

# NTD6600N

## Power MOSFET 100 V, 12 A, N-Channel, Logic Level DPAK

### Features

- Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- Avalanche Energy Specified
- Logic Level
- Pb-Free Packages are Available

### Typical Applications

- PWM Motor Controls
- Power Supplies
- Converters

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	100	Vdc
Drain-to-Source Voltage ( $R_{GS} = 1.0\text{ M}\Omega$ )	$V_{DGR}$	100	Vdc
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	Vdc
Drain Current – Continuous @ $T_A = 25^\circ\text{C}$ – Continuous @ $T_A = 100^\circ\text{C}$ – Pulsed (Note 3)	$I_D$ $I_D$ $I_{DM}$	12 9.0 44	Adc Adc Apk
Total Power Dissipation Derate above $25^\circ\text{C}$ Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 2)	$P_D$	56.6 0.38 1.76 1.28	W W/ $^\circ\text{C}$ W W
Operating and Storage Temperature Range	$T_J, T_{stg}$	$-55$ to $+175$	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 50\text{ Vdc}$ , $V_{GS} = 5.0\text{ Vdc}$ , $I_L = 12\text{ Apk}$ , $L = 1.0\text{ mH}$ , $R_G = 25\text{ }\Omega$ )	$E_{AS}$	72	mJ
Thermal Resistance – Junction-to-Case – Junction-to-Ambient (Note 1) – Junction-to-Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	2.65 85 117	$^\circ\text{C/W}$
Maximum Temperature for Soldering Purposes, (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$

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.

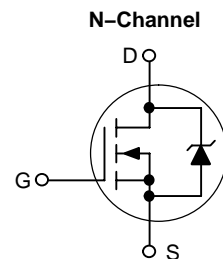
1. When surface mounted to an FR4 board using 0.5 sq in pad size.
2. When surface mounted to an FR4 board using the minimum recommended pad size.
3. Pulse Test: Pulse Width = 10  $\mu\text{s}$ , Duty Cycle = 2%.



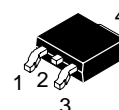
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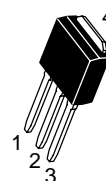
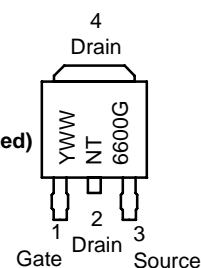
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
100 V	118 m $\Omega$ @ 5.0 V	12 A



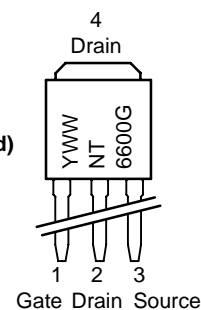
### MARKING DIAGRAMS



DPAK  
CASE 369C  
(Surface Mounted)  
STYLE 2



DPAK-3  
CASE 369D  
(Straight Lead)  
STYLE 2



Y = Year  
WW = Work Week  
NT6600 = 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.

# NTD6600N

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc)	V <sub>(BR)DSS</sub>	100	–	–	Vdc
Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = 100 Vdc, T <sub>J</sub> = 25°C) (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = 100 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	– –	– –	1.0 10	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0)	I <sub>GSS</sub>	–	–	±100	nAdc

### ON CHARACTERISTICS

Gate Threshold Voltage V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	1.0 –	1.5 –4.4	2.0 –	Vdc mV/°C
Static Drain-to-Source On-State Resistance (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 6.0 Adc)	R <sub>DS(on)</sub>	–	118	146	mΩ
Drain-to-Source On-Voltage (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 12 Adc)	V <sub>DS(on)</sub>	–	1.5	2.2	Vdc
Forward Transconductance (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 6.0 Adc)	g <sub>FS</sub>	–	10	–	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	463	700	pF
Output Capacitance		C <sub>oss</sub>	–	116	225	
Reverse Transfer Capacitance		C <sub>rss</sub>	–	36	75	

### SWITCHING CHARACTERISTICS (Notes 4 & 5)

Turn-On Delay Time	(V <sub>DD</sub> = 80 Vdc, I <sub>D</sub> = 6.0 Adc, V <sub>GS</sub> = 5.0 Vdc, R <sub>G</sub> = 9.1 Ω)	t <sub>d(on)</sub>	–	10.5	20	ns
Rise Time		t <sub>r</sub>	–	75	140	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	26	40	
Fall Time		t <sub>f</sub>	–	50	90	
Total Gate Charge	(V <sub>DS</sub> = 80 Vdc, I <sub>D</sub> = 6.0 Adc, V <sub>GS</sub> = 5.0 Vdc)	Q <sub>tot</sub>	–	11.3	20	nC
Gate-to-Source Charge		Q <sub>gs</sub>	–	1.9	–	
Gate-to-Drain Charge		Q <sub>gd</sub>	–	7.4	–	

