

# NCE3060G-VB Datasheet

## N-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}(\Omega)$	I <sub>D</sub> (A) <sup>a, e</sup>	Q <sub>g</sub> (Typ.)			
30	0.003 at V <sub>GS</sub> = 10 V	120	71 nC			
30	$0.005$ at $V_{GS} = 4.5 \text{ V}$	90	71110			

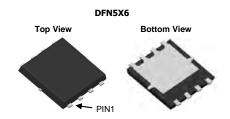
#### **FEATURES**

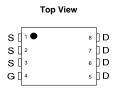
- Trench Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested

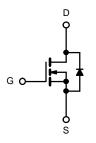


#### **APPLICATIONS**

- Notebook PC Core
- VRM/POL







N-Channel MOSFET

Parameter	Symbol	Limit	Unit		
Drain-Source Voltage	V <sub>DS</sub>	30	V		
Gate-Source Voltage		V <sub>GS</sub>	± 20	7	
	T <sub>C</sub> = 25 °C		120 <sup>a, e</sup>		
Continuous Prain Current (T. – 175 °C)	T <sub>C</sub> = 70 °C	1-	90 <sup>e</sup>		
Continuous Drain Current (T <sub>J</sub> = 175 °C)	T <sub>A</sub> = 25 °C	I <sub>D</sub>	21 <sup>b, c</sup>	A	
	T <sub>A</sub> = 70 °C		20.8 <sup>b, c</sup>	_ ^	
Pulsed Drain Current		I <sub>DM</sub>	250		
Avalanche Current Pulse	L = 0.1 mH	I <sub>AS</sub>	56		
Single Pulse Avalanche Energy	L = 0.1 IIII	E <sub>AS</sub>	60	mJ	
Continuous Source-Drain Diode Current	T <sub>C</sub> = 25 °C	I <sub>S</sub>	80 <sup>a, e</sup>	А	
Continuous Source-Diam Diode Current	T <sub>A</sub> = 25 °C	'S	76 <sup>b, c</sup>		
	T <sub>C</sub> = 25 °C		210 <sup>a</sup>		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C	P <sub>D</sub>	155	W	
	T <sub>A</sub> = 25 °C	' D	35 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		13 <sup>b, c</sup>		
Operating Junction and Storage Temperature Ra	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C		

THERMAL RESISTANCE RATINGS							
Parameter	Symbol	Typical	Maximum	Unit			
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	41	50	°C/W		
Maximum Junction-to-Case	Steady State	R <sub>thJC</sub>	0.7	0.9	C/VV		

#### Notes:

- a. Based on T<sub>C</sub> = 25 °C. b. Surface mounted on 1" x 1" FR4 board.
- d. Maximum under steady state conditions is 90 °C/W.
- e. Calculated based on maximum junction temperature. Package limitation current is 80 A.



