

NTD14N03R, NVD14N03R

Power MOSFET 14 Amps, 25 Volts

N-Channel DPAK

Features

- Planar HD3e Process for Fast Switching Performance
- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low C_{iss} to Minimize Driver Loss
- Low Gate Charge
- Optimized for High Side Switching Requirements in High-Efficiency DC-DC Converters
- NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	25	Vdc
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	Vdc
Thermal Resistance – Junction-to-Case	$R_{\theta JC}$	6.0	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	20.8	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$, Chip	I_D	14	A
– Continuous @ $T_A = 25^\circ\text{C}$, Limited by Package	I_D	11.4	A
– Single Pulse ($t_p \leq 10 \mu\text{s}$)	I_D	28	A
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	80	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.56	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	I_D	3.1	A
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	120	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.04	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	I_D	2.5	A
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

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 0.5 sq. in pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.

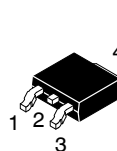
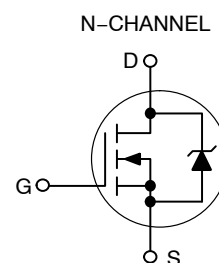


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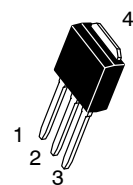
<http://onsemi.com>

14 AMPERES, 25 VOLTS

$R_{DS(on)} = 70.4 \text{ m}\Omega$ (Typ)

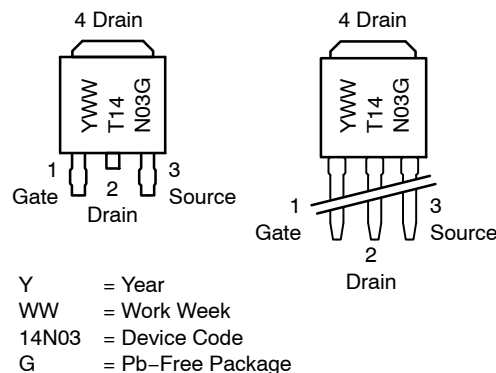


CASE 369C
DPAK
(Surface Mount)
STYLE 2



CASE 369D
DPAK-3
(Straight Lead)
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENTS



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NTD14N03R, NVD14N03R

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

Characteristics	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) (V _{GS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Positive)	V _{(br)DSS}	25 –	28 –	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, T _J = 150°C)	I _{DSS}	– –	– –	1.0 10	μAdc
Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	–	–	±100	nAdc

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) (V _{DS} = V _{GS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative)	V _{GS(th)}	1.0 –	1.5 –	2.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V _{GS} = 4.5 Vdc, I _D = 5 Adc) (V _{GS} = 10 Vdc, I _D = 5 Adc)	R _{DS(on)}	– –	117 70.4	130 95	mΩ
Forward Transconductance (Note 3) (V _{DS} = 10 Vdc, I _D = 5 Adc)	g _{FS}	–	7.0	–	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 20 Vdc, V _{GS} = 0 V, f = 1 MHz)	C _{iss}	–	115	–	pF
Output Capacitance		C _{oss}	–	62	–	
Transfer Capacitance		C _{rss}	–	33	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V _{GS} = 10 Vdc, V _{DD} = 10 Vdc, I _D = 5 Adc, R _G = 3 Ω)	t _{d(on)}	–	3.8	–	ns
Rise Time		t _r	–	27	–	
Turn-Off Delay Time		t _{d(off)}	–	9.6	–	
Fall Time		t _f	–	2.0	–	
Gate Charge	(V _{GS} = 5 Vdc, I _D = 5 Adc, V _{DS} = 10 Vdc) (Note 3)	Q _T	–	1.8	–	nC
		Q ₁	–	0.8	–	
		Q ₂	–	0.7	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I _S = 5 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 5 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	– –	0.93 0.82	1.2 –	Vdc
Reverse Recovery Time	(I _S = 5 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) (Note 3)	t _{rr}	–	6.6	–	ns
		t _a	–	4.75	–	
		t _b	–	1.88	–	
Reverse Recovery Stored Charge		Q _{RR}	–	0.002	–	μC

