

### Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D$
60V	12mΩ@10V	22A
	15mΩ@4.5V	

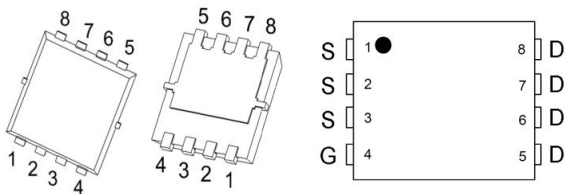
### Feature

- Fast Switching
- Extremely low switching loss
- Excellent Rdson and Low Gate Charge

### Application

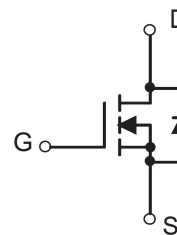
- Power Management
- Switched mode power supply

### Package

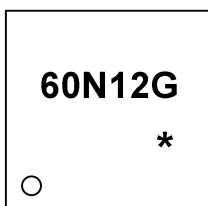


PDFNWB3.3×3.3-8L

### Circuit diagram



### Marking



60N12G      =Device Code  
\*                =Month Code

**Absolute maximum ratings (Ta=25°C unless otherwise noted)**

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	60	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous drain current <sup>1)</sup> , TC=25 °C	$I_D$	22	A
Pulsed drain current <sup>2)</sup> , TC=25 °C	$I_{DM}$	88	A
Continuous diode forward current <sup>1)</sup> , TC=25 °C	$I_S$	12	A
Power dissipation <sup>3)</sup> , TC=25 °C	$P_D$	41	W
Single pulsed avalanche energy <sup>4)</sup>	$E_{AS}$	36	mJ
Thermal resistance, junction-case	$R_{\theta JC}$	3.05	°C/W
Operation and storage temperature	$T_{stg}, T_J$	-55 to 150	°C

**Electrical characteristics (TA=25 °C, unless otherwise noted)**

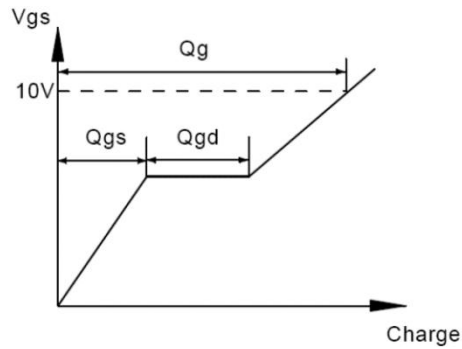
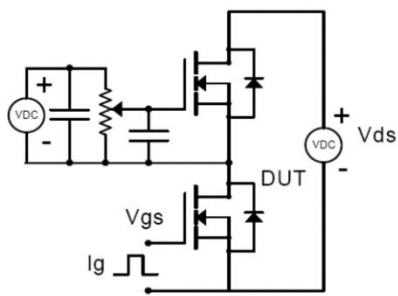
Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$	60			V
Gate-source leakage current	$I_{GSS}$	$V_{GS}=\pm 20\text{ V}$			$\pm 100$	nA
Drain-source leakage current	$I_{DSS}$	$V_{DS}=48\text{ V}, V_{GS}=0\text{ V}$			1	$\mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$	1	1.6	2.5	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=20\text{ A}$		12	16	m $\Omega$
		$V_{GS}=4.5\text{ V}, I_D=10\text{ A}$		15	22	
<b>Dynamic Characteristics</b>						
Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$		940		pF
Output capacitance	$C_{oss}$			235		
Reverse transfer capacitance	$C_{rss}$			10		
Total gate charge	$Q_g$	$V_{GS}=10\text{ V}, V_{DS}=30\text{ V}, I_D=20\text{ A}$		23		nC
Gate-source charge	$Q_{gs}$			4.8		
Gate-drain charge	$Q_{gd}$			4.0		
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{GS}=10\text{ V}, V_{DS}=30\text{ V}, R_G=1.6\ \Omega, I_D=20\text{ A}$		4.7		ns
Rise time	$t_r$			2.9		
Turn-off delay time	$t_{d(off)}$			14		
Fall time	$t_f$			2.9		
<b>Body Diode Characteristics</b>						
Diode forward voltage	$V_{SD}$	$I_S=1\text{ A}, V_{GS}=0\text{ V}$			1.2	V

Note:

