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# NTD5806N, NVD5806N

## Power MOSFET

40 V, 33 A, Single N-Channel, DPAK/IPAK

### Features

- Low  $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- NVD and SVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- CCFL Backlight
- DC Motor Control
- Power Supply Secondary Side Synchronous Rectification

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	40	V	
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	V	
Gate-to-Source Voltage – Non-Repetitive ( $t_p < 10 \mu\text{s}$ )	$V_{GS}$	$\pm 30$	V	
Continuous Drain Current ( $R_{\theta JC}$ ) (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$ 33	A
		$T_C = 100^\circ\text{C}$	23	
Power Dissipation ( $R_{\theta JC}$ ) (Note 1)		$T_C = 25^\circ\text{C}$	$P_D$ 40	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$ 67	A	
Operating Junction and Storage Temperature	$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$	
Source Current (Body Diode)	$I_S$	33	A	
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 50 \text{ V}, V_{GS} = 10 \text{ V}, R_G = 25 \Omega, I_{L(pk)} = 28 \text{ A}, L = 0.1 \text{ mH}, V_{DS} = 40 \text{ V}$ )	$E_{AS}$	39	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3.7	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	57.5	

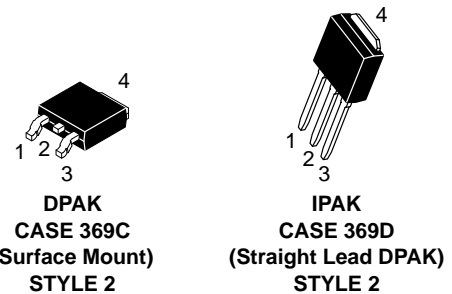
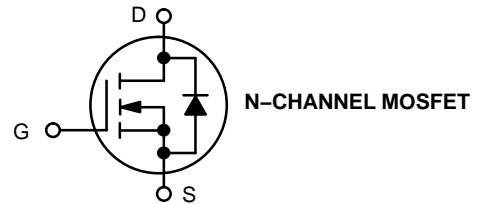
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



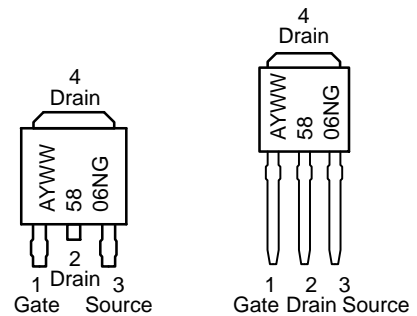
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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
40 V	26 m $\Omega$ @ 4.5 V	33 A
	19 m $\Omega$ @ 10 V	



### MARKING DIAGRAMS & PIN ASSIGNMENT



- A = Assembly Location\*
- Y = Year
- WW = Work Week
- 5806N = Device Code
- G = Pb-Free Package

\* The Assembly Location code (A) is front side optional. In cases where the Assembly Location is stamped in the package, the front side assembly code may be blank.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NTD5806N, NVD5806N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	40	45.5		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			29.5		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 40 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 150°C		100	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.4		2.5	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			5.8		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A		12.7	19	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A		17.8	26	

### CHARGES, CAPACITANCES AND GATE RESISTANCES

Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 25 V		860		pF
Output Capacitance	C <sub>oss</sub>			130		
Reverse Transfer Capacitance	C <sub>rss</sub>			100		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 20 V, I <sub>D</sub> = 30 A		17	38	nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.95		
Gate-to-Source Charge	Q <sub>GS</sub>			3.4		
Gate-to-Drain Charge	Q <sub>GD</sub>			4.5		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 20 V, I <sub>D</sub> = 30 A, R <sub>G</sub> = 2.5 Ω		10.6		ns
Rise Time	t <sub>r</sub>			93.7		
Turn-Off Delay Time	t <sub>d(off)</sub>			14.2		
Fall Time	t <sub>f</sub>			4.3		
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 20 V, I <sub>D</sub> = 30 A, R <sub>G</sub> = 2.5 Ω		8.0		ns
Rise Time	t <sub>r</sub>			49		
Turn-Off Delay Time	t <sub>d(off)</sub>			19.8		
Fall Time	t <sub>f</sub>			2.6		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 10 A	T <sub>J</sub> = 25°C	0.86	1.2	V
			T <sub>J</sub> = 150°C	0.69		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 30 A		18.8		ns
Charge Time	t <sub>a</sub>			11.8		
Discharge Time	t <sub>b</sub>			7.0		
Reverse Recovery Charge	Q <sub>RR</sub>			10.9		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

