

NTD40N03R

Power MOSFET 40 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
- Pb-Free Package May be Available. The G-Suffix Denotes a Pb-Free Lead Finish

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	$R_{\theta JC}$	3.0	$^\circ\text{C/W}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	41.7	W
Drain Current	I_D	40	A
– Continuous @ $T_C = 25^\circ\text{C}$, Chip	I_D	32	A
– Continuous @ $T_A = 25^\circ\text{C}$, Limited by Wires	I_D	80	A
– Single Pulse ($t_p \leq 10 \mu\text{s}$)			
Thermal Resistance – Junction-to-Ambient (Note 1)	$R_{\theta JA}$	71.4	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.75	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	I_D	8.0	A
Thermal Resistance – Junction-to-Ambient (Note 2)	$R_{\theta JA}$	100	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.25	W
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$	I_D	7.0	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	$^\circ\text{C}$

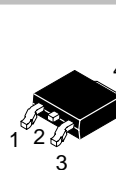
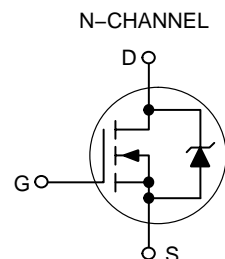
1. When surface mounted to an FR4 board using 0.5 sq in pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.



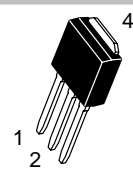
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40 AMPERES, 25 VOLTS
 $R_{DS(on)} = 12.6 \text{ m}\Omega$ (Typ)

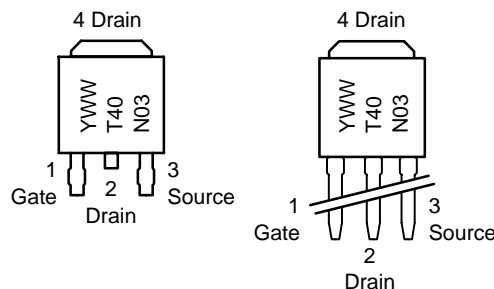


CASE 369AA
DPAK
(Surface Mount)
STYLE 2



CASE 369D
DPAK
(Straight Lead)
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENTS



40N03= Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

NTD40N03R

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 –	1.7 –	2.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V _{GS} = 4.5 Vdc, I _D = 10 Adc) (V _{GS} = 10 Vdc, I _D = 10 Adc)	R _{DS(on)}	– –	18.6 12.6	23 16.5	mΩ
Forward Transconductance (Note 3) (V _{DS} = 10 Vdc, I _D = 10 Adc)	g _{FS}	–	20	–	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 20 Vdc, V _{GS} = 0 V, f = 1 MHz)	C _{iss}	–	584	–	pF
Output Capacitance		C _{oss}	–	254	–	
Transfer Capacitance		C _{rss}	–	99	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V _{GS} = 10 Vdc, V _{DD} = 10 Vdc, I _D = 10 Adc, R _G = 3 Ω)	t _{d(on)}	–	4.5	–	ns
Rise Time		t _r	–	19.5	–	
Turn-Off Delay Time		t _{d(off)}	–	16.7	–	
Fall Time		t _f	–	3.5	–	
Gate Charge	(V _{GS} = 4.5 Vdc, I _D = 10 Adc, V _{DS} = 10 Vdc) (Note 3)	Q _T	–	5.78	–	nC
		Q ₁	–	2.1	–	
		Q ₂	–	2.5	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I _S = 10 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 10 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	– –	0.85 0.71	1.2 –	Vdc
Reverse Recovery Time	(I _S = 10 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs) (Note 3)	t _{rr}	–	20.4	–	ns
		t _a	–	8.25	–	
		t _b	–	12.1	–	
Reverse Recovery Stored Charge		Q _{RR}	–	0.007	–	μC

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

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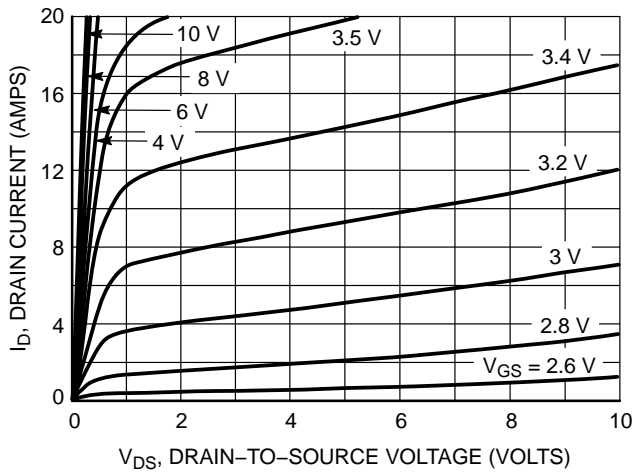


