

MOSFET – Power, Single N-Channel 40 V, 0.67 mΩ, 420 A



NTMTS0D7N04C

Features

- Small Footprint (8x8 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- Power 88 Package, Industry Standard
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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		V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	I_D	420
		$T_C = 100^\circ\text{C}$		297
Power Dissipation $R_{\theta JC}$ (Note 1)		$T_C = 25^\circ\text{C}$	P_D	205
		$T_C = 100^\circ\text{C}$		103
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	I_D	65
		$T_A = 100^\circ\text{C}$		46
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		$T_A = 25^\circ\text{C}$	P_D	4.9
		$T_A = 100^\circ\text{C}$		2.5
Pulsed Drain Current	$T_A = 25^\circ\text{C}$, $t_p = 10\ \mu\text{s}$	I_{DM}	900	A
Operating Junction and Storage Temperature Range		T_J , T_{Stg}	-55 to +175	°C
Source Current (Body Diode)		I_S	171	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 40\ \text{A}$)		E_{AS}	1446	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	°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

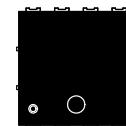
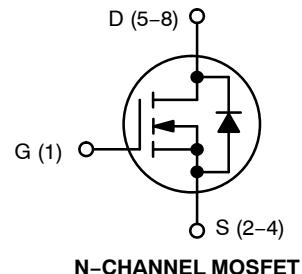
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	0.73	°C/W
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	30.4	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

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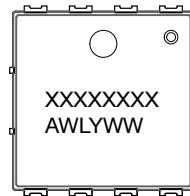
www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
40 V	0.67 mΩ @ 10 V	420 A



DFNW8
TX SUFFIX
CASE 507AP

MARKING DIAGRAM



XXX = Device Code
(8 A–N characters max)
A = Assembly Location
WL = 2-digit Wafer Lot Code
Y = Year Code
WW = Work Week Code

ORDERING INFORMATION

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

NTMTS0D7N04C

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$		40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$				20		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 40 \text{ V}$	$T_J = 25^\circ\text{C}$		10		μA
			$T_J = 125^\circ\text{C}$			250	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = 20 \text{ V}$				100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_D = 250 \mu\text{A}$		2.0		4.0	V
Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})}/T_J$				-8.5		$\text{mV}/^\circ\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$	$I_D = 50 \text{ A}$		0.57	0.67	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 5 \text{ V}, I_D = 50 \text{ A}$			200		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}, f = 1 \text{ MHz}, V_{\text{DS}} = 25 \text{ V}$		9230		pF
Output Capacitance	C_{oss}			4730		
Reverse Transfer Capacitance	C_{rss}			126		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 20 \text{ V}; I_D = 50 \text{ A}$		140		nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			22.7		
Gate-to-Source Charge	Q_{GS}			37		
Gate-to-Drain Charge	Q_{GD}			28.3		
Plateau Voltage	V_{GP}			4.28		V

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 20 \text{ V}, I_D = 50 \text{ A}, R_{\text{G}} = 6 \Omega$		28.9		ns
Rise Time	t_r			18.1		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			61.0		
Fall Time	t_f			20.4		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = 0 \text{ V}, I_S = 50 \text{ A}$	$T_J = 25^\circ\text{C}$		0.77	1.2	V
			$T_J = 125^\circ\text{C}$		0.65		
Reverse Recovery Time	t_{RR}	$V_{\text{GS}} = 0 \text{ V}, dI_S/dt = 100 \text{ A}/\mu\text{s}, I_S = 50 \text{ A}$			83		ns
Charge Time	t_a				58		
Discharge Time	t_b				25		
Reverse Recovery Charge	Q_{RR}				191		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. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