TYPICAL PERFORMANCE CHARACTERISTICS

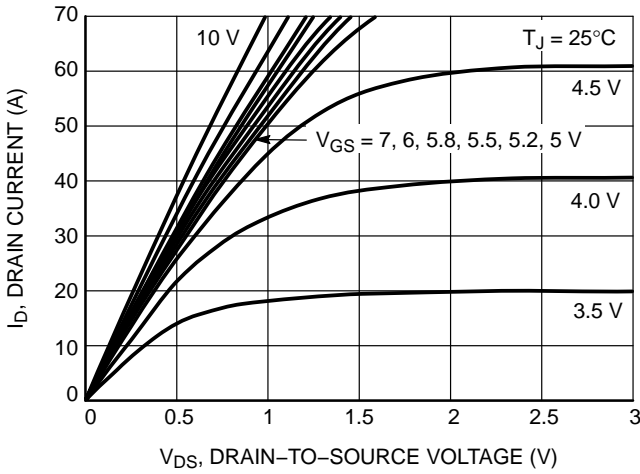


Figure 1. On-Region Characteristics

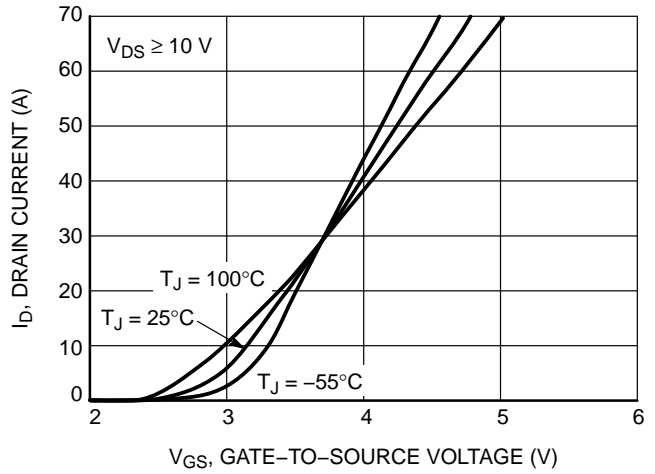


Figure 2. Transfer Characteristics

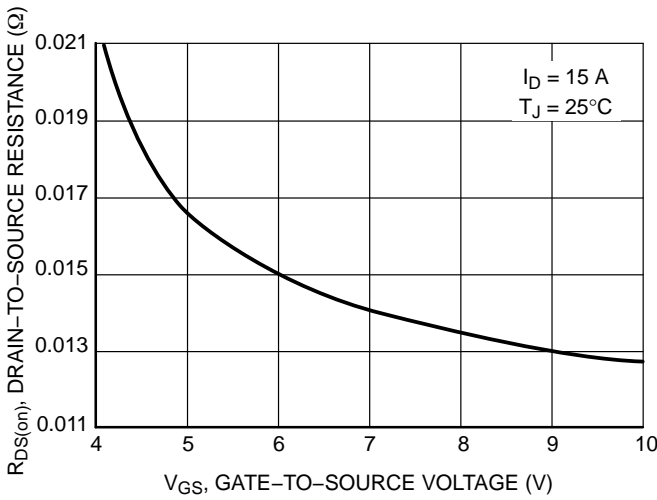