Figure 1. On-Region Characteristics

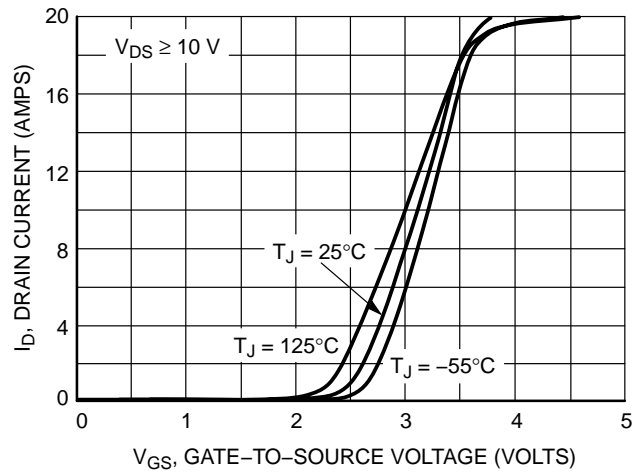


Figure 2. Transfer Characteristics

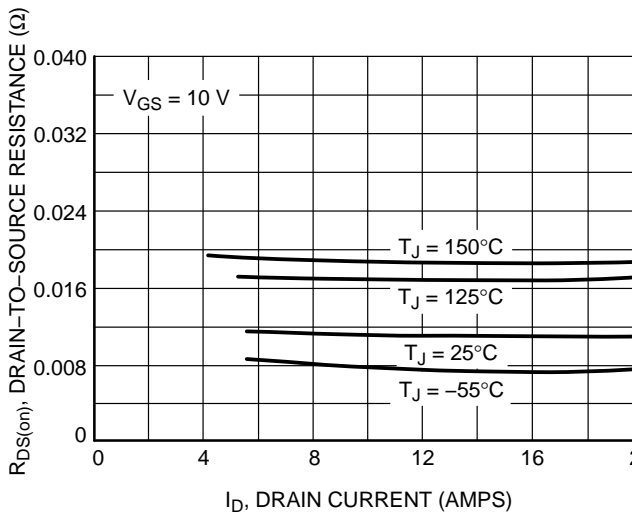


Figure 3. On-Resistance versus Drain Current and Temperature

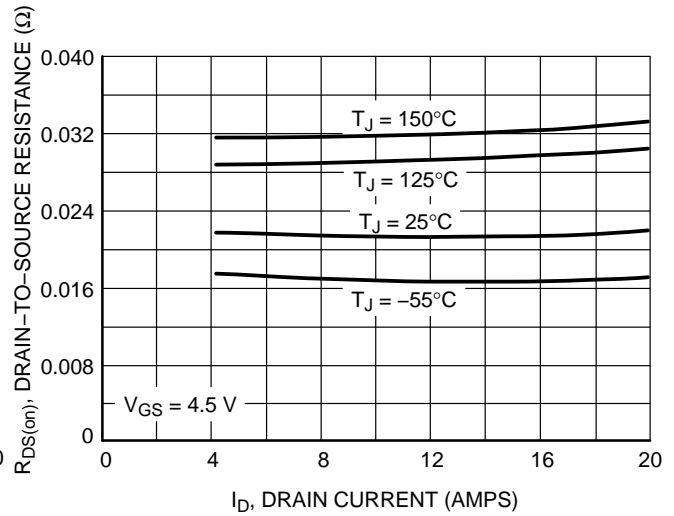


Figure 4. On-Resistance versus Drain Current and Temperature