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

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TYPICAL CHARACTERISTICS

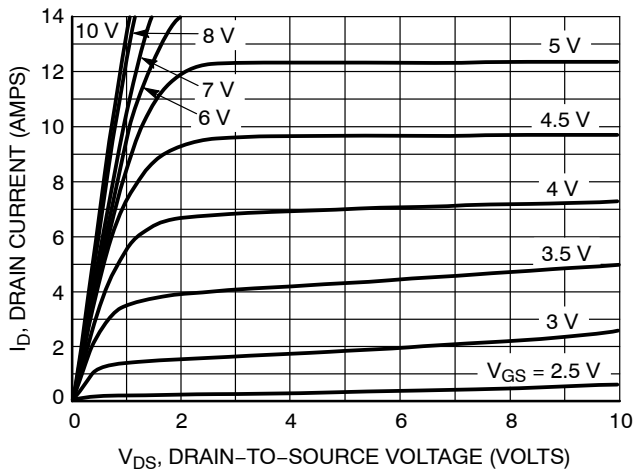


Figure 1. On-Region Characteristics

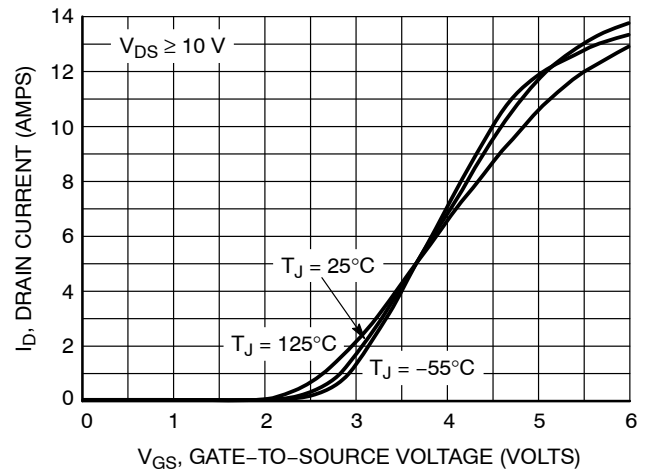


Figure 2. Transfer Characteristics

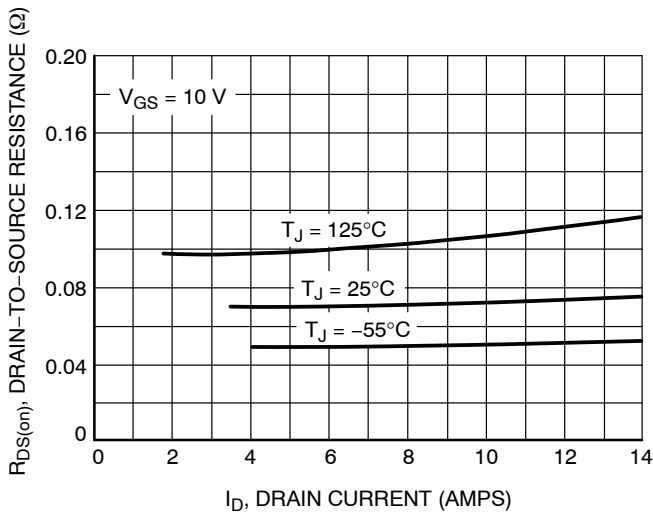


Figure 3. On-Resistance versus Drain Current and Temperature

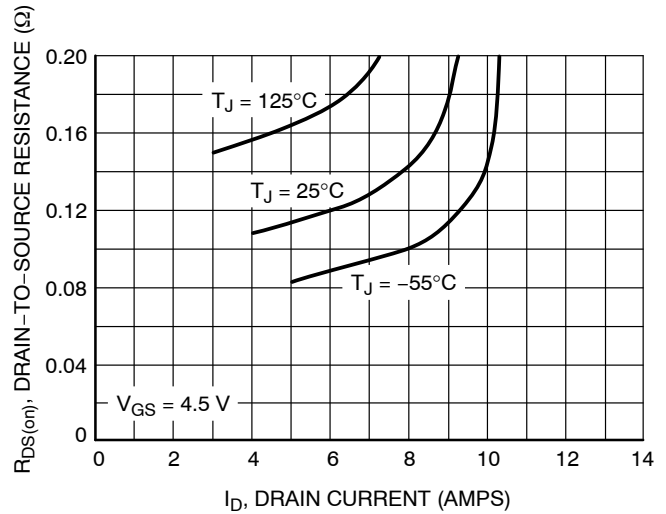


Figure 4. On-Resistance versus Drain Current and Temperature

