

NTD20P06L

Power MOSFET

60 V, 15 A, Single P-Channel, DPAK

Features

- Withstands High Energy in Avalanche and Commutation Modes
- Low Gate Charge for Fast Switching

Applications

- Bridge Circuits
- Power Supplies, Power Motor Controls
- DC-DC Conversion

Maximum Ratings (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V _{DSS}	-60	V	
Gate-to-Source Voltage	Continuous	V _{GS}	± 15 V	
	Non-Repetitive	t _p ≤ 10 ms	V _{GSM}	± 20
Continuous Drain Current (Note 1)	Steady State	T _A = 25°C	I _D	-15 A
	Steady State	T _A = 25°C	P _D	54 W
Pulsed Drain Current	t _p = 10 μs	I _{DM}	± 50 A	
Operating Junction and Storage Temperature	T _J , T _{STG}	-55 to 150	°C	
Single Pulse Drain-to-Source Avalanche Energy (V _{DD} = 25 V, V _{GS} = 5 V, I _{PK} = 15 A, L = 2.7 mH, R _G = 25 Ω)	E _{AS}	304	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T _L	260	°C	

Thermal Resistance Ratings

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain)	R _{θJC}	2.3	°C/W
Junction-to-Ambient - Steady State (Note 1)	R _{θJA}	80	
Junction-to-Ambient - Steady State (Note 2)	R _{θJA}	110	

1. Surface-mounted on FR4 board using 1 in sq. pad size (Cu area = 1.127 in sq. [1 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.412 in sq.)

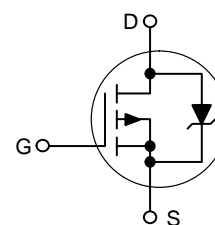


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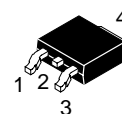
<http://onsemi.com>

V _{(BR)DSS}	R _{DS(on)} TYP	I _D MAX Note 1
-60 V	130 mΩ @ -5.0 V	-15 A

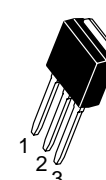
N-Channel



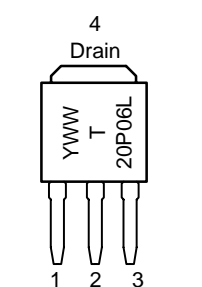
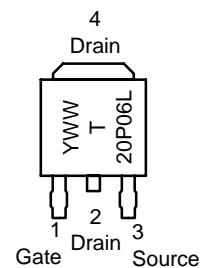
MARKING DIAGRAMS



**DPAK
CASE 369C
Style 2**



**DPAK
CASE 369D
Style 2**



20P06L 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.

NTD20P06L

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = -250 μA	-60	-74		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			-64		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = -60 V	T _J = 25°C		-1.0	μA
			T _J = 150°C		-10	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±15 V			±100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = -250 μA	-1.0	-1.5	-2.0	V
Gate Threshold Temperature Coefficient	V _{GS(TH)} /T _J			3.1		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = -5.0 V, I _D = -7.5 A		0.130	0.150	Ω
		V _{GS} = -5.0 V, I _D = -15 A		0.143		
Forward Transconductance	g _{FS}	V _{DS} = -10 V, I _D = -7.5 A		11		S
Drain-to-Source On-Voltage	V _{DS(on)}	V _{GS} = -5.0 V, I _D = -7.5 A	T _J = 25°C		-1.2	V
			T _J = 150°C		-1.9	

CHARGES AND CAPACITANCES

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = -25 V		740	1190	pF
Output Capacitance	C _{OSS}			207	300	
Reverse Transfer Capacitance	C _{RSS}			66	120	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = -5.0 V, V _{DS} = -48 V, I _D = -18 A		15	26	nC
Gate-to-Source Charge	Q _{GS}			4.0		
Gate-to-Drain Charge	Q _{GD}			7.0		

