

# MOSFET - Power, Single N-Channel, STD Gate, TCPAK1012

80 V, 0.64 mΩ, 767 A

## Preliminary Document NTBYST0D6N08X

### Features

- Top-side Cooling Package for Superior Thermal Performance
- Low  $Q_{RR}$ , Soft Recovery Body Diode
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- ORing
- Power Supply Unit (PSU)
- Motor Drives
- Synchronous Rectifier

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

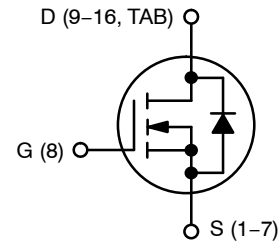
Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	80	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C = 25\text{ }^\circ\text{C}$	767
		$T_C = 100\text{ }^\circ\text{C}$	542
Power Dissipation	$P_D$	750	W
Pulsed Drain Current	$I_{DM}$ $I_{SM}$	$T_C = 25\text{ }^\circ\text{C}$	2443
		$t_p = 100\text{ }\mu\text{s}$	2443
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$
Continuous Source-Drain Current (Body Diode)	$I_S$	932	A
Single Pulse Avalanche Energy ( $I_{PK} = 177\text{ A}$ )	$E_{AS}$	1566	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds)	$T_L$	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.

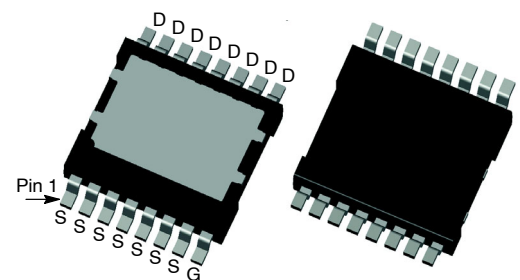
1. Surface-mounted on FR4 board using a 1 in<sup>2</sup>, 1 oz. Cu pad
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
3.  $E_{AS}$  is based on started  $T_J = 25\text{ }^\circ\text{C}$ , rated  $I_{AS}$ ,  $V_{DD} = 64\text{ V}$ ,  $V_{GS} = 10\text{ V}$ , 100% avalanche tested.

This Preliminary document is for informational purposes only. onsemi may update or withdraw it without notice. Content and referenced products are under development and subject to change.

$V_{(BR)DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
80 V	0.64 mΩ @ 10 V	767 A

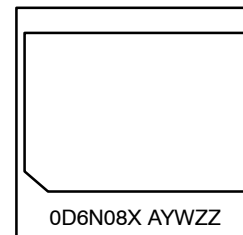


N-CHANNEL MOSFET



TCPAK1012  
(TopCool)  
CASE 762AA

### MARKING DIAGRAM



0D6N08X = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTBYST0D6N08XTXG	TCPAK1012	1500 / Tape & Reel

<sup>†</sup> For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

# NTBYST0D6N08X

## THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Top)	$R_{\theta JC}$	0.20	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	38	
Thermal Characterization Parameter, Junction-to-Source Lead (Pin 1-7)*	$\Psi_{JL}$	4.1	
Thermal Characterization Parameter, Junction-to-Drain Lead (Pin 9-16)*	$\Psi_{JL}$	3.2	

\* Low thermal conductivity test boards compliant with JEDEC Standard 51-3 for leaded surface-mount packages. 1s0p PCB board with a 1 in<sup>2</sup> copper plane, tested under natural convection conditions.

## ELECTRICAL CHARACTERISTICS ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)

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

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25\text{ }^\circ\text{C}$	80			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$ , Referenced to 25 °C		29		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 80\text{ V}, T_J = 25\text{ }^\circ\text{C}$			2.0	μA
		$V_{DS} = 80\text{ V}, T_J = 125\text{ }^\circ\text{C}$			250	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA

### ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 80\text{ A}, T_J = 25\text{ }^\circ\text{C}$		0.56	0.64	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 895\text{ } \mu\text{A}, T_J = 25\text{ }^\circ\text{C}$	2.4		3.6	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 895\text{ } \mu\text{A}$		-7		mV/°C
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 80\text{ A}$		200		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance (Note 4)	$C_{ISS}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	8200	16419	24628	pF	
Output Capacitance (Note 4)	$C_{OSS}$			4654	6981		
Reverse Transfer Capacitance (Note 4)	$C_{RSS}$			69	125		
Output Charge	$Q_{OSS}$	$V_{DD} = 40\text{ V}, I_D = 80\text{ A}, V_{GS} = 10\text{ V}$		333		nC	
Total Gate Charge (Note 4)	$Q_{G(TOT)}$			228	342		
Threshold Gate Charge	$Q_{G(TH)}$			50			
Gate-to-Source Charge	$Q_{GS}$			73			
Gate-to-Drain Charge (Note 4)	$Q_{GD}$			35	63		
Gate Plateau Voltage	$V_{GP}$			4.5			V
Gate Resistance (Note 4)	$R_G$		$f = 1\text{ MHz}$	0.32	0.79		1.3

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 0/10\text{ V}$ , $V_{DD} = 40\text{ V}, I_D = 80\text{ A}$ , $R_G = 2.5\text{ } \Omega$		57		ns
Rise Time	$t_r$			17		
Turn-Off Delay Time	$t_{d(OFF)}$			92		
Fall Time	$t_f$			15		

### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$I_S = 80\text{ A}, V_{GS} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$		0.78	1.2	V
		$I_S = 80\text{ A}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		0.61		

# NTBYST0D6N08X

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>SOURCE-TO-DRAIN DIODE CHARACTERISTICS</b>						
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 80 A, di/dt = 1000 A/μs, V <sub>DD</sub> = 40 V		57		ns
Charge Time	t <sub>a</sub>			30		
Discharge Time	t <sub>b</sub>			27		
Reverse Recovery Charge	Q <sub>RR</sub>			740		nC

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.