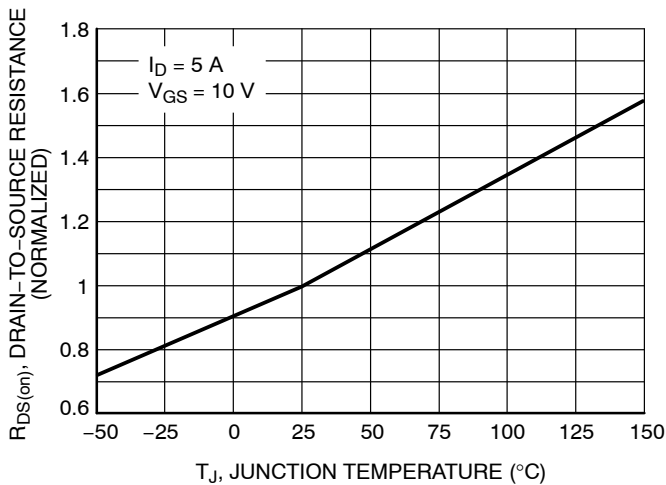


Figure 5. On-Resistance Variation with Temperature

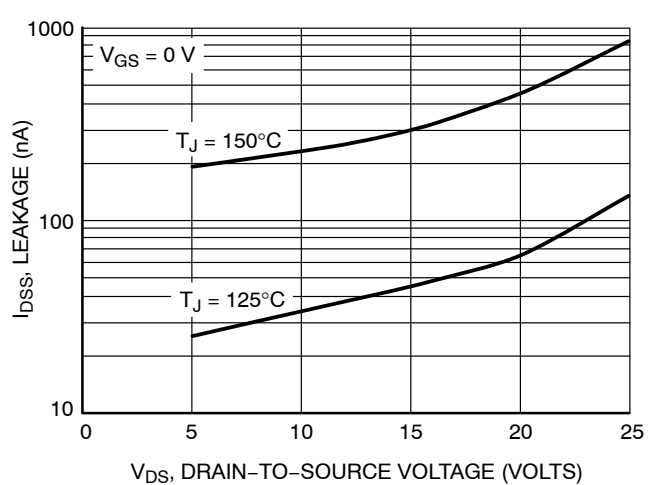


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL CHARACTERISTICS

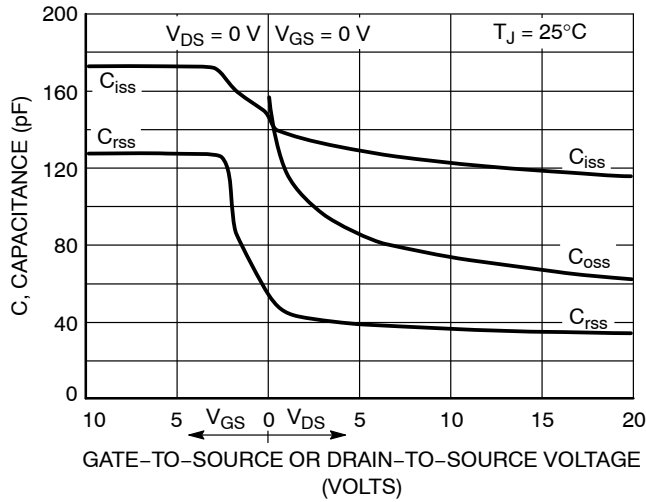


Figure 7. Capacitance Variation

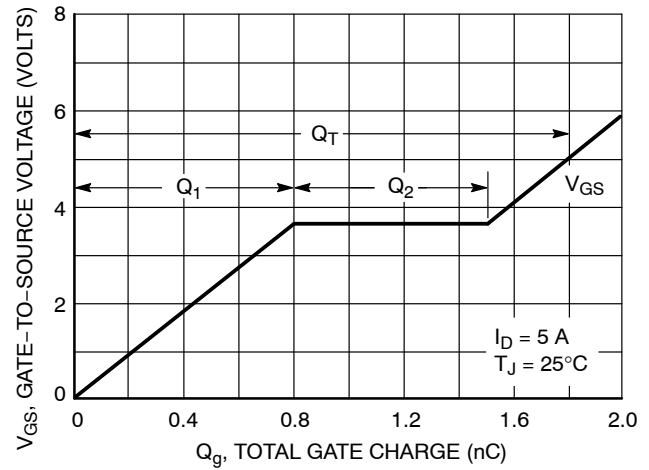


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

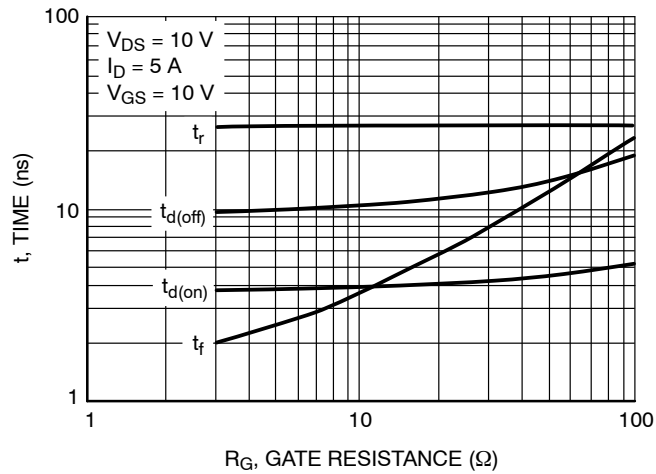


Figure 9. Resistive Switching Time Variation versus Gate Resistance

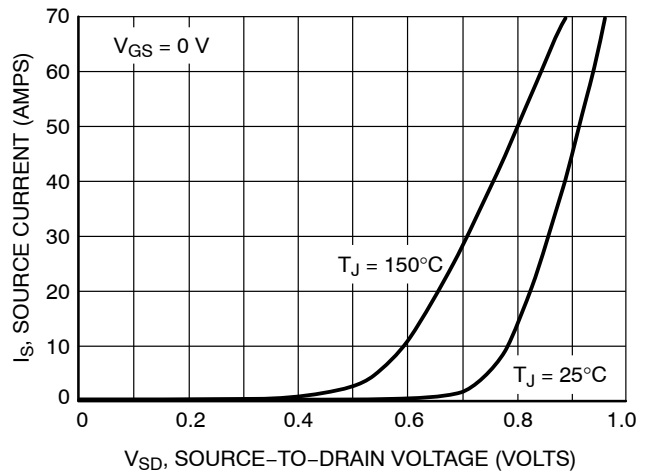


