

NTP75N03-06, NTB75N03-06

Power MOSFET 75 Amps, 30 Volts N-Channel TO-220 and D²PAK

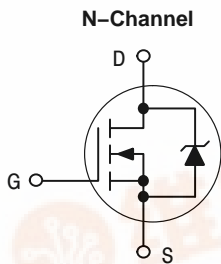
This 20 V_{GS} gate drive vertical Power MOSFET is a general purpose part that provides the “best of design” available today in a low cost power package. This power MOSFET is designed to withstand high energy in the avalanche and commutation modes. The Drain-to-Source Diode has a fast response with soft recovery.

Features

- Ultra-Low R_{DS(on)}, Single Base, Advanced Technology
- SPICE Parameters Available
- Diode is Characterized for Use in Bridge Circuits
- I_{DSS} and V_{DS(on)} Specified at Elevated Temperatures
- High Avalanche Energy Capability
- ESD JEDAC Rated HBM Class 1, MM Class B, CDM Class 0

Typical Applications

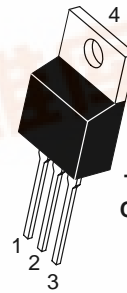
- Power Supplies
- Inductive Loads
- PWM Motor Controls
- Replaces MTP1306 and MTB1306



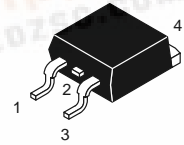
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V _{(BR)DSS}	R _{DS(on)} TYP	I _D MAX
30 A	5.3 mΩ @ 10 V	75 A

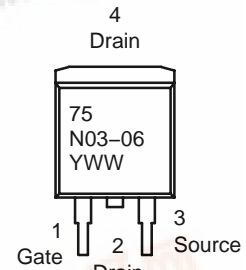
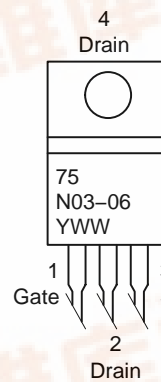


TO-220AB
CASE 221A
Style 5



D²PAK
CASE 418AA
Style 2

MARKING DIAGRAMS & PIN ASSIGNMENTS



75N03-06 = Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NTP75N03-06	TO-220	50 Units/Rail
NTB75N03-06	D ² PAK	50 Units/Rail
NTB75N03-06T4	D ² PAK	800/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.



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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	30	Vdc
Drain-to-Gate Voltage (RGS = 10 M Ω)	V_{DGB}	30	Vdc
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	Vdc
Non-repetitive ($t_p \leq 10$ ms)	V_{GS}	± 24	Vdc
Drain Current – Continuous @ $T_C = 25^\circ\text{C}$ – Continuous @ $T_C = 100^\circ\text{C}$ – Single Pulse ($t_p \leq 10$ μs)	I_D I_D I_{DM}	75 59 225	Adc Adc Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1)	P_D	125 1.0 2.5	W W/ $^\circ\text{C}$ W
Operating and Storage Temperature Range	T_J and T_{stg}	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 38$ Vdc, $V_{GS} = 10$ Vdc, $L = 1$ mH, $I_L(pk) = 55$ A, $V_{DS} = 40$ Vdc)	E_{AS}	1500	mJ
Thermal Resistance – Junction-to-Case – Junction-to-Ambient – Junction-to-Ambient (Note 1)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	1.0 62.5 50	$^\circ\text{C}/\text{W}$
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 the minimum recommended pad size.

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

Characteristic	Symbol	Min	Typ.	Max	Unit
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OFF CHARACTERISTICS

Drain-Source Breakdown Voltage (Note 2) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\ \mu\text{Adc}$) Temperature Coefficient (Negative)	$V_{(BR)DSS}$	30	– –57	– –	Vdc mV $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 30\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 30\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 150^\circ\text{C}$)	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 2)

Gate Threshold Voltage (Note 2) ($V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 –	1.6 –6	2.0 –	Vdc mV $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 2) ($V_{GS} = 10\text{ Vdc}$, $I_D = 37.5\text{ Adc}$)	$R_{DS(on)}$	–	5.3	6.5	m Ω
Static Drain-to-Source On Resistance (Note 2) ($V_{GS} = 10\text{ Vdc}$, $I_D = 75\text{ Adc}$) ($V_{GS} = 10\text{ Vdc}$, $I_D = 37.5\text{ Adc}$, $T_J = 125^\circ\text{C}$)	$V_{DS(on)}$	– –	0.53 0.35	0.68 0.50	Vdc
Forward Transconductance (Notes 2 & 4) ($V_{DS} = 3\text{ Vdc}$, $I_D = 20\text{ Adc}$)	g_{FS}	–	58	–	Mhos

