

ON Semiconductor

Is Now



To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and onsemi. and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi 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 onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi 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. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi 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 onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi 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 onsemi was negligent regarding the design or manufacture of the part. onsemi is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.

NDD60N550U1

N-Channel Power MOSFET 600 V, 550 mΩ

Features

- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

ABSOLUTE MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter			Symbol	NDD	Unit
Drain-to-Source Voltage			V _{DSS}	600	V
Gate-to-Source Voltage			V _{GS}	±25	V
Continuous Drain Current R _{θJC}	Steady State	T _C = 25°C	I _D	8.2	A
		T _C = 100°C		5.2	
Power Dissipation – R _{θJC}	Steady State	T _C = 25°C	P _D	94	W
Pulsed Drain Current	t _p = 10 μs		I _{DM}	34	A
Operating Junction and Storage Temperature			T _J , T _{STG}	–55 to +150	°C
Source Current (Body Diode)			I _S	8.2	A
Single Pulse Drain-to-Source Avalanche Energy (I _D = 4 A)			EAS	54	mJ
Peak Diode Recovery (Note 1)			dv/dt	15	V/ns
Lead Temperature for Soldering Leads			T _L	260	°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. $I_{SD} < 8.2 \text{ A}$, $di/dt \leq 400 \text{ A}/\mu\text{s}$, $V_{DS \text{ peak}} \leq V_{(BR)DSS}$, $V_{DD} = 80\% V_{(BR)DSS}$

THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain) NDD60N550U1	$R_{\theta JC}$	1.3	$^\circ\text{C}/\text{W}$
Junction-to-Ambient Steady State (Note 3) NDD60N550U1	$R_{\theta JA}$	47	$^\circ\text{C}/\text{W}$
(Note 2) NDD60N550U1-1		98	
(Note 2) NDD60N550U1-35		95	

2. Insertion mounted
3. Surface mounted on FR4 board using 1" sq. pad size (Cu area = 1.127 in sq [2 oz] including traces)

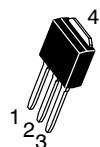
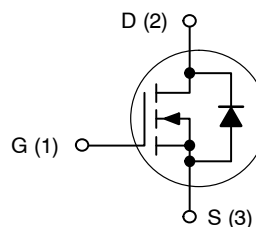


ON Semiconductor®

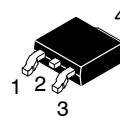
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON) \text{ MAX}}$
600 V	550 mΩ @ 10 V

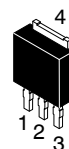
N-Channel MOSFET



IPAK
CASE 369D
STYLE 2



DPAK
CASE 369C
STYLE 2



IPAK
CASE 369AD
STYLE 2

MARKING AND ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

NDD60N550U1

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

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

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 1 mA	600			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			540		mV/°C
Drain-to-Source Leakage Current	I _{DSS}	V _{DS} = 600 V, V _{GS} = 0 V	T _J = 25°C		1	μA
			T _J = 125°C		100	
Gate-to-Source Leakage Current	I _{GSS}	V _{GS} = ±25 V			±100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250 μA	2	3.2	4	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J	Reference to 25°C, I _D = 250 μA		7.6		mV/°C
Static Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 4 A		510	550	mΩ
Forward Transconductance	g _{FS}	V _{DS} = 15 V, I _D = 4 A		7.0		S

DYNAMIC CHARACTERISTICS

Input Capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz		540		pF
Output Capacitance	C _{oss}			33		
Reverse Transfer Capacitance	C _{rss}			1.6		
Effective output capacitance, energy related (Note 6)	C _{o(er)}	V _{GS} = 0 V, V _{DS} = 0 to 480 V		24		
Effective output capacitance, time related (Note 7)	C _{o(tr)}	I _D = constant, V _{GS} = 0 V, V _{DS} = 0 to 480 V		84		
Total Gate Charge	Q _g	V _{DS} = 300 V, I _D = 9.5 A, V _{GS} = 10 V		18		nC
Gate-to-Source Charge	Q _{gs}			3.4		
Gate-to-Drain Charge	Q _{gd}			8.7		
Plateau Voltage	V _{GP}			5.4		V
Gate Resistance	R _g			5.5		Ω