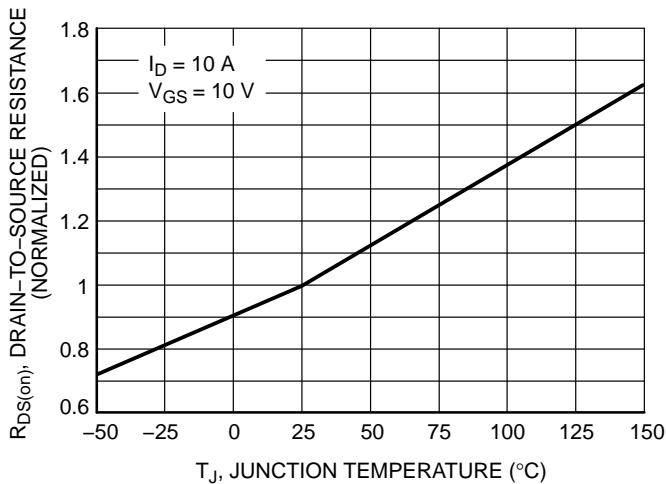


Figure 5. On-Resistance Variation with Temperature

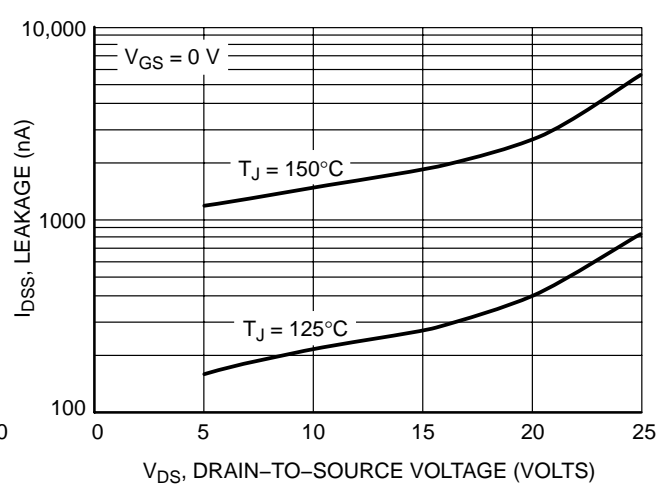


Figure 6. Drain-to-Source Leakage Current versus Voltage

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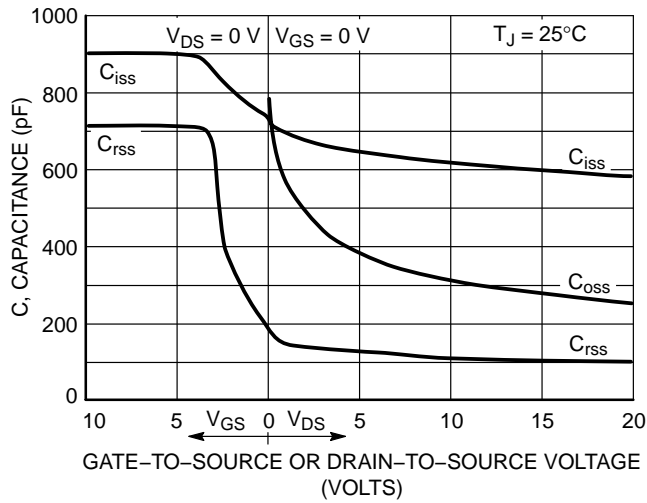