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = -5.0 V, V _{DD} = -30 V, I _D = -15 A, R _G = 9.1 Ω		11	20	ns
Rise Time	t _r			90	180	
Turn-Off Delay Time	t _{d(OFF)}			28	50	
Fall Time	t _f			70	135	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = -15 A	T _J = 25°C		1.5	2.5	V
			T _J = 150°C		1.3		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = -12 A		60		ns	
Charge Time	t _a			39			
Discharge Time	t _b			21			
Reverse Recovery Charge	Q _{RR}			0.13			nC

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%

4. Switching characteristics are independent of operating junction temperatures

NTD20P06L

TYPICAL PERFORMANCE CURVES

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

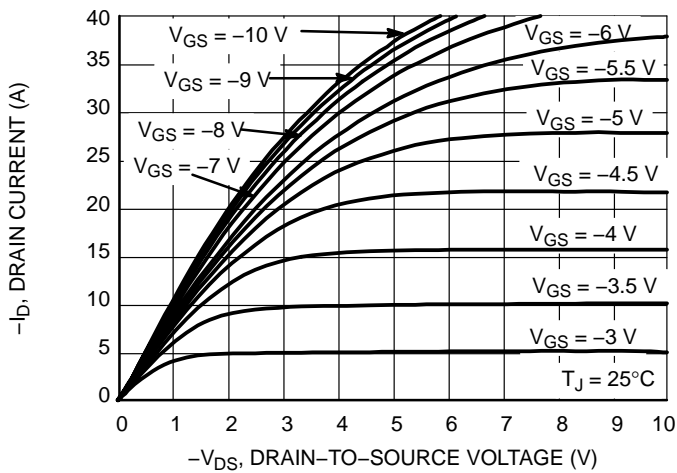


Figure 1. On-Region Characteristics

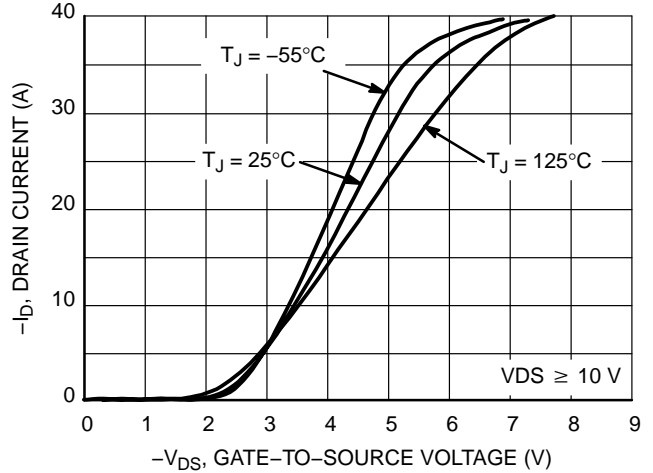


Figure 2. Transfer Characteristics

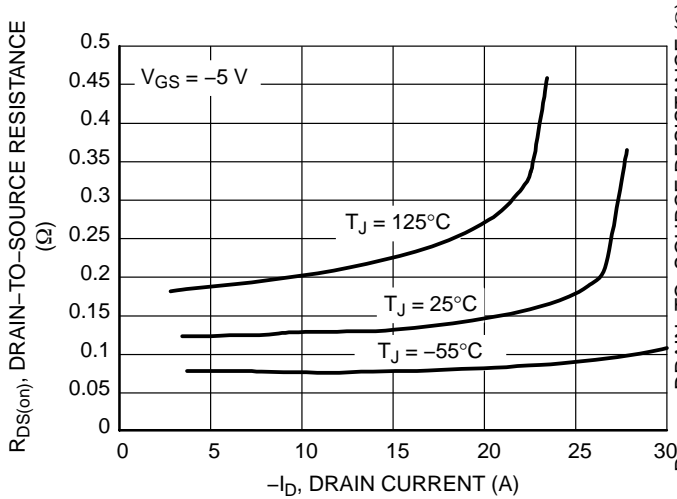


Figure 3. On-Resistance versus Drain Current and Temperature

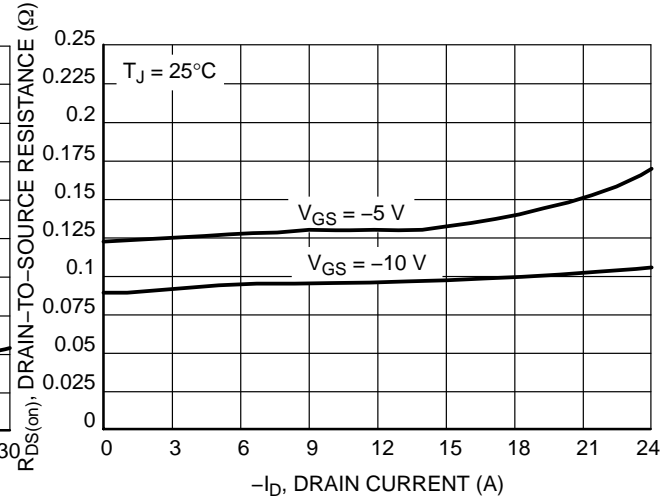


Figure 4. On-Resistance versus Drain Current and Gate Voltage

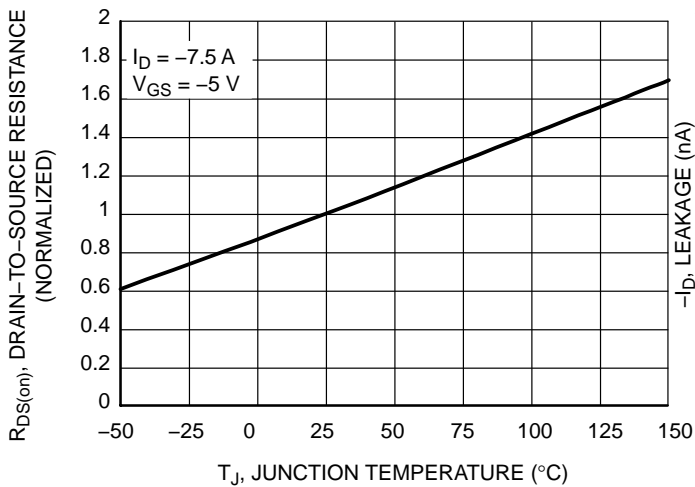


Figure 5. On-Resistance Variation with Temperature