RESISTIVE SWITCHING CHARACTERISTICS (Note 5)

Turn-on Delay Time	t _{d(on)}	V _{DD} = 300 V, I _D = 9.5 A, V _{GS} = 10 V, R _G = 0 Ω		8		ns
Rise Time	t _r			14		
Turn-off Delay Time	t _{d(off)}			20		
Fall Time	t _f			17		

SOURCE-DRAIN DIODE CHARACTERISTICS

Diode Forward Voltage	V _{SD}	I _S = 8.2 A, V _{GS} = 0 V	T _J = 25°C		0.9	1.3	V
			T _J = 100°C		0.82		
Reverse Recovery Time	t _{rr}	V _{GS} = 0 V, V _{DD} = 30 V, I _S = 9.5 A, dI/dt = 100 A/μs		290		ns	
Charge Time	t _a			160			
Discharge Time	t _b			130			
Reverse Recovery Charge	Q _{rr}			2.6			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.

4. Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

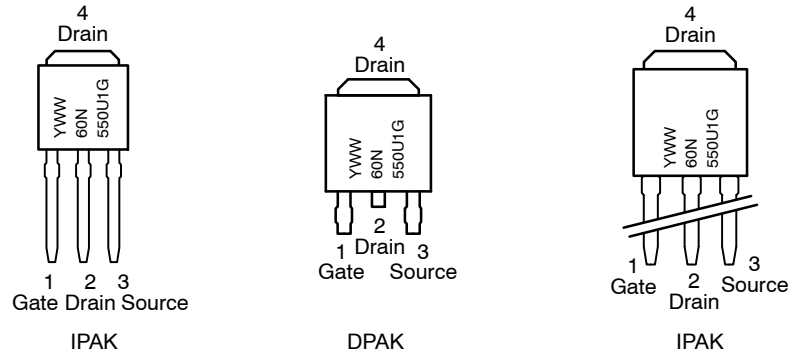
5. Switching characteristics are independent of operating junction temperatures.

6. C_{o(er)} is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}

7. C_{o(tr)} is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{(BR)DSS}

NDD60N550U1

MARKING DIAGRAMS



Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping [†]
NDD60N550U1-1G	IPAK (Pb-Free, Halogen-Free)	75 Units / Rail
NDD60N550U1-35G	IPAK (Pb-Free, Halogen-Free)	75 Units / Rail
NDD60N550U1T4G	DPAK (Pb-Free, Halogen-Free)	2500 / Tape & Reel