Figure 3. On-Resistance vs. Drain Current

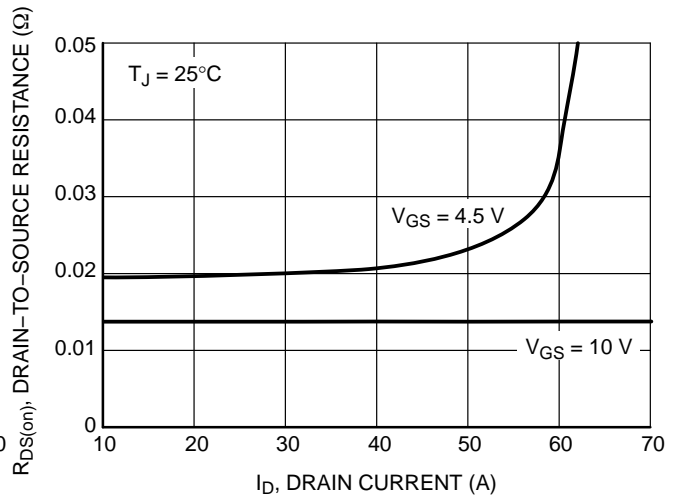


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

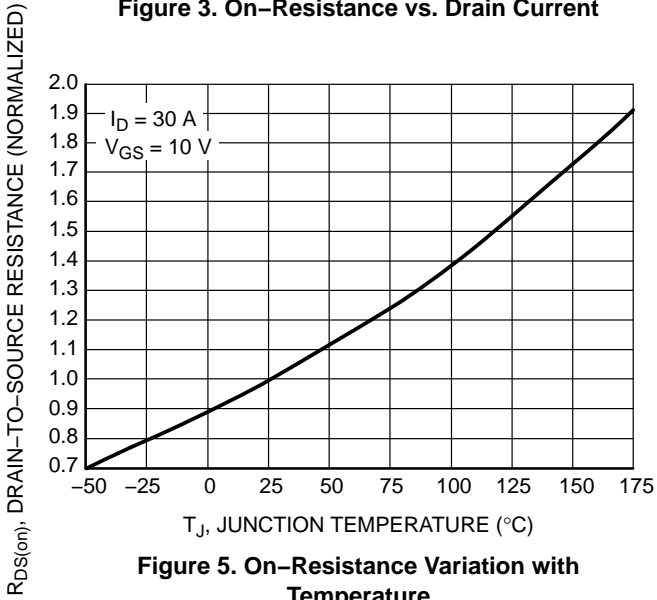


Figure 5. On-Resistance Variation with Temperature