4. Defined by design, not subject to production test.

# NTBYST0D6N08X

## TYPICAL CHARACTERISTICS

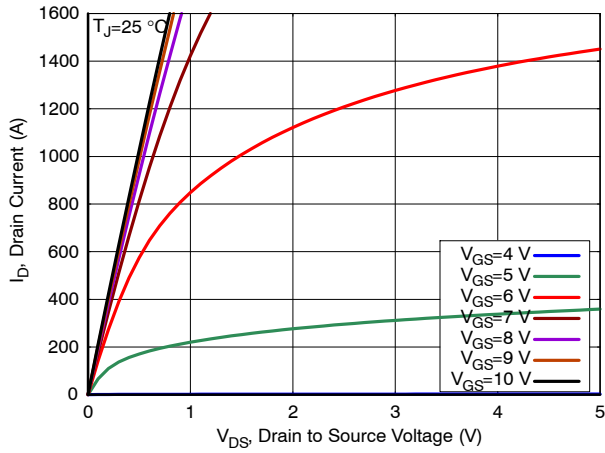


Figure 1. On-Region Characteristics

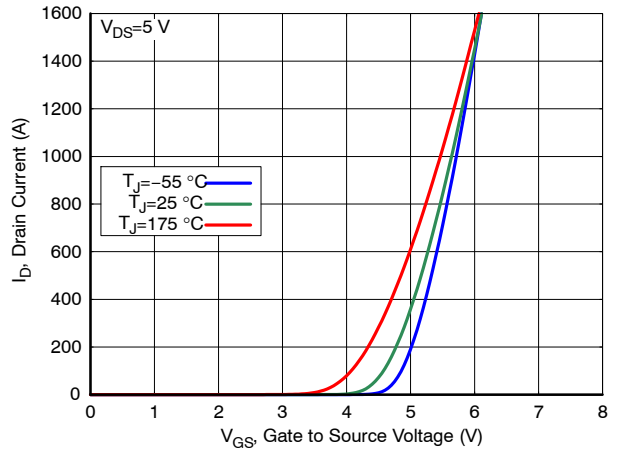


Figure 2. Transfer Characteristics

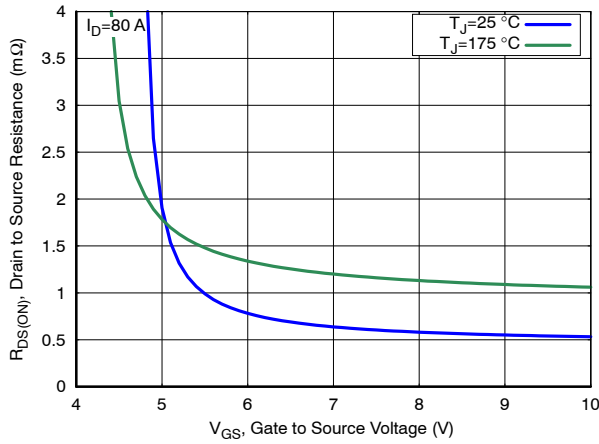


Figure 3. On-Resistance vs. Gate Voltage

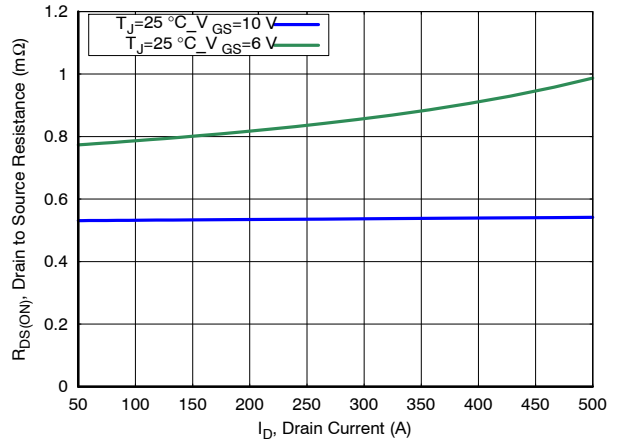


Figure 4. On-Resistance vs. Drain Current

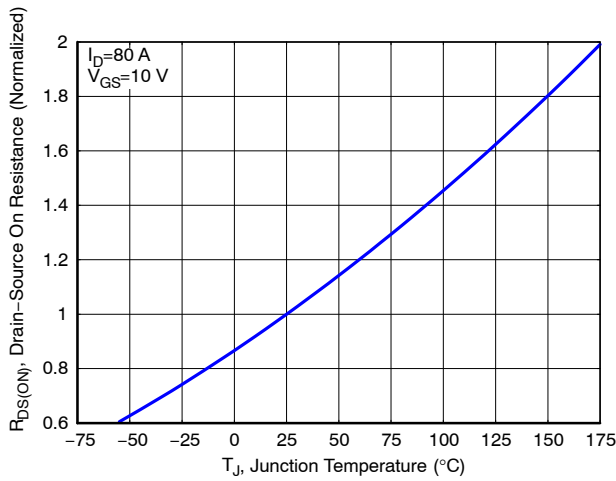


Figure 5. Normalized ON Resistance vs. Junction Temperature

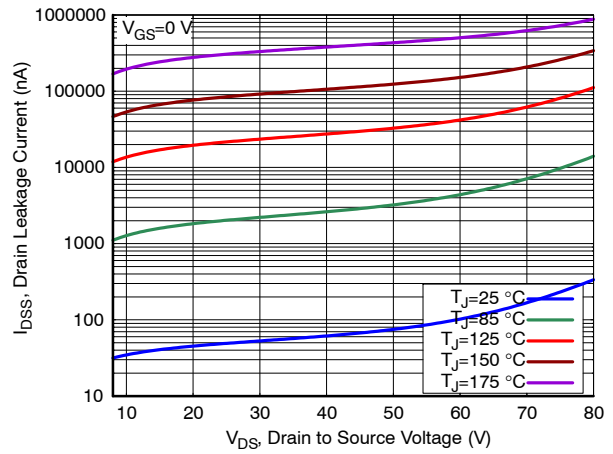


