

NVB072N65S3

MOSFET – Power, N-Channel, Automotive SUPERFET[®] III, Easy-Drive

650 V, 44 A, 72 mΩ

Description

SuperFET III MOSFET is ON Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss provide superior switching performance, and withstand extreme dv/dt rate. Consequently, SuperFET III MOSFET Easy-drive series helps manage EMI issues and allows for easier design implementation.

Features

- AEC-Q101 Qualified
- Max Junction Temperature 150°C
- Typ. $R_{DS(on)} = 61\text{ m}\Omega$
- Ultra Low Gate Charge (Typ. $Q_G = 82\text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{OSS(eff.)} = 724\text{ pF}$)
- 100% Avalanche Tested
- These Devices are Pb-Free and are RoHS Compliant

Typical Applications

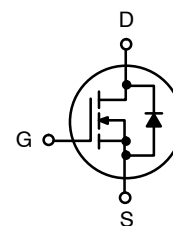
- Automotive PHEV-BEV DC-DC Converter
- Automotive Onboard Charger for PHEV-BEV



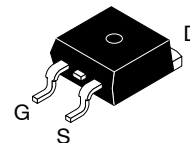
ON Semiconductor[®]

www.onsemi.com

BV_{DSS}	$R_{DS(on)}\text{ MAX}$	$I_D\text{ MAX}$
650 V	72 mΩ @ 10 V	44 A

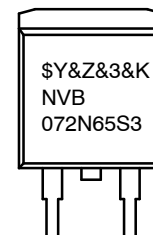


N-Channel MOSFET



D2PAK
3 LEAD
CASE 418AJ

MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
NVB072N65S3	= Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NVB072N65S3

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, Unless otherwise specified)

Symbol	Parameter		Value	Unit
V _{DSS}	Drain to Source Voltage		650	V
V _{GSS}	Gate to Source Voltage	DC	±30	V
		AC (f > 1 Hz)	±30	V
I _D	Drain Current	Continuous (T _C = 25°C)	44	A
		Continuous (T _C = 100°C)	28	A
I _{DM}	Pulsed Drain Current	Pulsed (Note 1)	110	A
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		214	mJ
E _{AR}	Repetitive Avalanche (Note 1)		3.12	mJ
dv/dt	MOSFET dv/dt		100	V/ns
	Peak Diode Recovery dv/dt (Note 3)		20	V/ns
P _D	Power Dissipation	(T _C = 25°C)	312	W
		Derate Above 25°C	2.5	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T _L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2. I_{AS} = 4.8 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} < 44 A, di/dt ≤ 200 A/ms, V_{DD} ≤ BVDSS, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R _{θJC}	Thermal Resistance, Junction to Case, Max.	0.37	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	62.5	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient (1 in ² Pad of 2-oz Copper), Max.	40	°C/W

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Shipping (Qty / Packing)
NVB072N65S3	NVB072N65S3	D ² PAK-3	Tube	30 Units / Tube

NVB072N65S3

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

OFF CHARACTERISTICS

BV _{DSS}	Drain-to-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 1 mA, T _J = 25°C	650	-	-	V
		V _{GS} = 0 V, I _D = 1 mA, T _J = 150°C	700	-	-	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 1 mA, Referenced to 25°C	-	0.60	-	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0 V	-	0.30	1	μA
		V _{DS} = 520 V, V _{GS} = 0 V, T _c = 125°C	-	7.30	-	
I _{GSS}	Gate to Body Leakage Current	V _{GS} = ±30 V, V _{DS} = 0 V	-	-	±100	nA

ON CHARACTERISTICS

V _{GS(th)}	Gate to Source Threshold Voltage	V _{GS} = V _{DS} , I _D = 1.0 mA	2.5	-	4.5	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10 V, I _D = 22 A, T _J = 25°C	-	61	72	mΩ
		V _{GS} = 10 V, I _D = 22 A, T _J = 100°C	-	107	-	mΩ
g _{FS}	Forward Transconductance	V _{DS} = 20 V, I _D = 44 A	-	29.7	-	S

