

# NTD6N40

Preferred Device

## Power MOSFET 6 Amps, 400 Volts N-Channel DPAK

Designed for high voltage, high speed switching applications in power supplies, converters, power motor controls and bridge circuits.

### Features

- Higher Current Rating
- Lower  $R_{DS(on)}$
- Lower Capacitances
- Lower Total Gate Charge
- Tighter  $V_{SD}$  Specifications
- Avalanche Energy Specified
- Industry Standard DPAK Surface Mount Package

### Typical Applications

- Switch Mode Power Supplies
- PWM Motor Controls
- Converters
- Bridge Circuits

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

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	400	Vdc
Drain-Gate Voltage ( $R_{GS} = 1.0\text{ M}\Omega$ )	$V_{DGR}$	400	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$	Vdc
- Continuous	$V_{GSM}$	$\pm 40$	
- Non-Repetitive ( $t_p \leq 10\text{ ms}$ )			
Drain - Continuous	$I_D$	6.0	Adc
- Continuous @ $100^\circ\text{C}$	$I_D$	4.2	
- Single Pulse ( $t_p \leq 10\text{ }\mu\text{s}$ )	$I_{DM}$	21	
Total Power Dissipation	$P_D$	96	Watts
Derate above $25^\circ\text{C}$		0.77	W/ $^\circ\text{C}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ when mounted with the minimum recommended pad size		1.75	W/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Single Drain-to-Source Avalanche Energy - Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 100\text{ Vdc}$ , $V_{GS} = 10\text{ Vdc}$ , $I_L = 6\text{ A}$ , $L = 10\text{ mH}$ , $R_G = 25\text{ }\Omega$ )	$E_{AS}$	180	mJ
Thermal Resistance			$^\circ\text{C}/\text{W}$
- Junction-to-Case	$R_{\theta JC}$	1.30	
- Junction-to-Ambient	$R_{\theta JA}$	100	
- Junction-to-Ambient (Note 1.)	$R_{\theta JA}$	71.4	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

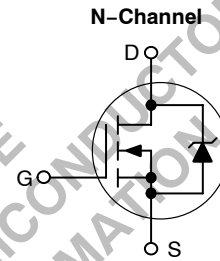
1. When surface mounted to an FR4 board using the minimum recommended pad size.



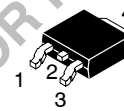
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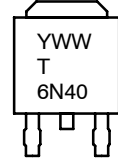
**6 AMPERES**  
**400 VOLTS**  
 $R_{DS(on)} = 1.1\text{ }\Omega$



### MARKING DIAGRAMS

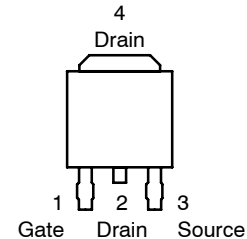


**CASE 369A**  
**DPAK**  
**STYLE 2**



Y = Year  
WW = Work Week  
T = MOSFET

### PIN ASSIGNMENT



### ORDERING INFORMATION

Device	Package	Shipping
NTD6N40	DPAK	75 Units/Rail
NTD6N40-1	DPAK	75 Units/Rail
NTD6N40T4	DPAK	2500 Tape & Reel

Preferred devices are recommended choices for future use and best overall value.

# NTD6N40

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

Characteristic	Symbol	Min	Typ	Max	Unit
Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 0.25 mAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	400	-	-	Vdc
		-	500	-	mV/°C
Zero Gate Voltage Collector Current (V <sub>DS</sub> = 400 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 400 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	-	-	10	μAdc
		-	-	100	
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0)	I <sub>GSS(f)</sub> I <sub>GSS(r)</sub>	-	-	100	nAdc
		-	-	100	

## ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage I <sub>D</sub> = 0.25 mA, V <sub>DS</sub> = V <sub>GS</sub> Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	2.0	2.7	4.0	Vdc
		-	6.0	-	mV/°C
Static Drain-to-Source On-Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 3 Adc)	R <sub>DS(on)</sub>	-	900	1100	mOhm
Drain-to-Source On-Voltage (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 6 Adc) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 3 Adc, T <sub>J</sub> = 125°C)	V <sub>DS(on)</sub>	-	-	7.9	Vdc
		-	-	6.9	
Forward Transconductance (V <sub>DS</sub> = 15 Vdc, I <sub>D</sub> = 3 Adc)	g <sub>FS</sub>	2.0	4.4	-	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>	-	515	720	pF
Output Capacitance		C <sub>OSS</sub>	-	185	260	
Transfer Capacitance		C <sub>FSS</sub>	-	15	30	

## SWITCHING CHARACTERISTICS (Note 2)

Turn-On Delay Time	(V <sub>DD</sub> = 200 Vdc, I <sub>D</sub> = 6 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 9.1 Ω)	t <sub>d(on)</sub>	-	7.0	10	ns
Rise Time		t <sub>r</sub>	-	11	20	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	19	40	
Fall Time		t <sub>f</sub>	-	10	20	
Gate Charge	(V <sub>DS</sub> = 320 Vdc, I <sub>D</sub> = 6 Adc, V <sub>GS</sub> = 10 Vdc)	Q <sub>T</sub>	-	9.5	19	nC
		Q <sub>1</sub>	-	2.0	-	
		Q <sub>2</sub>	-	3.0	-	
		Q <sub>3</sub>	-	6.0	-	

## SOURCE-DRAIN DIODE CHARACTERISTICS

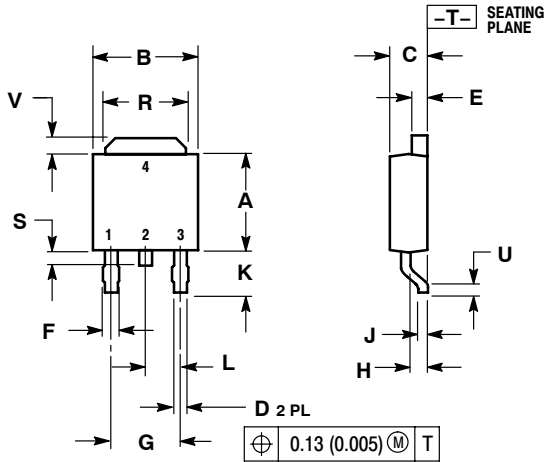
Forward On-Voltage (Note 1)	(I <sub>S</sub> = 6 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 6 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	-	0.9	1.0	Vdc
			-	0.8	-	
Reverse Recovery Time	(I <sub>S</sub> = 6 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs)	t <sub>rr</sub>	-	270	-	ns
		t <sub>a</sub>	-	110	-	
		t <sub>b</sub>	-	160	-	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	-	1.6	-	μC

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

# NTD6N40

## PACKAGE DIMENSIONS

DPAK  
CASE 369A-13  
ISSUE AA



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	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	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
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	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	---	0.51	---
V	0.080	0.050	0.77	1.27
Z	0.188	---	3.51	---

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

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