DYNAMIC CHARACTERISTICS (Note 4)

Input Capacitance	$(V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{iss}	–	4398	5635	pF
Output Capacitance		C_{oss}	–	1160	1894	
Transfer Capacitance		C_{rss}	–	317	430	

SWITCHING CHARACTERISTICS (Notes 3 and 4)

Turn-On Delay Time	$(V_{GS} = 5.0\text{ Vdc}$, $V_{DD} = 20\text{ Vdc}$, $I_D = 75\text{ Adc}$, $R_G = 4.7\ \Omega$) (Note 2)	$t_{d(on)}$	–	16	30	ns
Rise Time		t_r	–	130	200	
Turn-Off Delay Time		$t_{d(off)}$	–	65	110	
Fall Time		t_f	–	105	175	
Gate Charge	$(V_{GS} = 5.0\text{ Vdc}$, $I_D = 75\text{ Adc}$, $V_{DS} = 24\text{ Vdc}$) (Note 2)	Q_T	–	57	75	nC
		Q_1	–	11	15	
		Q_2	–	34	50	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	$(I_S = 75\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) ($I_S = 75\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$) (Note 2)	V_{SD}	– –	1.19 1.09	1.25 –	Vdc
Reverse Recovery Time (Note 4)	$(I_S = 75\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$ $di_S/dt = 100\text{ A}/\mu\text{s}$) (Note 2)	t_{rr}	–	37	–	ns
Reverse Recovery Stored Charge (Note 4)		t_a	–	20	–	μC
		t_b	–	17	–	
		Q_{RR}	–	0.023	–	

2. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
3. Switching characteristics are independent of operating junction temperatures.
4. From characterization test data.

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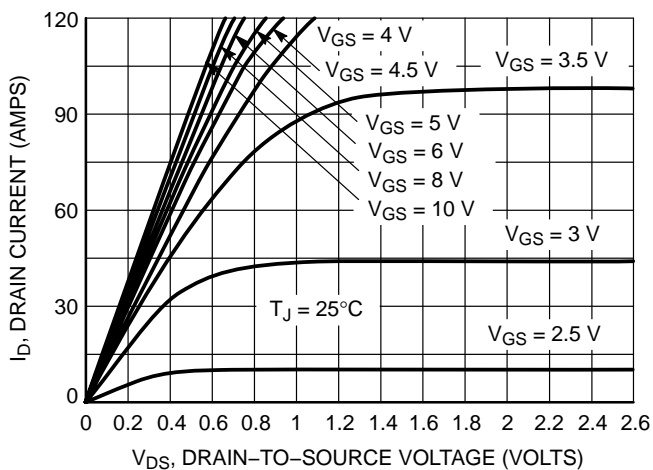