DYNAMIC CHARACTERISTICS

C _{iss}	Input Capacitance	V _{DS} = 400 V, V _{GS} = 0 V, f = 1 MHz	-	3300	-	pF
C _{oss}	Output Capacitance		-	72.8	-	pF
C _{rss}	Reverse Transfer Capacitance		-	14.6	-	pF
C _{oss(eff.)}	Effective Output Capacitance	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	-	724	-	pF
C _{oss(er.)}	Energy Related Output Capacitance	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	-	104	-	pF
Q _{g(tot)}	Total Gate Charge	V _{DS} = 400 V, V _{GS} = 10 V, I _D = 44 A (Note 4)	-	82.0	-	nC
Q _{gs}	Gate to Source Gate Charge		-	23.3	-	nC
Q _{gd}	Gate to Drain "Miller" Charge		-	34.0	-	nC
R _G	Gate Resistance		f = 1 MHz	-	0.685	-

SWITCHING CHARACTERISTICS

t _{d(on)}	Turn-On Delay Time	V _{DD} = 400 V, I _D = 44 A, V _{GS} = 10 V, R _G = 4.7 Ω (Note 4)	-	26.3	-	ns
t _r	Turn-On Rise Time		-	50	-	ns
t _{d(off)}	Turn-Off Delay Time		-	65.9	-	ns
t _f	Fall Time		-	32	-	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	44	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	110	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 22 A	-	-	1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 44 A dI _F /dt = 100 A/μs	-	576	-	nS
Q _{rr}	Reverse Recovery Charge		-	14.3	-	μC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