Figure 7. Capacitance Variation

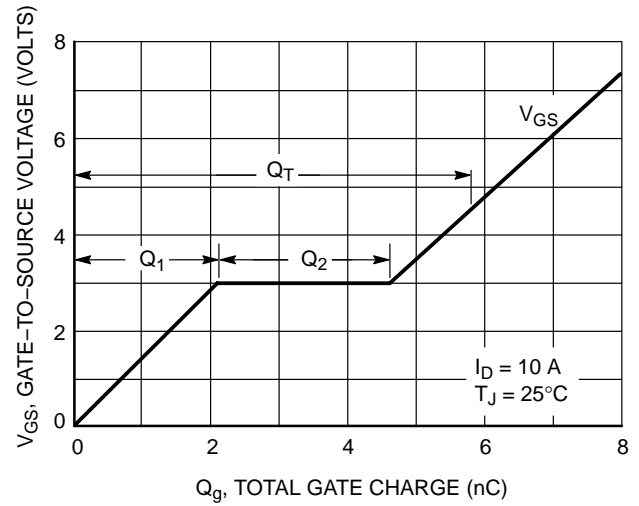


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

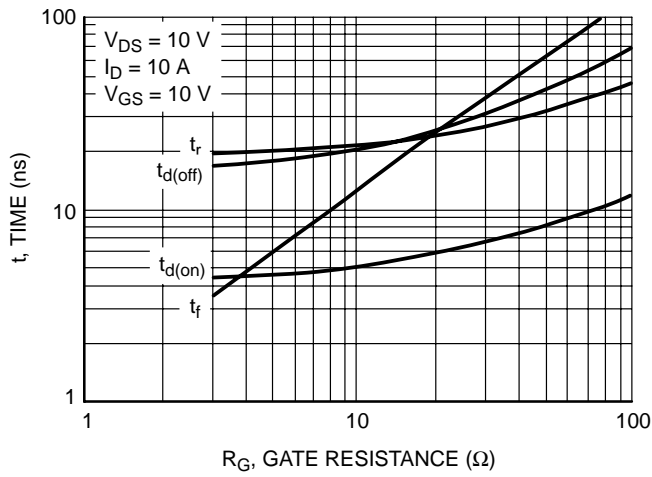


Figure 9. Resistive Switching Time Variation versus Gate Resistance

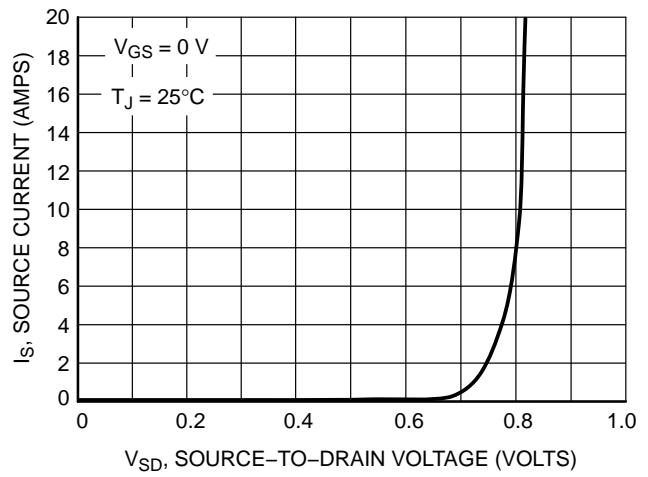


Figure 10. Diode Forward Voltage versus Current

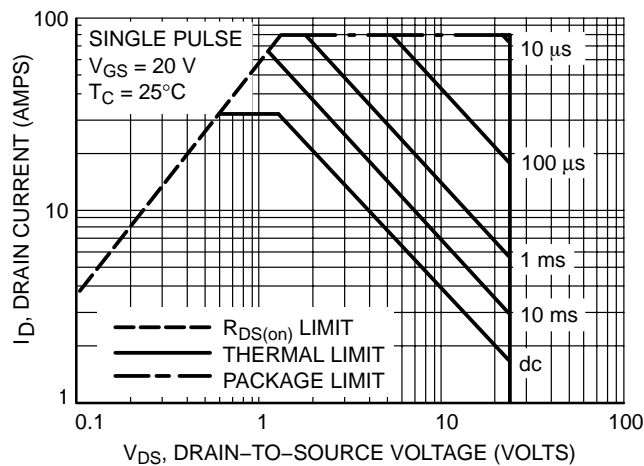


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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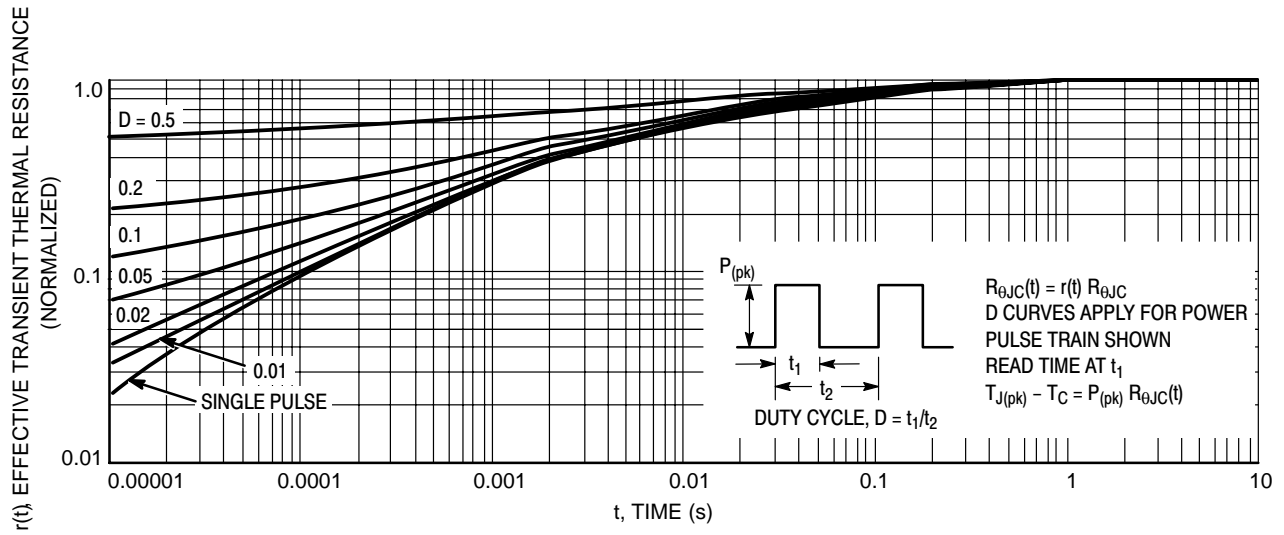