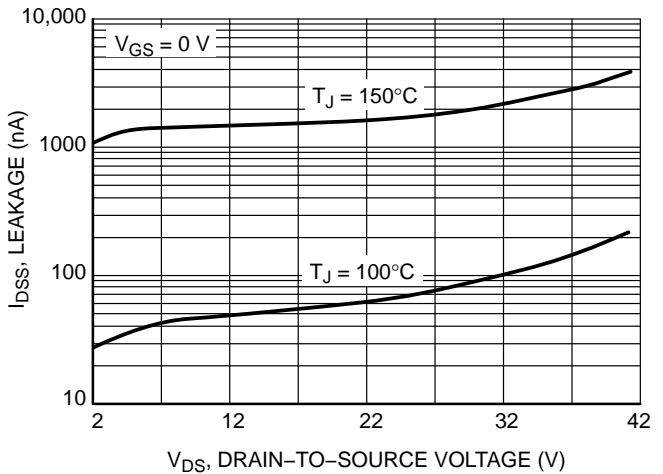
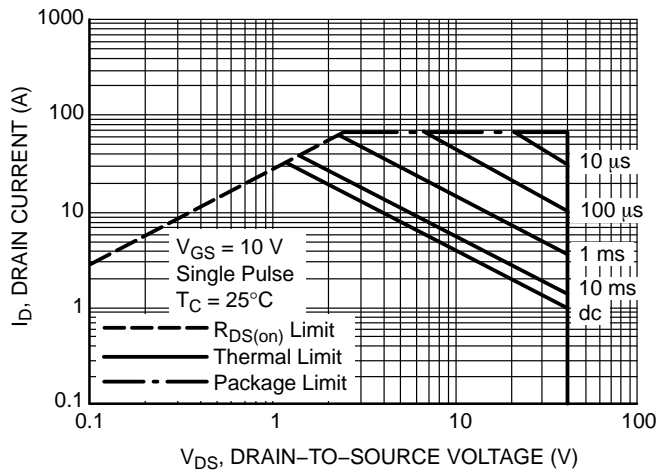
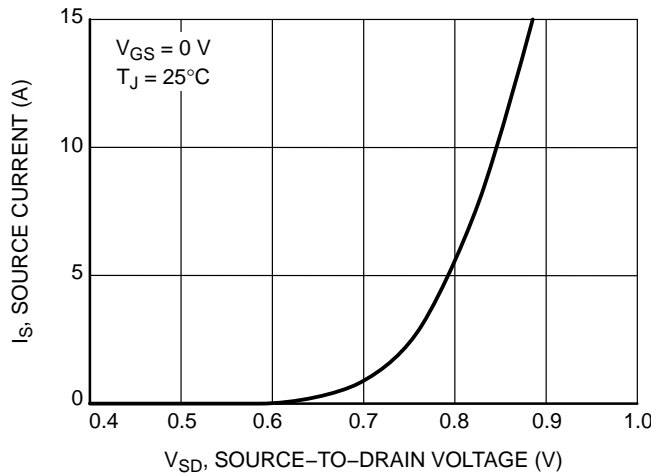
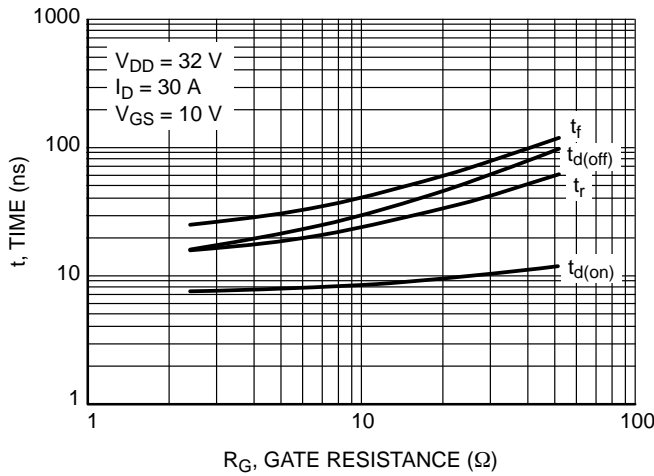
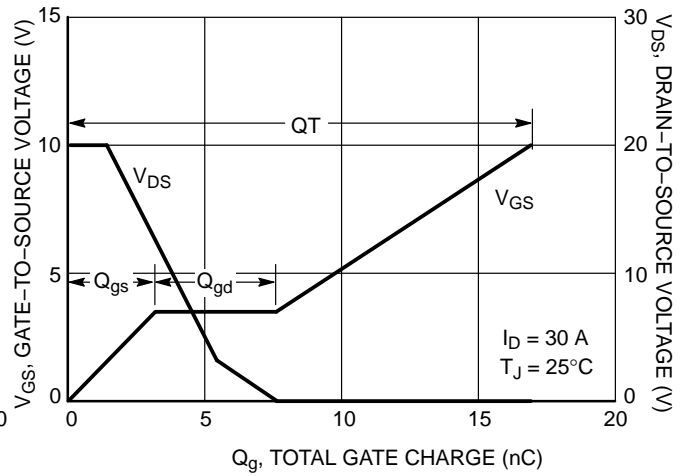
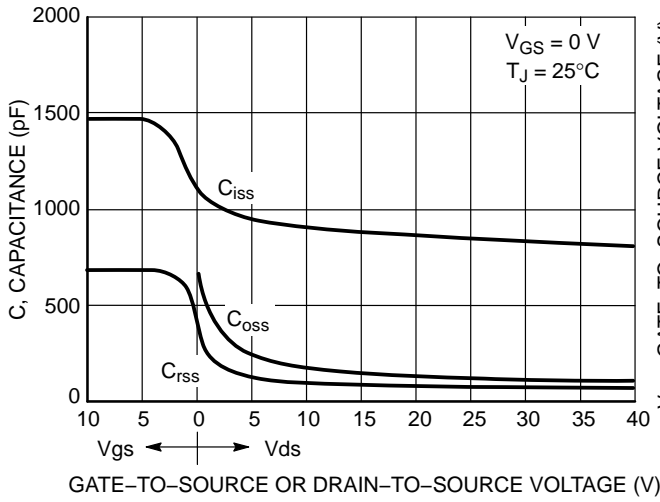


