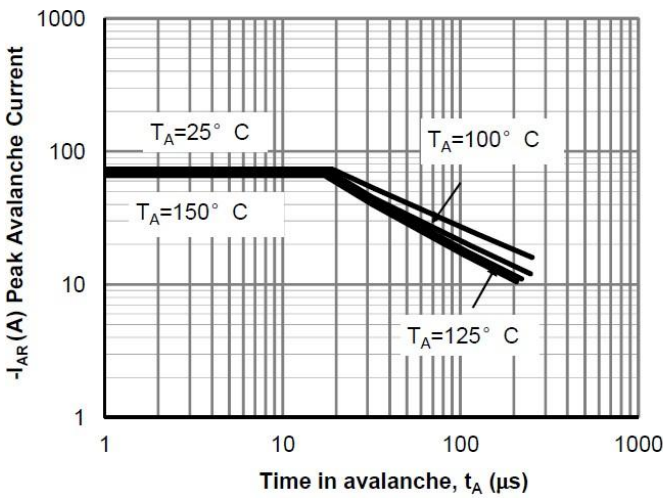


Figure 9: Single Pulse Avalanche capability

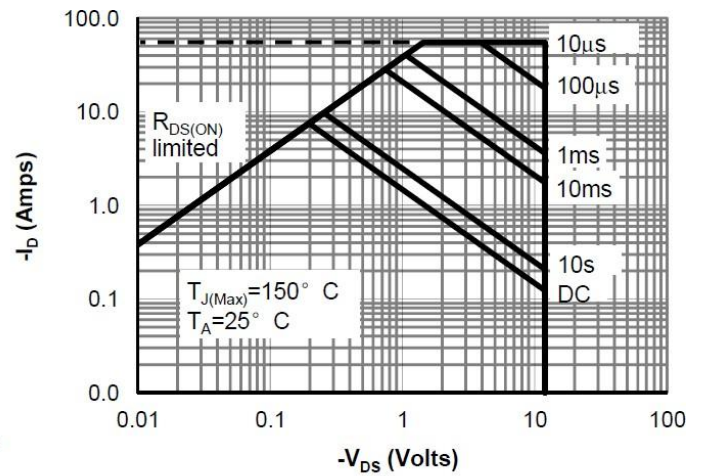


Figure 10: Maximum Forward Biased Safe Operating Area

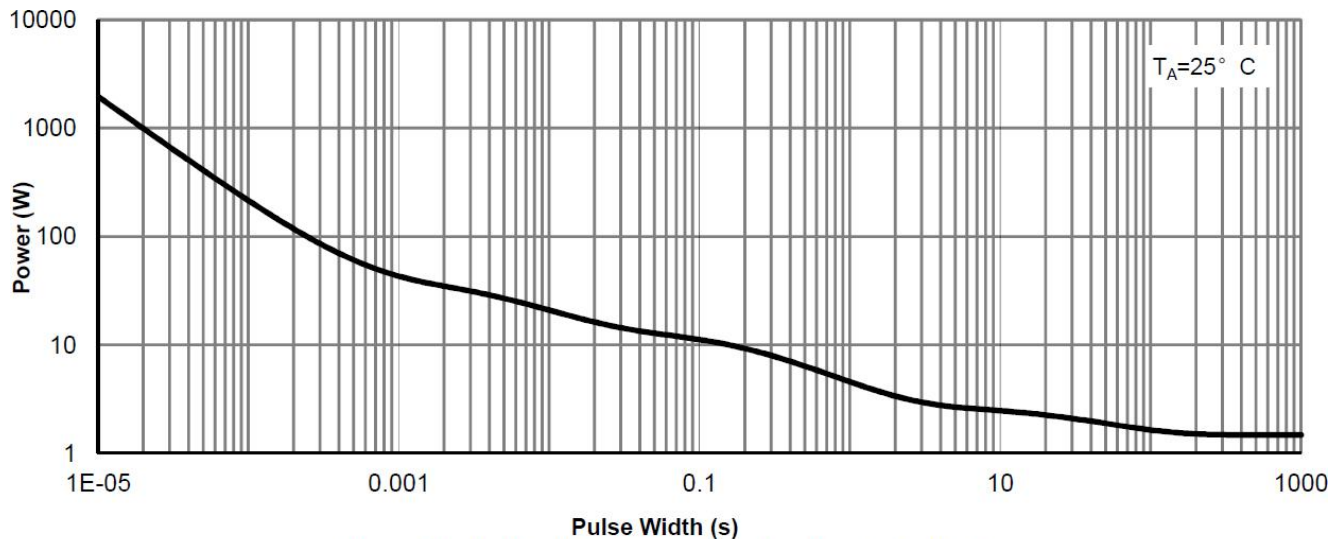