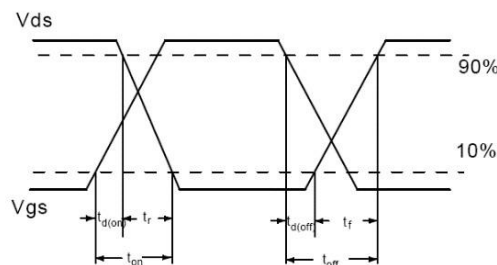
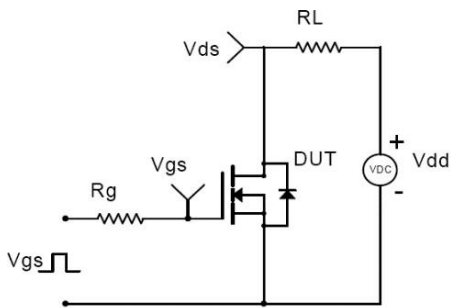
1. Calculated continuous current based on maximum allowable junction temperature.
2. Repetitive rating; pulse width limited by max. junction temperature.
3.  $P_D$  is based on max. junction temperature, using junction-case thermal resistance.
4.  $V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, L=0.5\text{ mH}$ , starting  $T_J=25\text{ °C}$ .

**Test circuits and waveforms**

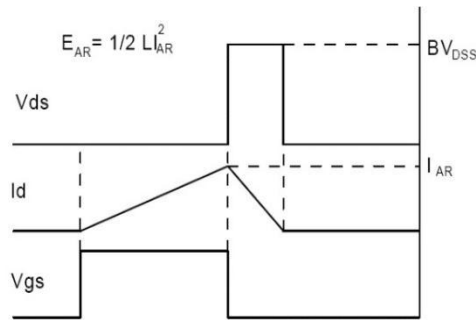
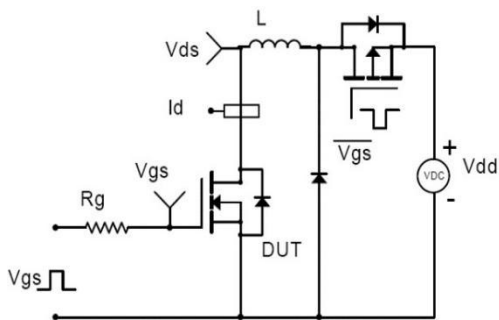
**1) Gate charge test circuit & waveform**



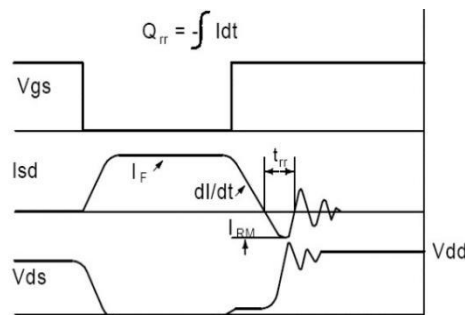
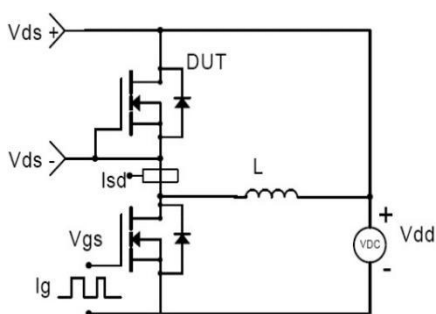
**2) Switching time test circuit & waveforms**