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

TYPICAL CHARACTERISTICS

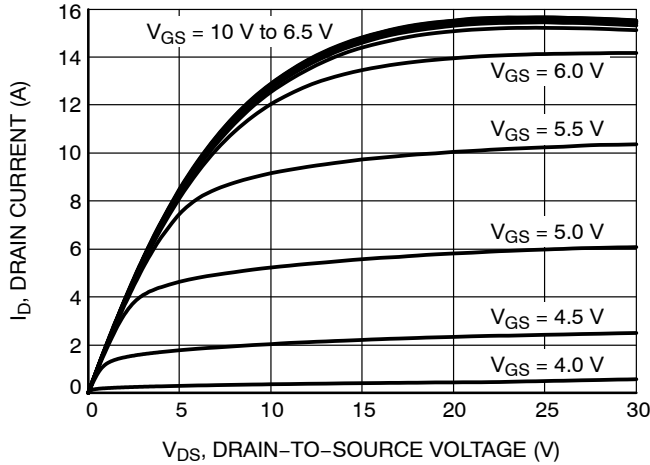


Figure 1. On-Region Characteristics

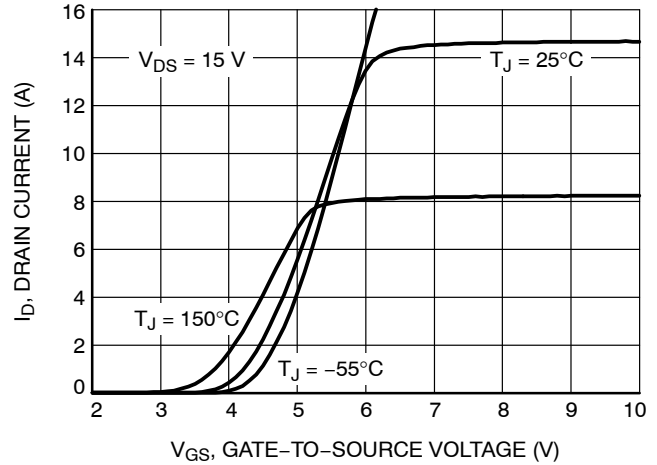


Figure 2. Transfer Characteristics

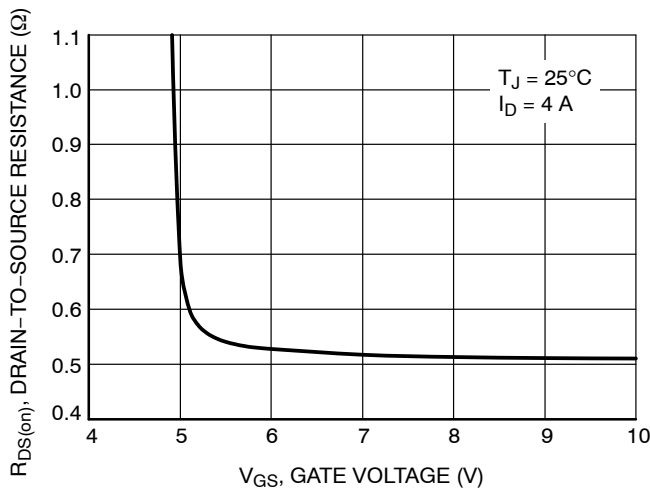


Figure 3. On-Resistance vs. Gate-to-Source Voltage

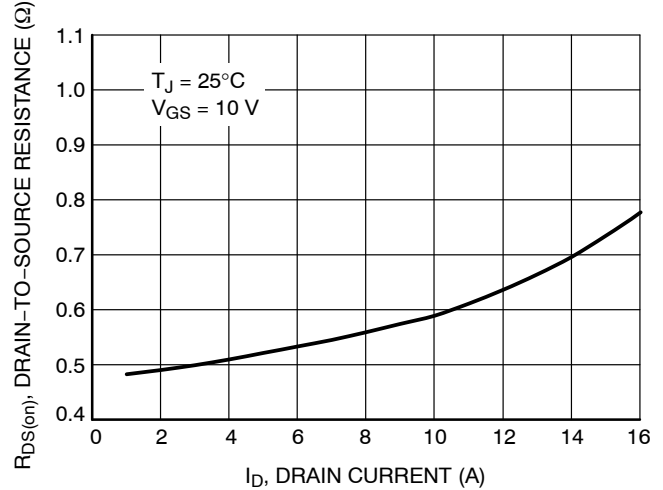


