

## Product Summary

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

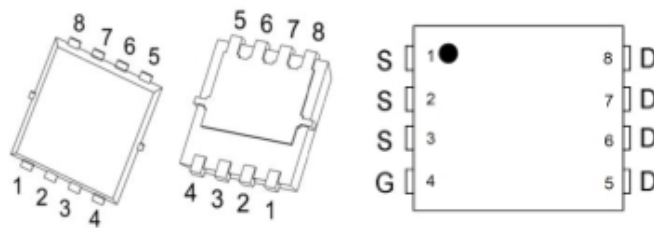
## Feature

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

## Applications

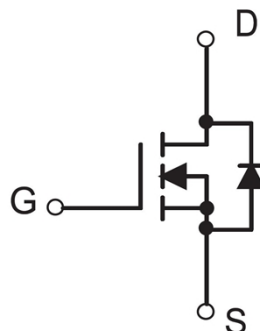
- Power Management
- Switched mode power supply

## Package



PDFNWB3.3×3.3-8L

## Circuit diagram



## Marking



60N12G  
\*

=Device Code  
=Month Code

## Absolute maximum ratings

(T<sub>a</sub>=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-source voltage	V <sub>DS</sub>	60	V
Gate-source voltage	V <sub>GS</sub>	±20	V
Continuous drain current <sup>1)</sup> , T <sub>C</sub> =25 °C	I <sub>D</sub>	22	A
Pulsed drain current <sup>2)</sup> , T <sub>C</sub> =25 °C	I <sub>DM</sub>	88	A
Continuous diode forward current <sup>1)</sup> , T <sub>C</sub> =25 °C	I <sub>S</sub>	12	A
Power dissipation <sup>3)</sup> , T <sub>C</sub> =25 °C	P <sub>D</sub>	41	W
Single pulsed avalanche energy <sup>4)</sup>	E <sub>AS</sub>	36	mJ
Thermal resistance, junction-case	R <sub>θJC</sub>	3.05	°C/W
Operation and storage temperature	T <sub>STG</sub> , T <sub>J</sub>	-55 to 175	°C

## Electrical characteristics

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

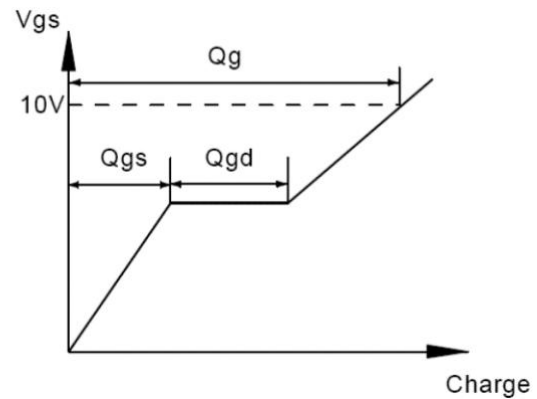
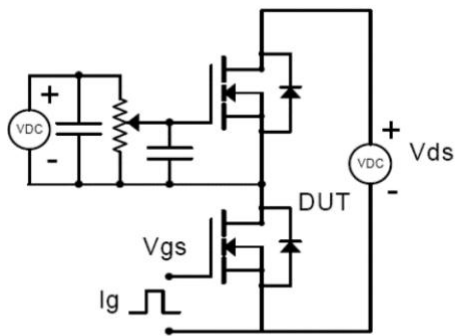
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV (BR)DSS	V <sub>GS</sub> = 0V, I <sub>D</sub> =250μA	60			V
Gate-source leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V			±100	uA
Drain-source leakage current	I <sub>DSS</sub>	V <sub>DS</sub> =48V, V <sub>GS</sub> = 0V			1	uA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.6	2.5	V
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A		12	16	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A		15	22	
Dynamic and Switching Characteristics						
Input capacitance	C <sub>iSS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz		940		pF
Output capacitance	C <sub>oSS</sub>			235		
Reverse transfer capacitance	C <sub>rSS</sub>			10		
Total gate charge	Q <sub>g</sub>	V <sub>GS</sub> =10V , V <sub>DS</sub> =30V , I <sub>D</sub> =20A		23		pF
Gate-source charge	Q <sub>gs</sub>			4.8		
Gate-drain charge	Q <sub>gd</sub>			4.0		
Switching Characteristics						
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, R <sub>G</sub> =1.6Ω, I <sub>D</sub> =20A		4.7		nS
Rise Time	T <sub>r</sub>			2.9		
Turn-Off Delay Time	T <sub>d(off)</sub>			14		
Fall Time	t <sub>f</sub>			2.9		
Drain-Source Body Diode Characteristics						
Diode forward voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V ,I <sub>S</sub> =1A			1.2	V