Figure 12. Thermal Response

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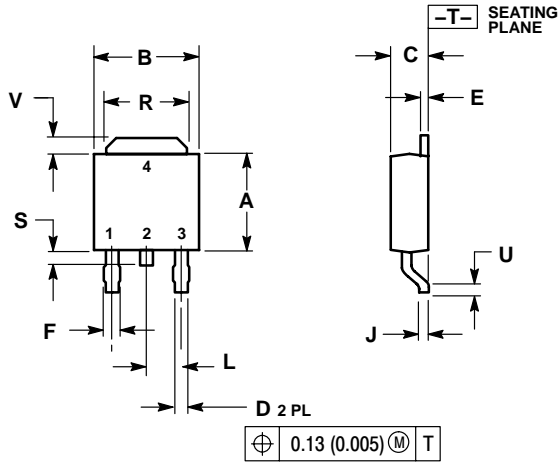
ORDERING INFORMATION

Device	Package	Shipping
NTD40N03R	DPAK	75 Units/Rail
NTD40N03R-1	DPAK (Straight Lead)	75 Units/Rail
NTD40N03RT4	DPAK	2500 Tape & Reel
NTD40N03RT4G	DPAK (Pb-Free)	2500 Tape & Reel
NTD40N03RG	DPAK (Pb-Free)	75 Units/Rail
NTD40N03R-1G	DPAK (Straight Lead, Pb-Free)	75 Units/Rail

NTD40N03R

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE) CASE 369AA-01 ISSUE O

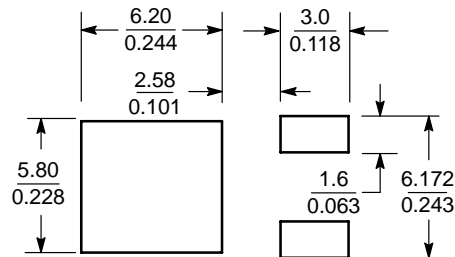


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.025	0.035	0.63	0.88
E	0.018	0.024	0.46	0.61
F	0.033	0.045	0.83	1.14
J	0.018	0.023	0.46	0.58
L	0.090	BSC	2.29	BSC
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

- STYLE 2:
- PIN 1. GATE
 - DRAIN
 - SOURCE
 - DRAIN

SOLDERING FOOTPRINT*



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

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

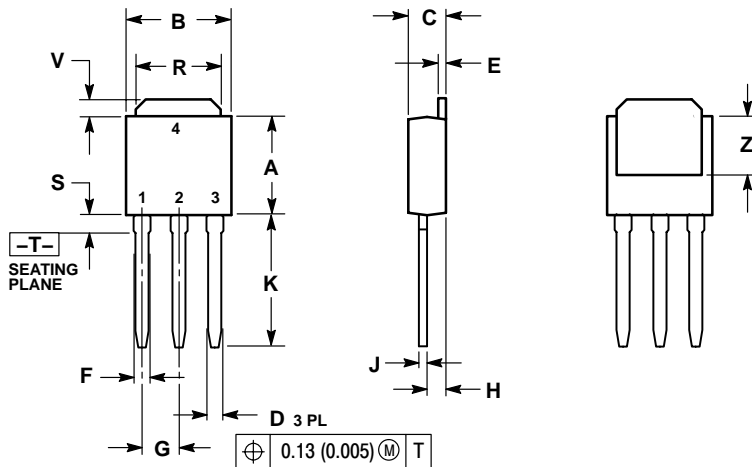
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PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)

CASE 369D-01

ISSUE A




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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