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

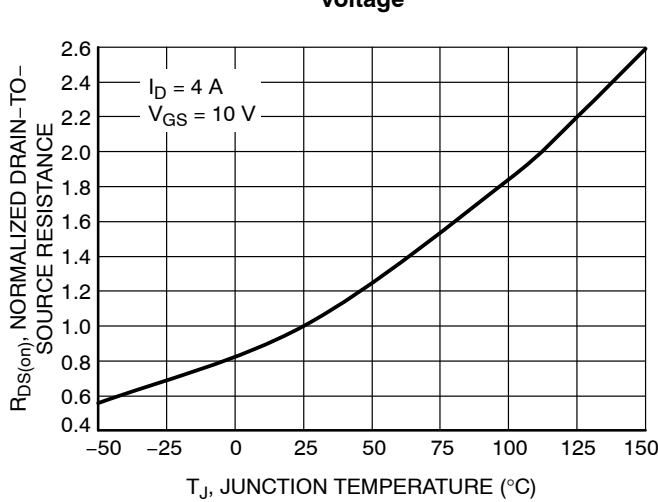


Figure 5. On-Resistance Variation with Temperature

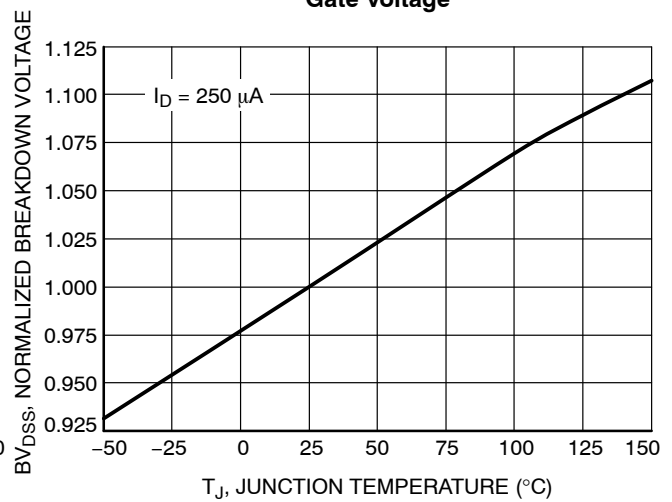


Figure 6. Breakdown Voltage Variation with Temperature

TYPICAL CHARACTERISTICS

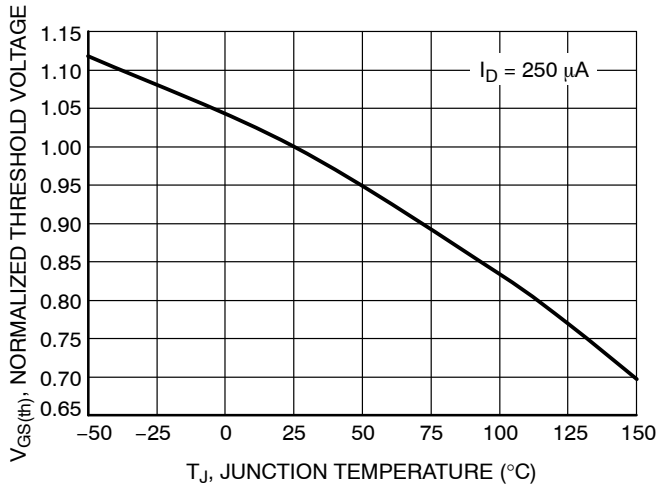


