

## N And P-Channel Enhancement Mode MOSFET

### Description

The NP6661BQR uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

### General Features

#### ◆ N-channel:

$V_{DS} = 30V, I_D = 10A$

$R_{DS(ON)} = 9.6m\Omega$  (typical) @  $V_{GS} = 10V$

$R_{DS(ON)} = 13.7m\Omega$  (typical) @  $V_{GS} = 4.5V$

#### P-Channel:

$V_{DS} = -30V, I_D = -10A$

$R_{DS(ON)} = 20m\Omega$  (typical) @  $V_{GS} = -10V$

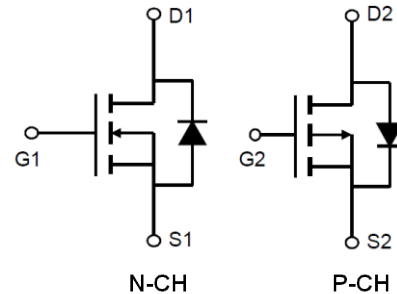
$R_{DS(ON)} = 29m\Omega$  (typical) @  $V_{GS} = -4.5V$

- ◆ Excellent gate charge x  $R_{DS(ON)}$  product(FOM)
- ◆ Very low on-resistance  $R_{DS(ON)}$
- ◆ 150 °C operating temperature
- ◆ Pb-free lead plating

### Application

- ◆ Pch+Nch Complementary MOSFET for DC-FAN
- ◆ H-Bridge application

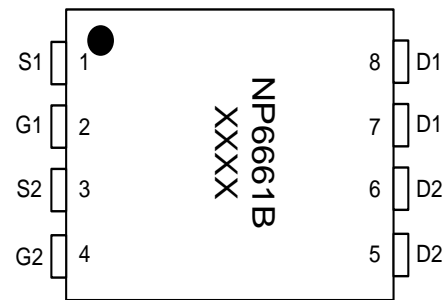
### Schematic diagram



### Marking and pin assignment

PDFN3 × 3-8L

(Top View)



### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP6661BQR-G	-55°C to +150°C	PDFN3*3-8L	3000

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

Parameter	Symbol	Limit		Unit	
		N	P		
Drain-source voltage	$V_{DS}$	30	-30	V	
Gate-source voltage	$V_{GS}$	±20	±20	V	
Operating junction Temperature range	$T_j$	-55—150	-55—150	°C	
Drain Current-Continuous (Silicon Limited)	$T_A = 25^\circ C$	$I_D$	10	-10	A
	$T_A = 75^\circ C$		6	-6	
Pulsed Drain Current (Package Limited)	$I_{DM}$	72	-72	A	

Avalanche Current <sup>C</sup>		$I_{AS}, I_{AR}$	22	-27	A
Avalanche energy $L=0.1\text{mH}^C$		$E_{AS}, E_{AR}$	24	36	mJ
Power Dissipation <sup>B</sup>	$T_A=25^\circ\text{C}$	$P_D$	12	20	W
	$T_A=75^\circ\text{C}$		5	8	
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55—150		$^\circ\text{C}$

**N-Channel Electrical Characteristics** ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu\text{A}$	30	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=30V, V_{GS}=0V$	-	-	1	$\mu\text{A}$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>ON Characteristics</b>						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	1.73	3.0	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	-	9.6	13	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$	-	13.7	17	
Forward transconductance	gfs	$V_{DS}=5V, I_D=10A$	-	43	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ISS}$	$V_{DS}=15V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	971	-	pF
Output capacitance	$C_{OSS}$		-	171	-	
Reverse transfer capacitance	$C_{RSS}$		-	131	-	
Gate resistance	$R_g$	$V_{GS}=0V, V_{DS}=0V,$ $f=1.0\text{MHz}$	-	1.6	2.4	$\Omega$
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{D(ON)}$	$V_{DS}=15V$ $V_{GS}=10V$ $R_L=1.5\Omega$ $R_{GEN}=3\Omega$	-	4.4	-	ns
Rise time	tr		-	9	-	
Turn-off delay time	$t_{D(OFF)}$		-	17	-	
Fall time	tf		-	6	-	
Total gate charge	Qg	$V_{DS}=15V, I_D=10A$ $V_{GS}=10V$	-	19.4	-	nC
Gate-source charge	Qgs		-	3	-	
Gate-drain charge	Qgd		-	3.9	-	