Figure 1. On-Region Characteristics

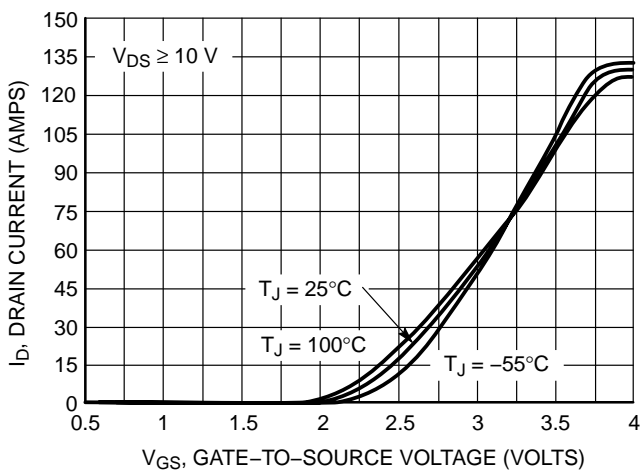


Figure 2. Transfer Characteristics

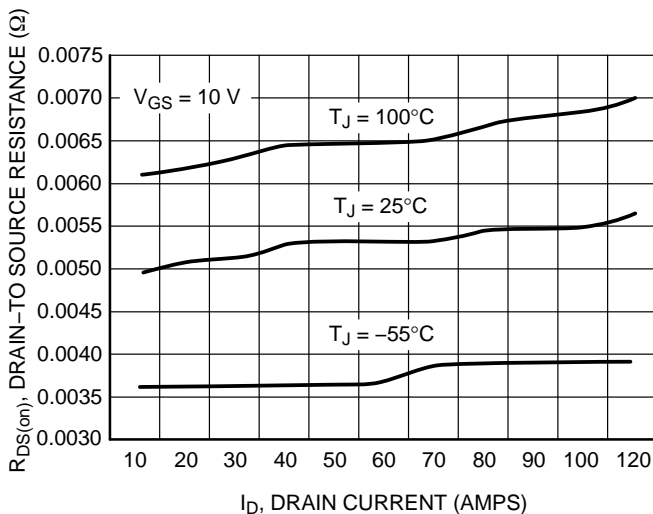


Figure 3. On-Resistance vs. Drain Current and Temperature

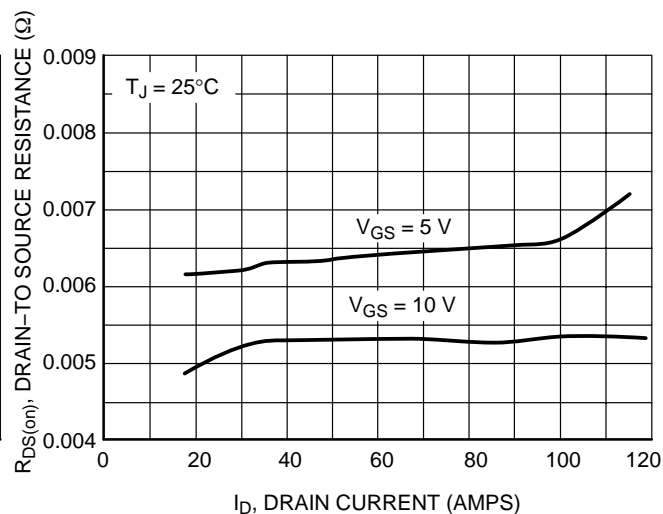


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

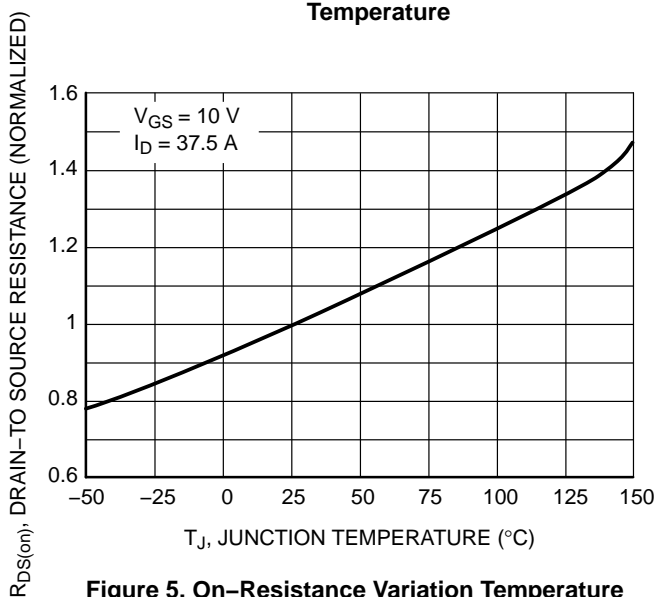


Figure 5. On-Resistance Variation Temperature

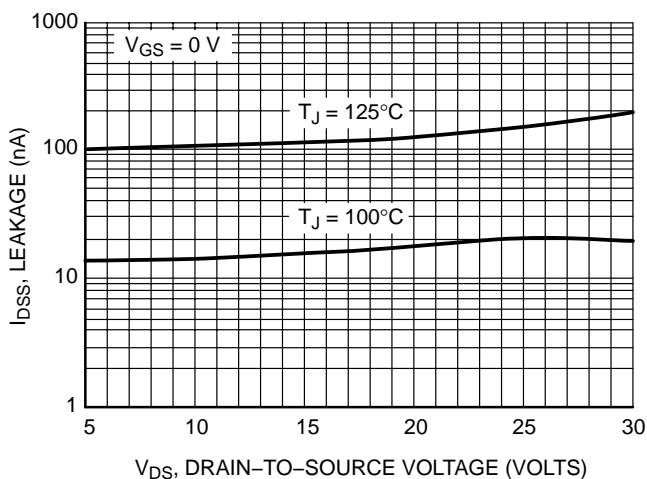


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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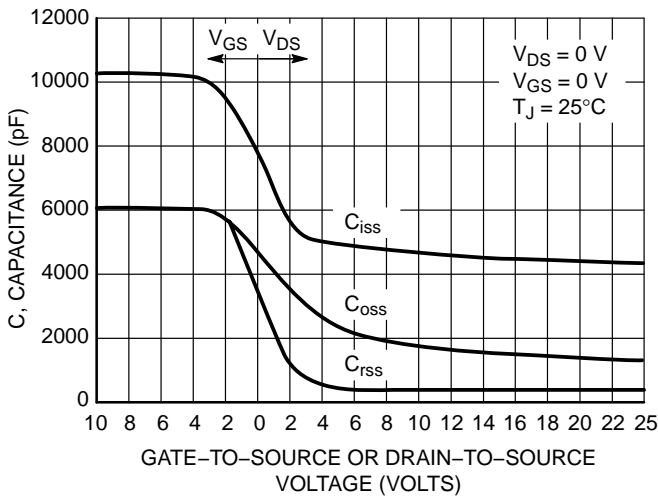