Parameter	Symbol	Test Conditions	Min .	Тур.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	30			V
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	I <sub>D</sub> = 250 μA		35		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	ι <sub>D</sub> = 230 μΑ		- 5.5		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	1.0		2.5	V
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zana Cata Valta na Dunin Commant	I <sub>DSS</sub>	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$			1	μΑ
Zero Gate Voltage Drain Current		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C			10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	80			Α
	Ь	$V_{GS} = 10 \text{ V}, I_D = 32 \text{ A}$		0.003		
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 4.5 \text{ V}, I_D = 29 \text{ A}$		0.005		Ω
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 32 A		130		S
Dynamic <sup>b</sup>			•		l .	
Input Capacitance	C <sub>iss</sub>				3200	pF
Output Capacitance	C <sub>oss</sub>	$V_{DS}$ = 12.5 V, $V_{GS}$ = 0 V, f = 1 MHz			1025	
Reverse Transfer Capacitance	C <sub>rss</sub>				970	
Total Gate Charge	Qg	$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 32 \text{ A}$			71	nC
					61.5	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 29 \text{ A}$			34	
Gate-Drain Charge	Q <sub>gd</sub>				29	
Gate Resistance	$R_{g}$	f = 1 MHz		1.4	2.1	Ω
Turn-On Delay Time	t <sub>d(on)</sub>			18	27	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 0.555 $\Omega$		11	17	- ns
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong 27$ A, $V_{GEN}=10$ V, $R_g=1$ $\Omega$		70	105	
Fall Time	t <sub>f</sub>			10	15	
Turn-On Delay Time	t <sub>d(on)</sub>			55	83	
Rise Time	t <sub>r</sub>	$V_{DD} = 15 \text{ V}, R_{L} = 0.625 \Omega$		180	270	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong$ 24 A, $V_{GEN}$ = 4.5 V, $R_g$ = 1 $\Omega$		55	83	
Fall Time	t <sub>f</sub>			12	18	
<b>Drain-Source Body Diode Characteristic</b>	s		l			
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			80	_
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				100	A
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 22 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>		İ	52	78	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	1 00 A dildt 400 A/22 T 05 00		70.2	105	nC
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 20 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 \text{ °C}$		27		
Reverse Recovery Rise Time	t <sub>b</sub>			25		ns

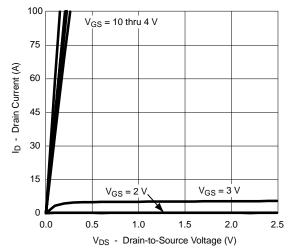
#### Notes:

- a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%.$
- b. Guaranteed by design, not subject to production testing.

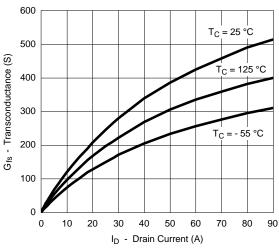
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



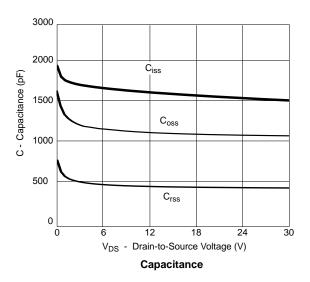
#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

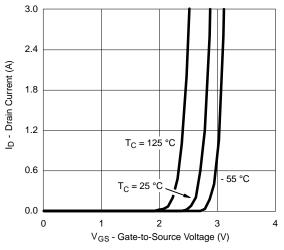


#### **Output Characteristics**

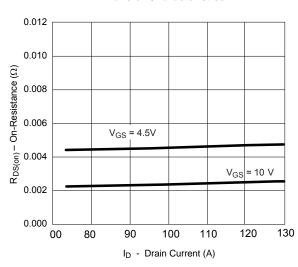


Transconductance

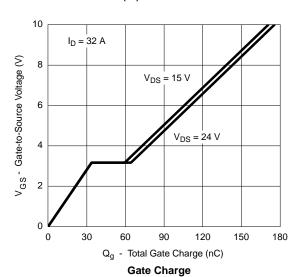




**Transfer Characteristics** 

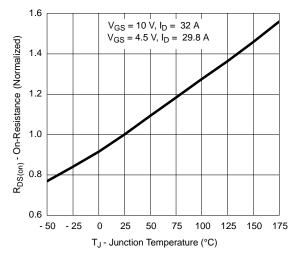


R<sub>DS(on)</sub> vs. Drain Current

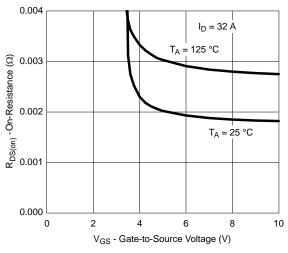




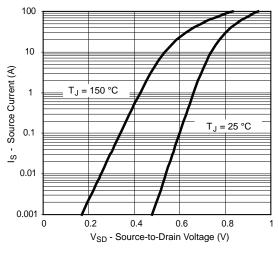
#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