**Typical Performance Characteristics**

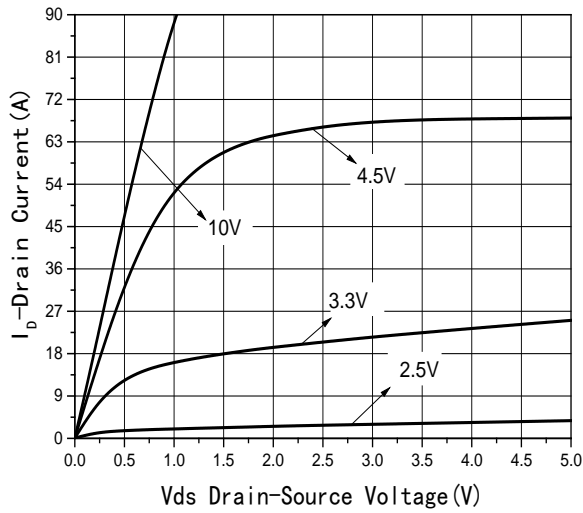


Fig1 Output Characteristics

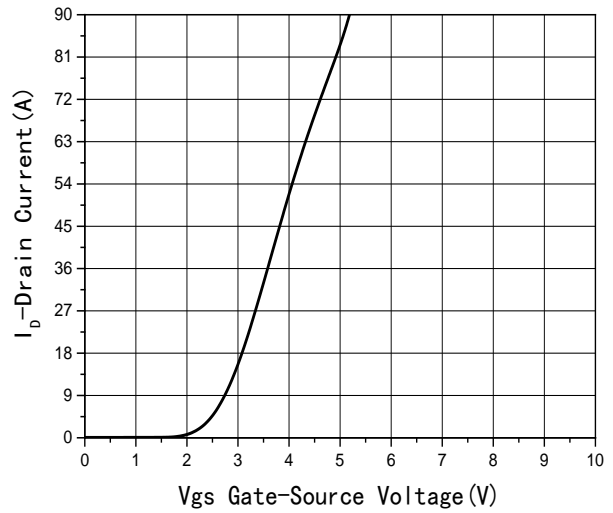


Fig2 Transfer Characteristics

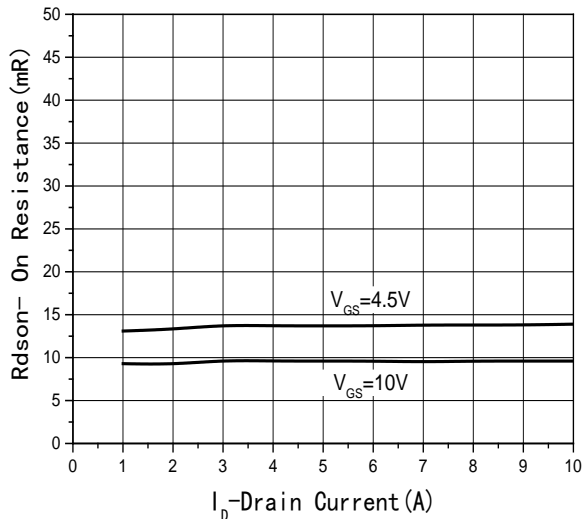


Fig3  $R_{DS(on)}$ -Drain current

