NTD5867NL

N-Channel Power MOSFET 60 V, 20 A, 39 mΩ

Features

- Low $R_{DS(on)}$
- High Current Capability
- 100% Avalanche Tested
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

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}	±20	V
Gate−to−Source Voltage − Non−Repetitive (t_p < 10 μs)			V_{GS}	±30	V
Continuous Drain Current ($R_{\theta JC}$)	Steady State	T_C = 25°C	I_D	20	A
		T_C = 100°C		13	
Power Dissipation ($R_{\theta JC}$)		T_C = 25°C	P_D	36	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	76	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to 150	°C
Source Current (Body Diode)			I_S	20	A
Single Pulse Drain−to−Source Avalanche Energy (V_{DD} = 50 V, V_{GS} = 10 V, R_G = 25 Ω, $I_{L(pk)}$ = 19 A, L = 0.1 mH, T_J = 25°C)			E_{AS}	18	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	3.5	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	45	

1. Surface−mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces.

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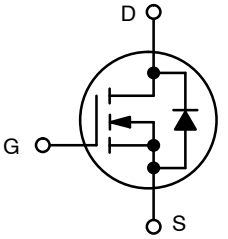
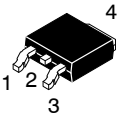
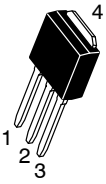
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
60 V	39 mΩ @ 10 V	20 A
	50 mΩ @ 4.5 V	18 A



N−CHANNEL MOSFET

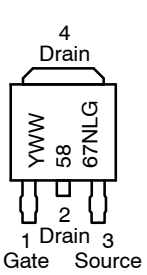


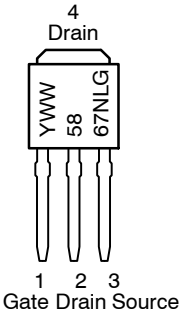
DPAK
CASE 369AA
(Surface Mount)
STYLE 2



IPAK
CASE 369D
(Straight Lead)
STYLE 2

MARKING DIAGRAMS & PIN ASSIGNMENT





Y = Year
WW = Work Week
5867NL = Device Code
G = Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				60		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 100 V	T_J = 25°C			1.0	μA
			T_J = 125°C			100	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.5	1.8	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				5.2		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 10 A			26	39	mΩ
		V_{GS} = 4.5 V, I_D = 10 A			33	50	
Forward Transconductance	gFS	V_{DS} = 15 V, I_D = 10 A			8.0		S
CHARGES, CAPACITANCES AND GATE RESISTANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 25 V			675		pF
Output Capacitance	C_{oss}				68		
Reverse Transfer Capacitance	C_{rss}				47		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 48 V, I_D = 20 A			15		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.0		
Gate−to−Source Charge	Q_{GS}				2.2		
Gate−to−Drain Charge	Q_{GD}				4.3		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 48 V, I_D = 20 A			7.6		nC
Gate Resistance	R_G				1.3		Ω
SWITCHING CHARACTERISTICS (Note 3)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 10 V, V_{DD} = 48 V, I_D = 20 A, R_G = 2.5 Ω			6.5		ns
Rise Time	t_r				12.6		
Turn−Off Delay Time	$t_{d(off)}$				18.2		
Fall Time	t_f				2.4		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 A	T_J = 25°C		0.87	1.2	V
			T_J = 100°C		0.78		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/μs, I_S = 20 A			17		ns
Charge Time	ta				13		
Discharge Time	tb				4.0		
Reverse Recovery Charge	Q_{RR}				12		nC

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

ORDERING INFORMATION

Order Number	Package	Shipping†
NTD5867NL−1G	IPAK (Straight Lead) (Pb−Free)	75 Units / Rail
NTD5867NLT4G	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.