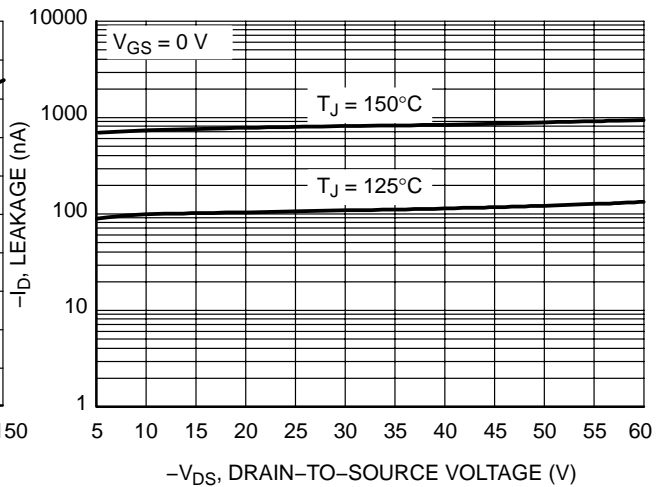


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTD20P06L

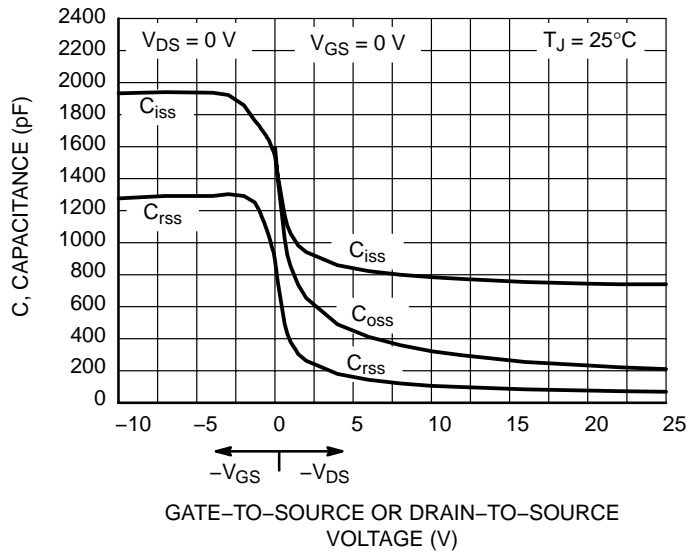


Figure 7. Capacitance Variation

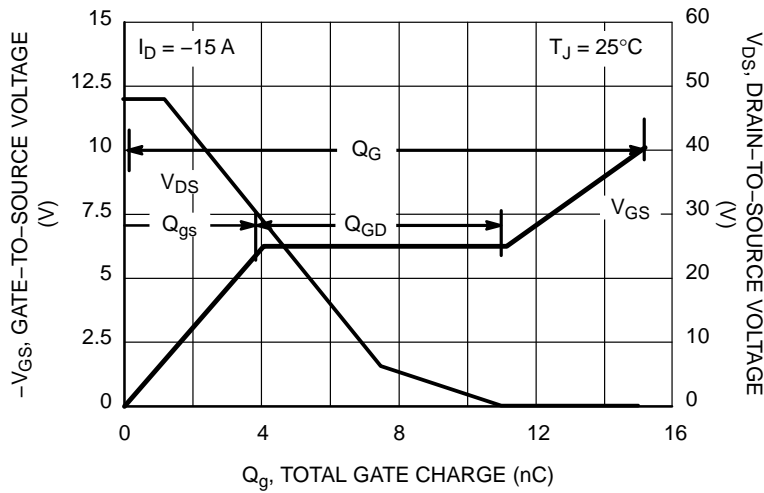


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

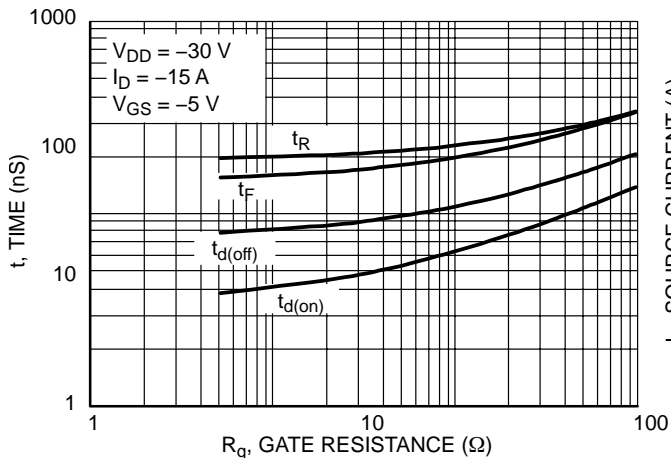


Figure 9. Resistive Switching Time Variation versus Gate Resistance

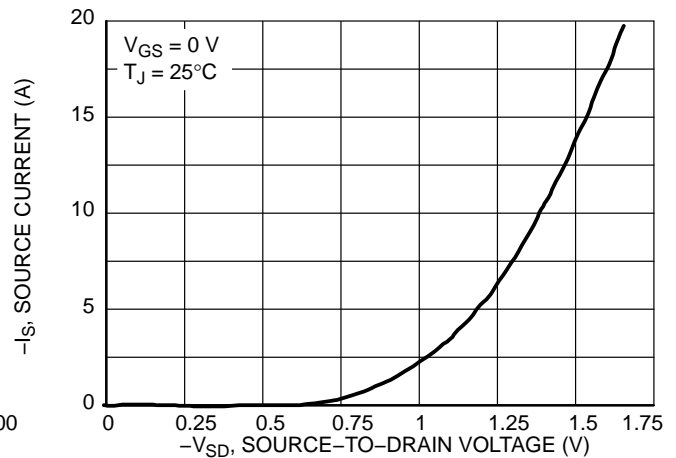


Figure 10. Diode Forward Voltage versus Current

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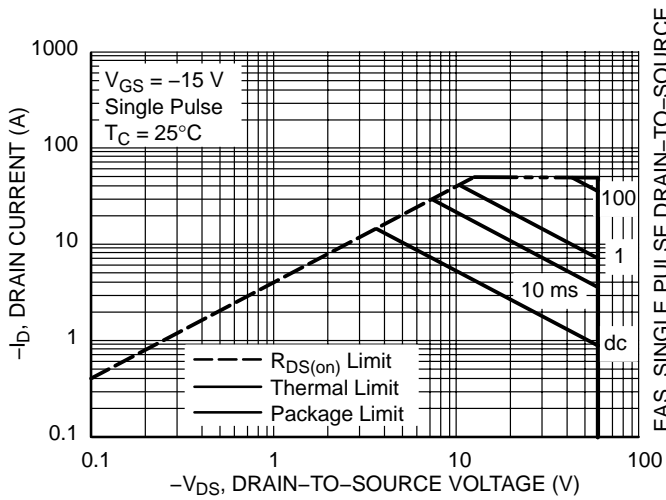


