NTB25P06, NVB25P06

Power MOSFET

−60 V, −27.5 A, P−Channel D²PAK

Designed for low voltage, high speed switching applications and to withstand high energy in the avalanche and commutation modes.

Features

- AEC Q101 Qualified − NVB25P06
- These Devices are Pb−Free and are RoHS Compliant

Typical Applications

- PWM Motor Controls
- Power Supplies
- Converters
- Bridge Circuits

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	−60	V
Gate−to−Source Voltage − Continuous − Non−Repetitive ($t_p \le 10$ ms)	 V_{GS} V_{GSM}	 ±15 ±20	 V Vpk
Drain Current − Continuous @ T_A = 25°C − Single Pulse ($t_p \le 10$ μs)	 I_D I_{DM}	 27.5 80	 A Apk
Total Power Dissipation @ T_A = 25°C	P_D	120	W
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to +175	°C
Single Pulse Drain−to−Source Avalanche Energy − Starting T_J = 25°C (V_{DD} = 25 V, V_{GS} = 10 V, $I_{L(pk)}$ = 20 A, L = 3 mH, R_G = 25 Ω)	E_{AS}	600	mJ
Thermal Resistance − Junction−to−Case − Junction−to−Ambient (Note 1) − Junction−to−Ambient (Note 2)	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	 1.25 46.8 63.2	°C/W
Maximum Lead Temperature for Soldering Purposes, (1/8″ from case for 10 s)	T_L	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

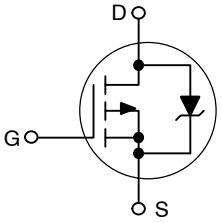
1. When surface mounted to an FR4 board using 1″ pad size (Cu Area 1.127 in²).
2. When surface mounted to an FR4 board using the minimum recommended pad size (Cu Area 0.412 in²).

ON Semiconductor®

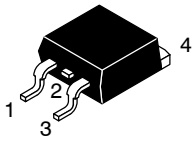
http://onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
−60 V	65 mΩ @ −10 V	−27.5 A

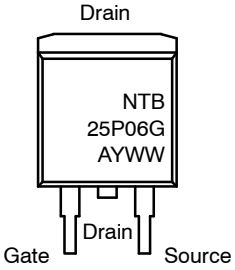
P−Channel



MARKING DIAGRAM & PIN ASSIGNMENT



D²PAK
CASE 418B



A	= Assembly Location
Y	= Year
WW	= Work Week
G	= Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping†
NTB25P06T4G	D²PAK (Pb−Free)	800 / Tape & Reel
NVB25P06T4G	D²PAK (Pb−Free)	800 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage (Note 3) (V_{GS} = 0 V, I_D = −250 μA) (Positive Temperature Coefficient)		$V_{(BR)DSS}$	 −60 −	 − 64	 − −	V mV/°C
Zero Gate Voltage Drain Current (V_{GS} = 0 V, V_{DS} = −60 V, T_J = 25°C) (V_{GS} = 0 V, V_{DS} = −60 V, , T_J = 150°C)		I_{DSS}	 − −	 − −	 −10 −100	μA
Gate−Body Leakage Current (V_{GS} = ±15 V, V_{DS} = 0 V)		I_{GSS}	−	−	±100	nA
ON CHARACTERISTICS (Note 3)						
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = −250 μA) (Negative Threshold Temperature Coefficient)		$V_{GS(th)}$	 −2.0 −	 −2.8 6.2	 −4.0 −	V mV/°C
Static Drain−Source On−State Resistance (V_{GS} = −10 V, I_D = −12.5 A) (V_{GS} = −10 V, I_D = −25 A)		$R_{DS(on)}$	 − −	 0.065 0.070	 0.075 0.082	Ω
Forward Transconductance (V_{DS} = −10 V, I_D = −12.5 A)		gFS	 −	 13	 −	Mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = −25 V, V_{GS} = 0 V, F = 1.0 MHz)	C_{iss}	−	1200	1680	pF
Output Capacitance		C_{oss}	−	345	480	
Reverse Transfer Capacitance		C_{rss}	−	90	180	
SWITCHING CHARACTERISTICS (Notes 3 & 4)						
Turn−On Delay Time	(V_{DD} = −30 V, I_D = −25 A, V_{GS} = −10 V R_G = 9.1 Ω)	$t_{d(on)}$	−	14	24	ns
Rise Time		t_r	−	72	118	ns
Turn−Off Delay Time		$t_{d(off)}$	−	43	68	ns
Fall Time		t_f	−	190	320	ns
Gate Charge	(V_{DS} = −48 V, I_D = −25 A, V_{GS} = −10 V)	Q_T	−	33	50	nC
		Q_1	−	6.5	−	
		Q_2	−	15	−	
BODY−DRAIN DIODE RATINGS (Note 3)						
Diode Forward On−Voltage	(I_S = −25 A, V_{GS} = 0 V) (I_S = −25 A, V_{GS} = 0 V, T_J = 150°C)	V_{SD}	− −	−1.8 −1.4	−2.5 −	V
Reverse Recovery Time	(I_S = −25 A, V_{GS} = 0 V, dI_S/dt = 100 A/μs)	t_{rr}	−	70	−	ns
		t_a	−	50	−	
		t_b	−	20	−	
Reverse Recovery Stored Charge		Q_{RR}	−	0.2	−	μC