Figure 11: Single Pulse Power Rating Junction-to-Ambient

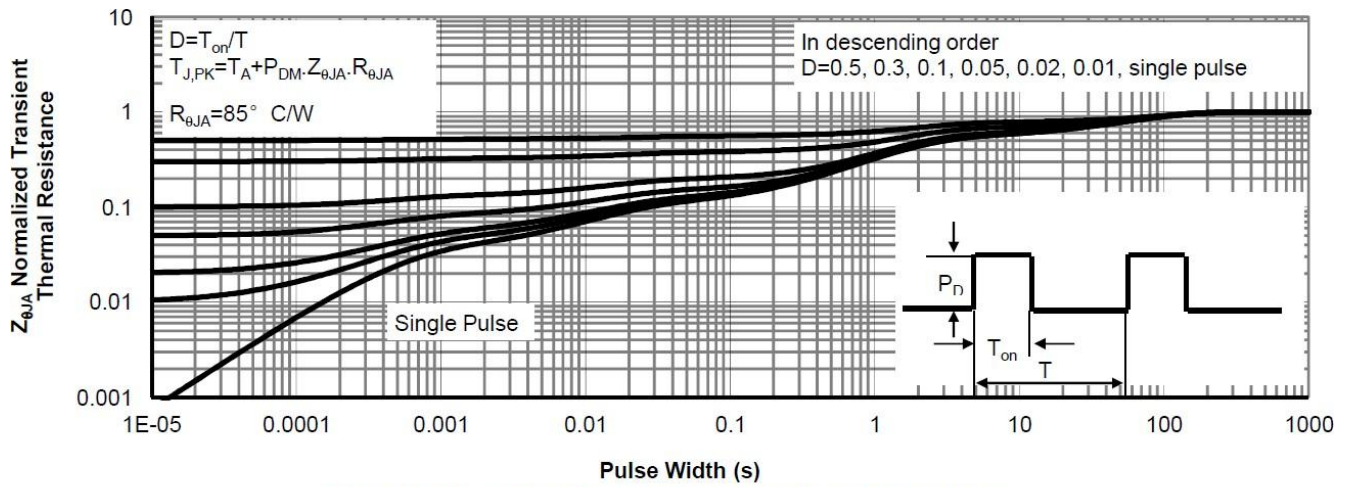
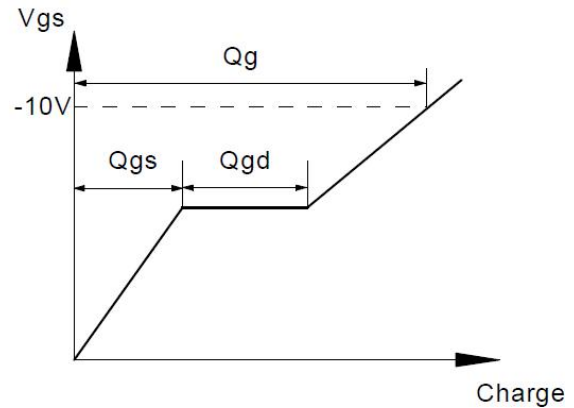
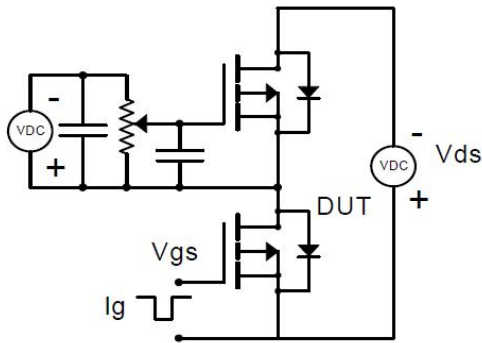
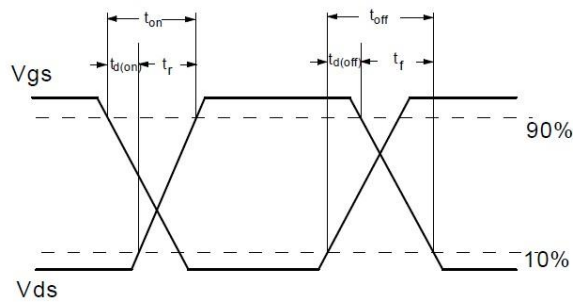
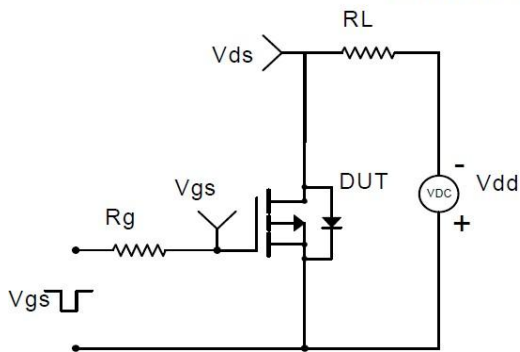