### BODY-DRAIN DIODE RATINGS (Note 4)

Diode Forward On-Voltage	(I <sub>S</sub> = 12 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 12 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	– –	0.90 0.80	1.4 –	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 12 Adc, V <sub>GS</sub> = 0 Vdc, di/dt = 100 A/μs)	t <sub>rr</sub>	–	80	–	ns
		t <sub>a</sub>	–	50	–	
		t <sub>b</sub>	–	30	–	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	–	0.240	–	μC

4. Indicates Pulse Test: P.W. = 300 μs max, Duty Cycle = 2%.  
5. Switching characteristics are independent of operating junction temperature.

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTD6600N	DPAK	75 Units/Rail
NTD6600N-1	DPAK-3	
NTD6600N-1G	DPAK-3 (Pb-Free)	
NTD6600NT4	DPAK	2500 Tape & Reel
NTD6600NT4G	DPAK (Pb-Free)	

<sup>†</sup>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 CHARACTERISTICS

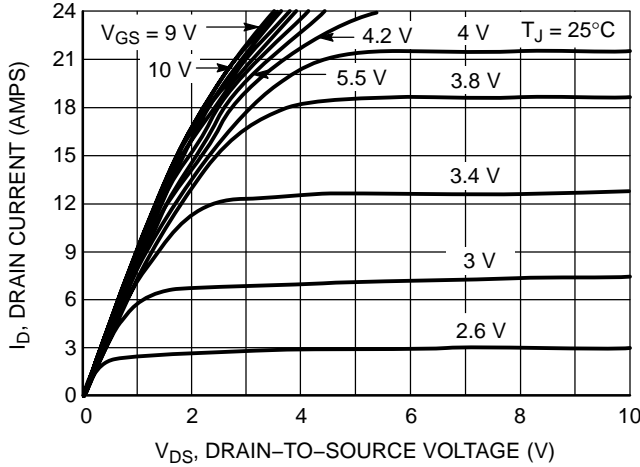


Figure 1. On-Region Characteristics

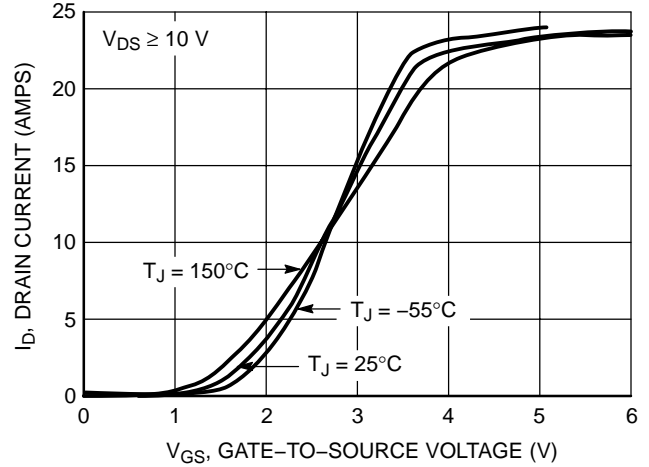


Figure 2. Transfer Characteristics

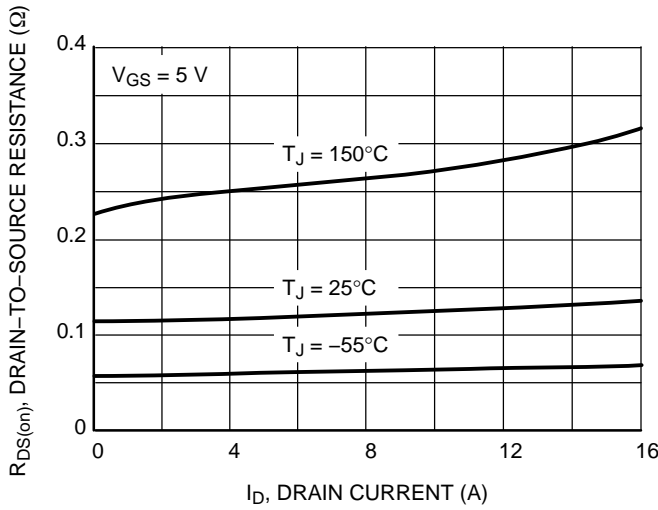


Figure 3. On-Resistance versus Drain Current and Temperature

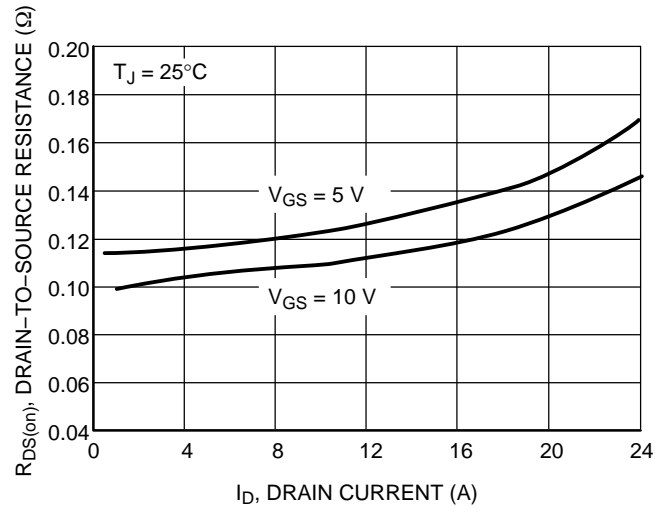


Figure 4. On-Resistance versus Drain Current and Temperature

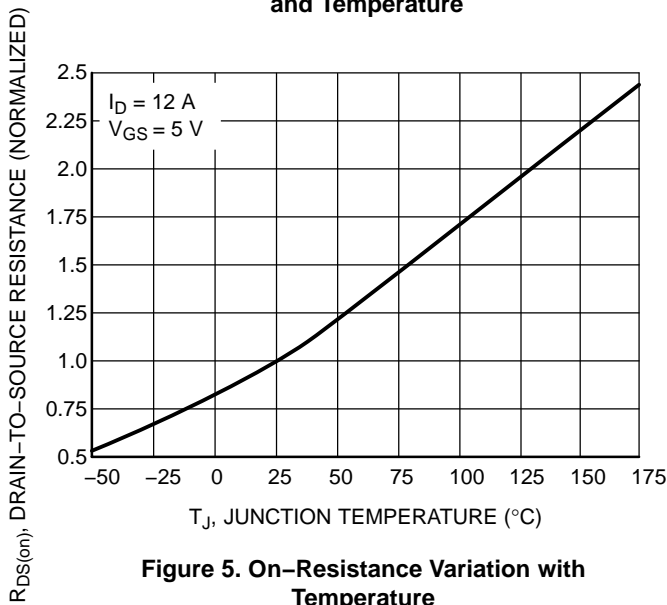


Figure 5. On-Resistance Variation with Temperature

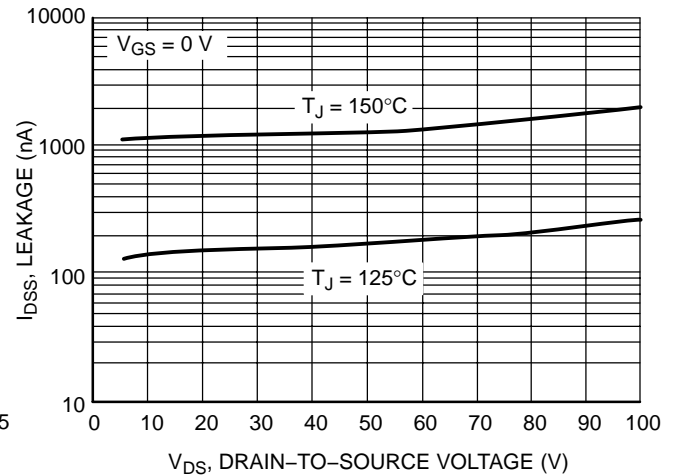


