

12V P-Channel Enhancement Mode MOSFET

Description

The NP1216DR 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

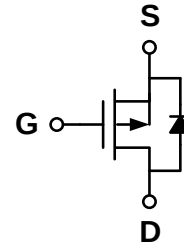
Application

- ◆ PWM applications
- ◆ Load switch

Package

- ◆ DFN2*2-6L-B

Schematic diagram

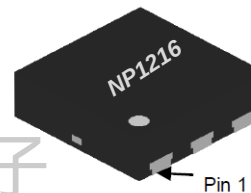


Marking and pin assignment

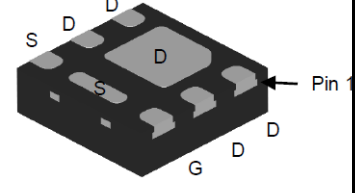
DFN2*2-6L-B

(Thickness 0.55mm)

Top View



Bottom View



NP----Natlinear Power

1216----NP1216

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP1216DR-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	$T_C = 25^\circ C$	I_D	-16 ^a	A
	$T_C = 70^\circ C$		-16 ^a	
	$T_A = 25^\circ C$		-16 ^{a,b,c}	
	$T_A = 70^\circ C$		-12 ^{b,c}	
Drain-source Diode forward current	$T_C = 25^\circ C$	I_S	-16 ^a	A
	$T_A = 25^\circ C$		-2.9 ^{b,c}	
Maximum power dissipation		P_D	18	W

	$T_C=70^{\circ}\text{C}$		12	
	$T_A=25^{\circ}\text{C}$		3.5 ^{b,c}	
	$T_A=70^{\circ}\text{C}$		2.2 ^{b,c}	
Operating junction Temperature range		T_j	-55—150	$^{\circ}\text{C}$

Thermal Resistance Ratings

Parameter		Symbol	Typ.	Max.	Unit
Maximum junction-to-ambient ^{b,d}	$t \leq 5 \text{ s}$	R_{thJA}	28	36	$^{\circ}\text{C/W}$
Maximum junction-to-case (drain)	Steady state	R_{thJC}	5.3	6.5	

Notes:

- a. Package limited
- b. Surface mounted on 1" x 1" FR4 board
- c. $t = 5 \text{ s}$
- 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
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-12	-18	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-12V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.5	-0.75	-1.2	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=-4.5V, I_D=-8A$	-	13	15	m Ω
		$V_{GS}=-2.5V, I_D=-6A$	-	18	23	
Forward transconductance	g_{fs}	$V_{DS}=-6V, I_D=-7A$	-	32	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=-6V, V_{GS}=0V$ $f=1.0MHz$	-	1300	-	pF
Output capacitance	C_{OSS}		-	380	-	
Reverse transfer capacitance	C_{RSS}		-	280	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-10V$ $I_D=-5A$ $V_{GEN}=-4.5V$ $R_L=1.0\Omega, 20\Omega$ $R_{GEN}=10\Omega$	-	11	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{D(OFF)}$		-	30	-	
Fall time	t_f		-	10	-	
Total gate charge	Q_g	$V_{DS}=-6V, I_D=-9A$ $V_{GS}=-4.5V$	-	13	-	nC
Gate-source charge	Q_{gs}		-	3	-	
Gate-drain charge	Q_{gd}		-	5	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						

Diode forward voltage	V_{SD}	$V_{GS}=0V, I_S=-1.25A$	-	-0.7	-1.2	V
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Typical Performance Characteristics