### Note:

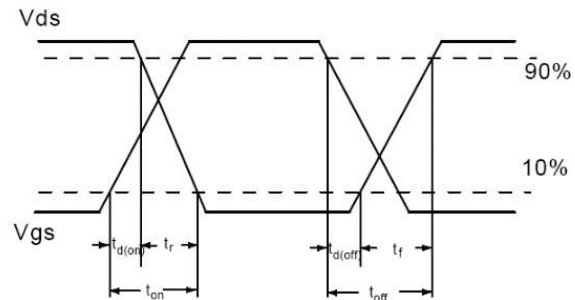
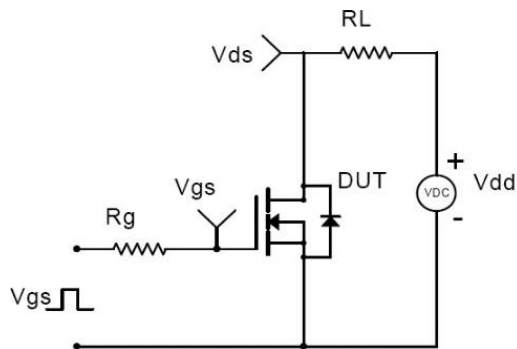
1. Calculated continuous current based on maximum allowable junction temperature.
2. Repetitive rating; pulse width limited by max. junction temperature.
3.  $P_d$  is based on max. junction temperature, using junction-case thermal resistance.
4.  $V_{DD}=30V, V_{GS}=10V, L=0.5mH$ , starting  $T_j=25^{\circ}\text{C}$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

## Test circuits and waveforms

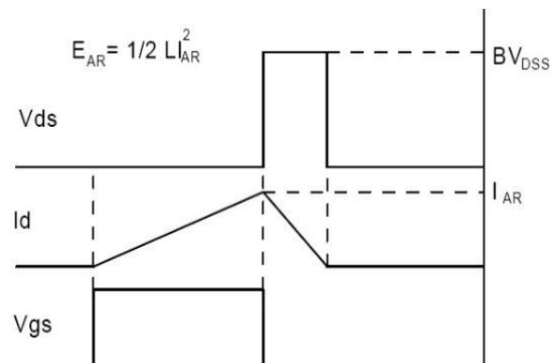
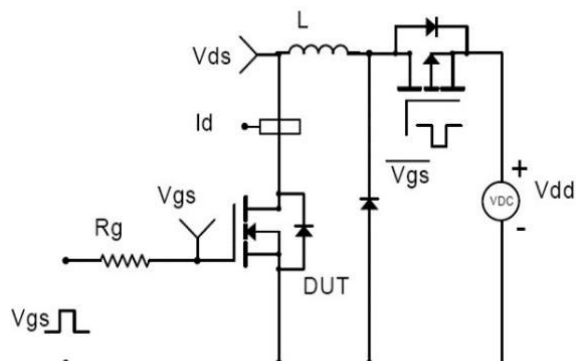
- Gate charge test circuit & waveform



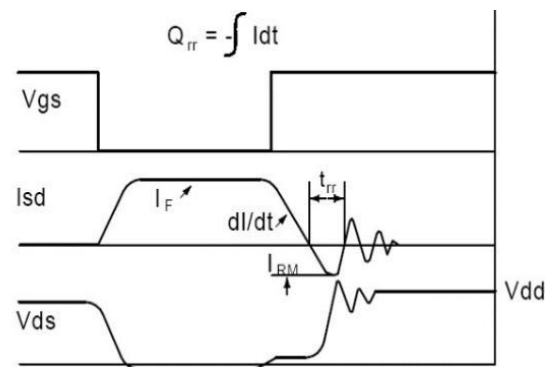
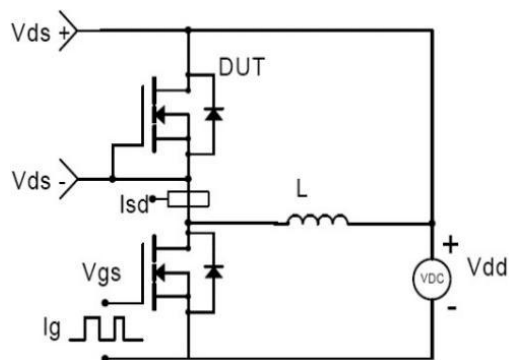
- Switching time test circuit & waveforms