3. Indicates Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

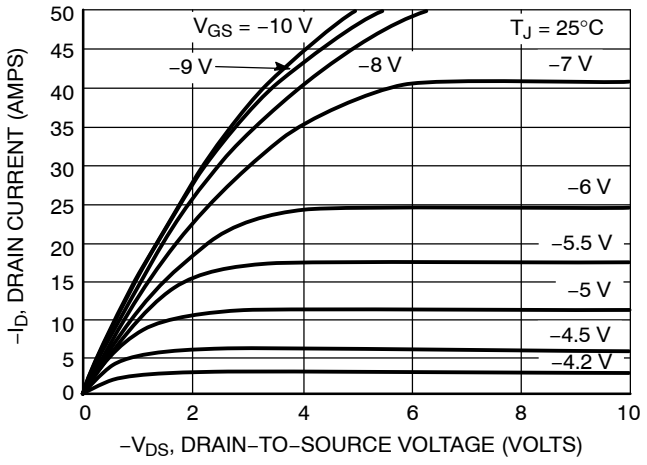


Figure 1. On−Region Characteristics

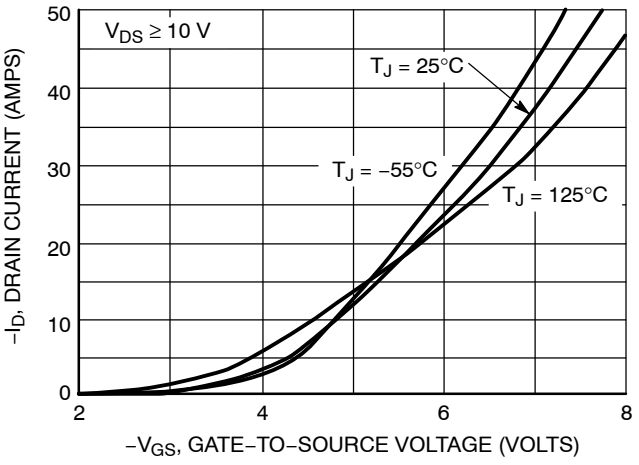


Figure 2. Transfer Characteristics

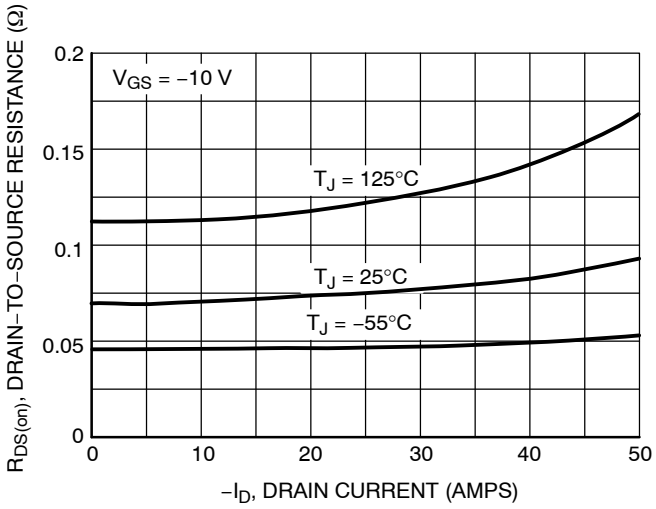


Figure 3. On−Resistance vs. Drain Current and Temperature

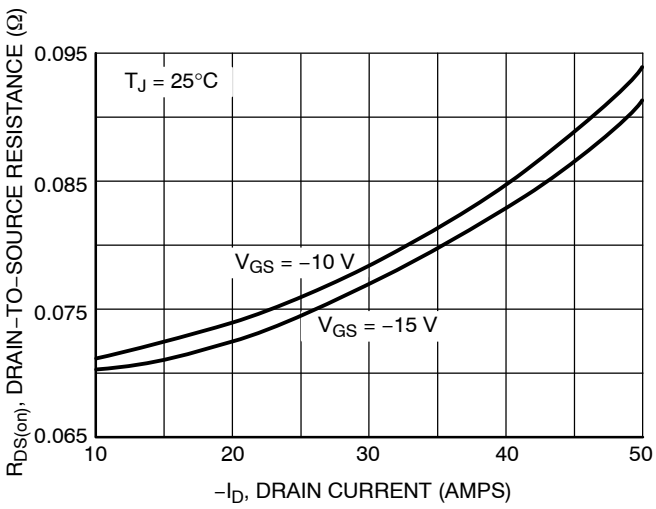


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