Figure 11. Maximum Rated Forward Biased Safe Operating Area

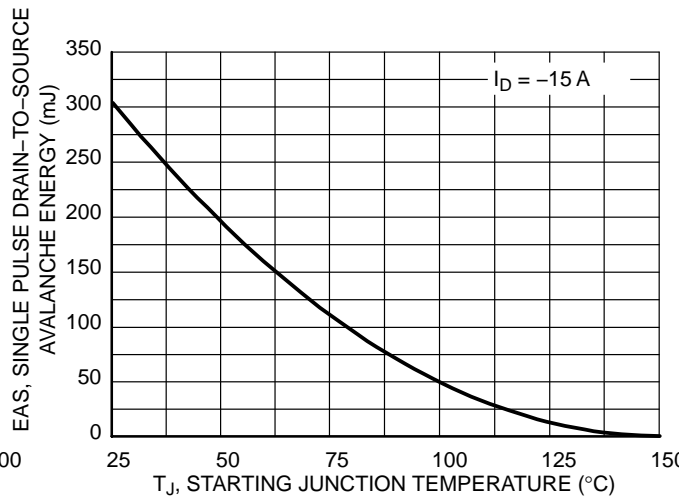


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

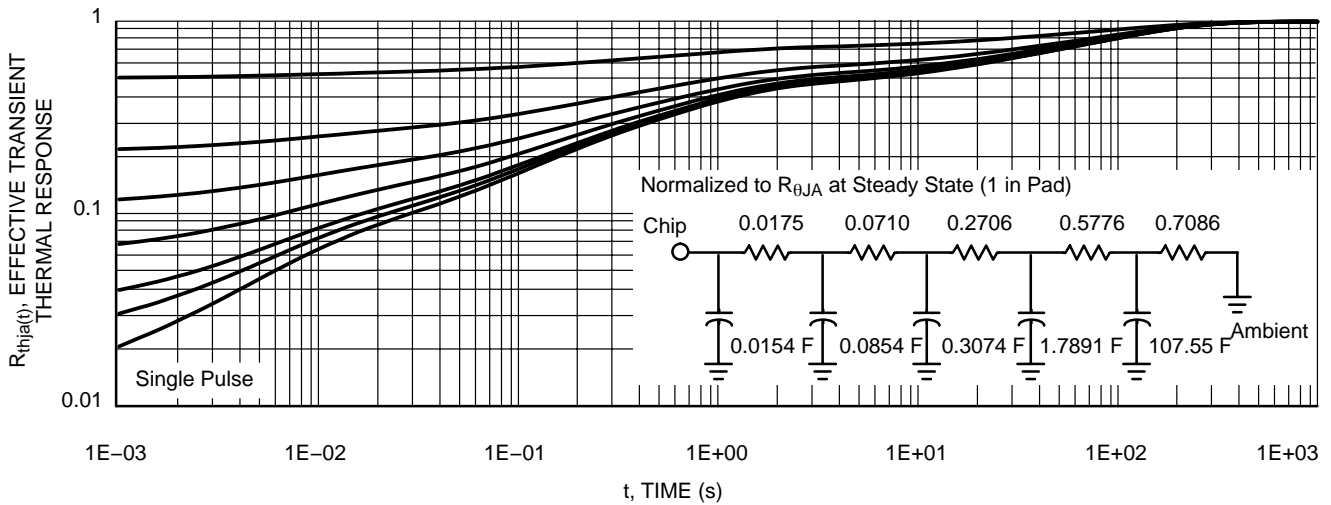


Figure 13. Thermal Response

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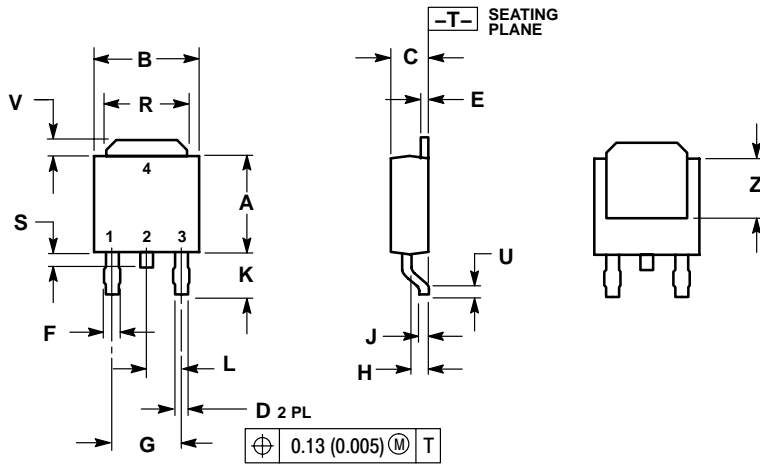
ORDERING INFORMATION

Device	Package	Shipping
NTD20P06L-1	DPAK	75 Units / Rail
NTD20P06L		75 Units / Rail
NTD20P06LT4		2500 /Tape & Reel