Figure 12: Normalized Maximum Transient Thermal Impedance

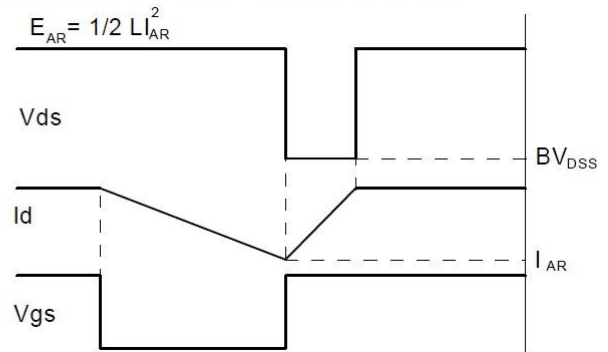
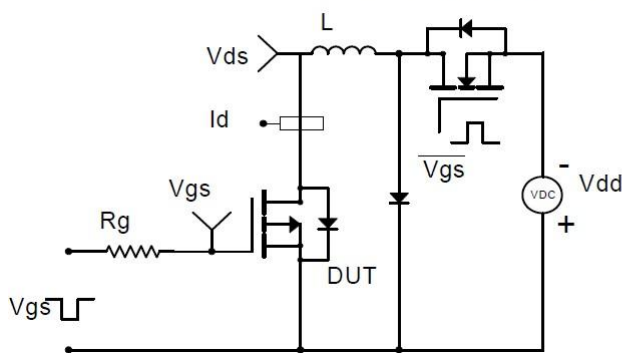
## Gate Charge Test Circuit & Waveform