TYPICAL PERFORMANCE CURVES

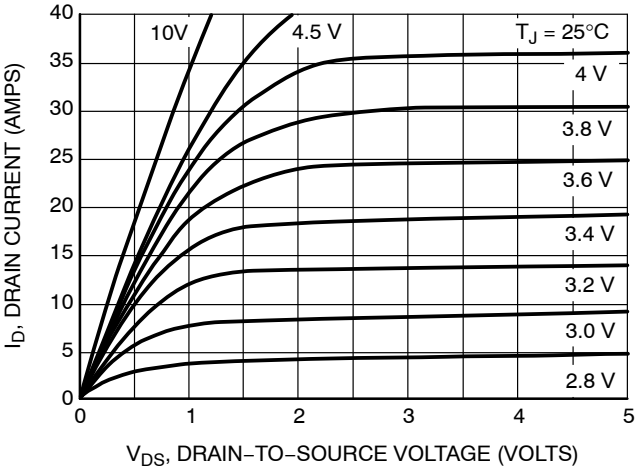


Figure 1. On−Region Characteristics

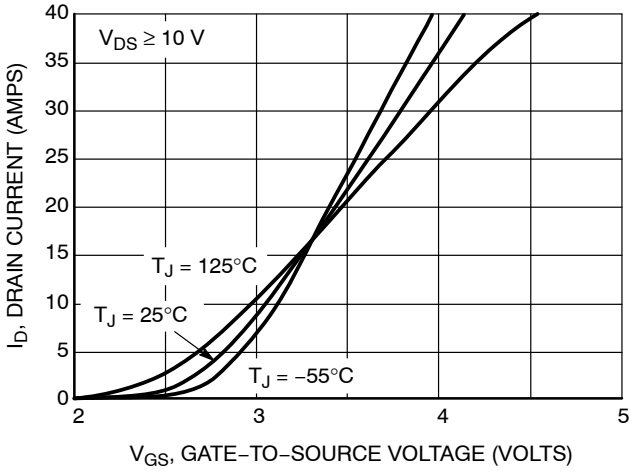


Figure 2. Transfer Characteristics

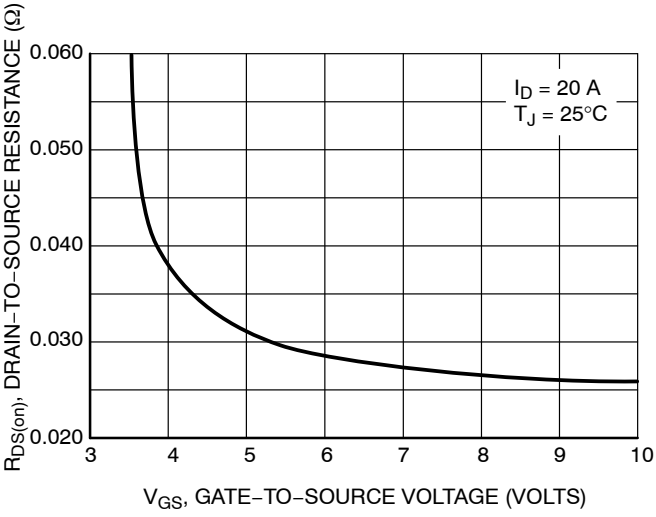


Figure 3. On−Resistance vs. Gate−to−Source Voltage

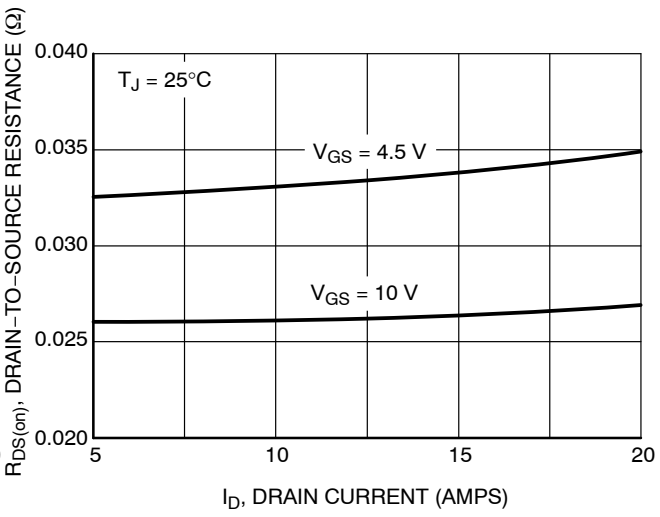


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

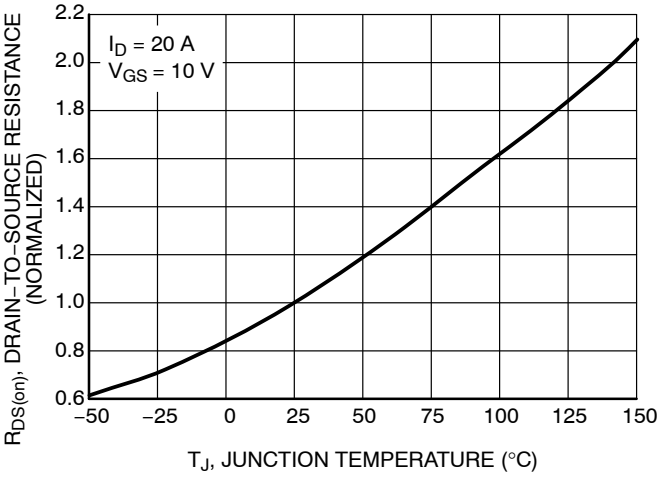


Figure 5. On−Resistance Variation with Temperature

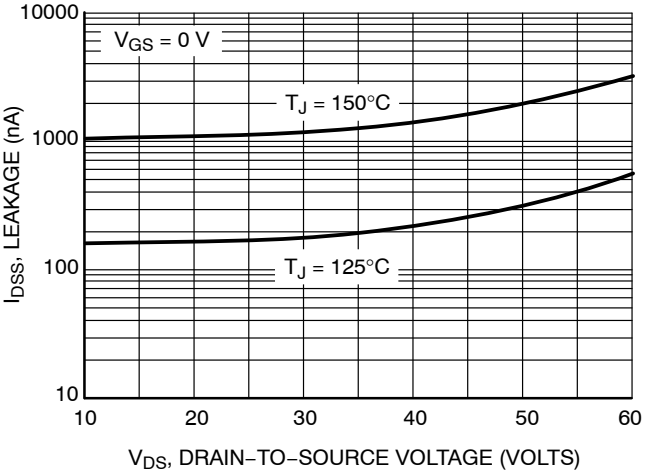


Figure 6. Drain−to−Source Leakage Current vs. Drain Voltage