Figure 6. Drain Leakage Current vs. Drain Voltage

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## TYPICAL CHARACTERISTICS

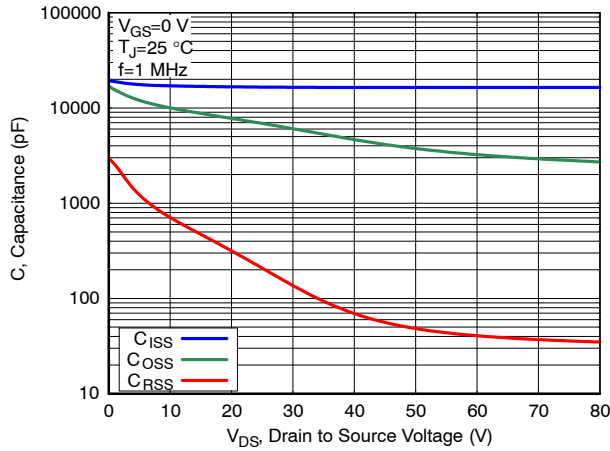


Figure 7. Capacitance Characteristics

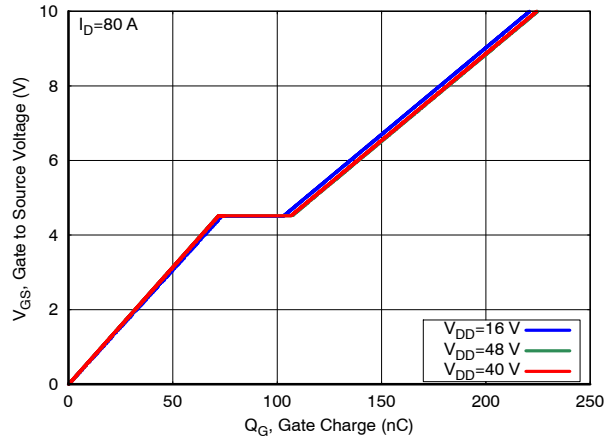


Figure 8. Gate Charge Characteristics

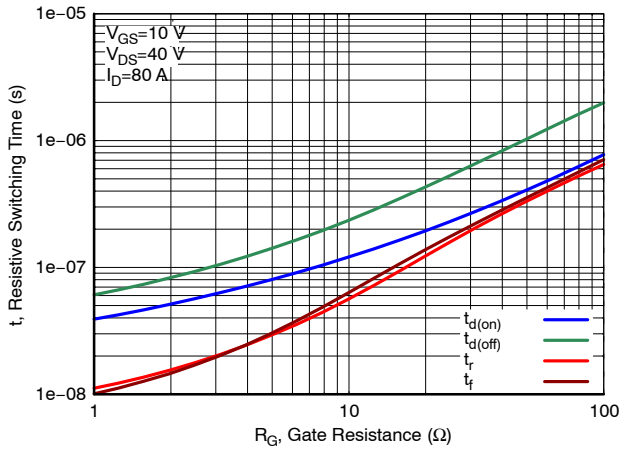


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

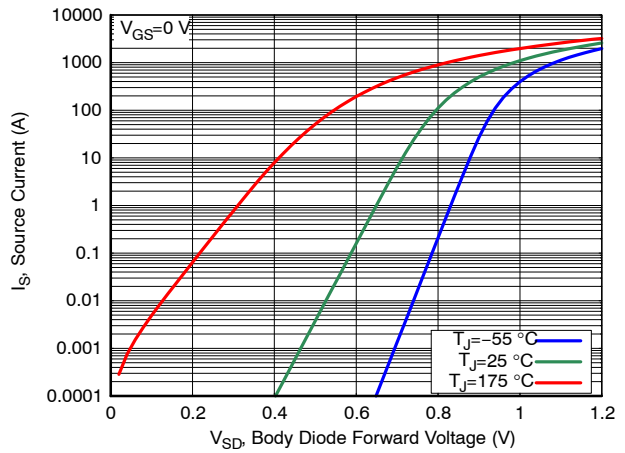


Figure 10. Diode Forward Characteristics

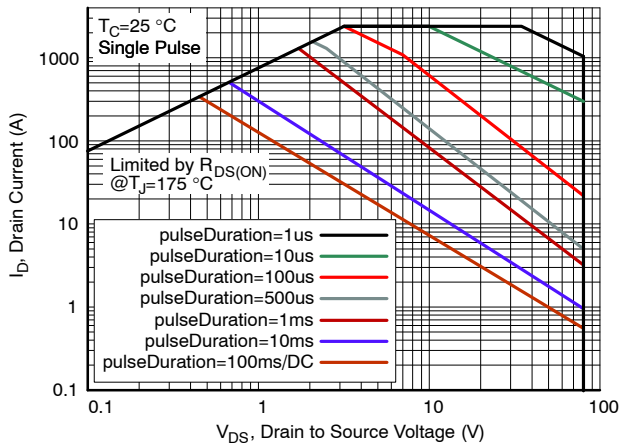


Figure 11. Safe Operating Area (SOA)