NTD20P06L-1G	DPAK (Pb-Free)	75 Units / Rail
NTD20P06LG		75 Units / Rail
NTD20P06LT4G		2500 / Tape & Reel

NTD20P06L

PACKAGE DIMENSIONS

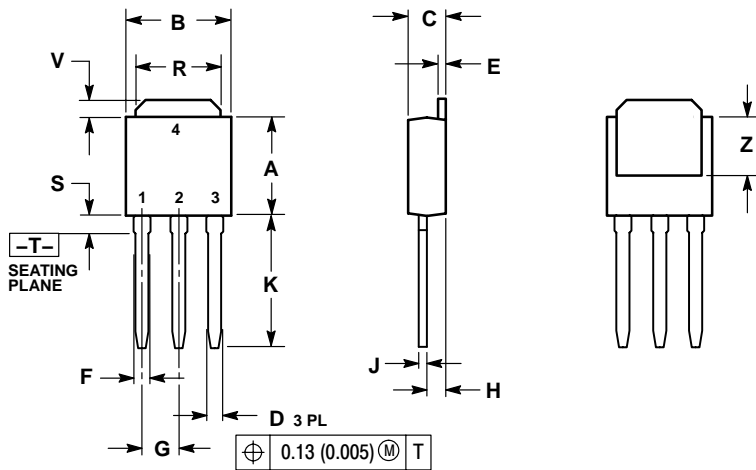
DPAK CASE 369C-01 ISSUE O



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 CASE 369D-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	6.35
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
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