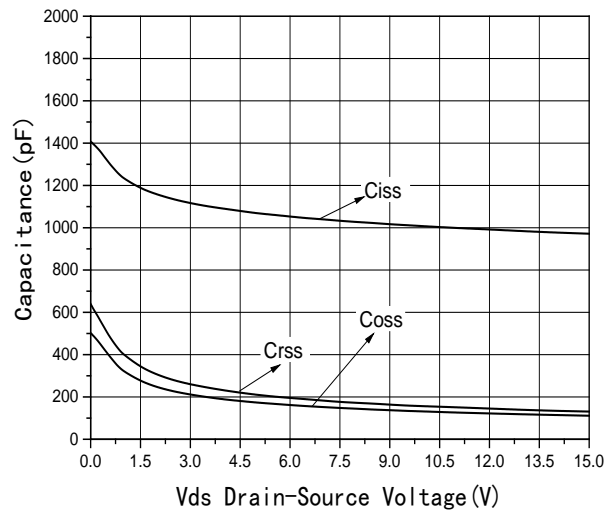


Fig4 Capacitance vs  $V_{DS}$

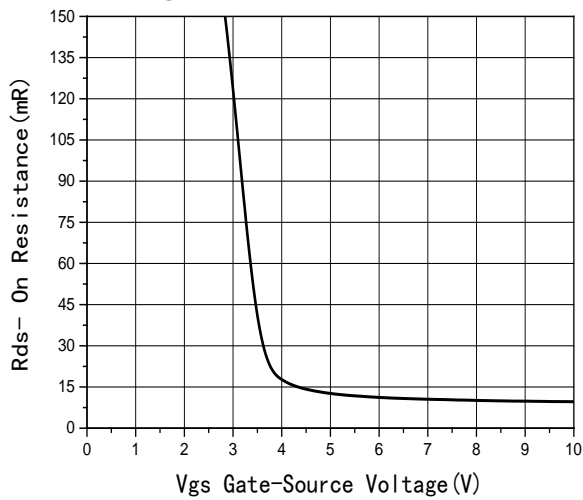


Fig5  $R_{DS(on)}$ -Gate Drain voltage

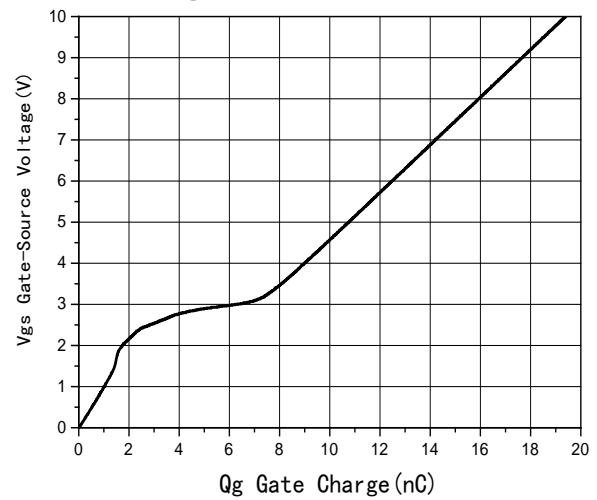
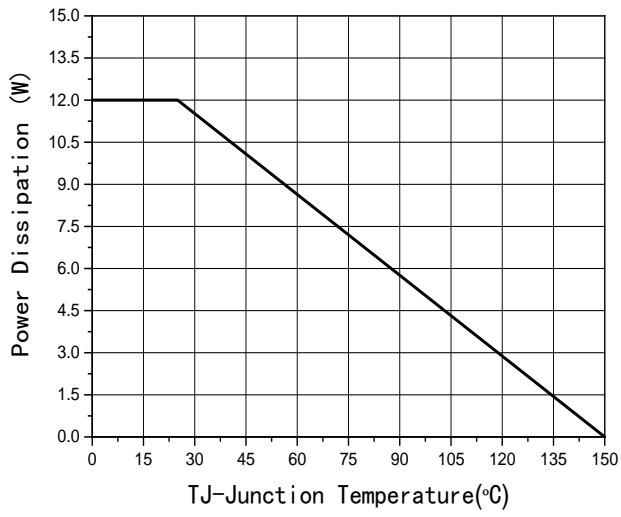
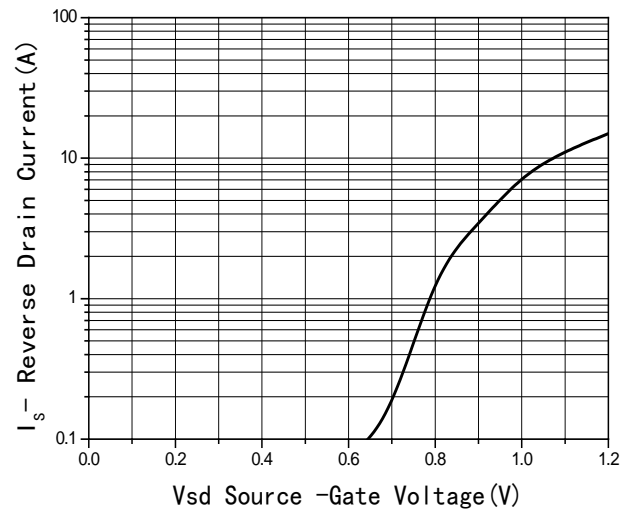