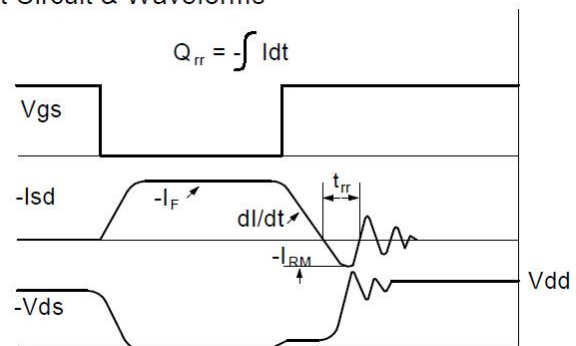
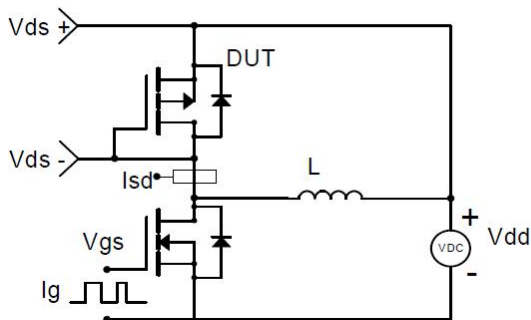
## Resistive Switching Test Circuit & Waveforms



## Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

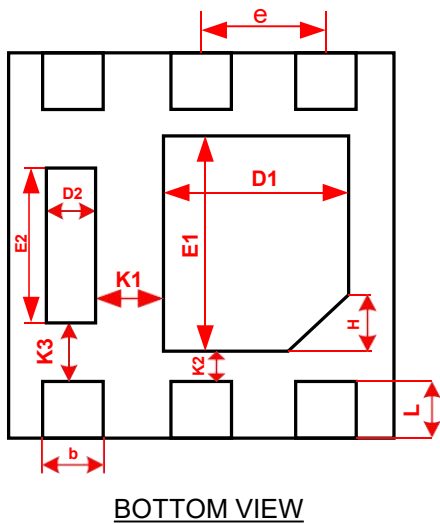
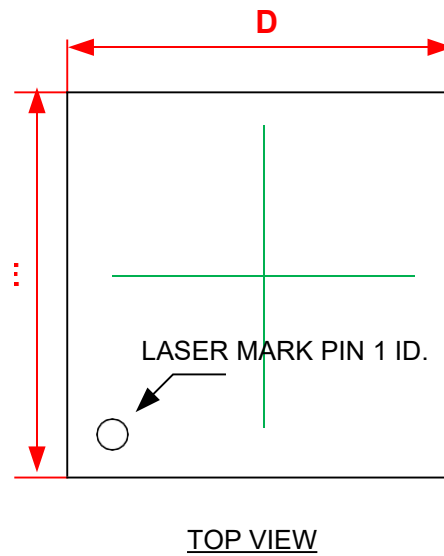
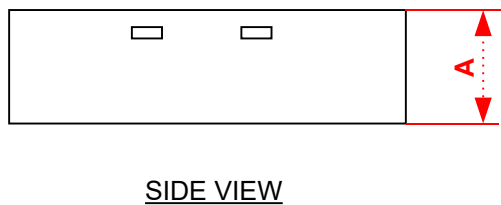
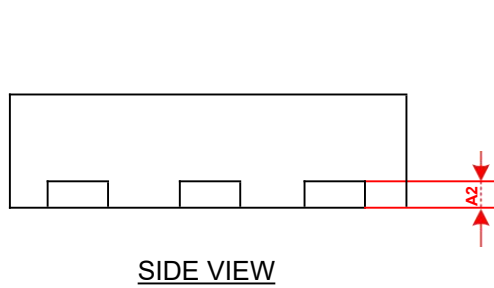