TYPICAL PERFORMANCE CURVES

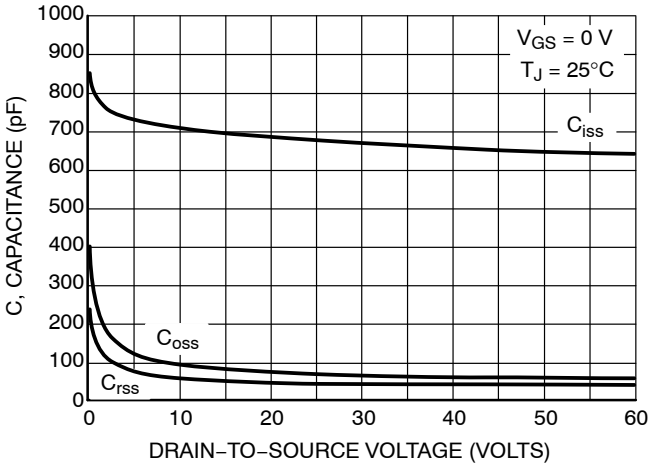


Figure 7. Capacitance Variation

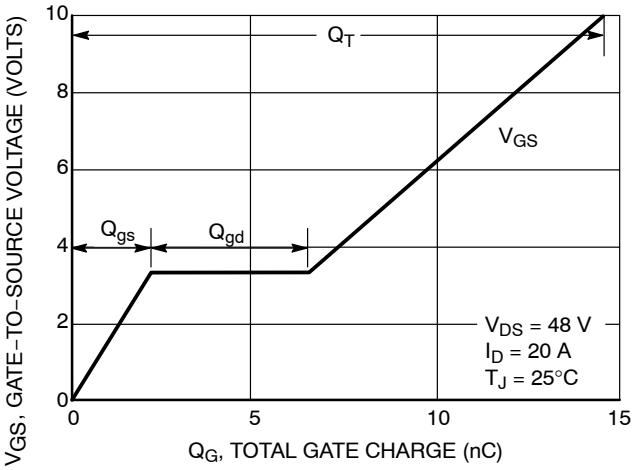


Figure 8. Gate−To−Source Voltage vs. Total Charge

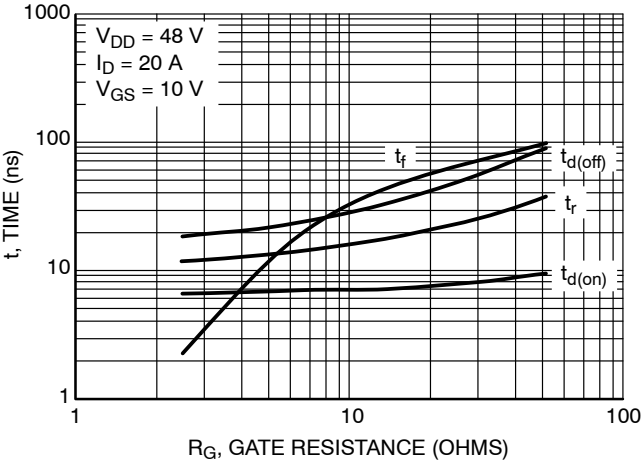


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

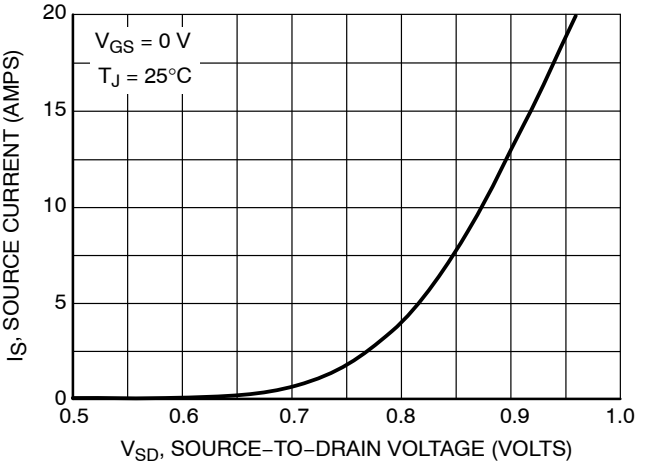


Figure 10. Diode Forward Voltage vs. Current

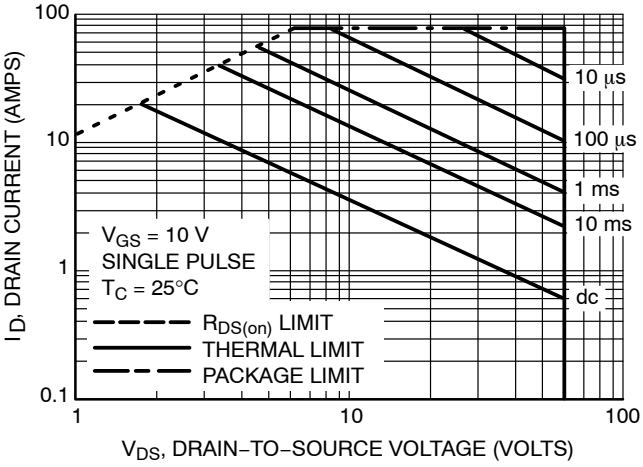


Figure 11. Maximum Rated Forward Biased Safe Operating Area

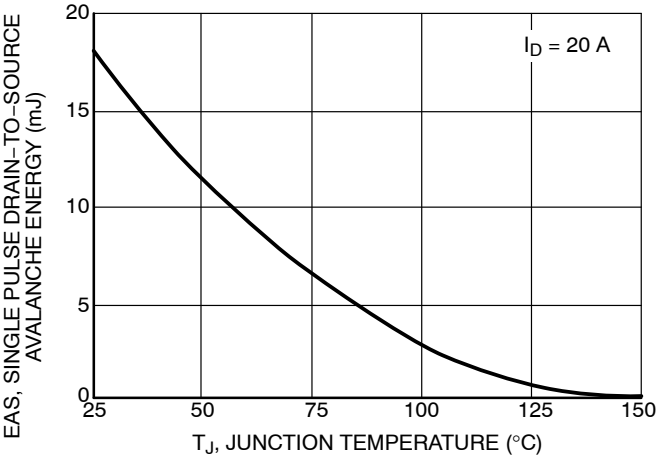