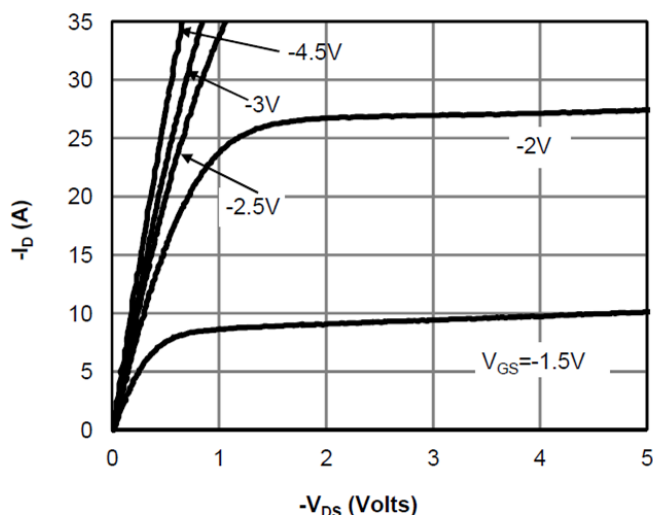


Fig 1: On-Region Characteristics

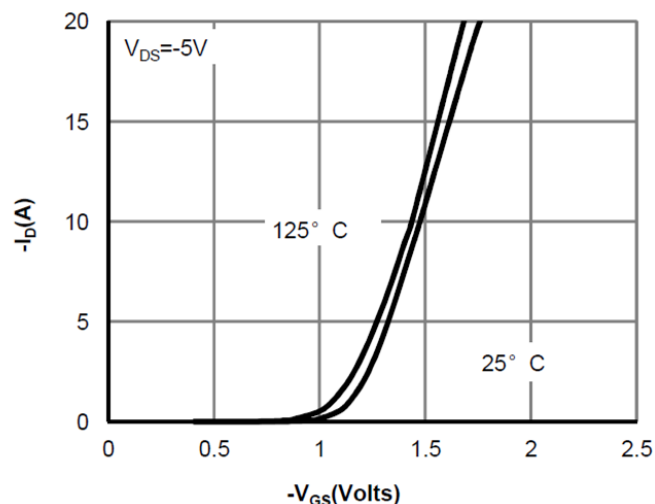


Figure 2: Transfer Characteristics

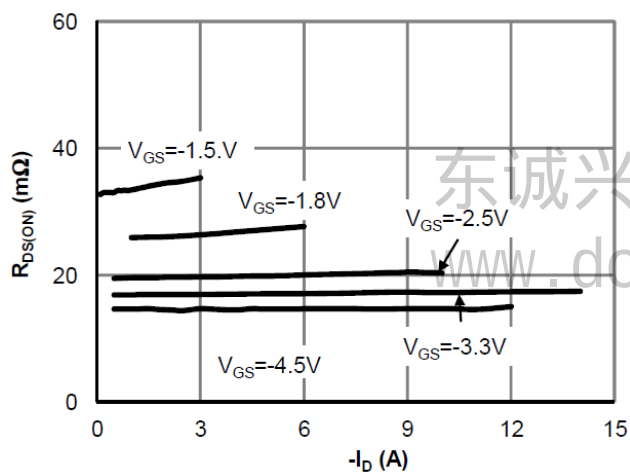


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