Figure 6. Drain-To-Source Leakage Current versus Voltage

TYPICAL CHARACTERISTICS

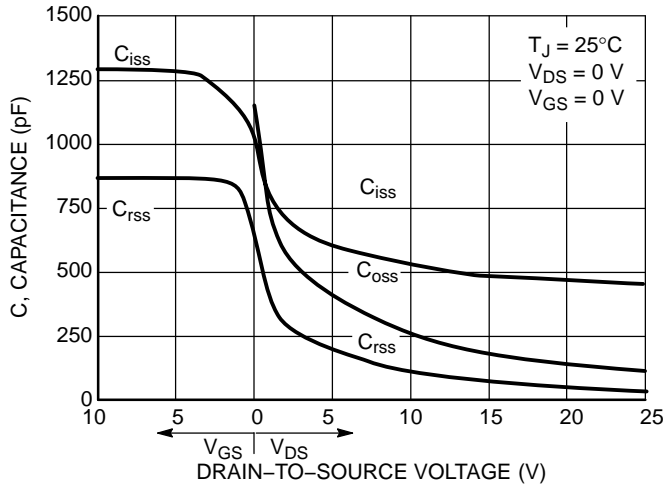


Figure 7. Capacitance Variation

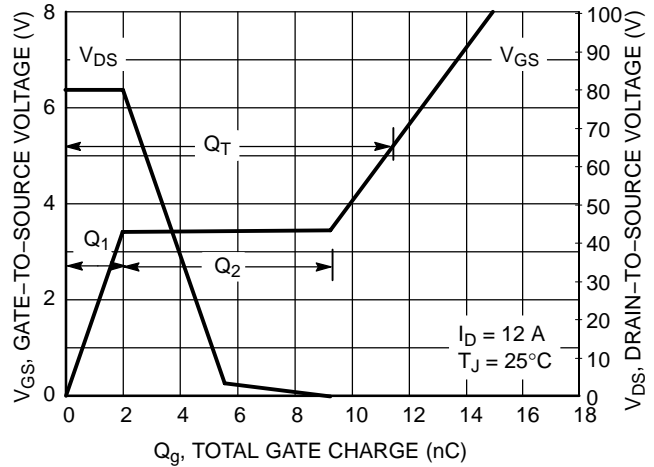


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

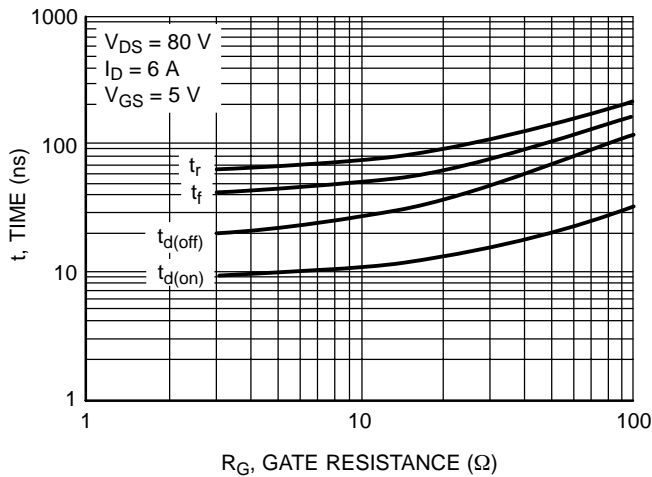


Figure 9. Resistive Switching Time Variation versus Gate Resistance

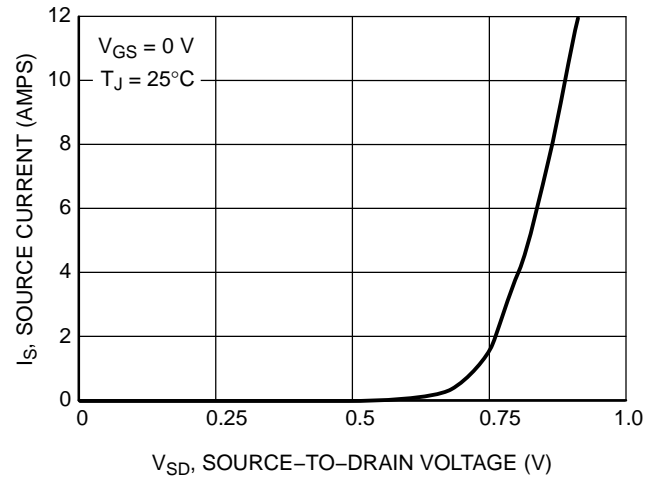


Figure 10. Diode Forward Voltage versus Current

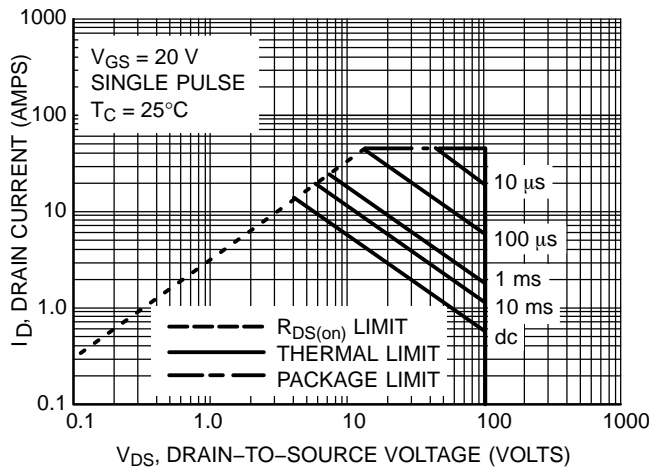


Figure 11. Maximum Rated Forward Biased Safe Operating Area

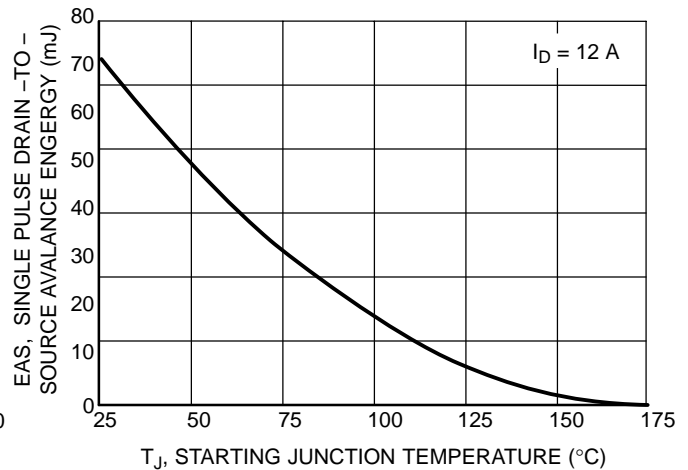
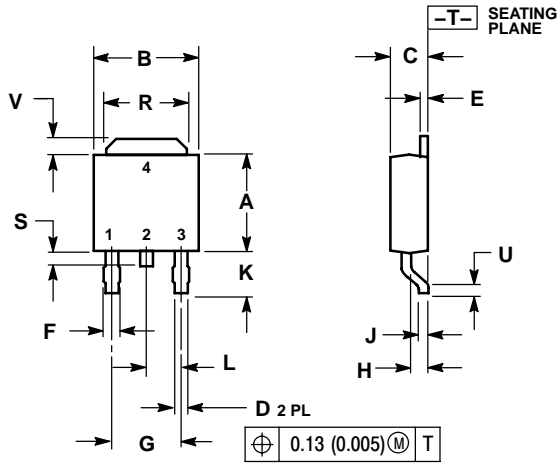


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