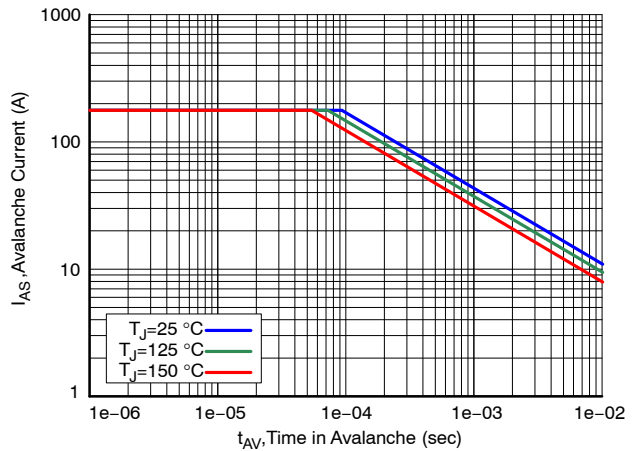


Figure 12. Avalanche Current vs. Pulse Time (UIS)

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## TYPICAL CHARACTERISTICS

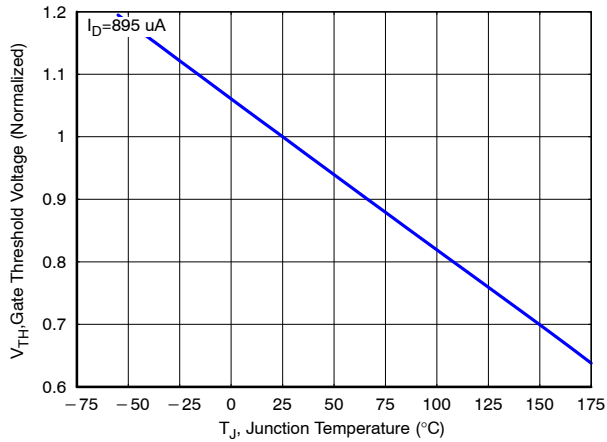


Figure 13. Gate Threshold Voltage vs Junction Temperature

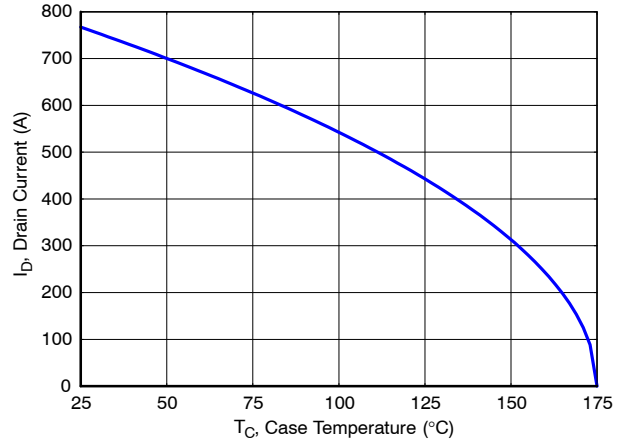


Figure 14. Maximum Current vs. Case Temperature