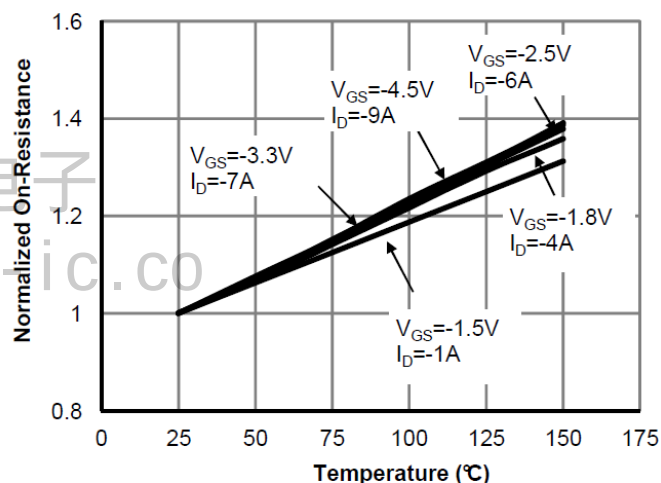


Figure 4: On-Resistance vs. Junction Temperature

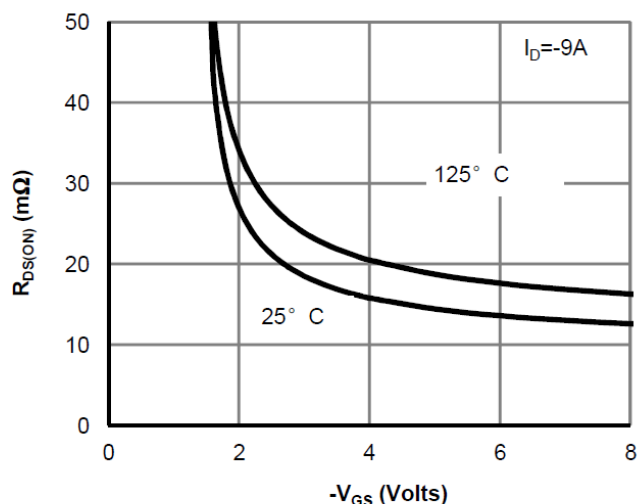


Figure 5: On-Resistance vs. Gate-Source Voltage

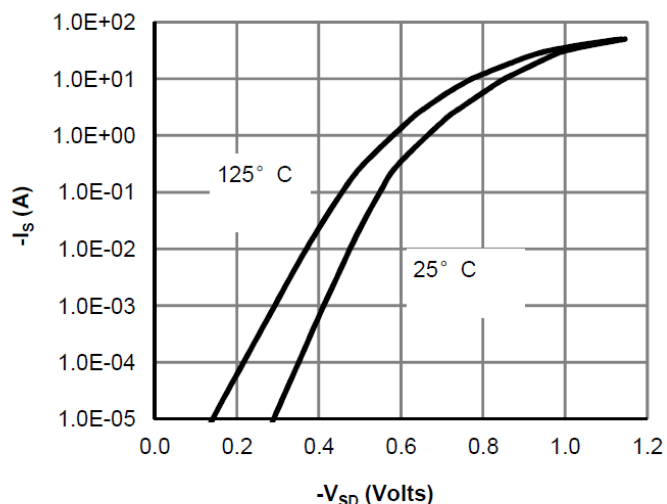


Figure 6: Body-Diode Characteristics

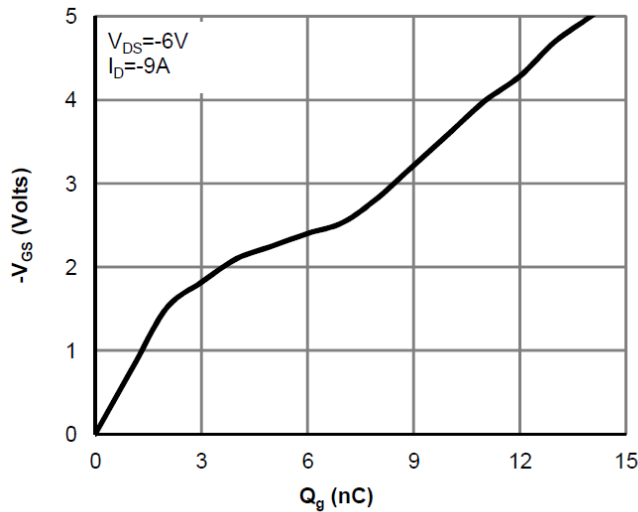