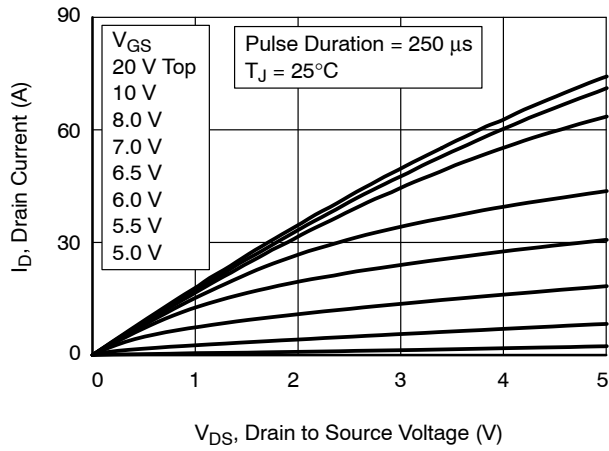


Figure 1. Saturation Characteristics

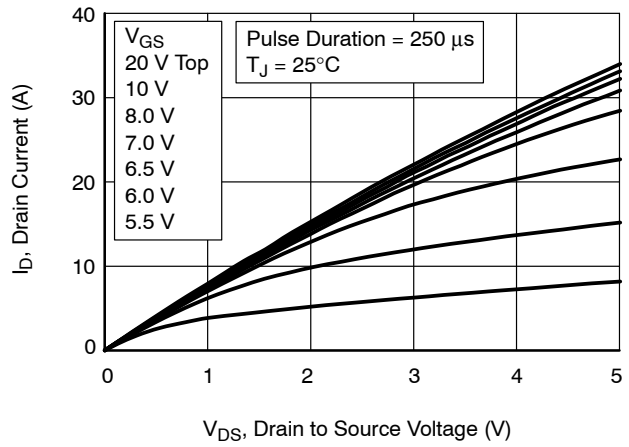


Figure 2. Saturation Characteristics

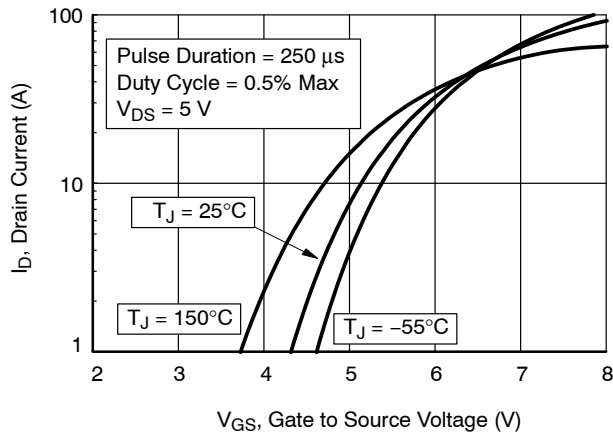


Figure 3. Transfer Characteristic

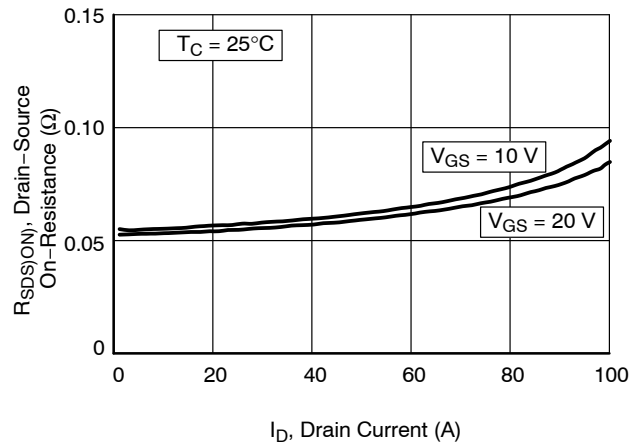


Figure 4. On-Resistance Variation vs. Drain Current and Gate Voltage

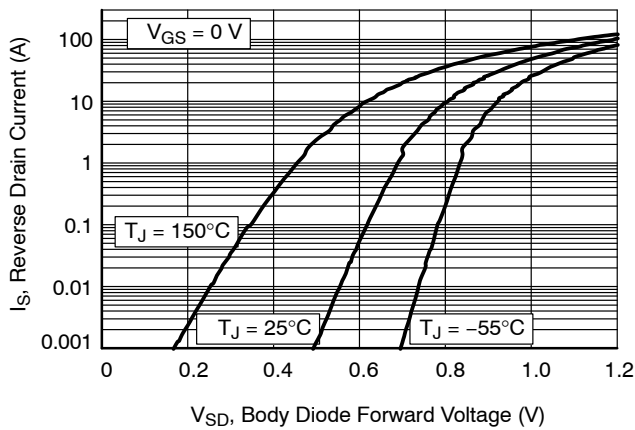


Figure 5. Forward Diode Characteristics

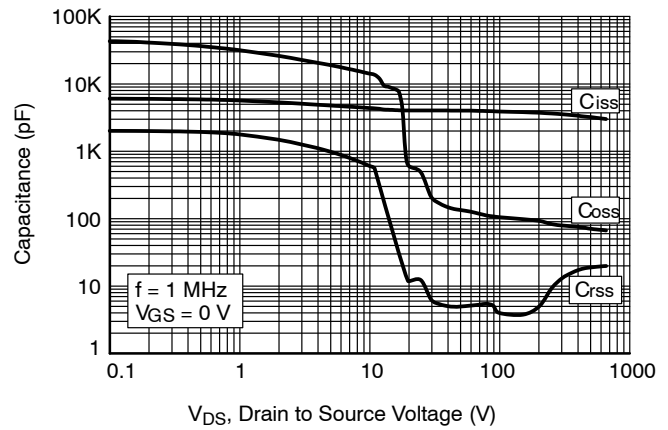


Figure 6. Capacitance vs. Drain to Source Voltage

TYPICAL CHARACTERISTICS (continued)