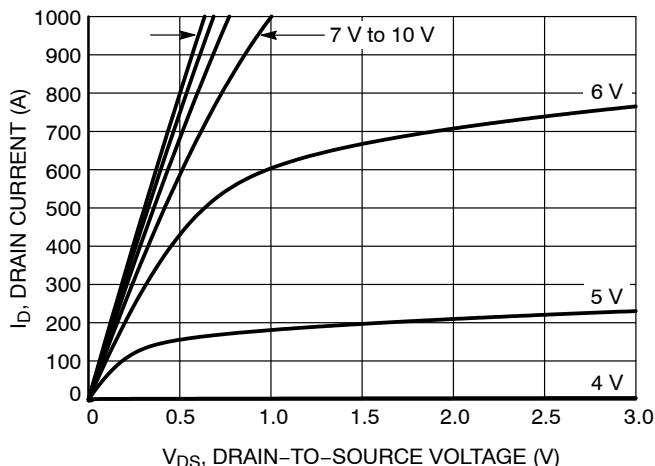


Figure 1. On-Region Characteristics

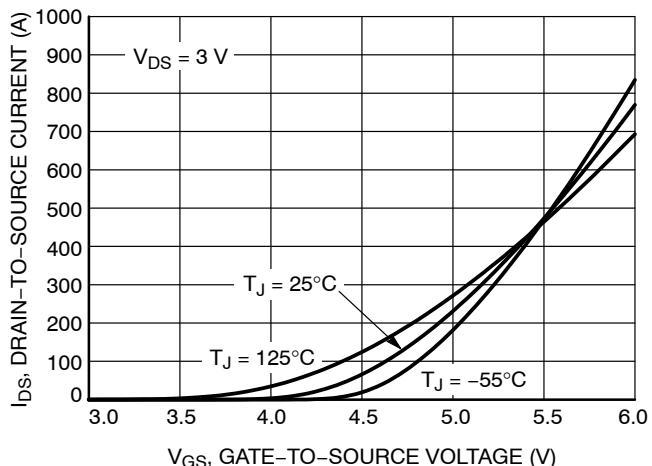


Figure 2. Transfer Characteristics

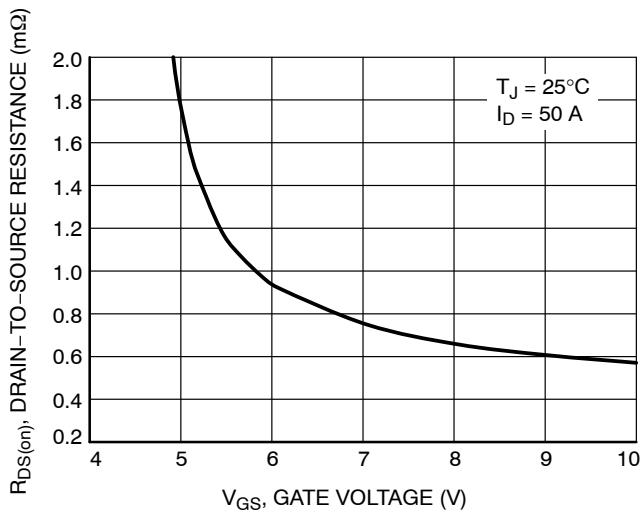


Figure 3. On-Resistance vs. Gate-to-Source Voltage

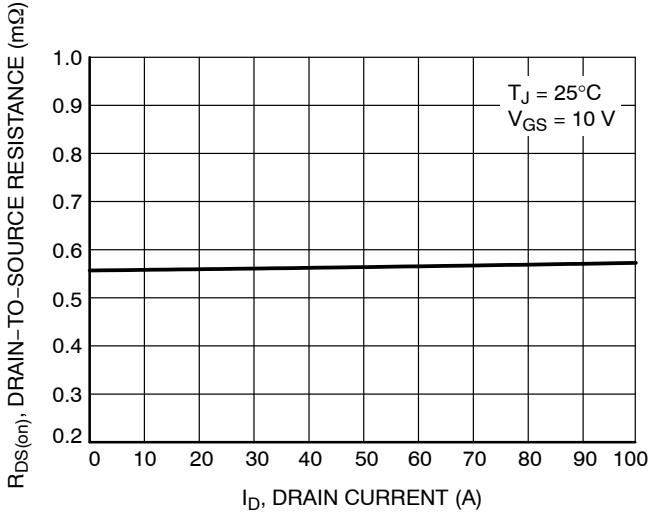


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

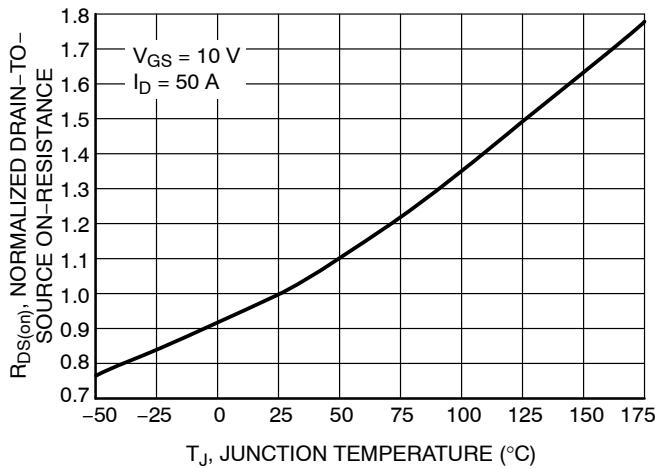