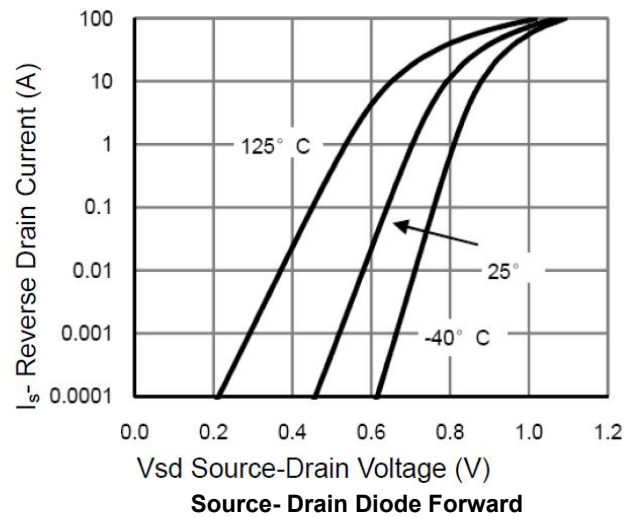
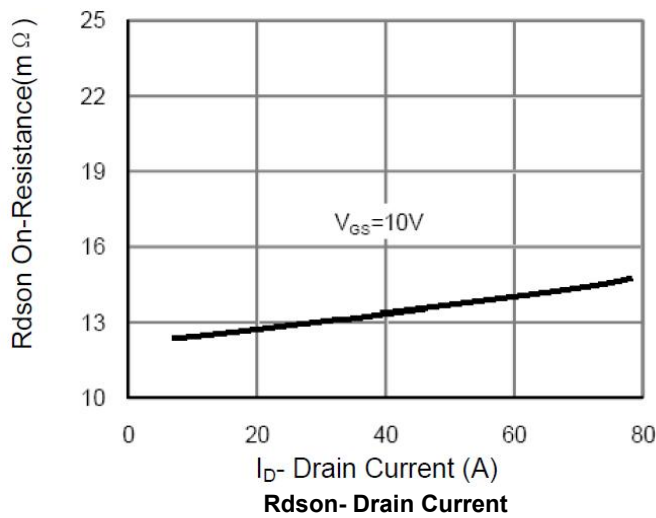
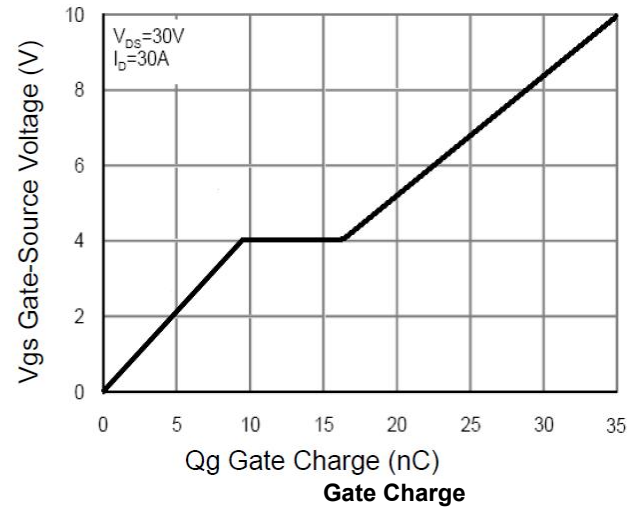
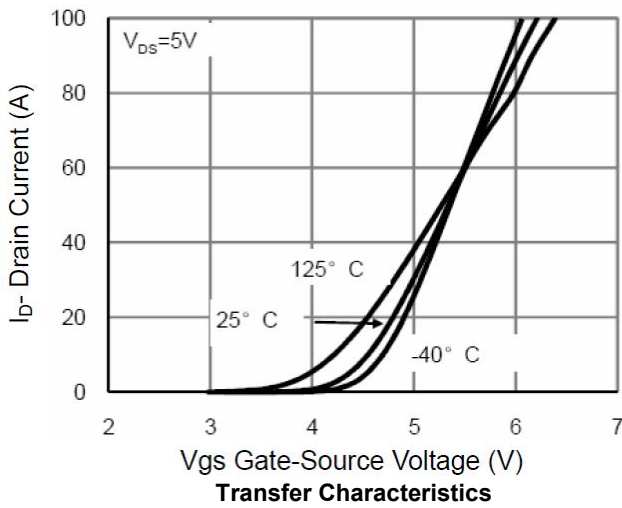
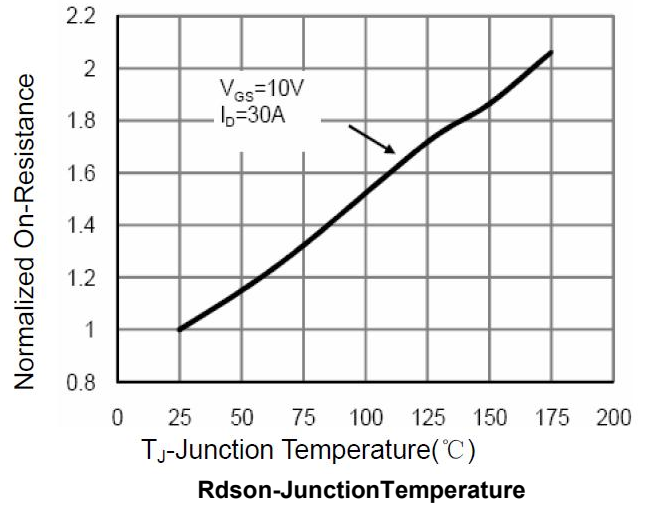
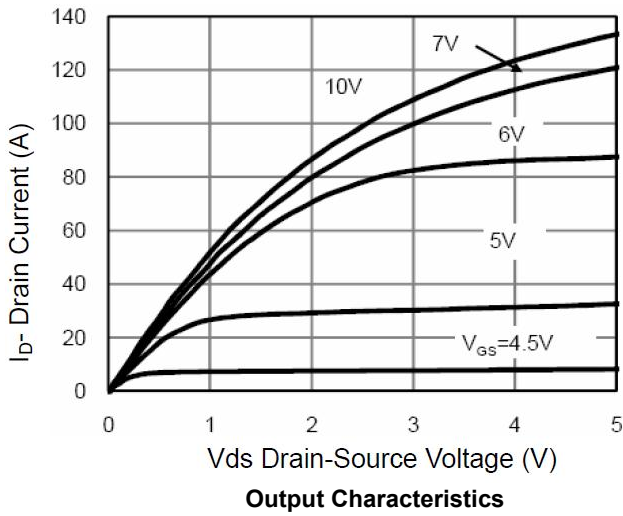
**3) Unclamped inductive switching (UIS) test circuit & waveforms**