Figure 7. Capacitance Variation

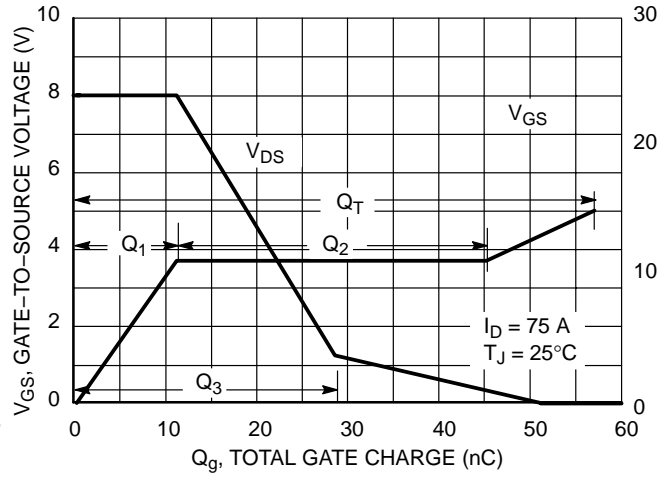


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

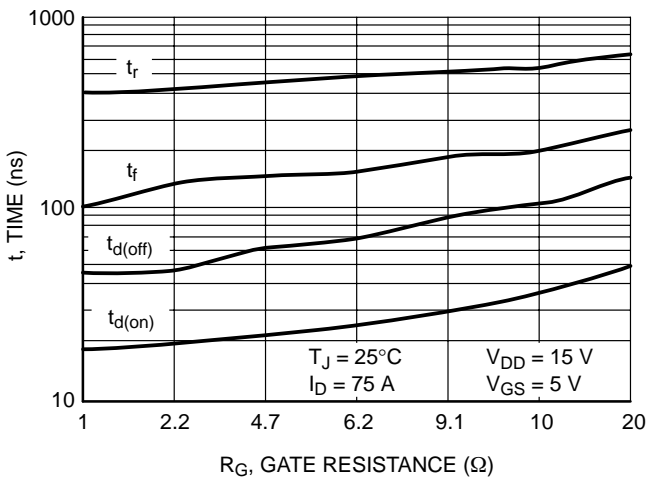


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

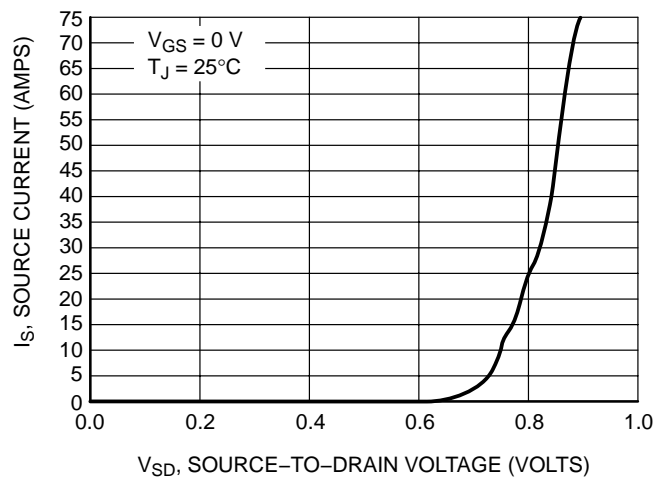


Figure 10. Diode Forward Voltage vs. Current

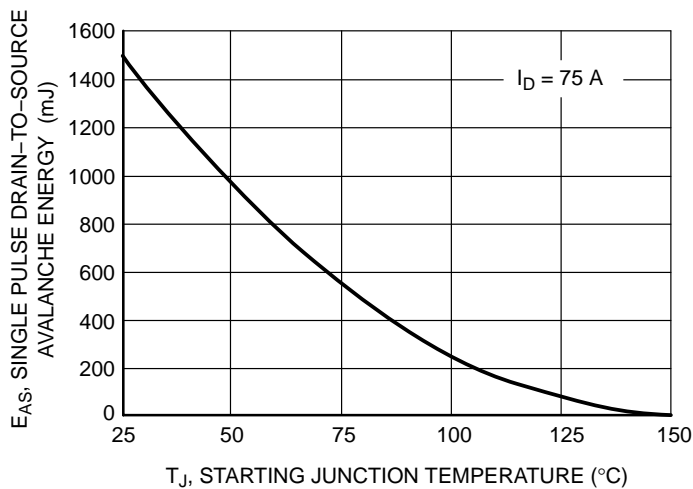
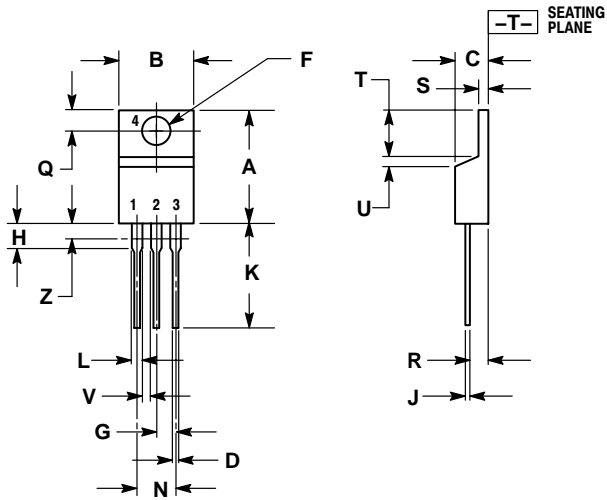


Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

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PACKAGE DIMENSIONS

TO-220 THREE-LEAD
TO-220AB
CASE 221A-09
ISSUE AA



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

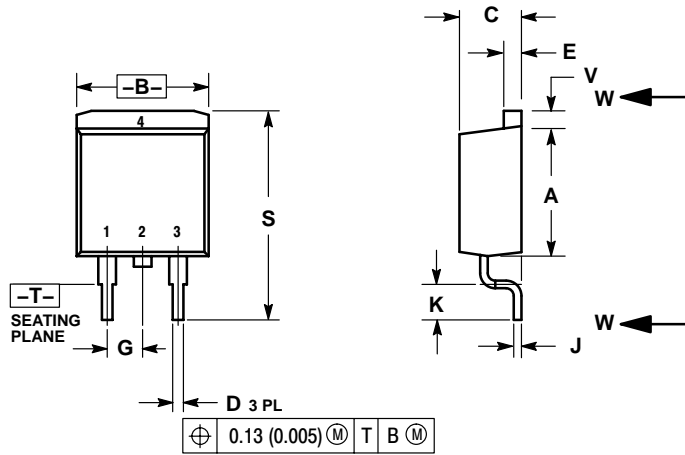