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTD5806N, NVD5806N

## TYPICAL PERFORMANCE CHARACTERISTICS



# NTD5806N, NVD5806N

## TYPICAL PERFORMANCE CHARACTERISTICS

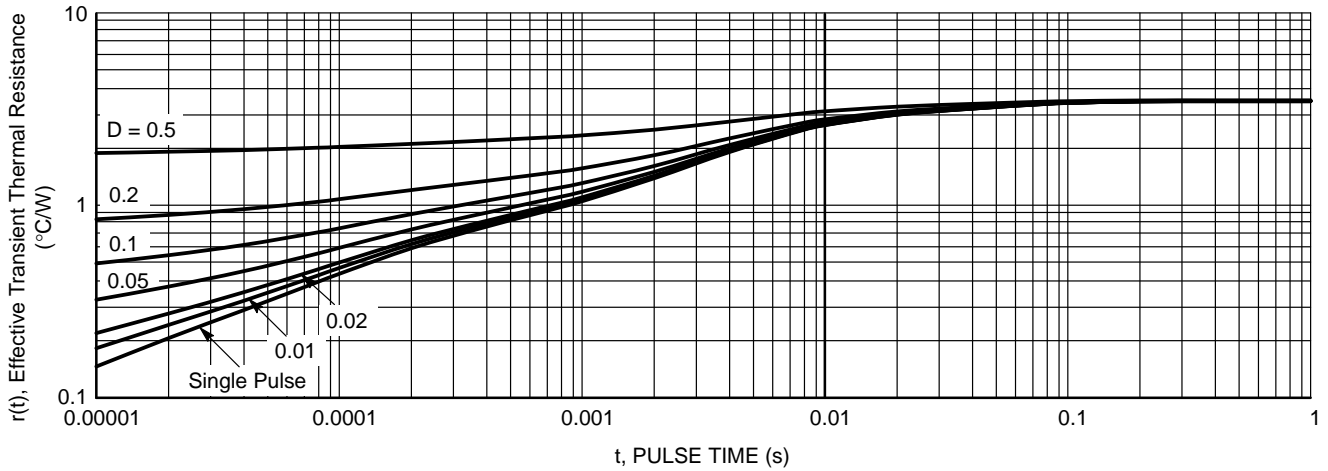


Figure 12. Thermal Response

### ORDERING INFORMATION

Order Number	Package	Shipping†
NTD5806NG	IPAK (Straight Lead DPAK) (Pb-Free)	75 Units / Rail
NTD5806NT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NVD5806NT4G*	DPAK (Pb-Free)	2500 / Tape & Reel
SVD5806NT4G*	DPAK (Pb-Free)	2500 / Tape & Reel