On-Resistance vs. Junction Temperature



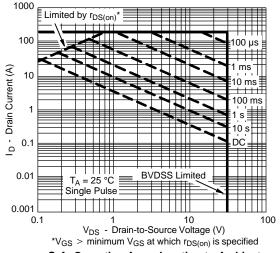
 $\rm R_{\rm DS(on)}$  vs.  $\rm V_{\rm GS}$  vs. Temperature



Forward Diode Voltage vs. Temperature



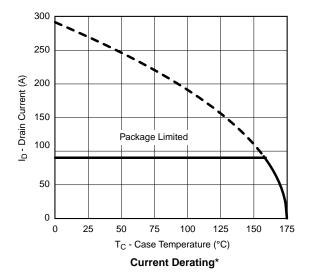
Threshold Voltage

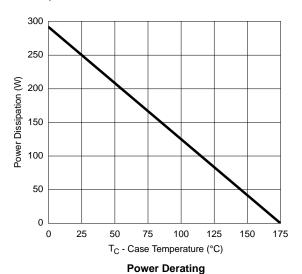


Safe Operating Area, Junction-to-Ambient

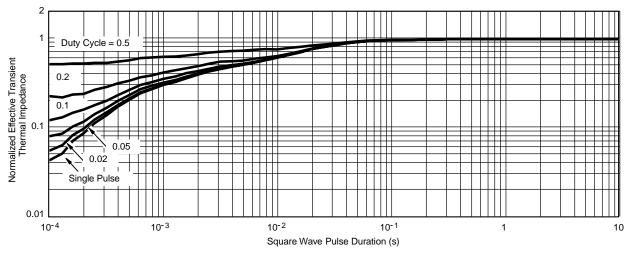


#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)





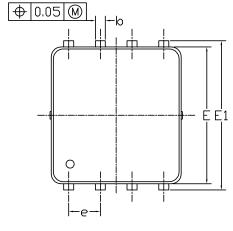
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 175$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

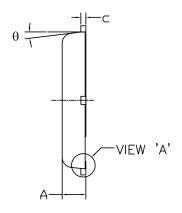


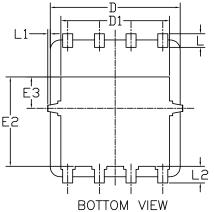
Normalized Thermal Transient Impedance, Junction-to-Case

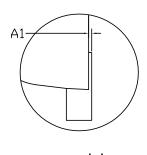


DFN5x6\_8L\_EP1\_P PACKAGE OUTLIN



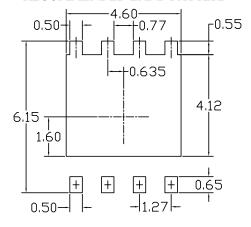






<u>VIEW 'A'</u> (SCALE 5:1)

#### RECOMMENDED LAND PATTERN



GVA (DOLG	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES			
SYMBOLS	MIN	NOM	MAX	MIN	NOM	MAX	
A	0.85	0. 95	1.00	0.033	0.037	0.039	
Al	0.00		0.05	0.000		0.002	
b	0.30	0.40	0.50	0.012	0.016	0.020	
c	0.15	0. 20	0. 25	0.006	0.008	0.010	
D	5. 10	5. 20	5. 30	0. 201	0. 205	0. 209	
D1	4. 25	4. 35	4. 45	0. 167	0. 171	0. 175	
Е	5. 45	5. 55	5. 65	0.215	0.219	0. 222	
E1	5. 95	6.05	6. 15	0. 234	0. 238	0. 242	
E2	3. 525	3.625	3. 725	0.139	0.143	0. 147	
E3	1. 175	1.275	1.375	0.046	0.050	0.054	
e	1. 27 BSC			0.050 BSC			
L	0.45	0. 55	0.65	0.018	0.022	0.026	
L1	0		0. 15	0		0.006	
L2	0.68 REF			0.027 REF			
θ	0°		10°	0°		10°	

#### **NOTE**

- 1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS. MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
- 2. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

UNIT: mm



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