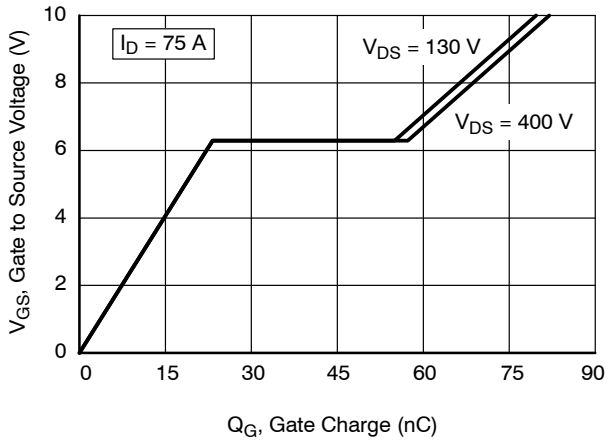


Figure 7. Gate Charge vs. Gate to Source Voltage

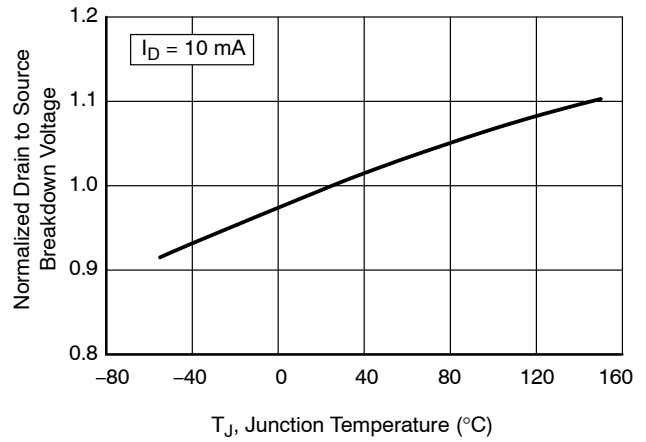


Figure 8. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

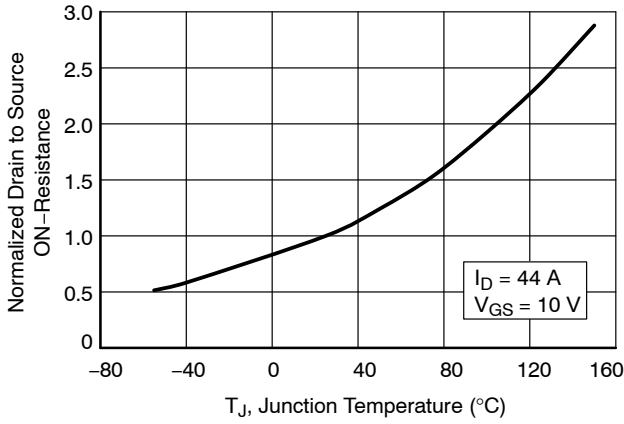


Figure 9. Normalized $R_{DS(on)}$ vs. Junction Temperature

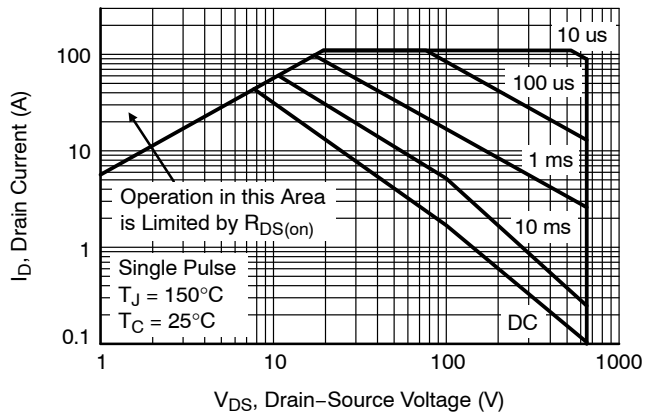


Figure 10. Forward Bias Safe Operating Area

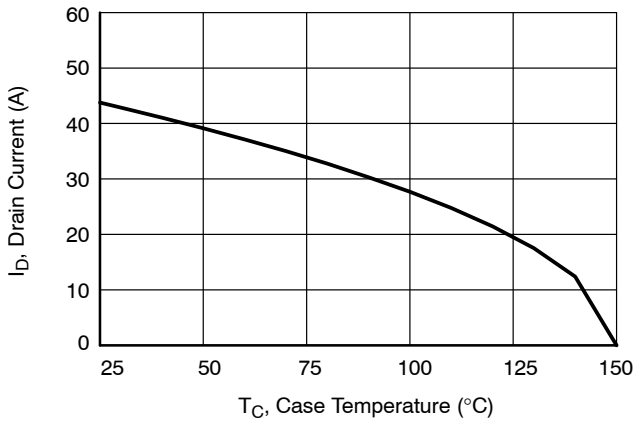


Figure 11. Maximum Continuous Drain Current vs. Case Temperature

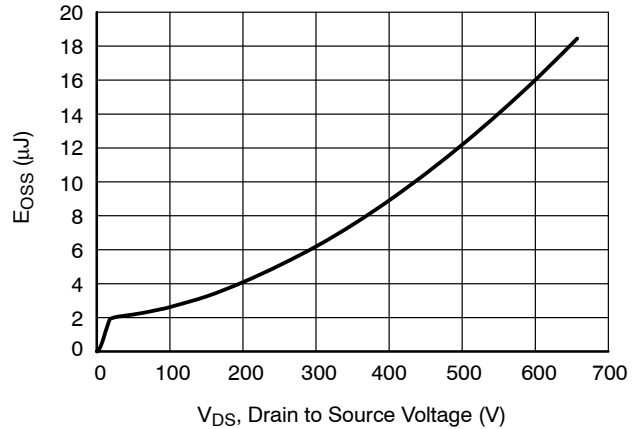


Figure 12. E_{OSS} vs. Drain to Source Voltage

TYPICAL CHARACTERISTICS (continued)