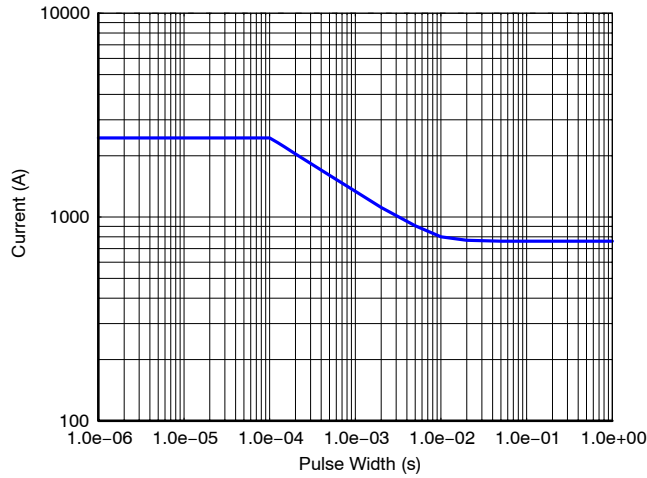


Figure 15. IDM vs. Pulse Width

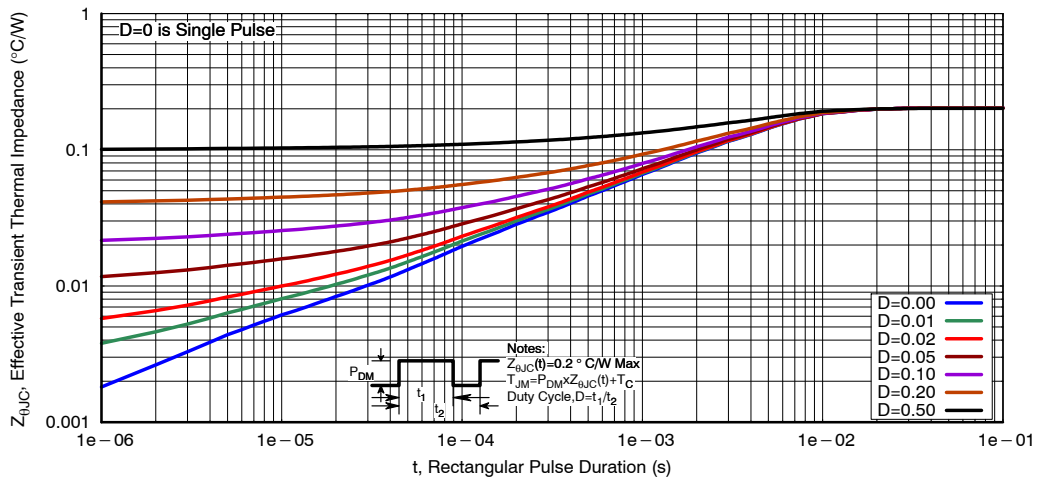


Figure 16. Transient Thermal Response

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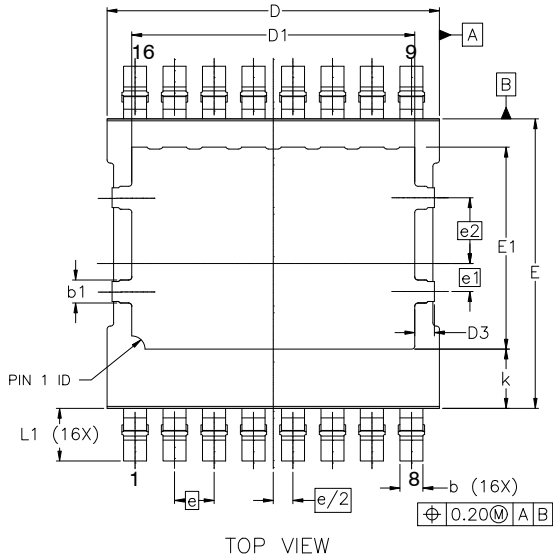
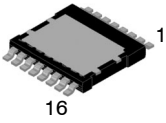
## REVISION HISTORY

Revision	Description of Changes	Date
P0	Initial Preliminary document release.	5/28/2026