Figure 7: Gate-Charge Characteristics

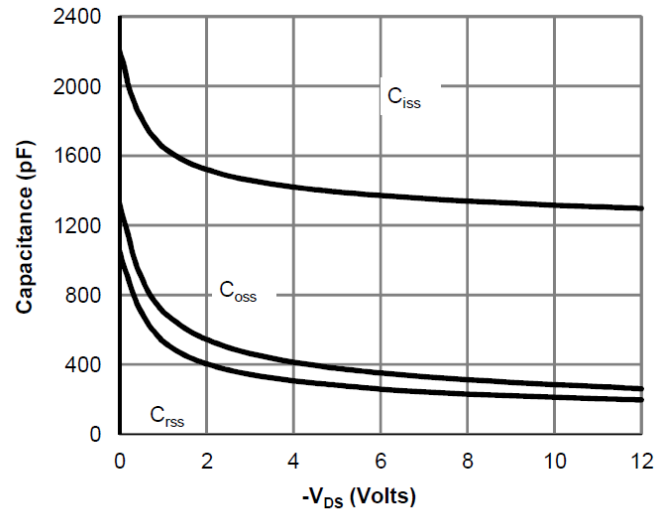


Figure 8: Capacitance Characteristics

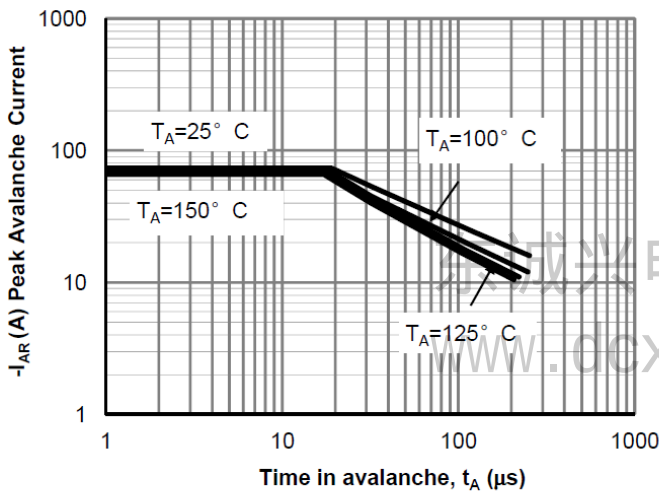


Figure 9: Single Pulse Avalanche capability

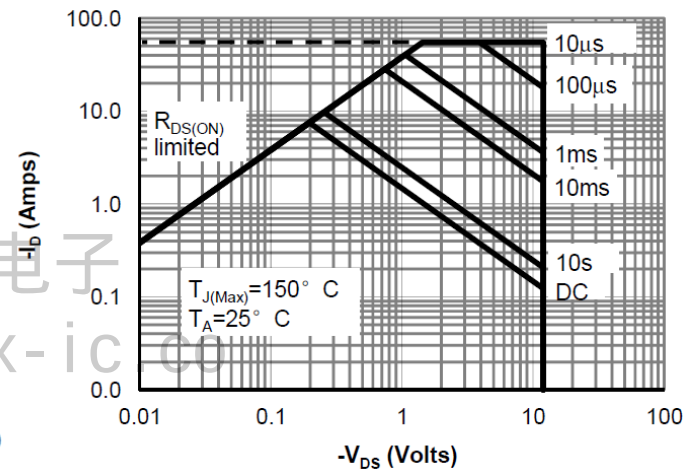