Figure 5. On-Resistance Variation with Temperature

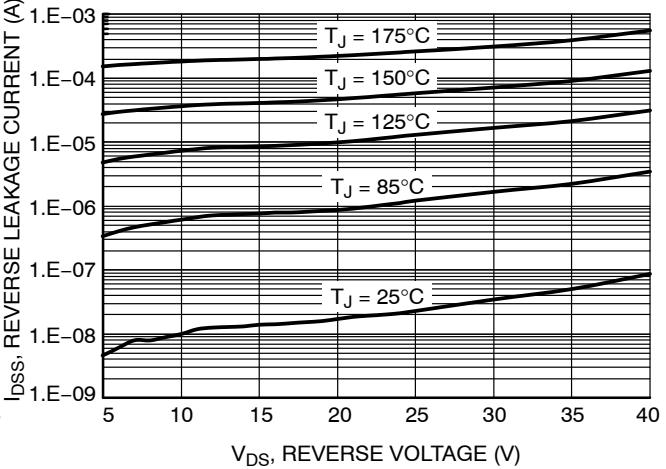


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

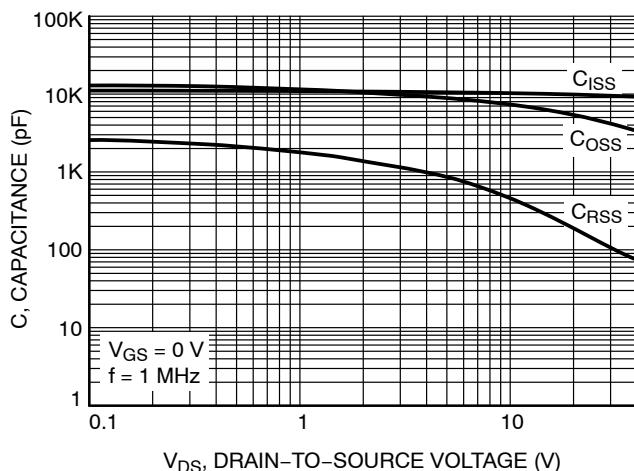


Figure 7. Capacitance Variation

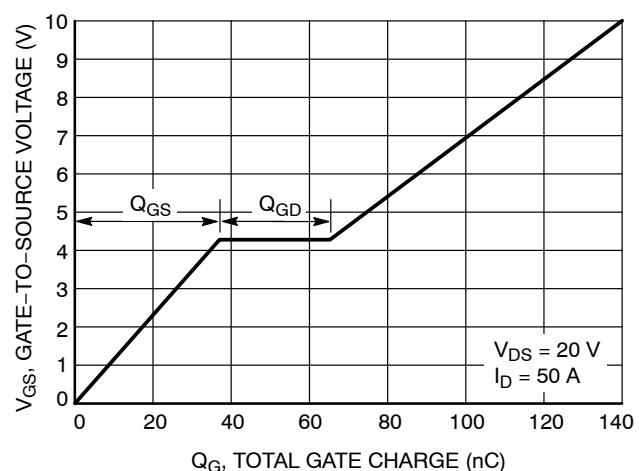


Figure 8. Gate-to-Source vs. Total Gate Charge

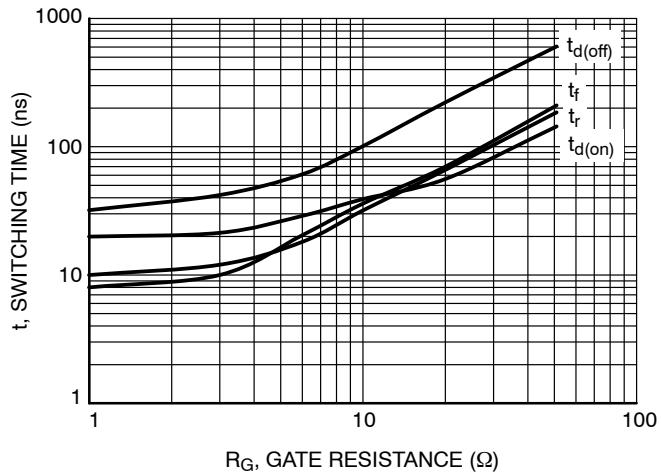


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

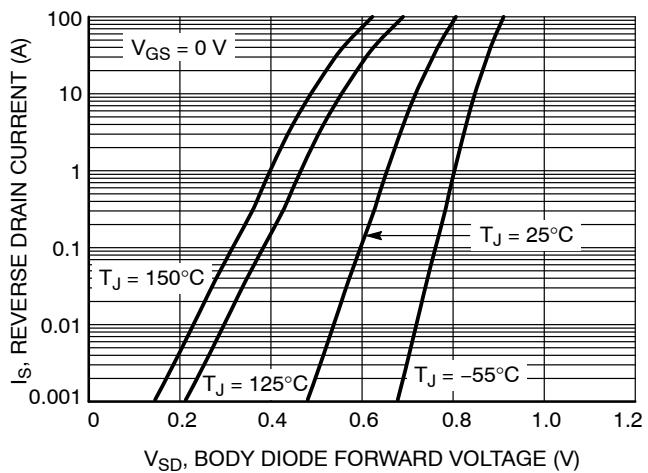