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL PERFORMANCE CURVES

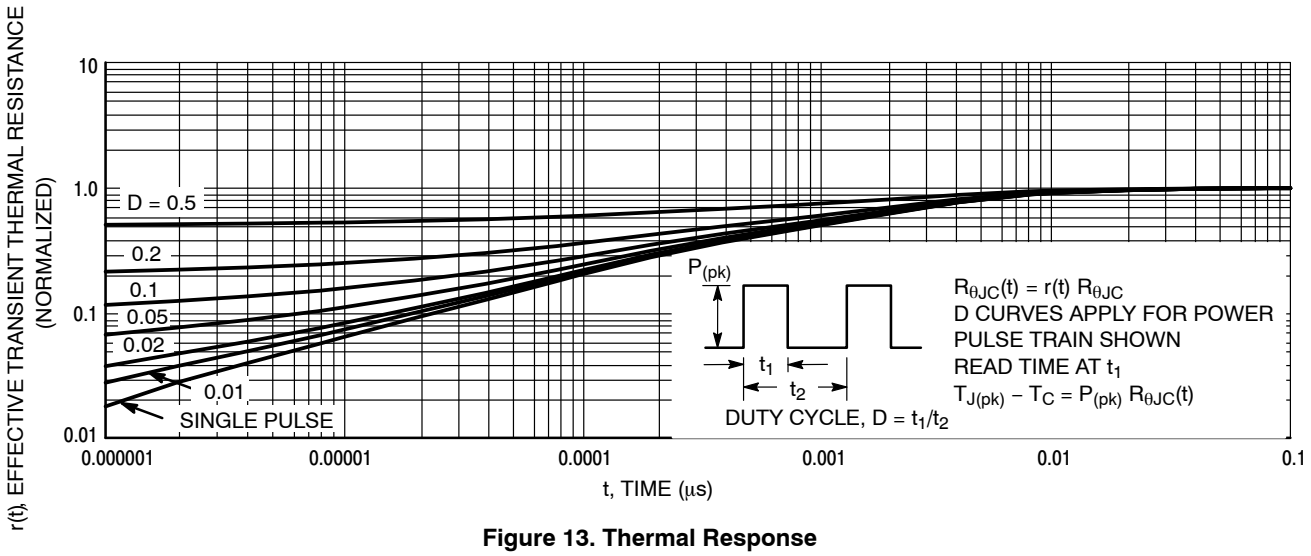
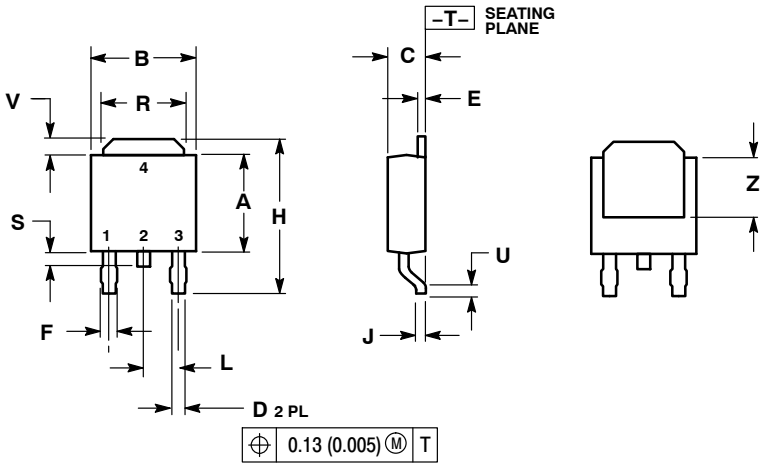


Figure 13. Thermal Response

PACKAGE DIMENSIONS

DPAK (SINGLE GUAGE)
CASE 369AA−01
ISSUE A

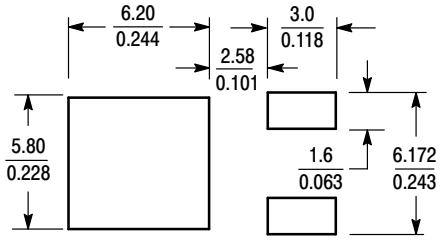


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	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	0.89
E	0.018	0.024	0.46	0.61
F	0.030	0.045	0.77	1.14
H	0.386	0.410	9.80	10.40
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	0.024	0.040	0.60	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