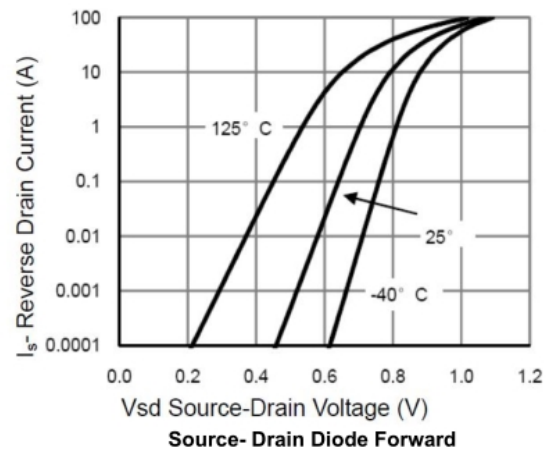
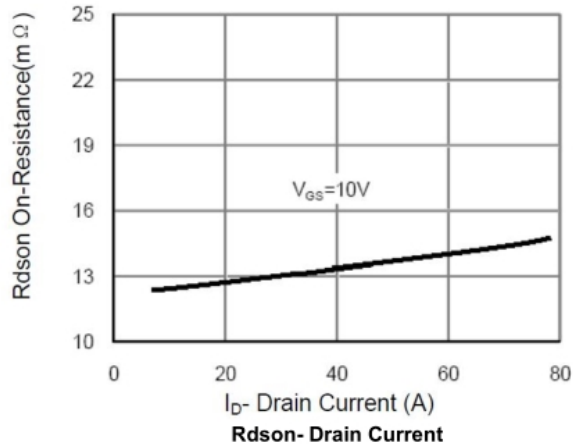
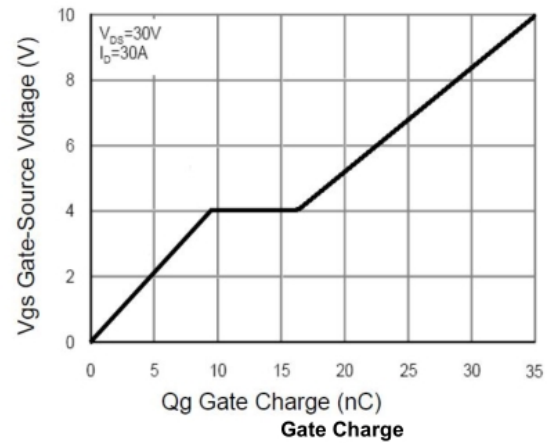
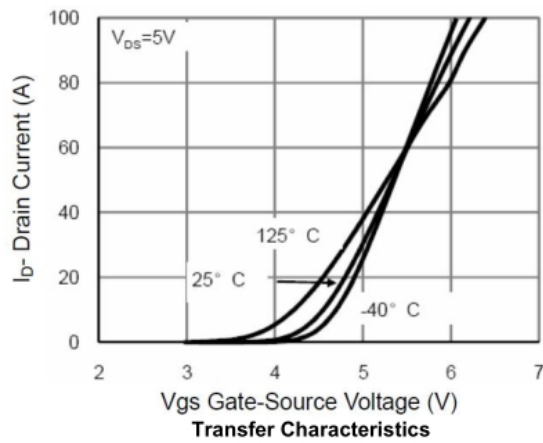
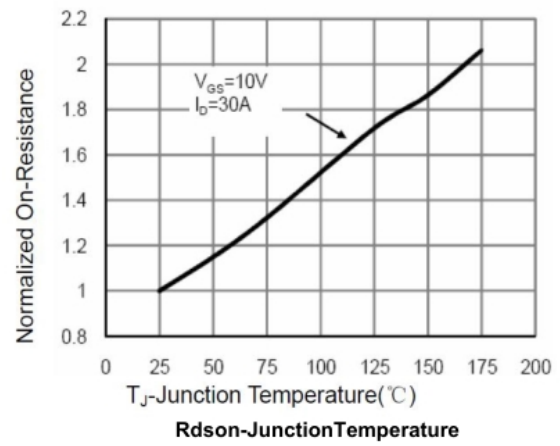
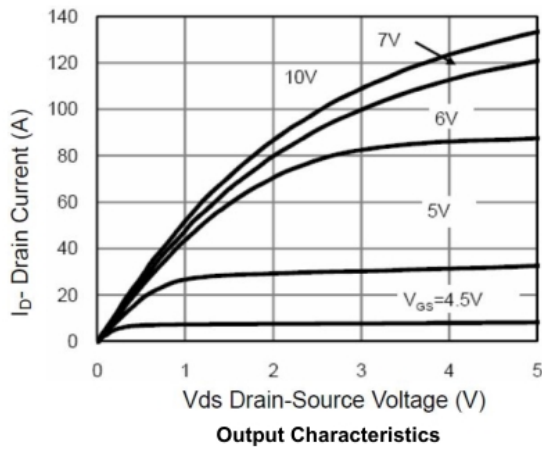
- Unclamped inductive switching (UIS) test circuit & waveforms