Figure 10. Diode Forward Voltage versus Current

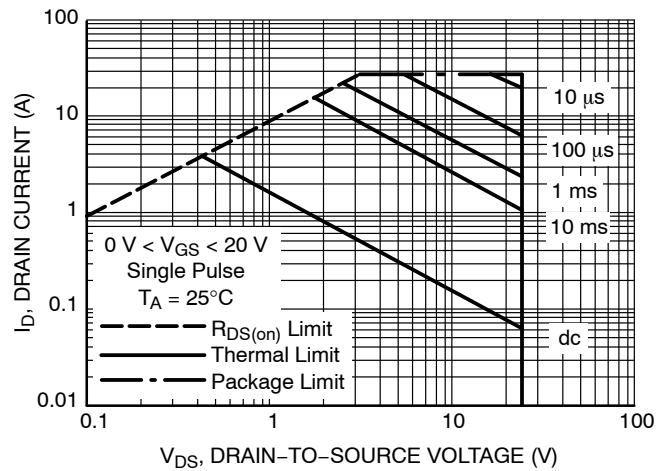


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS

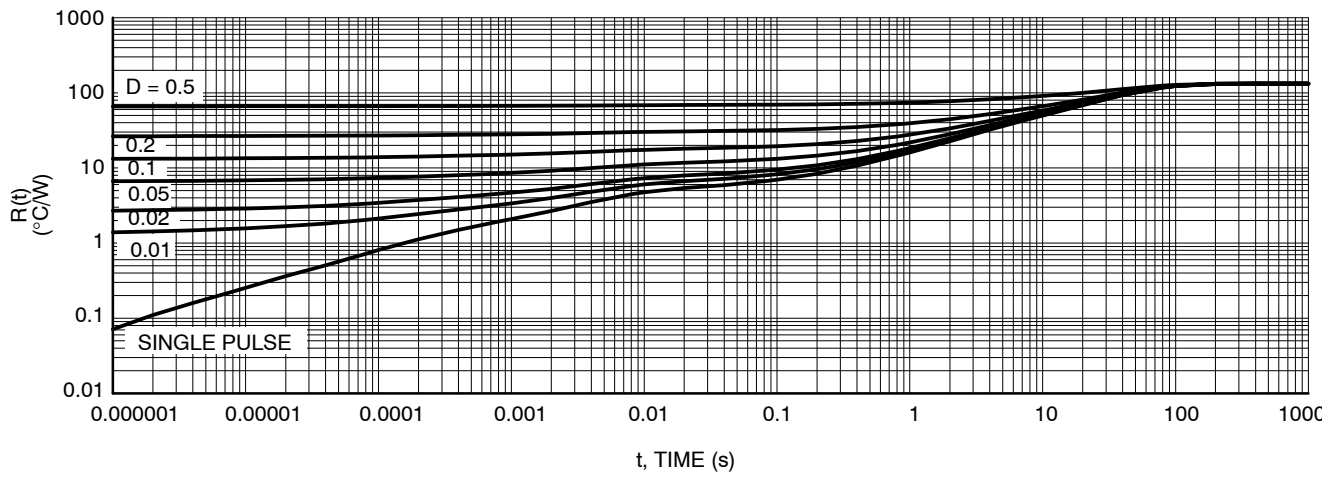


Figure 12. Thermal Response

ORDERING INFORMATION

Device	Package	Shipping [†]
NTD14N03RT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NVD14N03RT4G	DPAK (Pb-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.

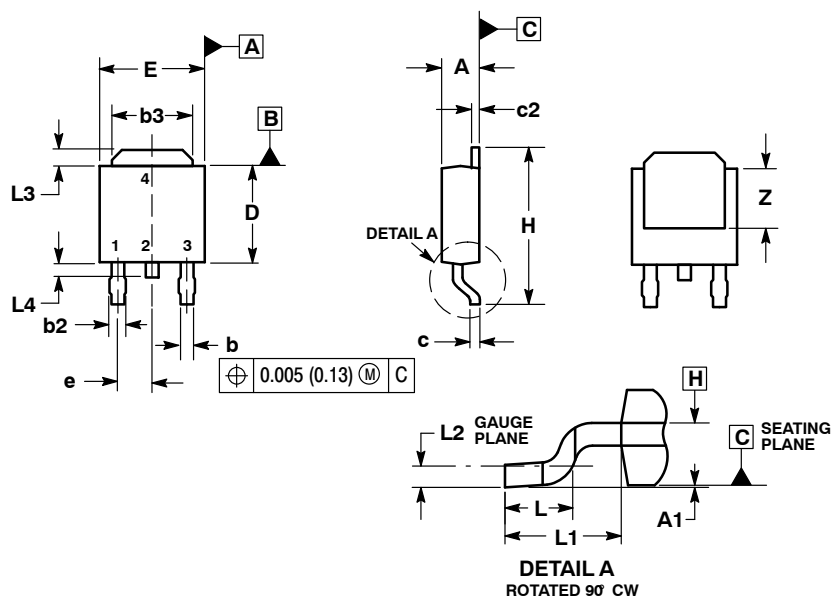
NTD14N03R, NVD14N03R

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)