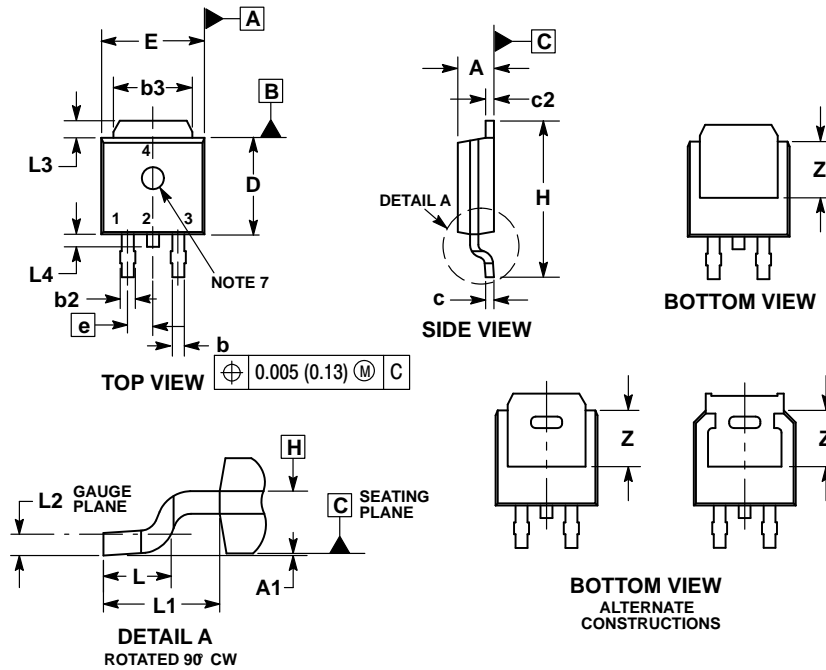
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*NVD and SVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

# NTD5806N, NVD5806N

## PACKAGE DIMENSIONS

### DPAK (SINGLE GAUGE) CASE 369C ISSUE E



**NOTES:**

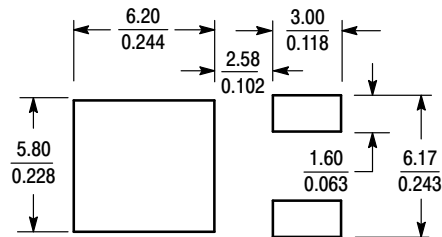
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.028	0.045	0.72	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090	BSC	2.29	BSC
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.114	REF	2.90	REF
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

**STYLE 2:**

1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

### SOLDERING FOOTPRINT\*



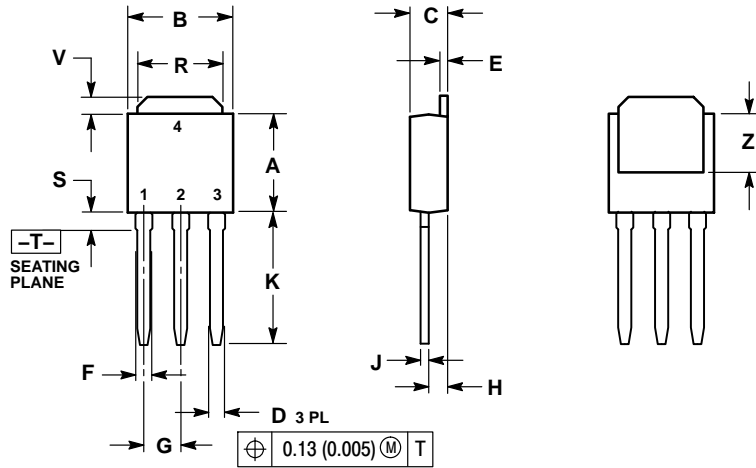
SCALE 3:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

# NTD5806N, NVD5806N

## PACKAGE DIMENSIONS

### IPAK CASE 369D ISSUE C



#### 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  
3: SOURCE  
4: DRAIN

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