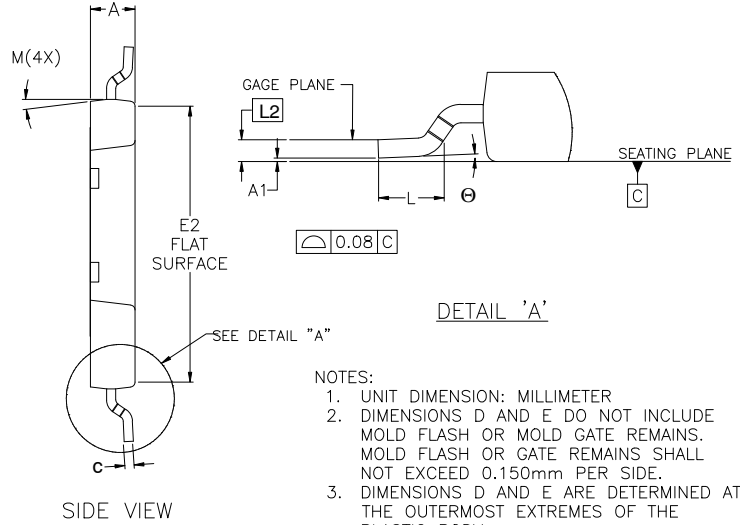
# NTBYST0D6N08X

## PACKAGE DIMENSIONS

TCPAK16 8.80x10.10, 1.20P (TCPAK1012)  
CASE 762AA  
ISSUE E



TOP VIEW

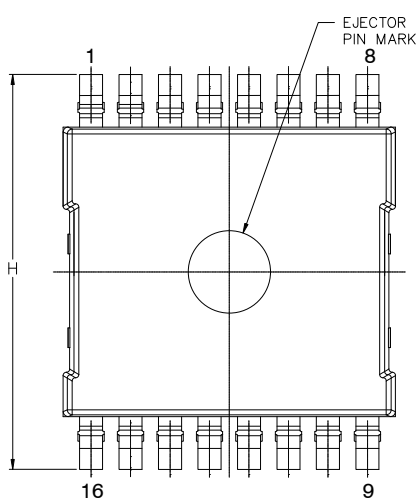


SIDE VIEW

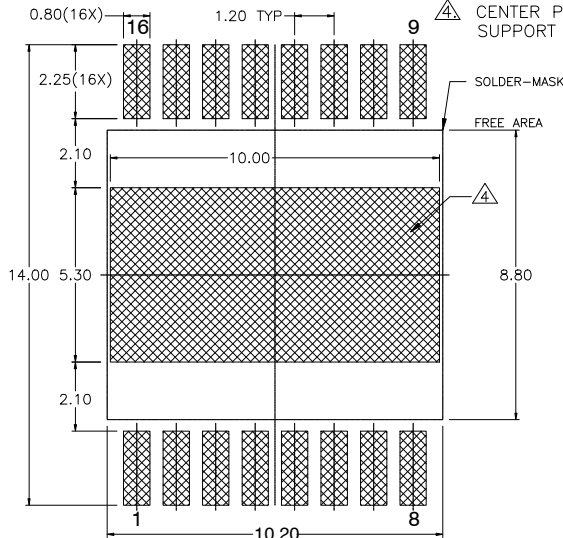
DETAIL 'A'

NOTES:

1. UNIT DIMENSION: MILLIMETER
  2. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR MOLD GATE REMAINS. MOLD FLASH OR GATE REMAINS SHALL NOT EXCEED 0.150mm PER SIDE.
  3. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- ▲ CENTER PAD IS FOR PKG MECHANICAL SUPPORT ONLY. NO SOLDERING REQUIRED.



BOTTOM VIEW



LAND PATTERN RECOMMENDATION

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

MILLIMETERS			
DIM	MIN	NOM	MAX
A	1.30	1.35	1.40
A1	0.00	0.05	0.10
b	0.67	0.72	0.77
b1	0.65	0.70	0.75
c	0.21	0.26	0.31
D	10.00	10.10	10.20
D1	8.50	8.60	8.70
D3	0.55	0.60	0.75
E	8.70	8.80	8.90
E1	6.04	6.14	6.24
E2	---	---	8.70
e	1.20 BSC		
e/2	0.60 BSC		
e1	0.85 BSC		
e2	2.00 BSC		
k	1.70	1.80	1.90
H	11.80	12.00	12.20
L	0.80	1.00	1.20
L1	1.40	1.60	1.80
L2	0.30 BSC		
theta	-	2.5°	5°

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