Figure 7. Threshold Voltage Variation with Temperature

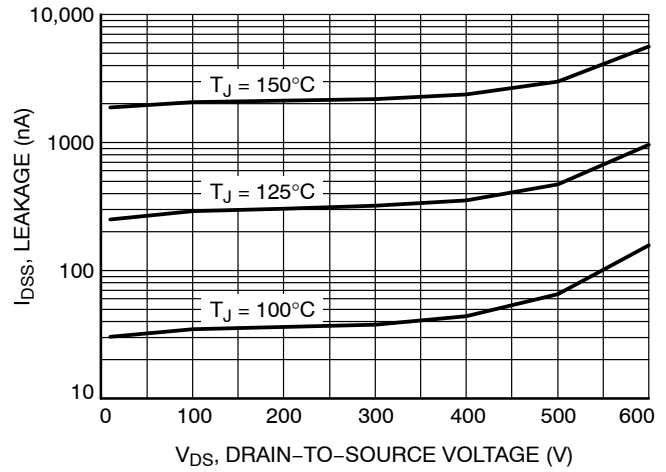


Figure 8. Drain-to-Source Leakage Current vs. Voltage

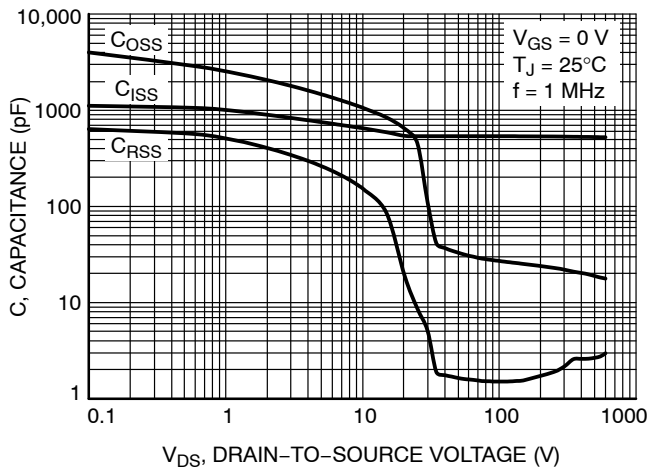


Figure 9. Capacitance Variation

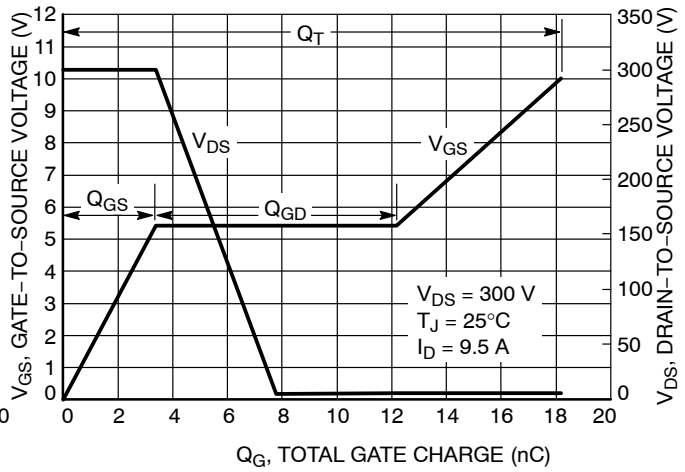


Figure 10. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

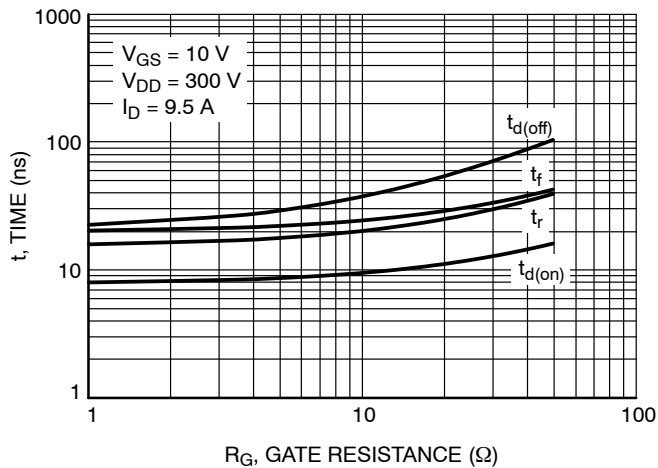