Fig6 Gate Charge



**Fig7 Power De-rating**

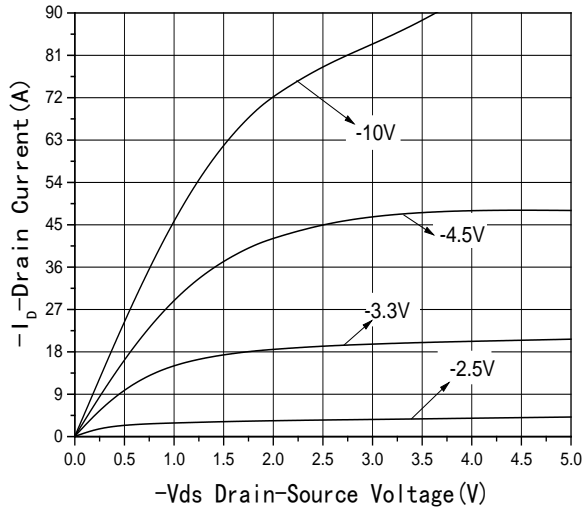


**Fig8 Source-Drain Diode Forward**

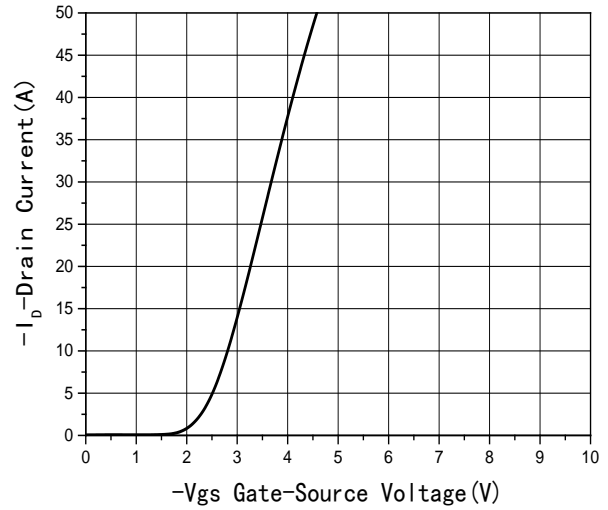
**P-Channel Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	$\mu A$
Gate-body leakage	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>ON Characteristics</b>						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.6	-2.5	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-10A$	-	20	25	m $\Omega$
		$V_{GS}=-4.5V, I_D=-10A$	-	29	40	
Forward transconductance	gfs	$V_{DS}=-5V, I_D=-10A$	-	18	-	S
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{ISS}$	$V_{DS}=-15V, V_{GS}=0V$ $f=1.0\text{MHz}$	-	1240	-	pF
Output capacitance	$C_{OSS}$		-	151	-	
Reverse transfer capacitance	$C_{RSS}$		-	138	-	
Gate resistance	$R_g$	$V_{GS}=0V, V_{DS}=0V,$ $f=1.0\text{MHz}$	-	4	-	$\Omega$
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{D(ON)}$	$V_{DS}=-15V$ $V_{GS}=-10V$ $R_L=2.3\Omega$ $R_{GEN}=3\Omega$	-	10	-	ns
Rise time	tr		-	5.5	-	
Turn-off delay time	$t_{D(OFF)}$		-	3.6	-	
Fall time	tf		-	4.6	-	
Total gate charge	Qg	$V_{DS}=-15V, I_D=-10A$ $V_{GS}=-10V$	-	24	-	nC
Gate-source charge	Qgs		-	3.5	-	
Gate-drain charge	Qgd		-	4.7	-	

