

## 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

- ◆  $V_{DS} = -12V$ ,  $I_D = -16A$   
 $R_{DS(ON)}(Typ.) = 11.7m\Omega$  @  $V_{GS} = -4.5V$   
 $R_{DS(ON)}(Typ.) = 16.2m\Omega$  @  $V_{GS} = -2.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

### Application

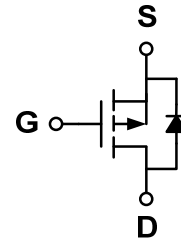
- ◆ PWM applications
- ◆ Load switch

### Package

- ◆ DFN2\*2-6L-B



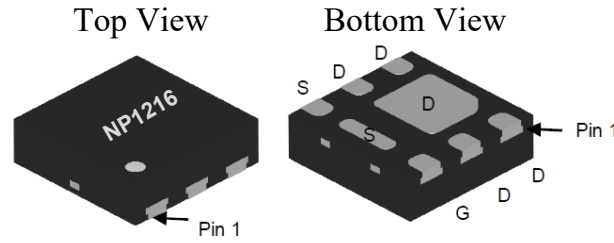
### Schematic diagram



### Marking and pin assignment

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

(Thickness 0.55mm)



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	$V_{DS}$	-12	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	$P_D$	2.3	W	

	$T_C=70^{\circ}\text{C}$		1.1	
	$T_A=25^{\circ}\text{C}$		3.5 <sup>b,c</sup>	
	$T_A=70^{\circ}\text{C}$		2.2 <sup>b,c</sup>	
Operating junction Temperature range		$T_j$	-55—150	$^{\circ}\text{C}$

## Thermal Resistance Ratings

Parameter	Symbol	Typ.	Max.	Unit	
Maximum junction-to-ambient <sup>b,d</sup>	$t \leq 5 \text{ s}$	$R_{thJA}$	20	25	$^{\circ}\text{C/W}$
Maximum junction-to-case (drain)	Steady state	$R_{thJC}$	45	55	

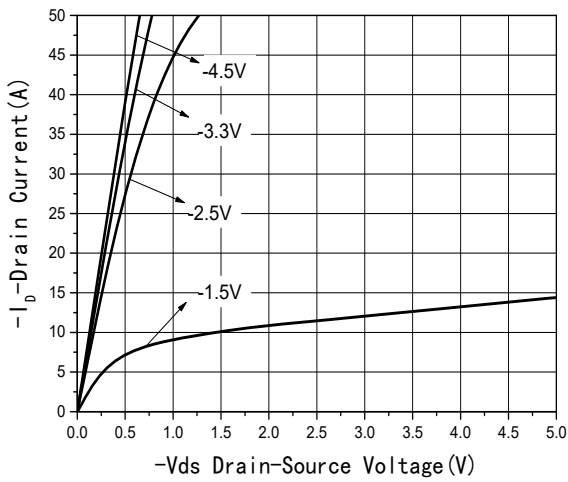
### Notes:

- a. Package limited;    b. Surface mounted on 1" x 1" FR4 board  
 c.  $t = 5 \text{ s}$ ;    d. Maximum under steady state conditions is  $80^{\circ}\text{C/W}$

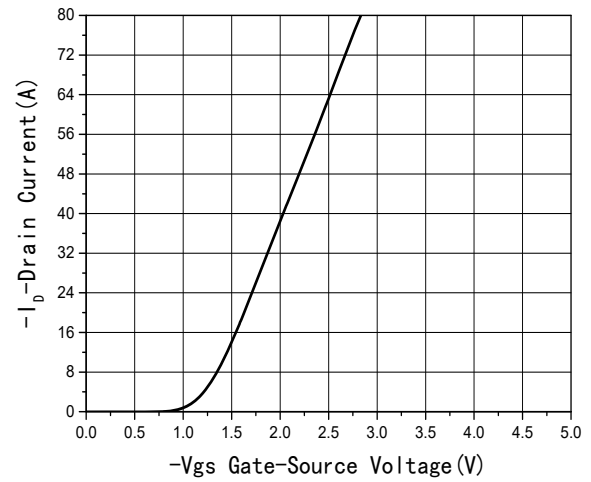
## Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{V}, I_D=-250\mu\text{A}$	-12	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=-12\text{V}, V_{GS}=0\text{V}$	-	-	-1	$\mu\text{A}$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$	-	-	$\pm 100$	nA
<b>ON Characteristics</b>						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-0.5	-0.75	-1.2	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-4.5\text{V}, I_D=-8\text{A}$	-	11.7	17.5	m $\Omega$
		$V_{GS}=-2.5\text{V}, I_D=-8\text{A}$	-	16.1	24.5	
Forward transconductance	$g_{fs}$	$V_{DS}=-6\text{V}, I_D=-7\text{A}$	-	60	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ISS}$	$V_{DS}=-6\text{V}, V_{GS}=0\text{V}$ $f=1.0\text{MHz}$	-	1507	-	pF
Output capacitance	$C_{OSS}$		-	296	-	
Reverse transfer capacitance	$C_{RSS}$		-	257	-	
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=-10\text{V}$ $I_D=-5\text{A}$ $V_{GEN}=-4.5\text{V}$ $R_L=1.2\text{ohm}$ $R_{GEN}=1\text{ohm}$	-	11	-	ns
Rise time	$t_r$		-	35	-	
Turn-off delay time	$t_{D(OFF)}$		-	30	-	
Fall time	$t_f$		-	10	-	
Total gate charge	$Q_g$	$V_{DS}=-6\text{V}, I_D=-9\text{A}$ $V_{GS}=-4.5\text{V}$	-	32	-	nC
Gate-source charge	$Q_{gs}$		-	2.8	-	
Gate-drain charge	$Q_{gd}$		-	5.1	-	
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{V}, I_S=-1.25\text{A}$	-	-0.7	-1.2	V