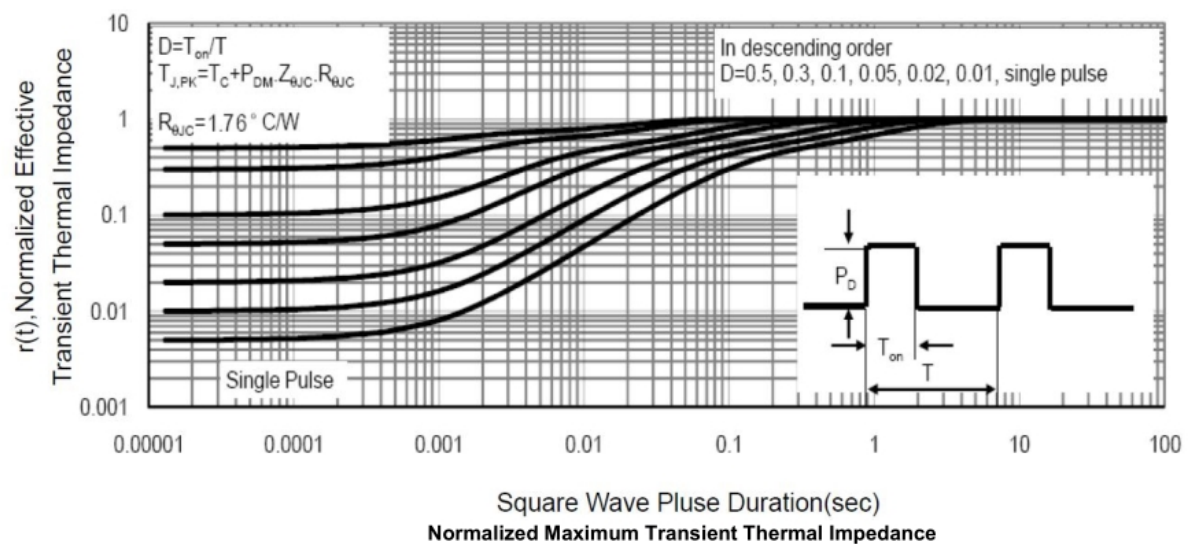
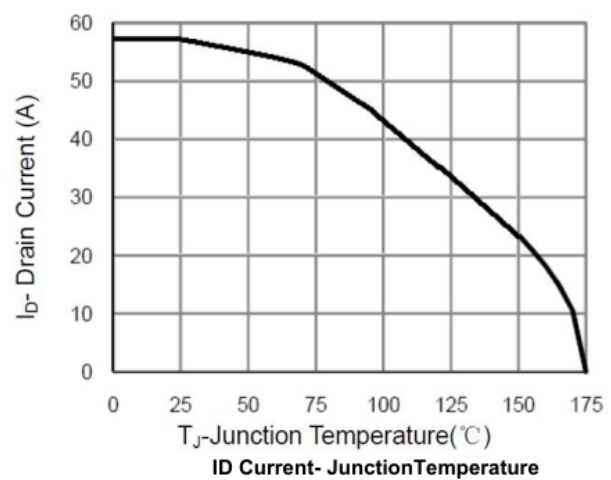
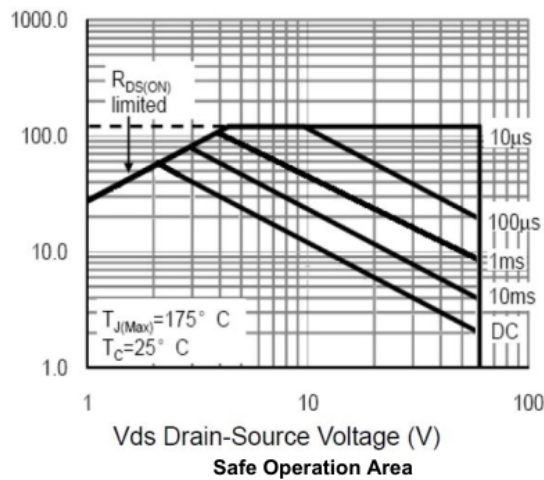
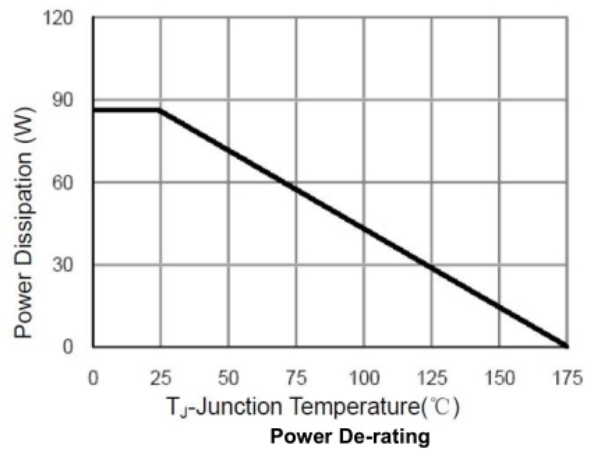
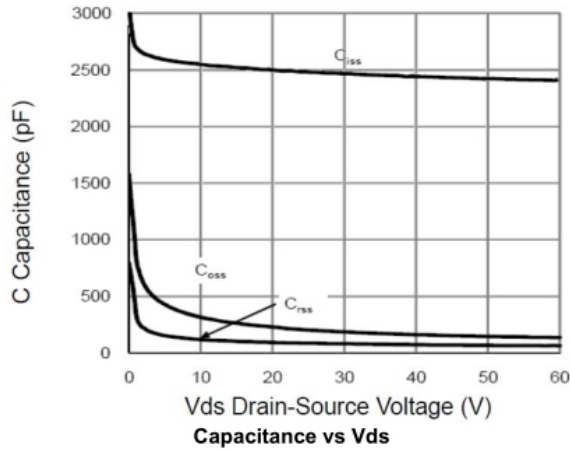