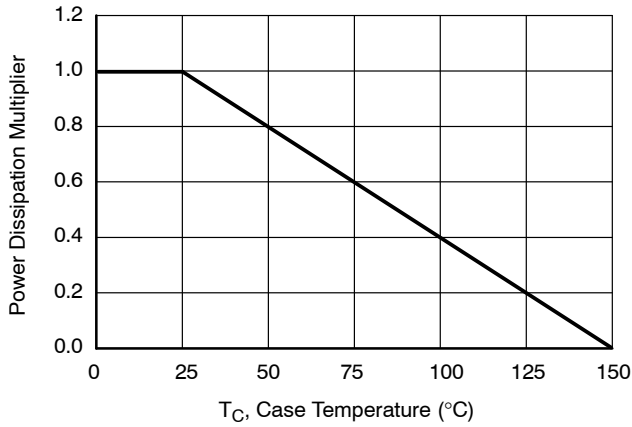


Figure 13. Normalized Power Dissipation vs. Case Temperature

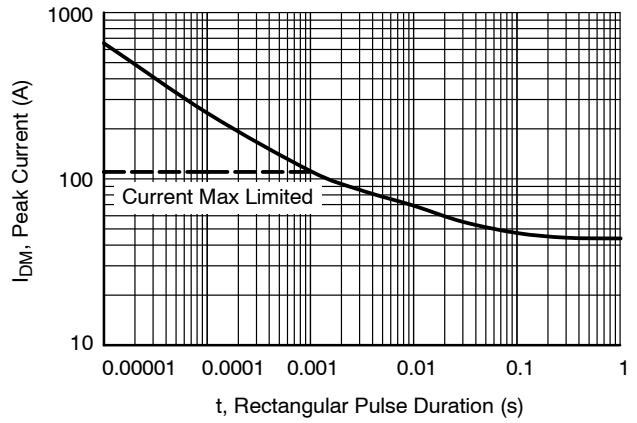


Figure 14. Peak Current Capability

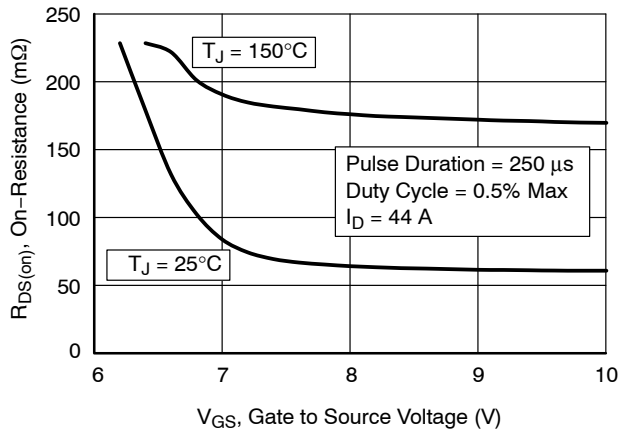


Figure 15. On-Resistance vs. Gate to Source Voltage

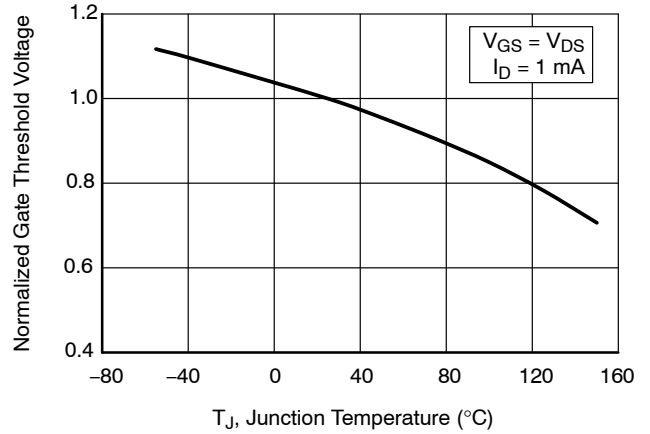


Figure 16. Normalized Gate Threshold Voltage vs. Temperature

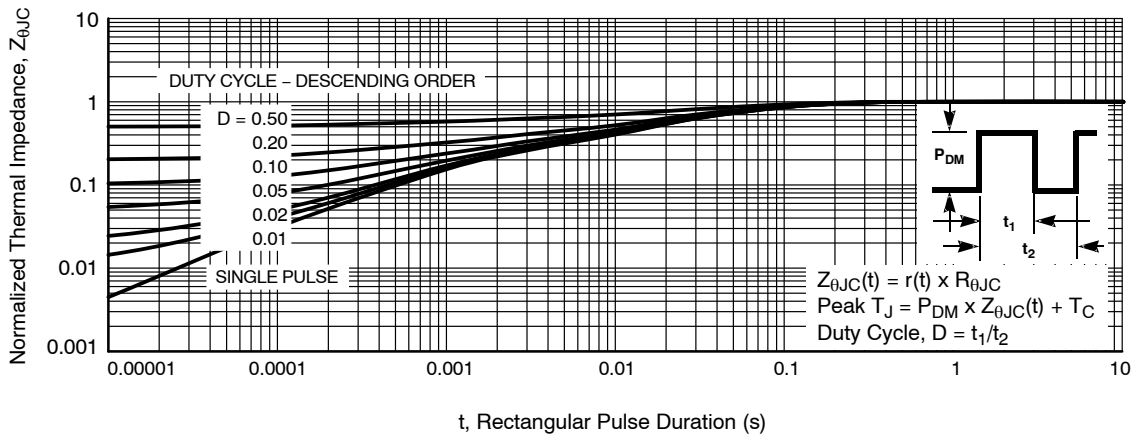
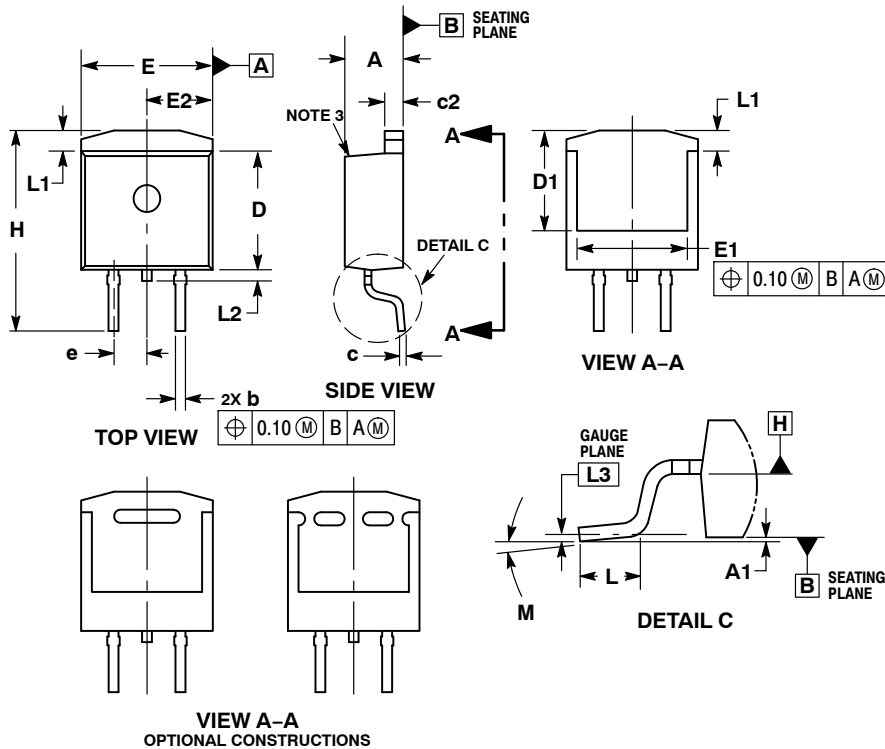


Figure 17. Normalized Maximum Transient Thermal Impedance

NVB072N65S3

PACKAGE DIMENSIONS

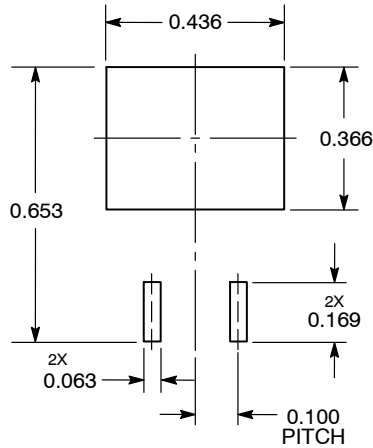
D²PAK-3 (TO-263, 3-LEAD) CASE 418AJ ISSUE C



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CHAMFER OPTIONAL
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1 AND E1.


RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: INCHES

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

SUPERFET is registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 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

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative