

NTD23N03R

Power MOSFET 23 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

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	$R_{\theta JC}$	5.6	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	22.3	W
Drain Current	I_D	23	A
- Continuous @ $T_A = 25^\circ\text{C}$, Chip	I_D	17.1	A
- Continuous @ $T_A = 25^\circ\text{C}$, Limited by Package	I_{DM}	40	A
Thermal Resistance - Junction-to-Ambient (Note 1)	$R_{\theta JA}$	76	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.64	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	I_D	4.5	A
Thermal Resistance - Junction-to-Ambient (Note 2)	$R_{\theta JA}$	110	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.14	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	I_D	3.8	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.



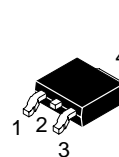
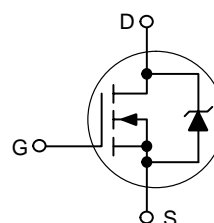
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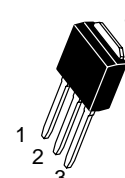
23 AMPERES, 25 VOLTS

$R_{DS(on)} = 32 \text{ m}\Omega$ (Typ)

N-CHANNEL

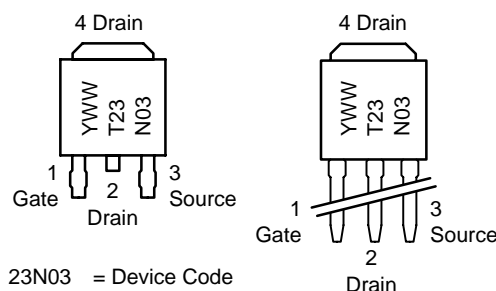


CASE 369C
DPAK
(Surface Mount)
STYLE 2



CASE 369D
DPAK
(Straight Lead)
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENTS



23N03 = Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NTD23N03R	DPAK	75 Units/Rail
NTD23N03R-1	DPAK Straight Lead	75 Units/Rail
NTD23N03RT4	DPAK	2500 Tape & Reel

NTD23N03R

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

Characteristics	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(br)DSS}$	25 -	28 -	- -	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	I_{DSS}	- -	- -	1.0 10	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	-	-	± 100	nAdc

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) ($V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 -	1.8 -	2.0 -	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 3) ($V_{GS} = 4.5\text{ Vdc}$, $I_D = 6\text{ Adc}$) ($V_{GS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$)	$R_{DS(on)}$	- -	50.3 32.3	60 45	m Ω
Forward Transconductance (Note 3) ($V_{DS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$)	g_{FS}	-	13	-	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$)	C_{iss}	-	225	-	pF
Output Capacitance		C_{oss}	-	108	-	
Transfer Capacitance		C_{rss}	-	48	-	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$(V_{GS} = 10\text{ Vdc}$, $V_{DD} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$, $R_G = 3\text{ }\Omega$)	$t_{d(on)}$	-	2.0	-	ns
Rise Time		t_r	-	14.9	-	
Turn-Off Delay Time		$t_{d(off)}$	-	9.9	-	
Fall Time		t_f	-	2.0	-	
Gate Charge	$(V_{GS} = 4.5\text{ Vdc}$, $I_D = 6\text{ Adc}$, $V_{DS} = 10\text{ Vdc}$) (Note 3)	Q_T	-	3.76	-	nC
		Q_1	-	1.7	-	
		Q_2	-	1.6	-	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	$(I_S = 6\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) (Note 3) $(I_S = 6\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	V_{SD}	- -	0.87 0.74	1.2 -	Vdc
Reverse Recovery Time	$(I_S = 6\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$) (Note 3)	t_{rr}	-	8.7	-	ns
		t_a	-	5.2	-	
		t_b	-	3.5	-	
Reverse Recovery Stored Charge		Q_{RR}	-	0.003	-	μC

3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

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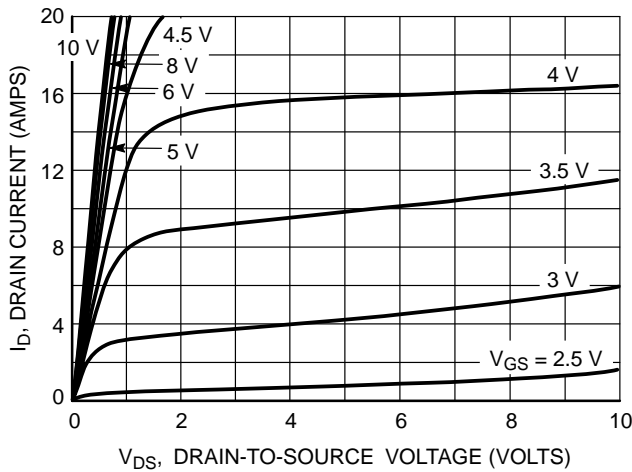


Figure 1. On-Region Characteristics

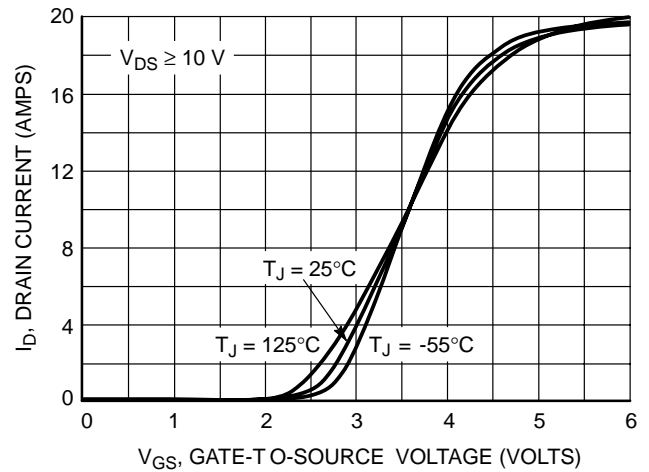


Figure 2. Transfer Characteristics

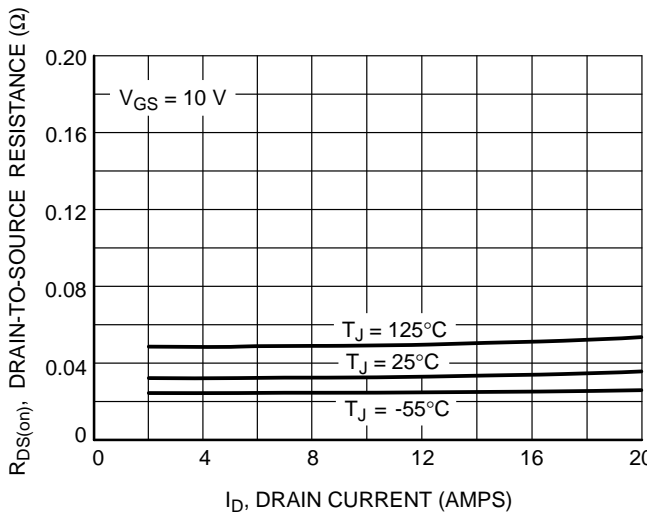


Figure 3. On-Resistance versus Drain Current and Temperature

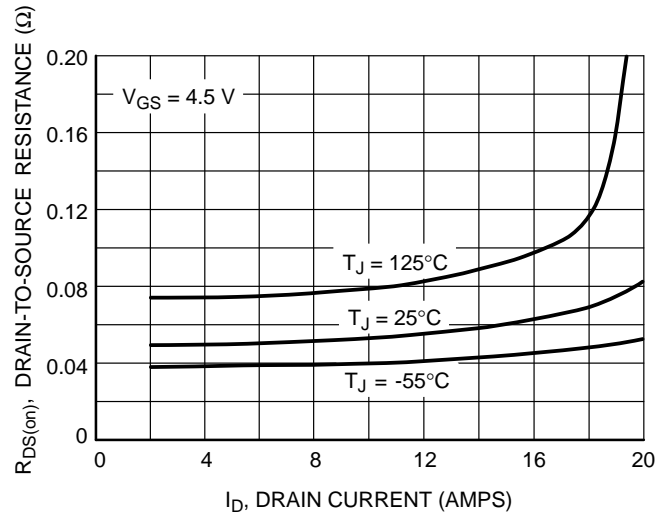


Figure 4. On-Resistance versus Drain Current and Temperature

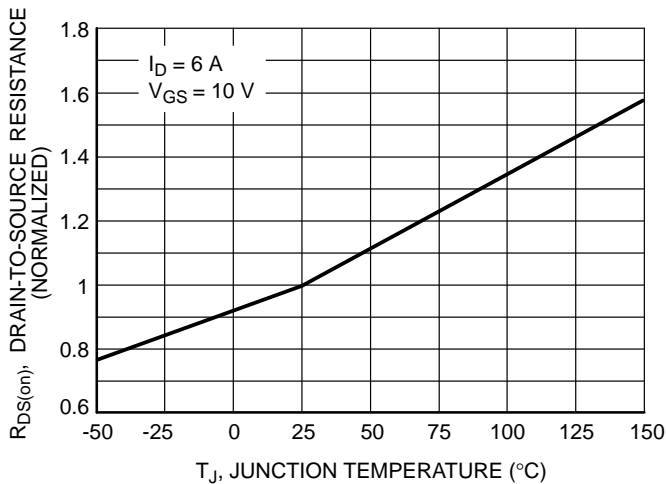


Figure 5. On-Resistance Variation with Temperature

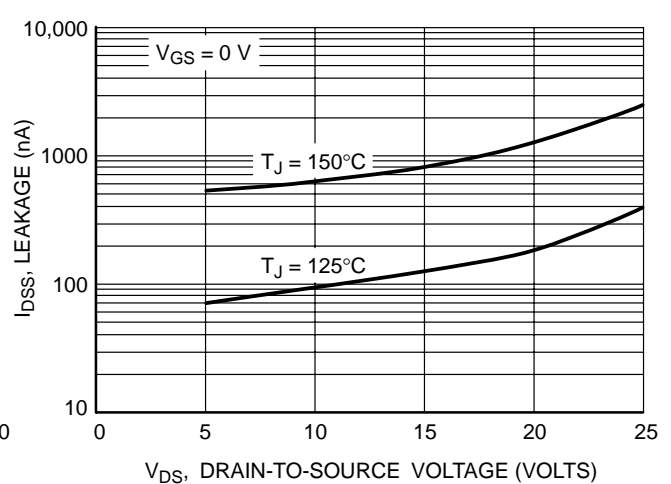


Figure 6. Drain-to-Source Leakage Current versus Voltage

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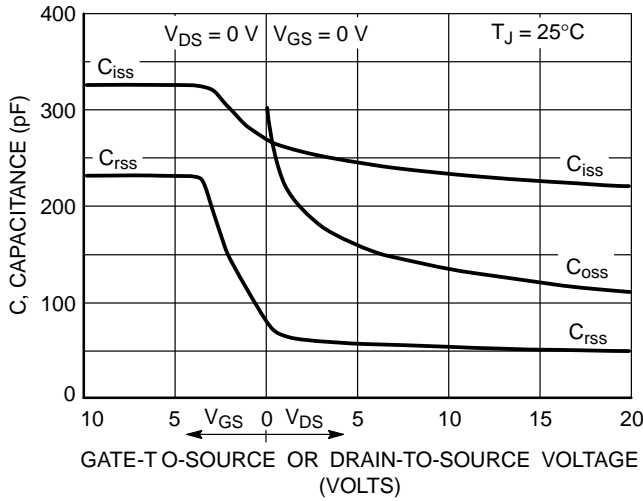


Figure 7. Capacitance Variation

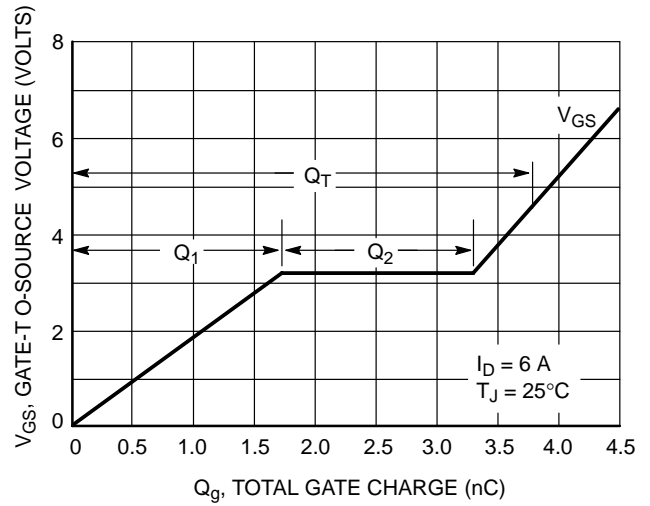


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

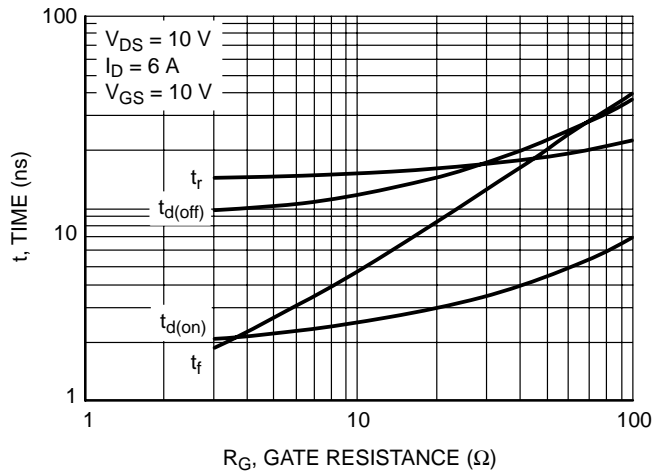


Figure 9. Resistive Switching Time Variation versus Gate Resistance

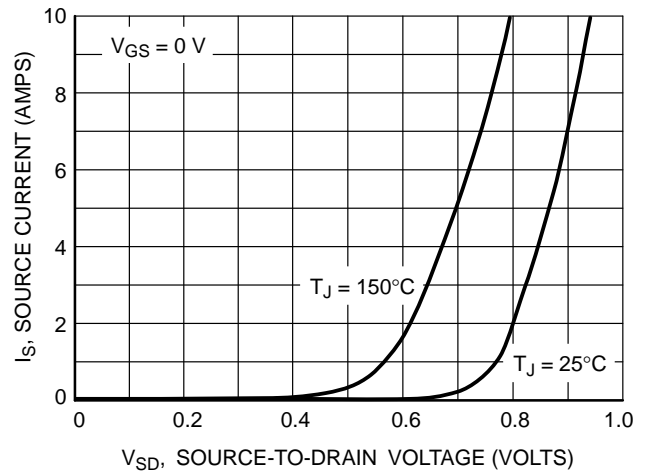


Figure 10. Diode Forward Voltage versus Current

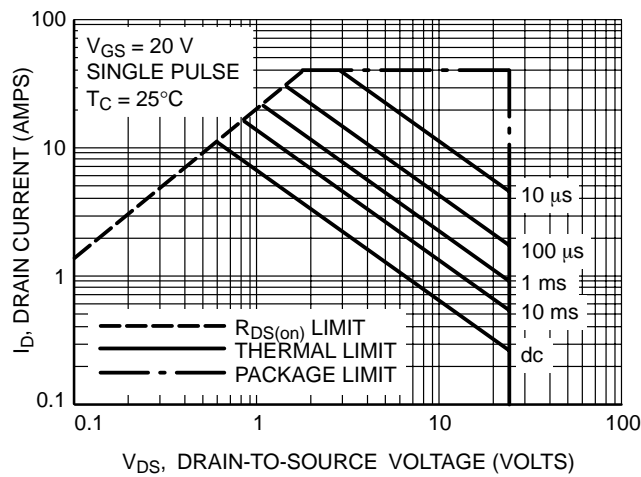


Figure 11. Maximum Rated Forward Biased Safe Operating Area

NTD23N03R

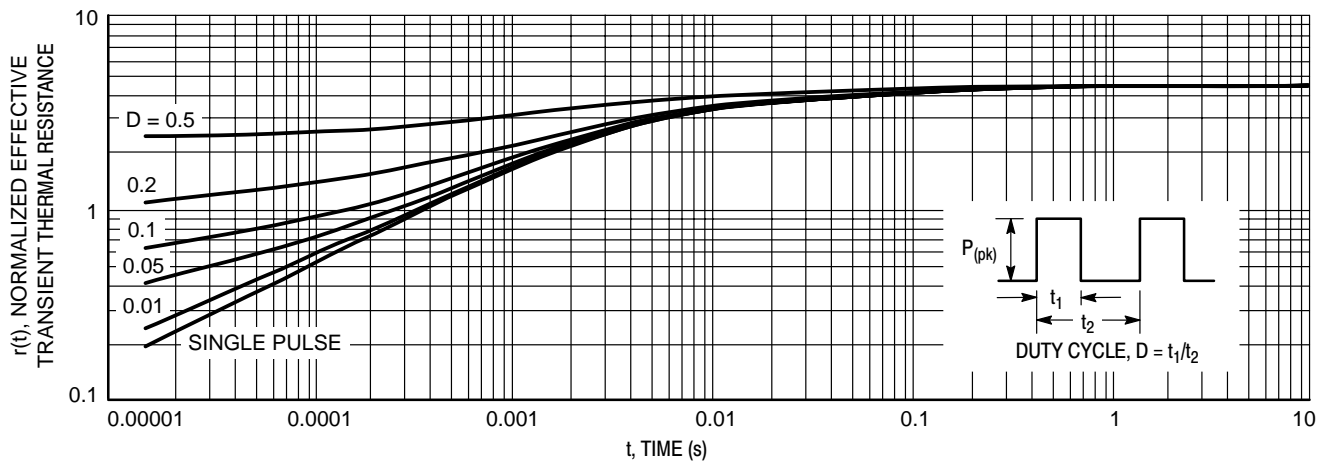
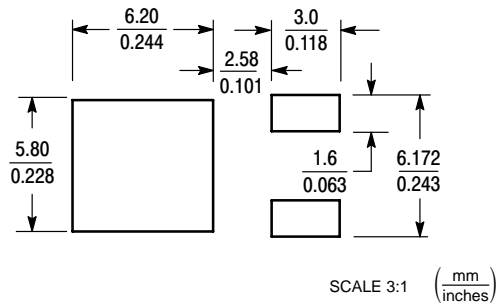


Figure 12. Thermal Response

RECOMMENDED FOOTPRINTS FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to ensure proper solder connection

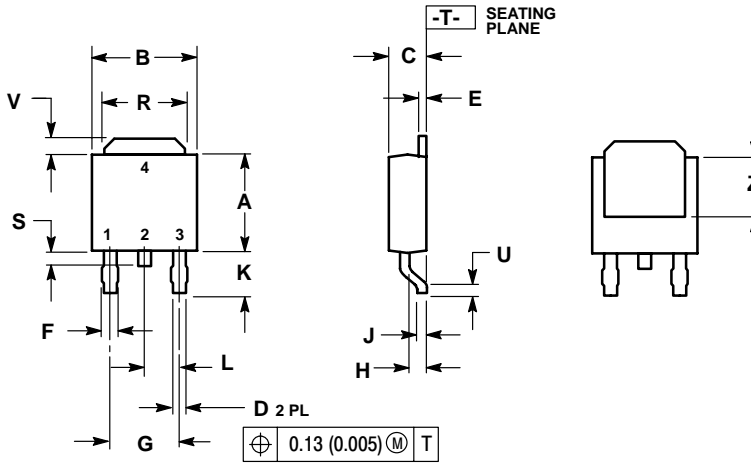
interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



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PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE) CASE 369C ISSUE O



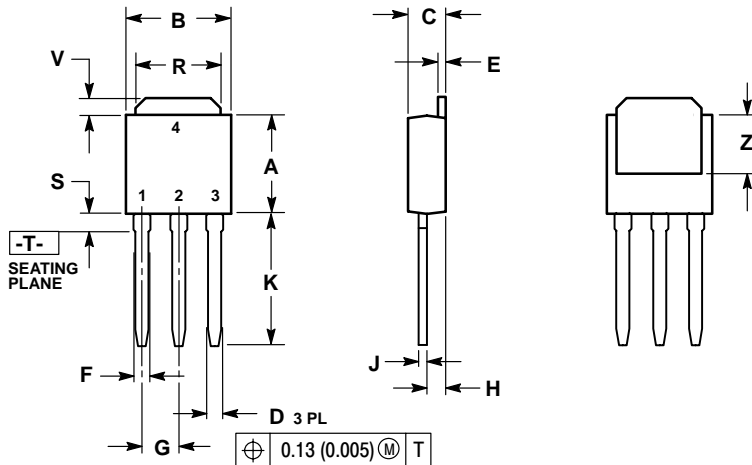
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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	0.027	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	0.180 BSC	4.58 BSC		
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
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
2. DRAIN
3. SOURCE
4. DRAIN

DPAK (SINGLE GAUGE) CASE 369D ISSUE O

SCALE 1:1



- 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
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Notes

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