- Diode reverse recovery test circuit & waveforms

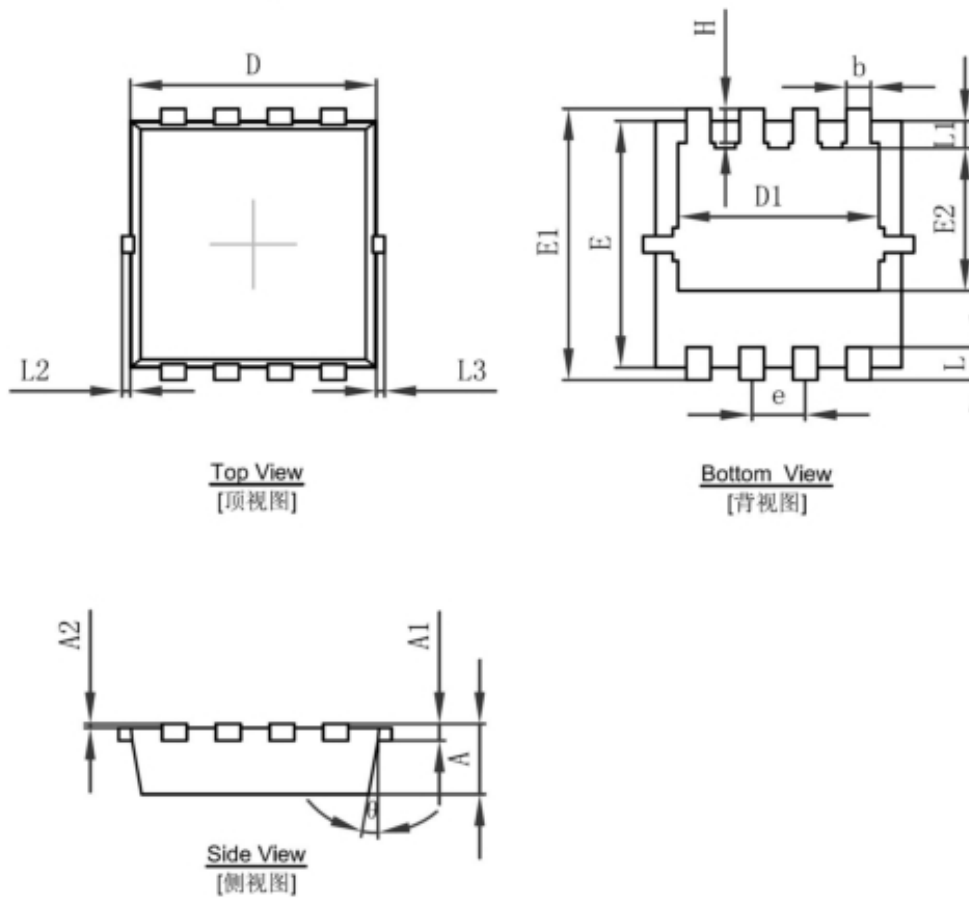


## Typical Characteristics





## 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
θ	9°	13°	9°	13°