## Diode Recovery Test Circuit & Waveforms



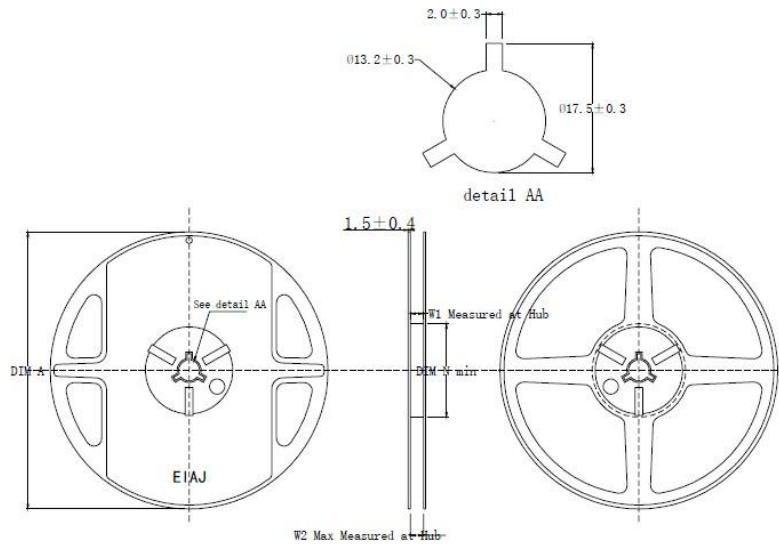
## Package Information

- DFN2\*2-6L-B

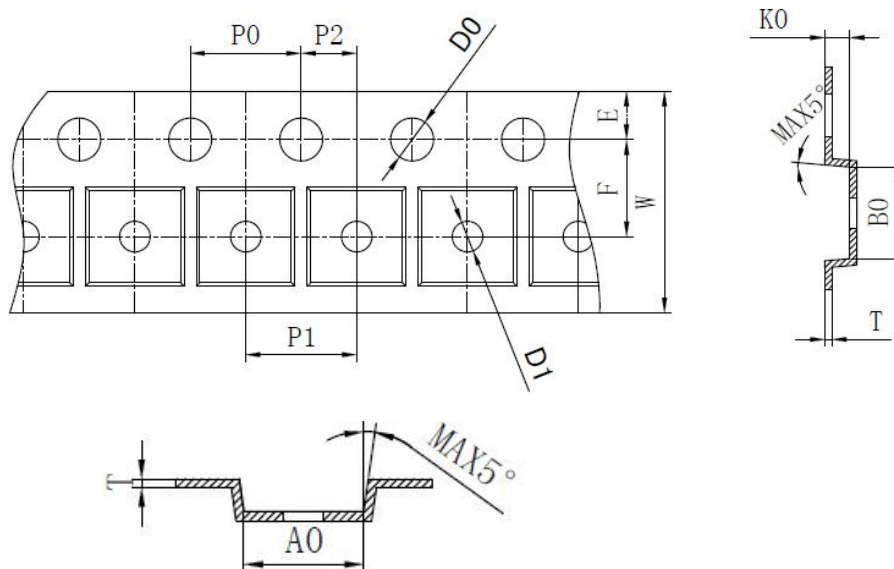


Common Dimension (mm)			
PKG	DFN2020-6L-B		
SYMBOL	MIN.	MON.	MAX.
A	0.527	0.552	0.577
A2		0.127REF	
b	0.25	0.30	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D1	0.85	0.95	1.05
E1	1.05	1.15	1.25
D2	0.20	0.25	0.30
E2	0.69	0.79	0.89
e	0.55	0.65	0.75
H	0.25	0.30	0.35
K1	0.25MIN		
K2	0.15MIN		
K3	0.20MIN		
L	0.20	0.25	0.30

## Tape and Reel



PRODUCT SPECIFICATIONS				
TYPE WIDTH	$\phi A$	$\phi N$	W1 (Min)	W2 (Max)
8MM	$178 \pm 2.0$	$60 \pm 1.0$	8.4	11.4
12MM	$178 \pm 2.0$	$60 \pm 1.0$	12.4	15.4



SYMBOL	A0	B0	K0	P0	P1	P2
SPEC	$2.20 \pm 0.05$	$2.20 \pm 0.05$	$0.75 \pm 0.10$	$4.00 \pm 0.10$	$4.00 \pm 0.10$	$2.00 \pm 0.05$
SYMBOL	T	E	F	D0	D1	W
SPEC	$0.20 \pm 0.03$	$1.75 \pm 0.10$	$3.50 \pm 0.05$	$1.55 \pm 0.05$	$1.00^{+0.10}_{-0}$	$8.00^{+0.20}_{-0.10}$