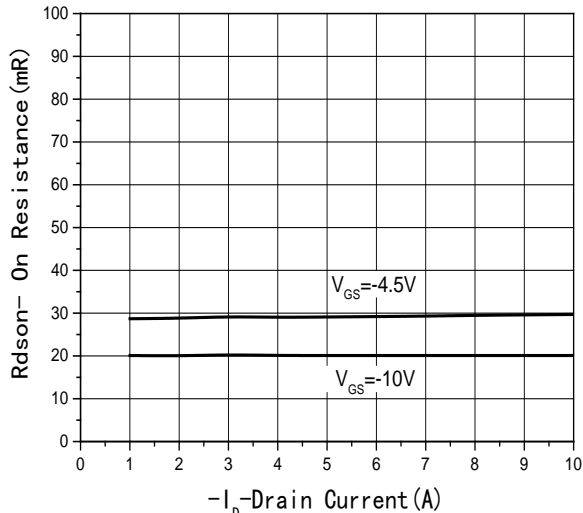
## Typical Performance Characteristics



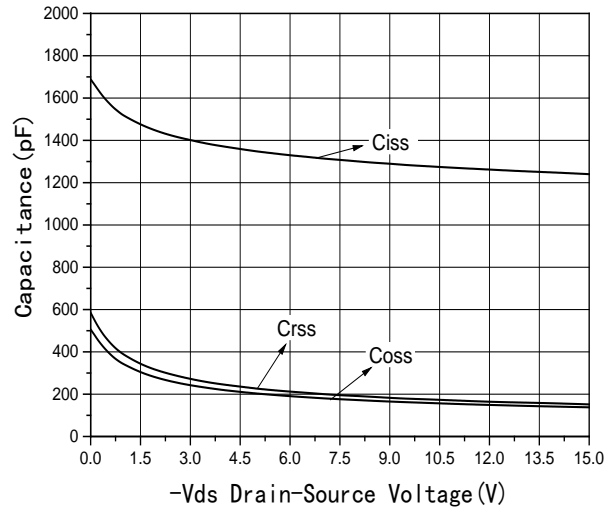
**Fig1 Output Characteristics**



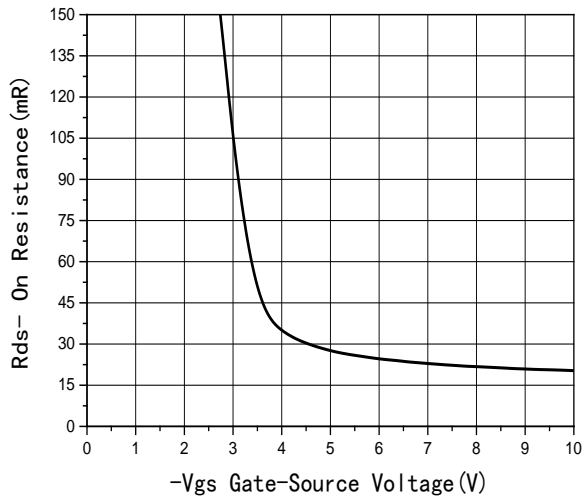
**Fig2 Transfer Characteristics**



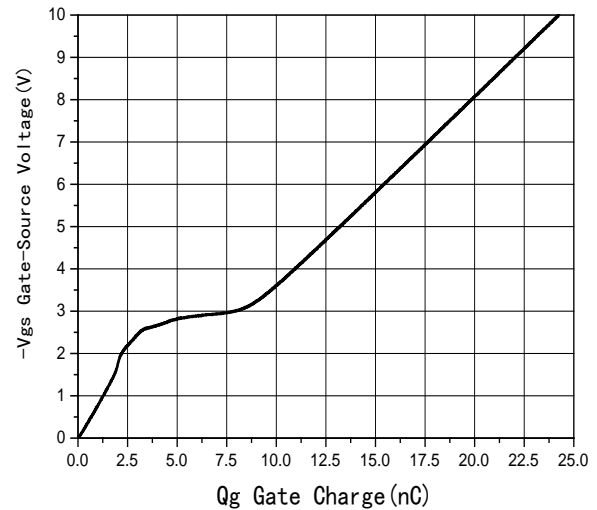