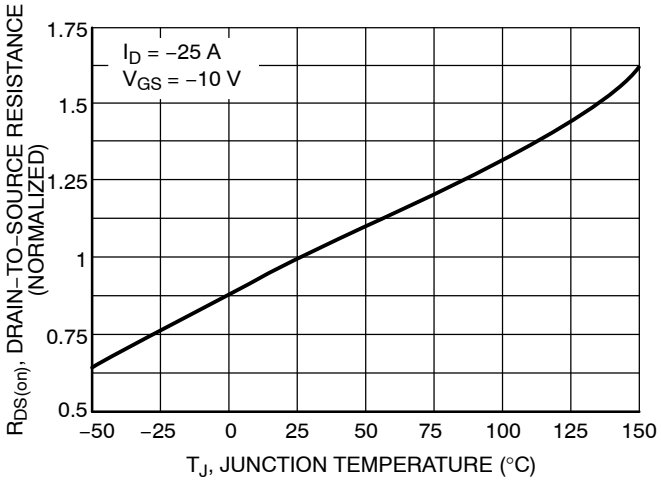


Figure 5. On−Resistance Variation with Temperature

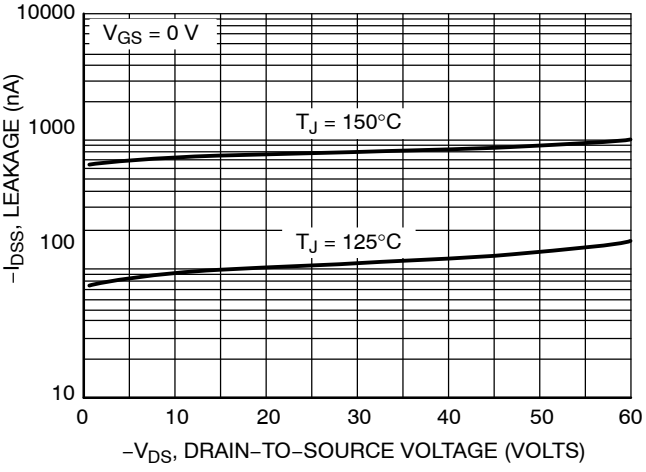


Figure 6. Drain−to−Source Leakage Current vs. Voltage

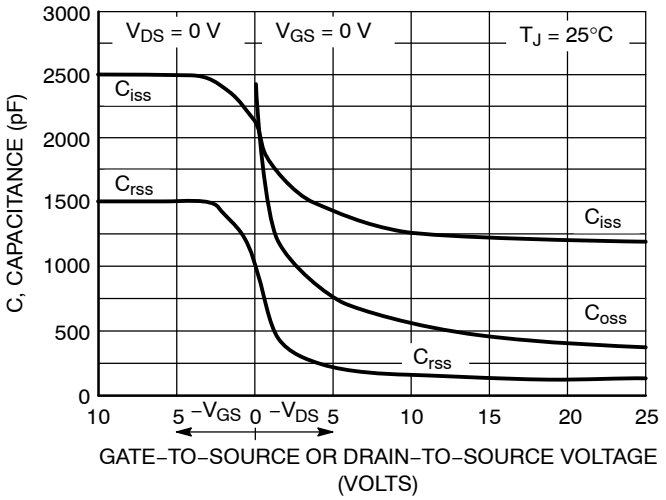


Figure 7. Capacitance Variation

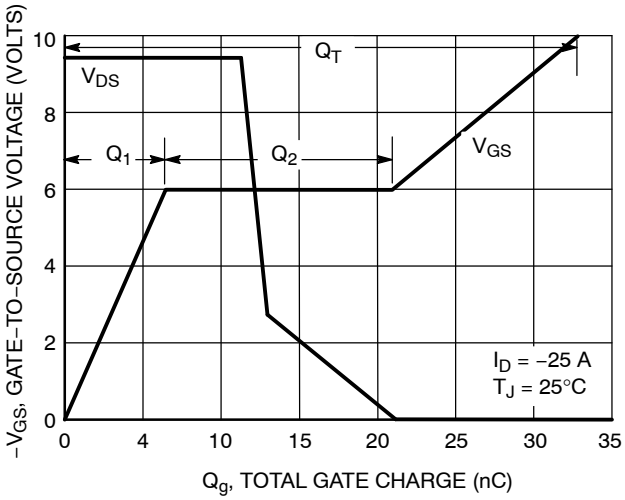


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

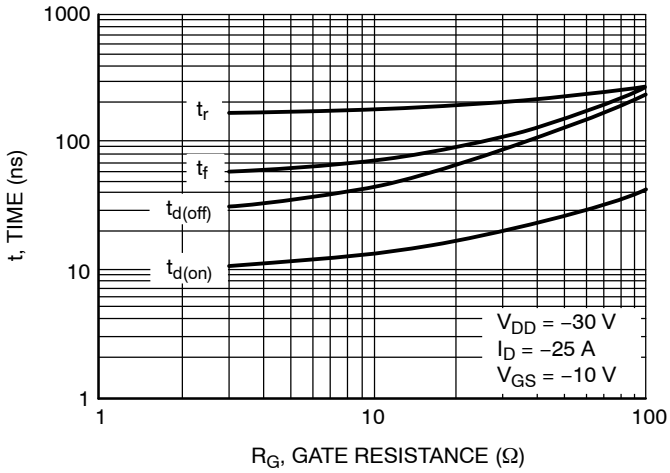


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