SOLDERING FOOTPRINT*

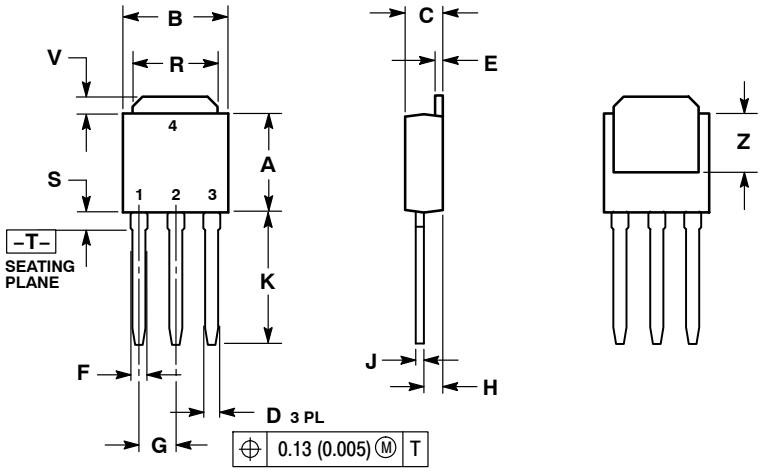


SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

PACKAGE DIMENSIONS

IPAK (STRAIGHT LEAD DPAK)
CASE 369D−01
ISSUE B



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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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
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N. American Technical Support: 800−282−9855 Toll Free USA/Canada
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NTD5867NL/D