# NTD6600N

## PACKAGE DIMENSIONS

DPAK  
CASE 369C-01  
ISSUE O

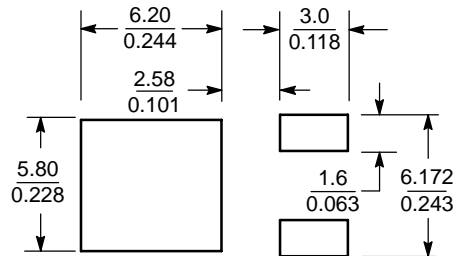


NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

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	0.027	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

## SOLDERING FOOTPRINT\*



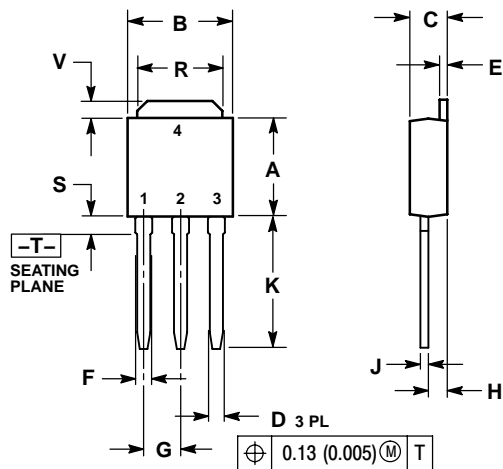
SCALE 3:1  $\left( \frac{\text{mm}}{\text{inches}} \right)$

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

# NTD6600N

## PACKAGE DIMENSIONS

### DPAK-3 CASE 369D-01 ISSUE B




#### 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
- DRAIN
- SOURCE
- DRAIN

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