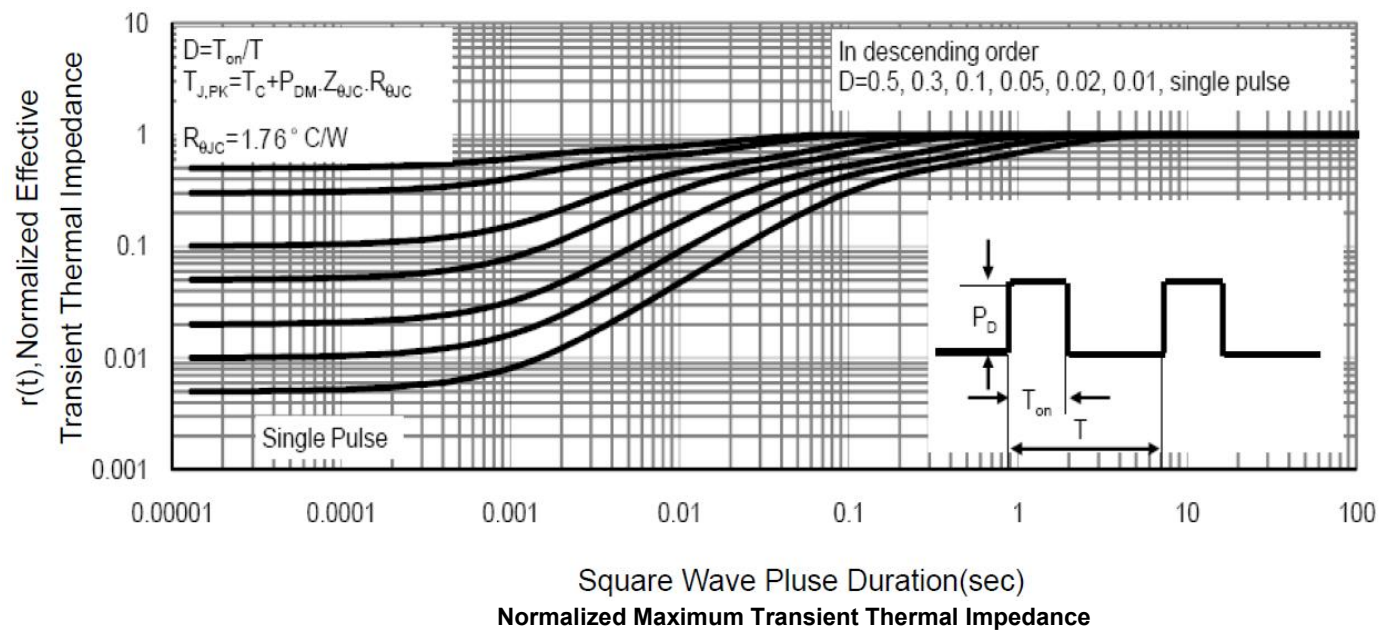
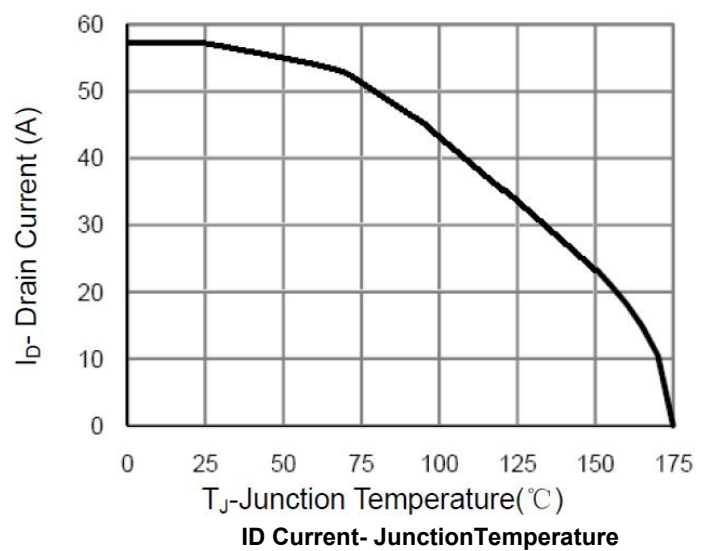
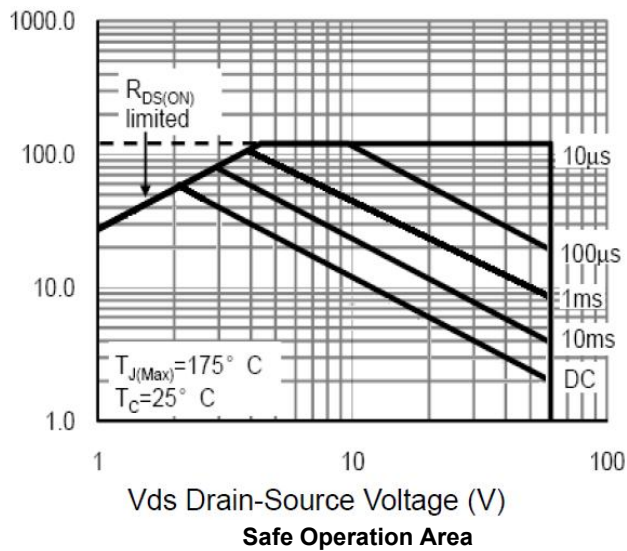