Figure 10: Maximum Forward Biased Safe Operating Area

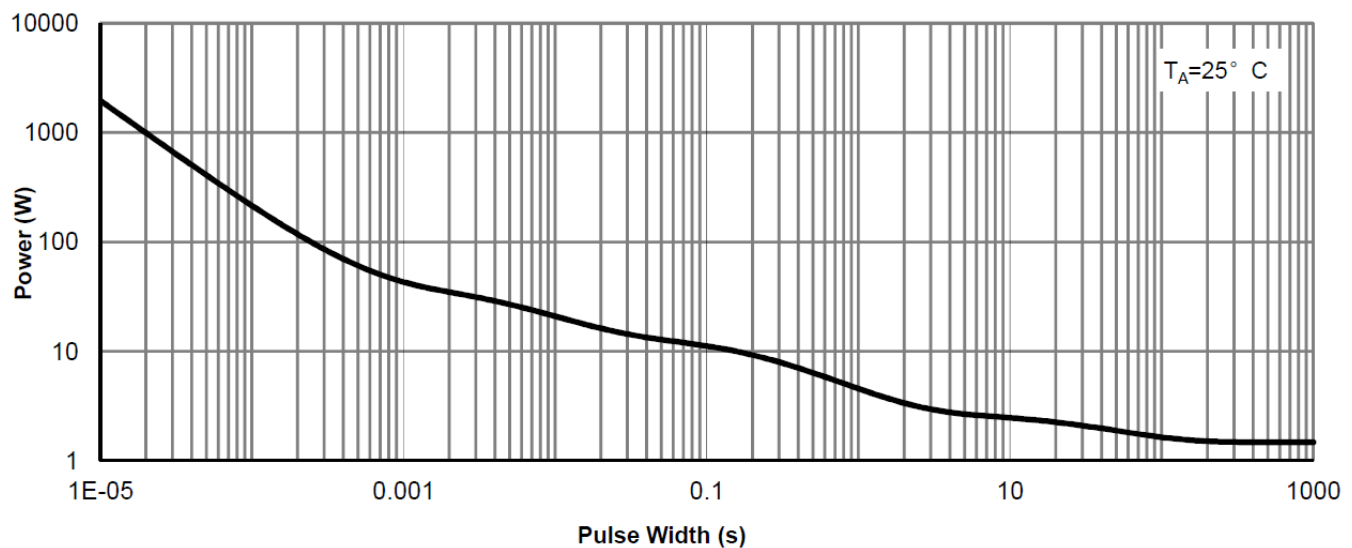


Figure 11: Single Pulse Power Rating Junction-to-Ambient

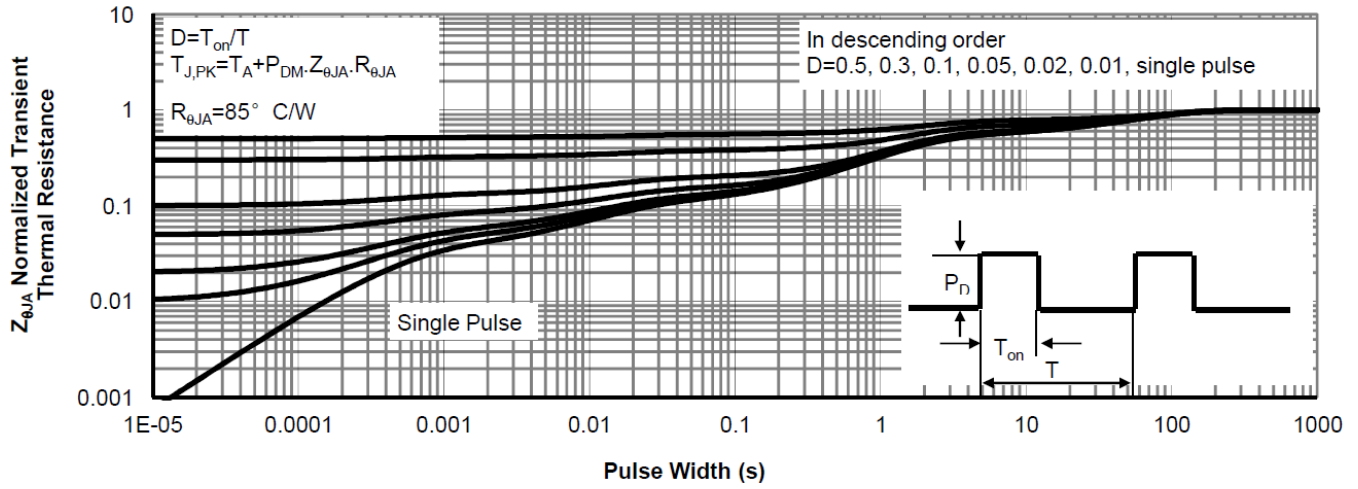
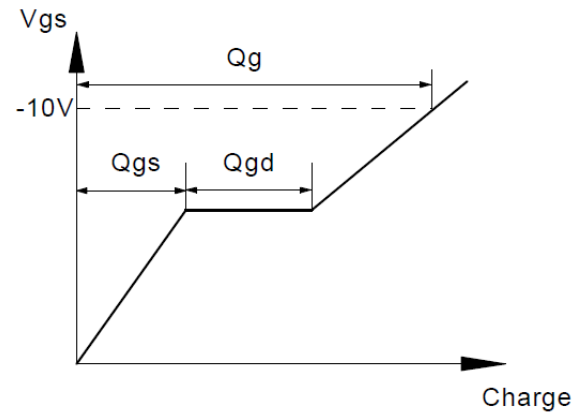
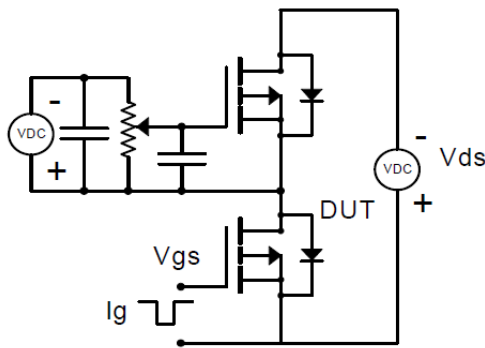


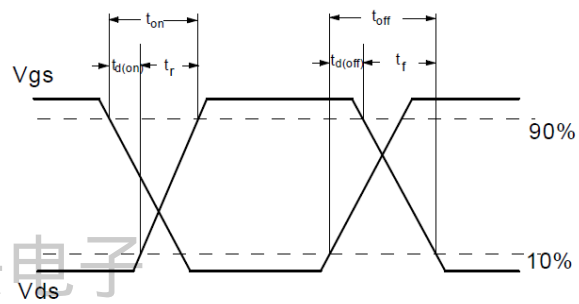
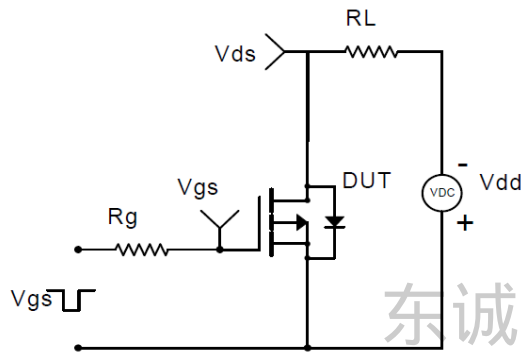
Figure 12: Normalized Maximum Transient Thermal Impedance

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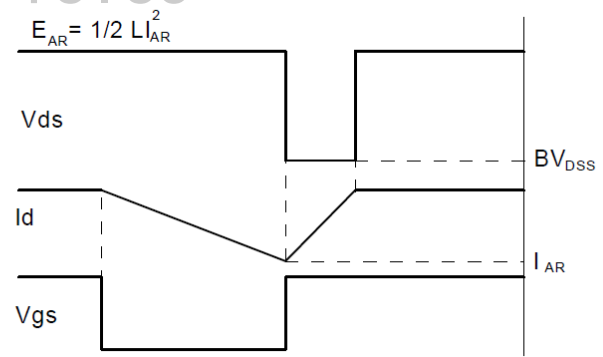
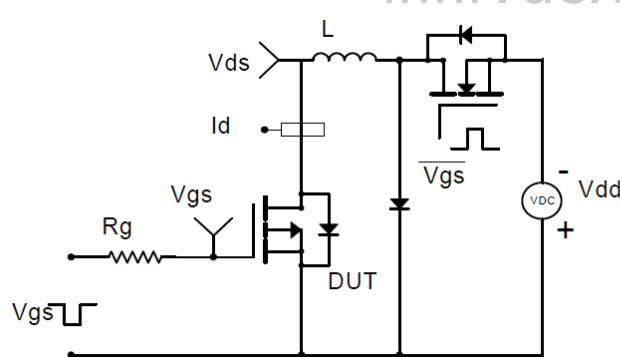
Gate Charge Test Circuit & Waveform



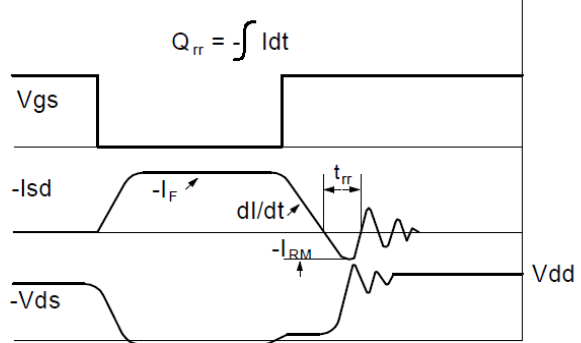
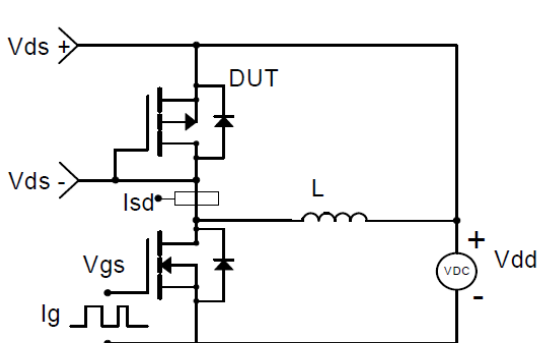
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

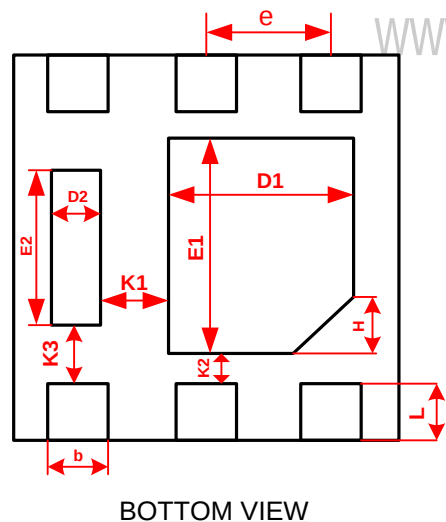
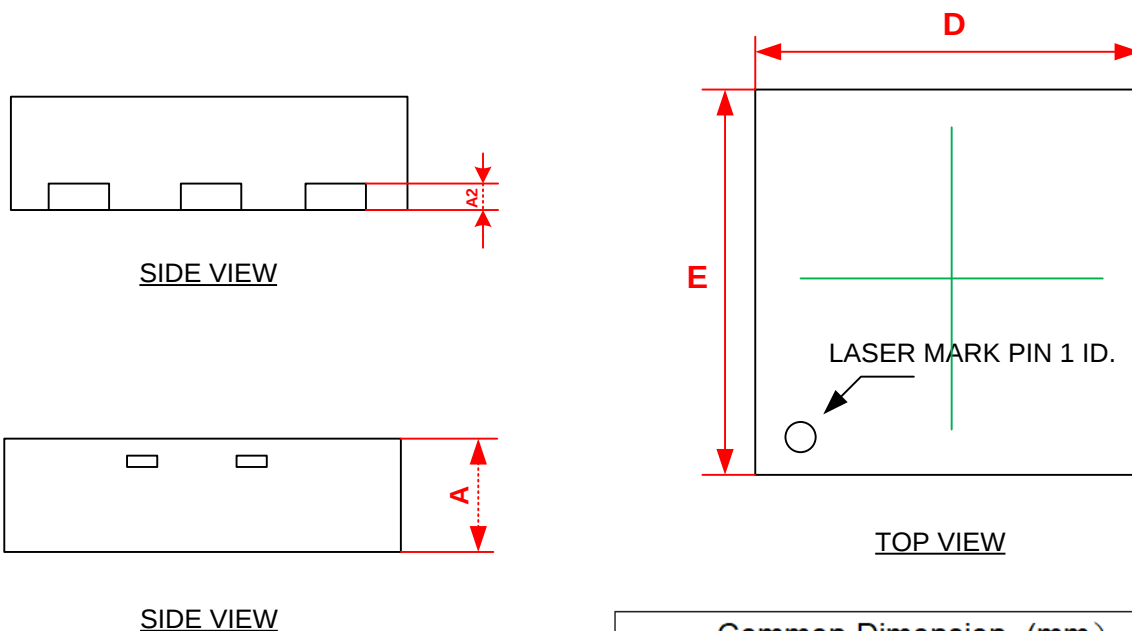


Diode Recovery Test Circuit & Waveforms



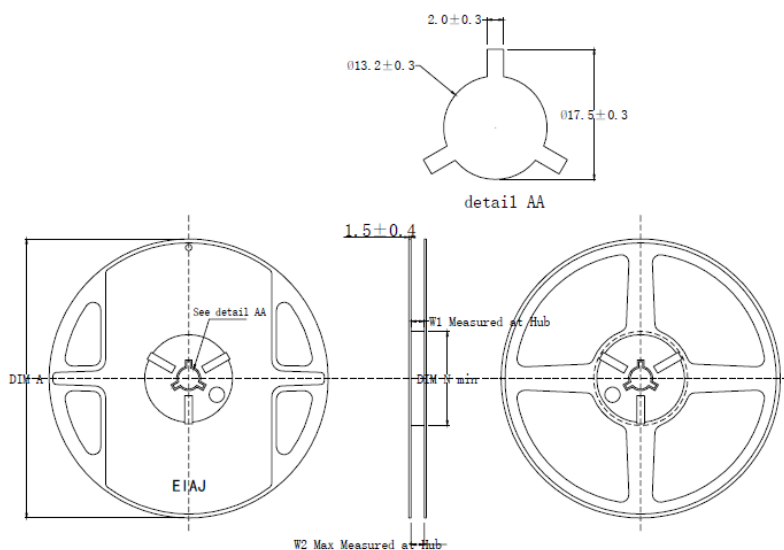
Package Information

- DFN2*2-6L-B

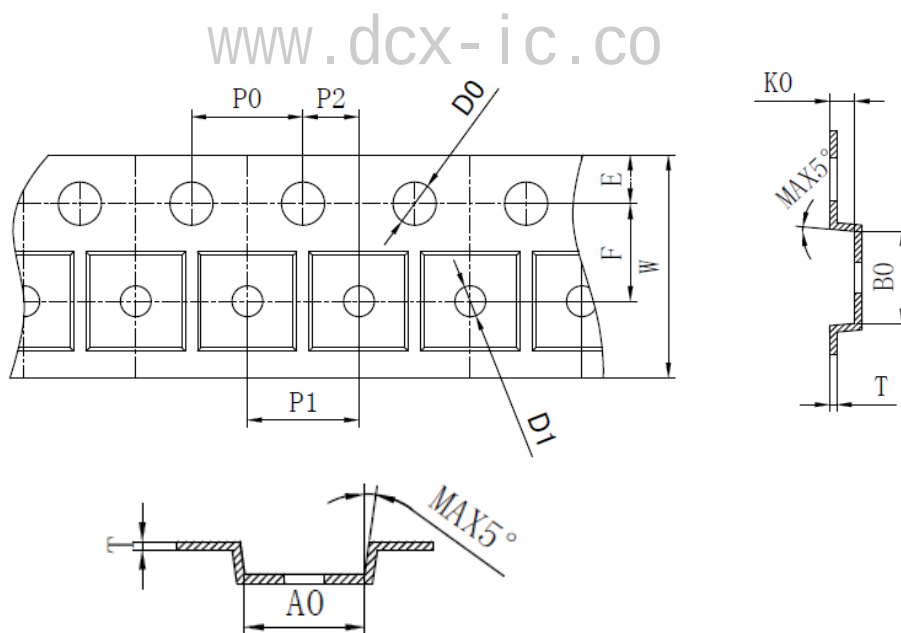


Common Dimension (mm)			
PKG	DFN2020-6L-B		
SYMBOL	MIN.	MON.	MAX.
A	0.527	0.552	0.577
A2	0.127REF		
b	0.25	0.30	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D1	0.85	0.95	1.05
E1	1.05	1.15	1.25
D2	0.20	0.25	0.30
E2	0.69	0.79	0.89
e	0.55	0.65	0.75
H	0.25	0.30	0.35
K1	0.25MIN		
K2	0.15MIN		
K3	0.20MIN		
L	0.20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

Tape and Reel



PRODUCT SPECIFICATIONS				
TYPE WIDTH	ØA	ØN	W1 (Min)	W2 (Max)
8MM	178±2.0	60±1.0	8.4	11.4
12MM	178±2.0	60±1.0	12.4	15.4



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