CASE 369C

ISSUE D

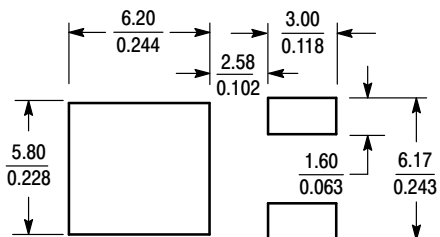


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

SOLDERING FOOTPRINT*



SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}} \right)$

STYLE 2:

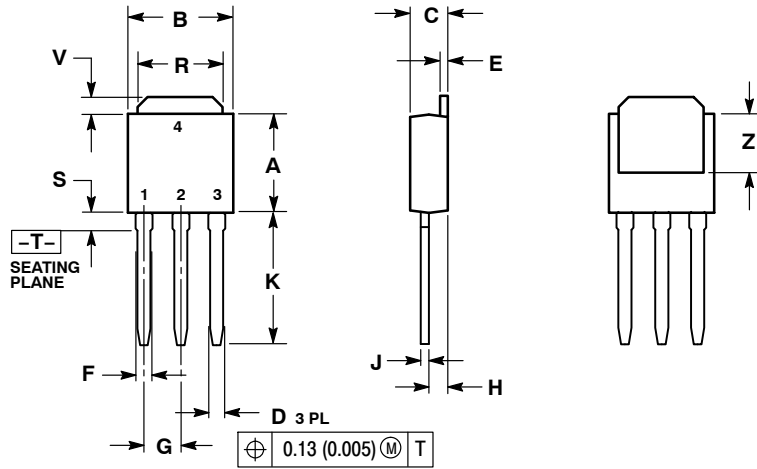
- PIN 1. GATE
- DRAIN
- SOURCE
- DRAIN

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

NTD14N03R, NVD14N03R

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

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NTD14N03R/D