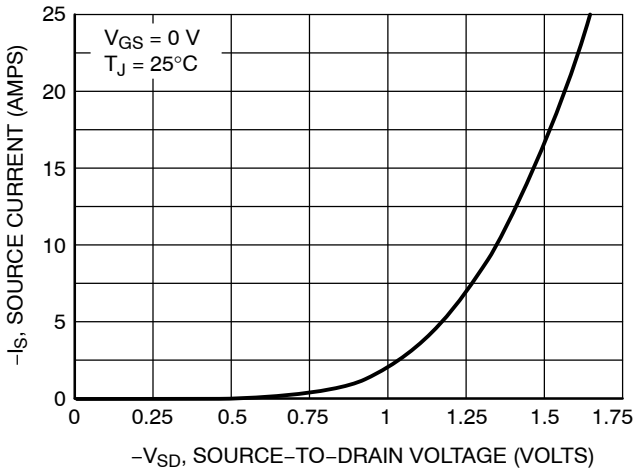


Figure 10. Diode Forward Voltage vs. Current

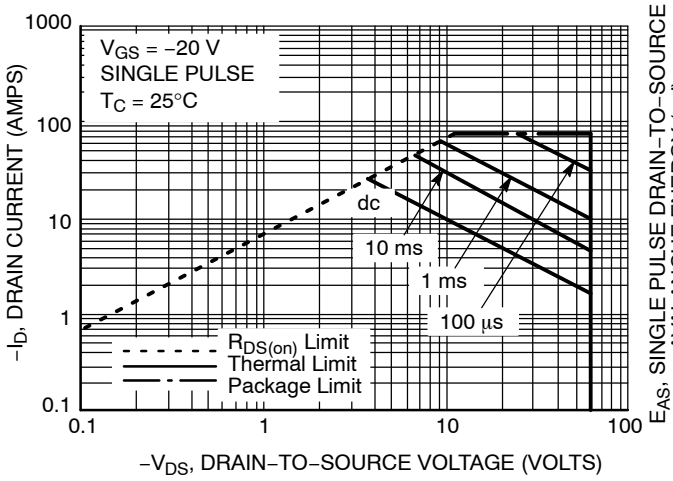


Figure 11. Maximum Rated Forward Biased Safe Operating Area

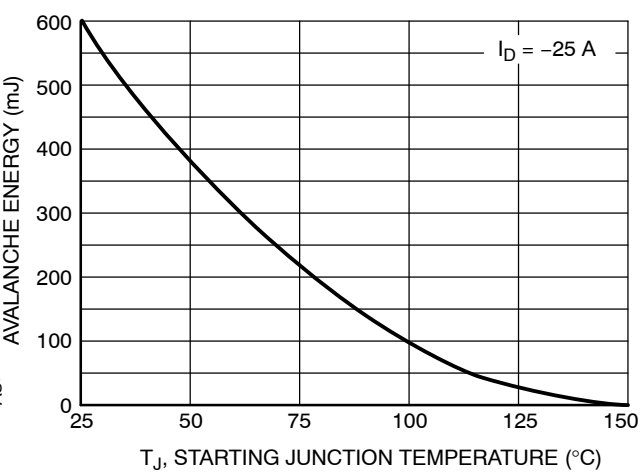
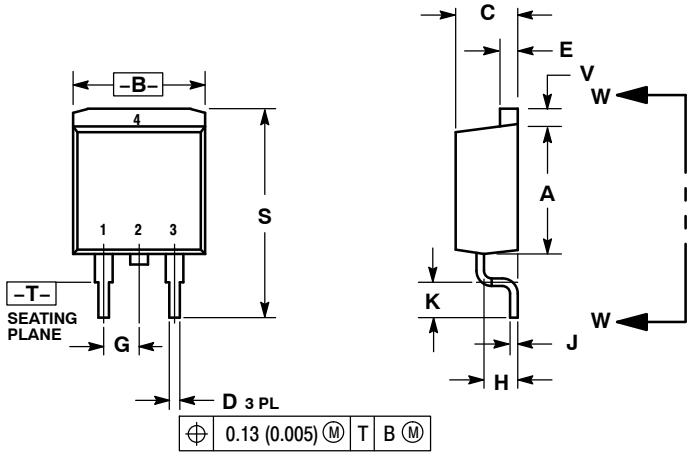


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

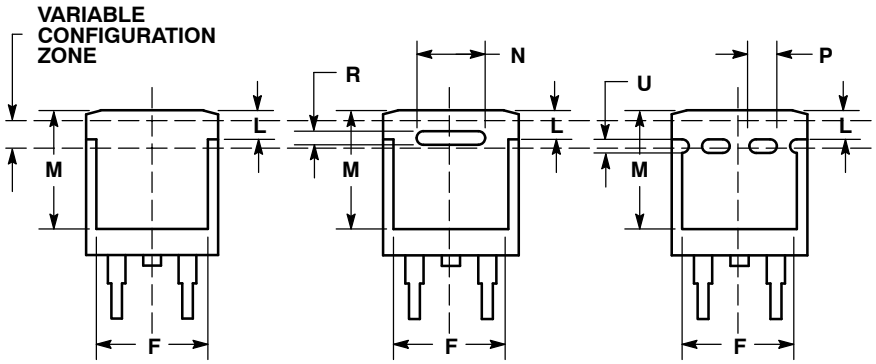
PACKAGE DIMENSIONS

D²PAK 3
CASE 418B–04
ISSUE K



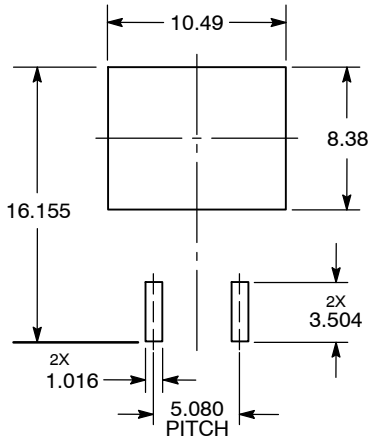
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B–01 THRU 418B–03 OBSOLETE, NEW STANDARD 418B–04.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197 REF		5.00 REF	
P	0.079 REF		2.00 REF	
R	0.039 REF		0.99 REF	
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40



VIEW W–W 1 | VIEW W–W 2 | VIEW W–W 3

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

NTB25P06/D