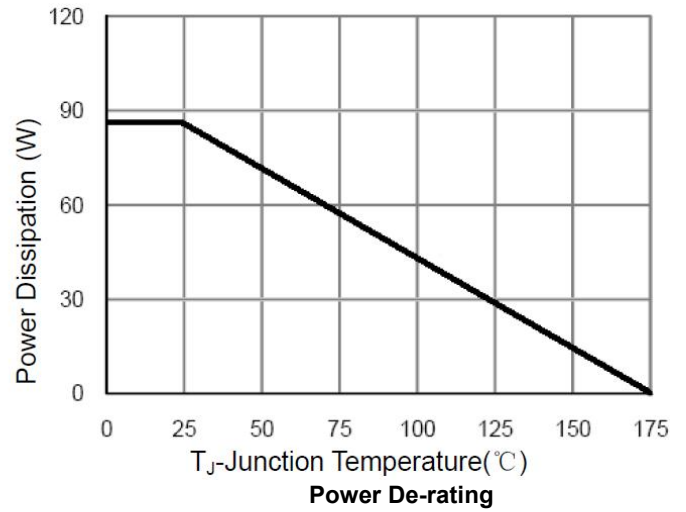
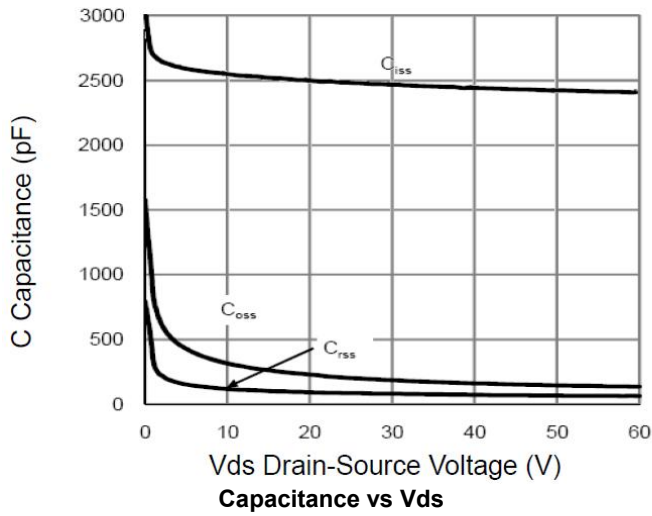