**Fig3  $R_{DS(on)}$ -Drain current**



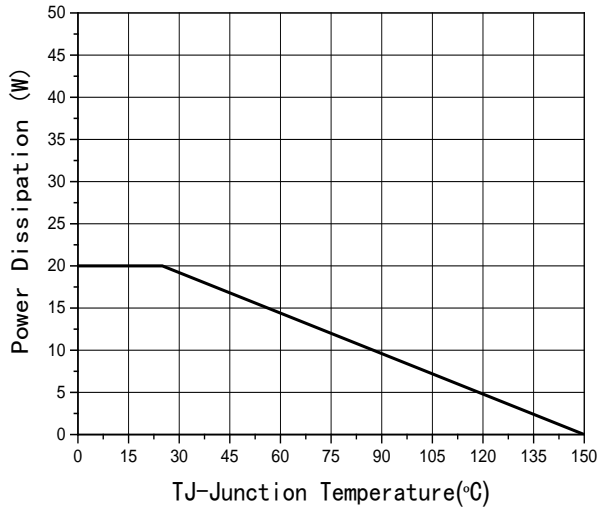
**Fig4 Capacitance vs  $V_{DS}$**



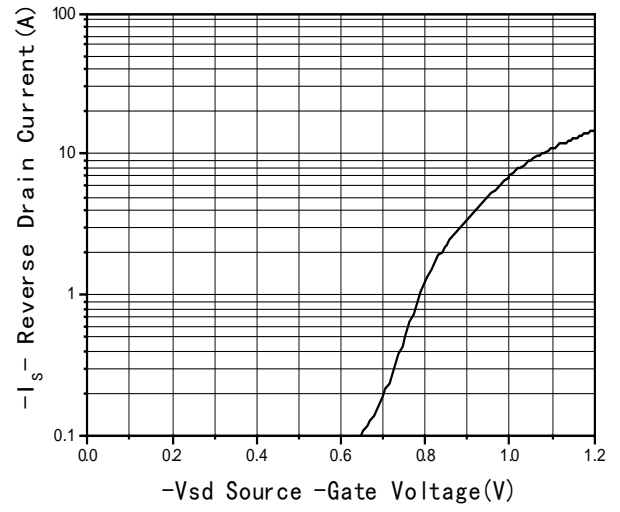
**Fig5  $R_{DS(on)}$ -Gate Drain voltage**



**Fig6 Gate Charge**



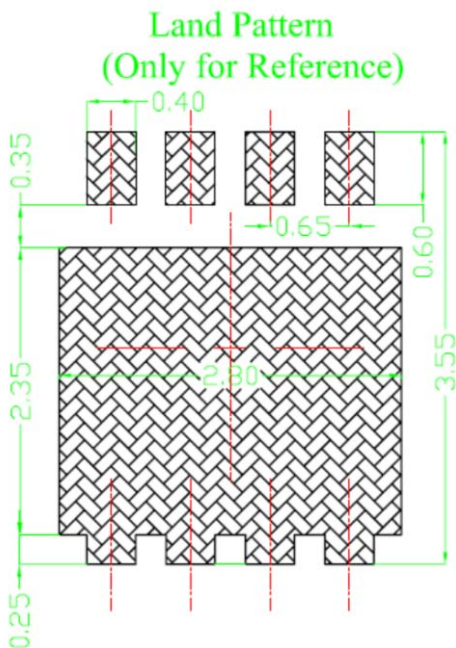
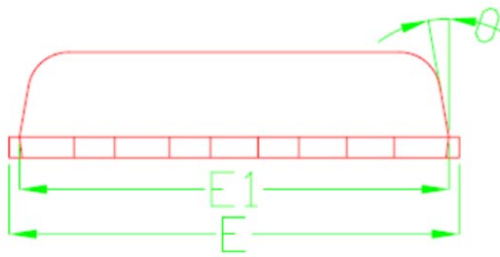
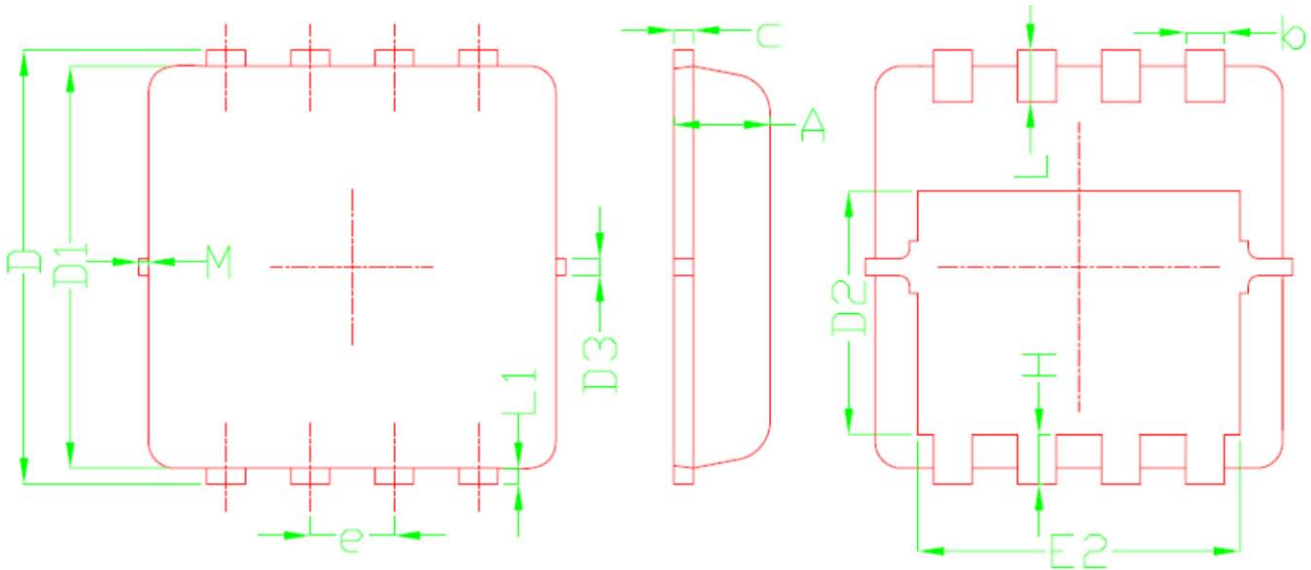
**Fig7 Power De-rating**



**Fig8 Source-Drain Diode Forward**

## Package Information

- PDFN3×3-8L



SYMBOL	DIMENSIONAL REQMTS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	---	0.13	---
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	---	0.13	---
$\theta$	---	10°	12°
M	*	*	0.15
* Not specified			