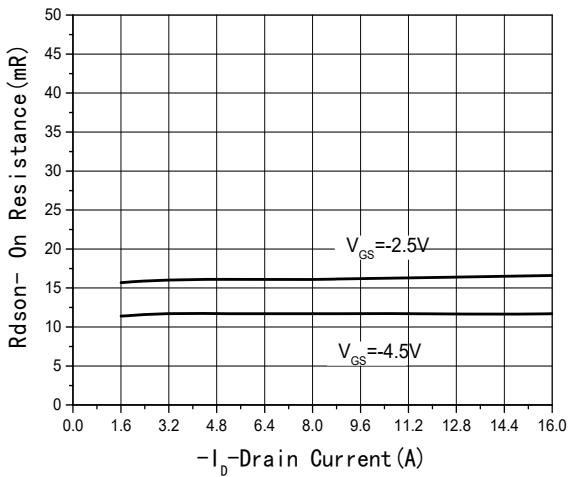
## Typical Performance Characteristics



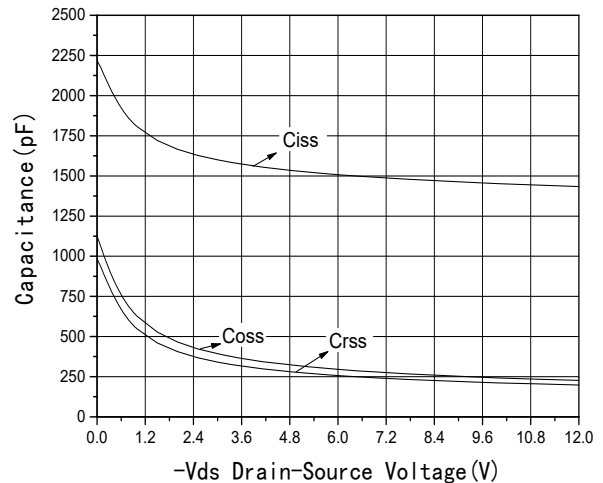
**Fig1 Output Characteristics**



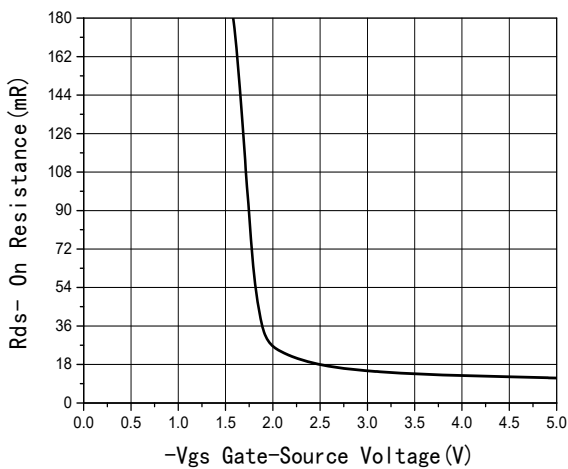
**Fig2 Transfer Characteristics**



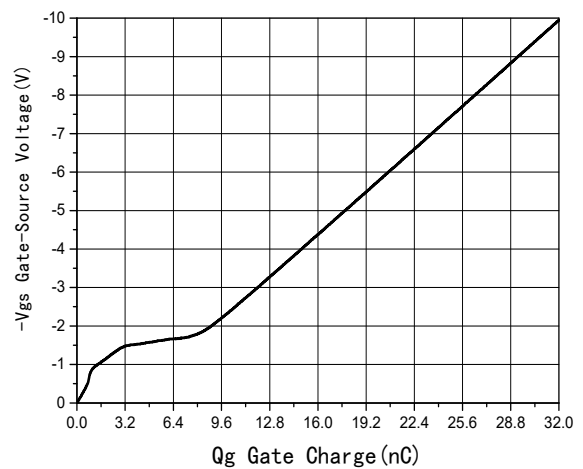
**Fig3 Rds(on)-Drain current**



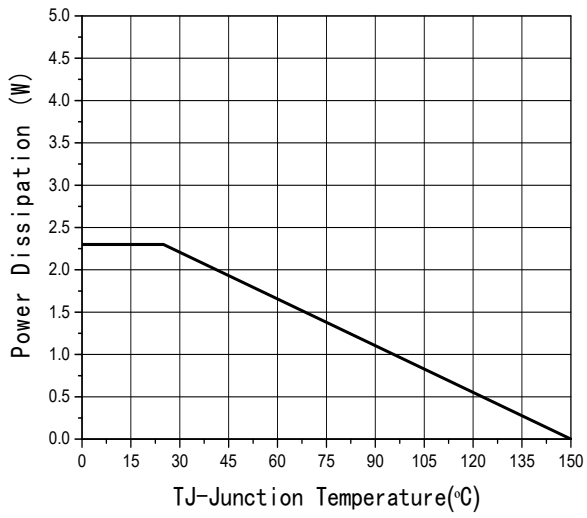