**4) Diode reverse recovery test circuit & waveforms**



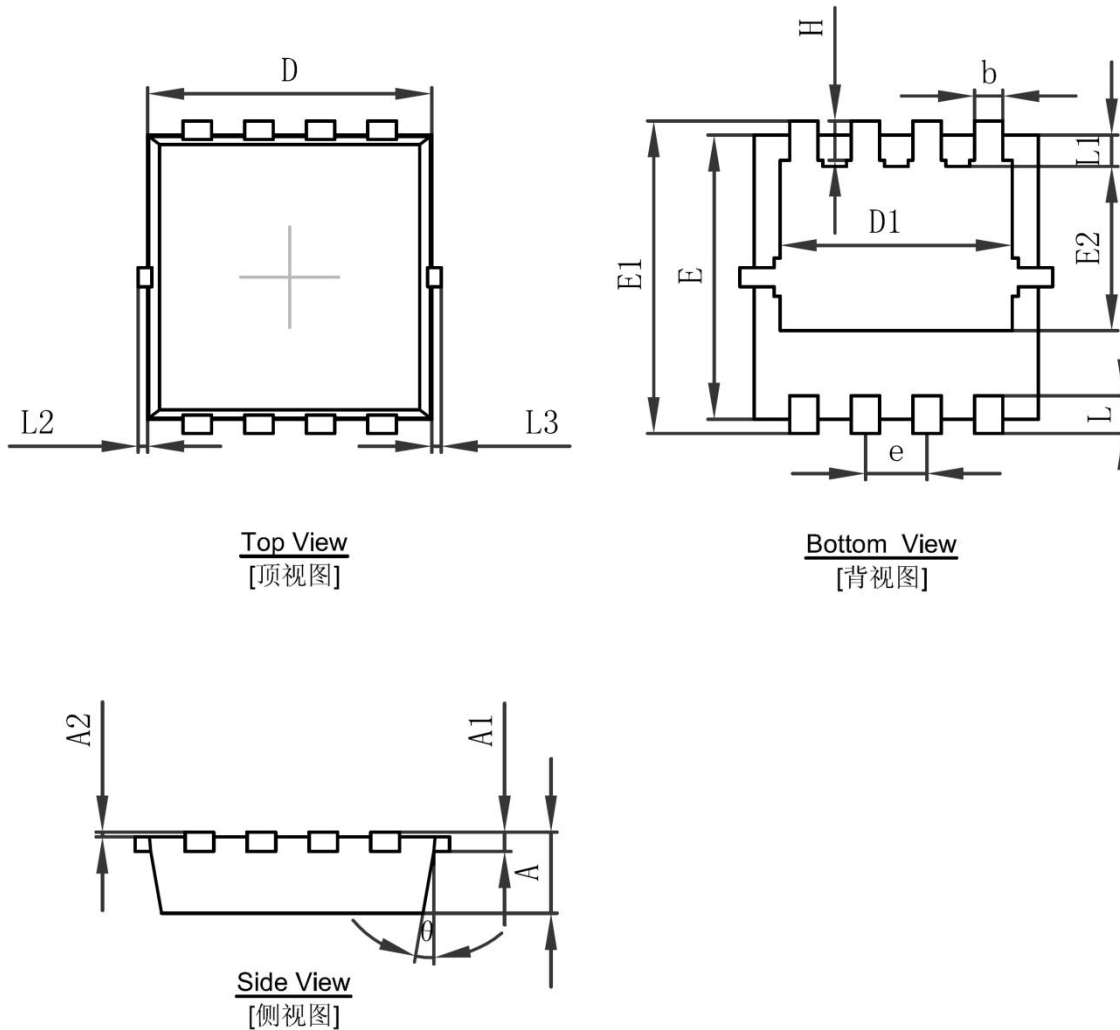
**Typical Characteristics**







PDFNWB3.3×3.3-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.650	0.850	0.026	0.033
A1	0.152 REF.		0.006 REF.	
A2	0~0.05		0~0.002	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.102
E	2.900	3.100	0.114	0.122
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0~0.100		0~0.004	
L3	0~0.100		0~0.004	
H	0.315	0.515	0.012	0.020
$\theta$	9°	13°	9°	13°

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