Figure 11. Resistive Switching Time Variation vs. Gate Resistance

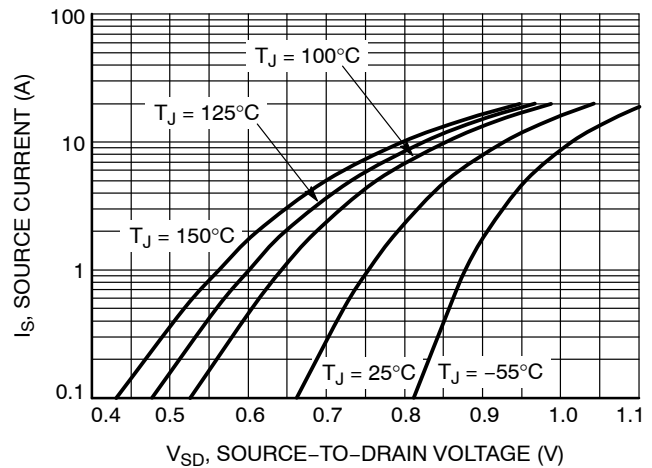


Figure 12. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS

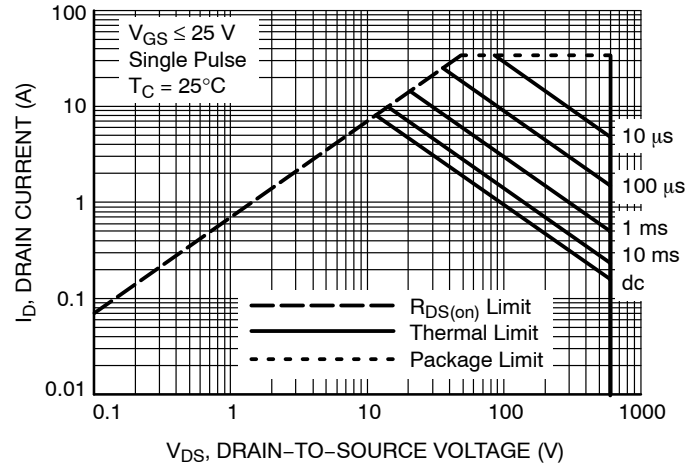


Figure 13. Maximum Rated Forward Biased Safe Operating Area

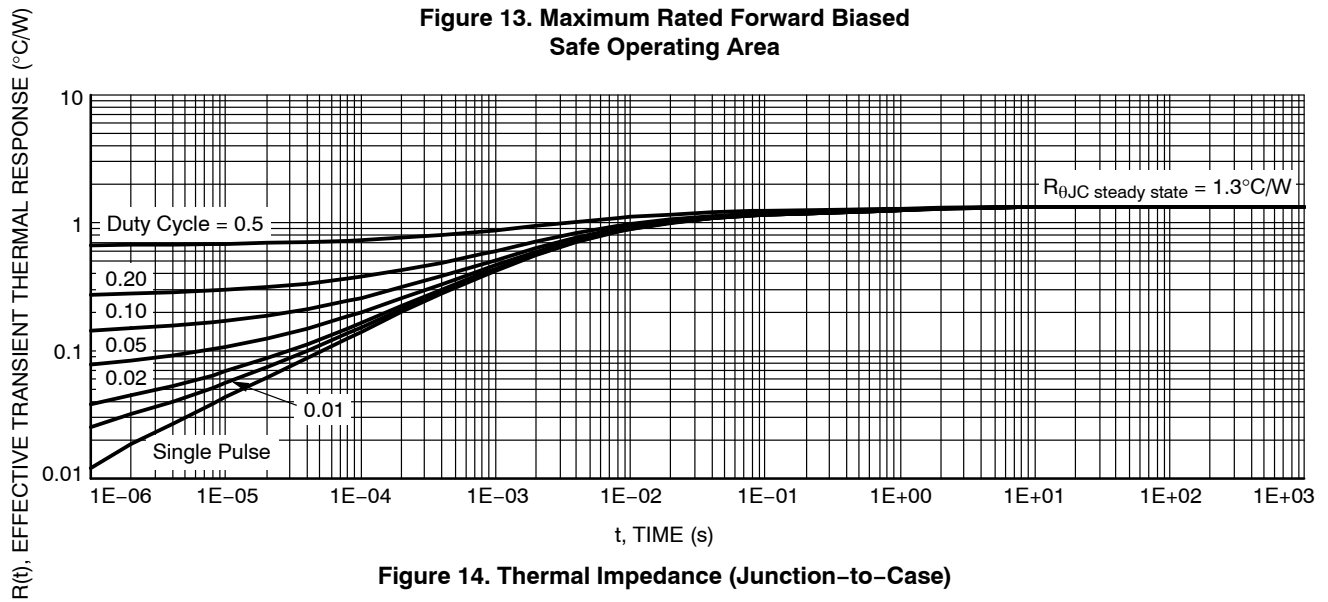
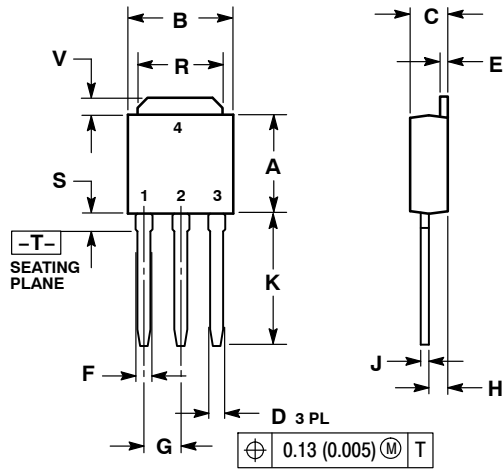