**Fig4 Capacitance vs Vds**



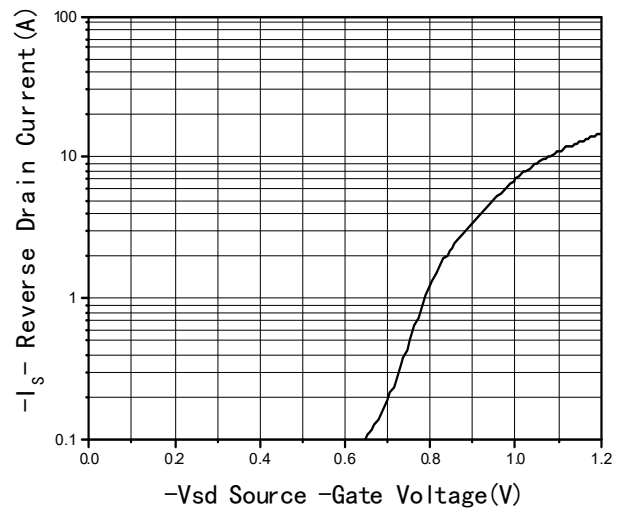
**Fig5 Rds(on)-Gate Drain voltage**



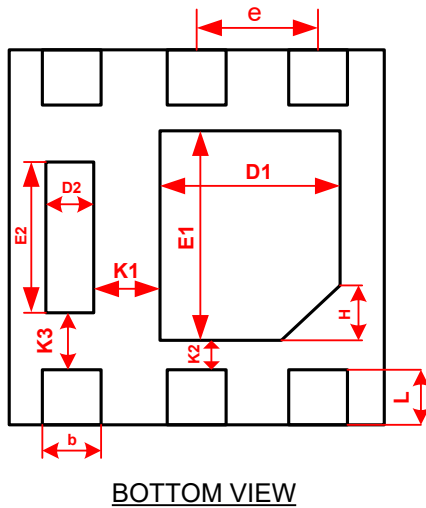
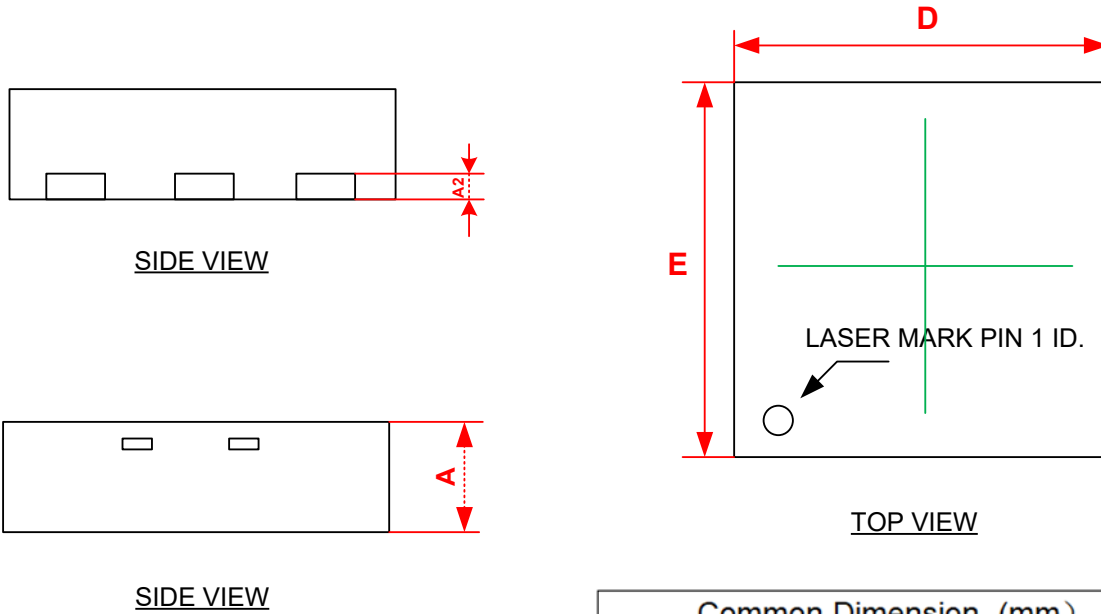
**Fig6 Gate Charge**



**Fig7 Power De-rating**



**Fig8 Source-Drain Diode Forward**

**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