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

- STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

NTP75N03-06, NTB75N03-06

PACKAGE DIMENSIONS

D²PAK
CASE 418AA-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	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.036	0.51	0.92
E	0.045	0.055	1.14	1.40
F	0.310	---	7.87	---
G	0.100 BSC		2.54 BSC	
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
M	0.280	---	7.11	---
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

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

SOLDERING FOOTPRINT*

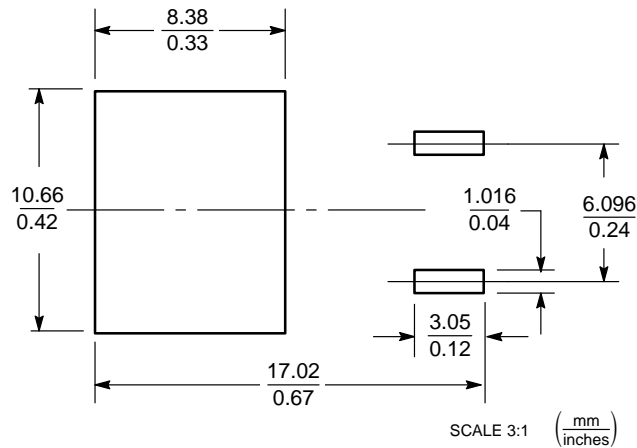



Figure 12. D²PAK

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