Figure 14. Thermal Impedance (Junction-to-Case)

NDD60N550U1

PACKAGE DIMENSIONS

IPAK CASE 369D ISSUE C



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

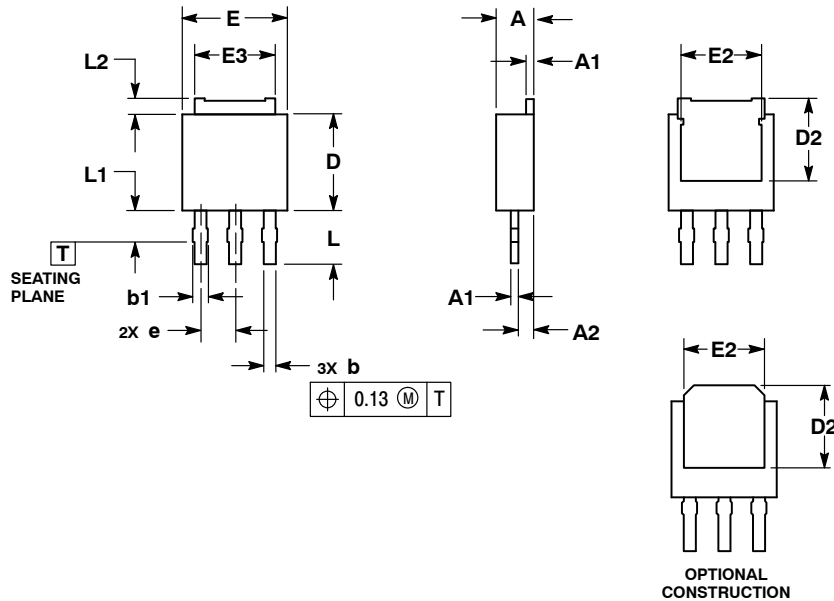
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

3.5 MM IPAK, STRAIGHT LEAD

CASE 369AD ISSUE B



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM TERMINAL TIP.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD GATE OR MOLD FLASH.

DIM	MILLIMETERS	
	MIN	MAX
A	2.19	2.38
A1	0.46	0.60
A2	0.87	1.10
b	0.69	0.89
b1	0.77	1.10
D	5.97	6.22
D2	4.80	---
E	6.35	6.73
E2	4.57	5.45
E3	4.45	5.46
e	2.28 BSC	
L	3.40	3.60
L1	---	2.10
L2	0.89	1.27

STYLE 2:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