Figure 10. Diode Forward Voltage vs. Current

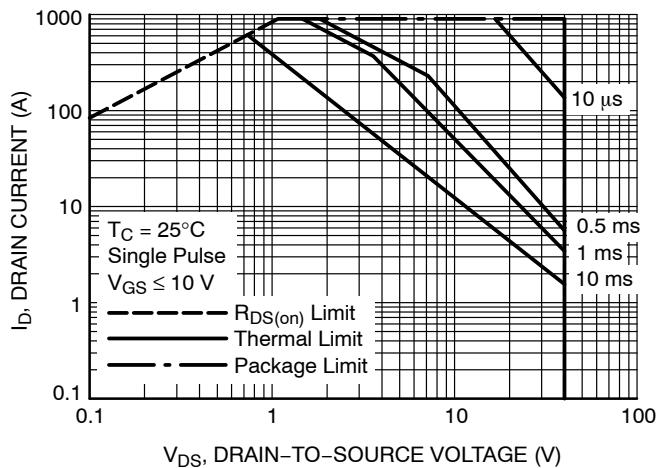
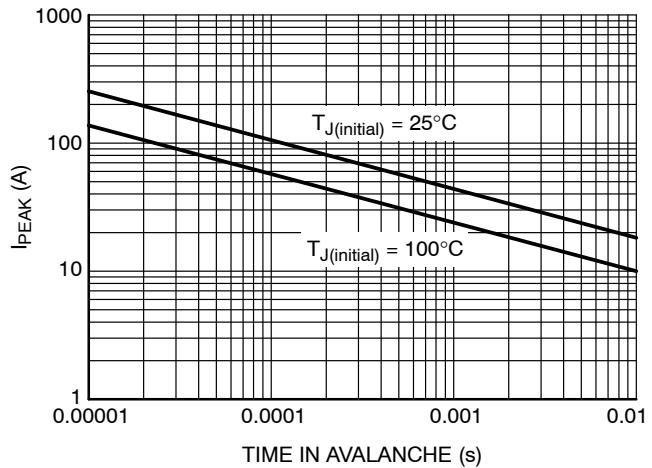


Figure 11. Maximum Rated Forward Biased Safe Operating Area

Figure 12. I_{PEAK} vs. Time in Avalanche

NTMTS0D7N04C

TYPICAL CHARACTERISTICS

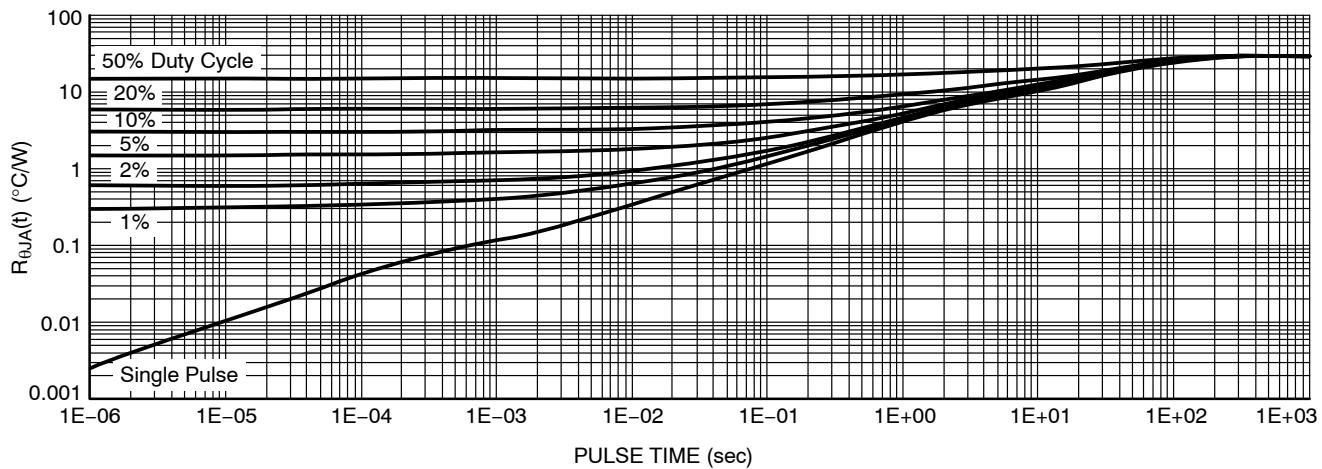


Figure 13. Thermal Characteristics – $R_{\theta JA}(t)$ ($^{\circ}\text{C}/\text{W}$)

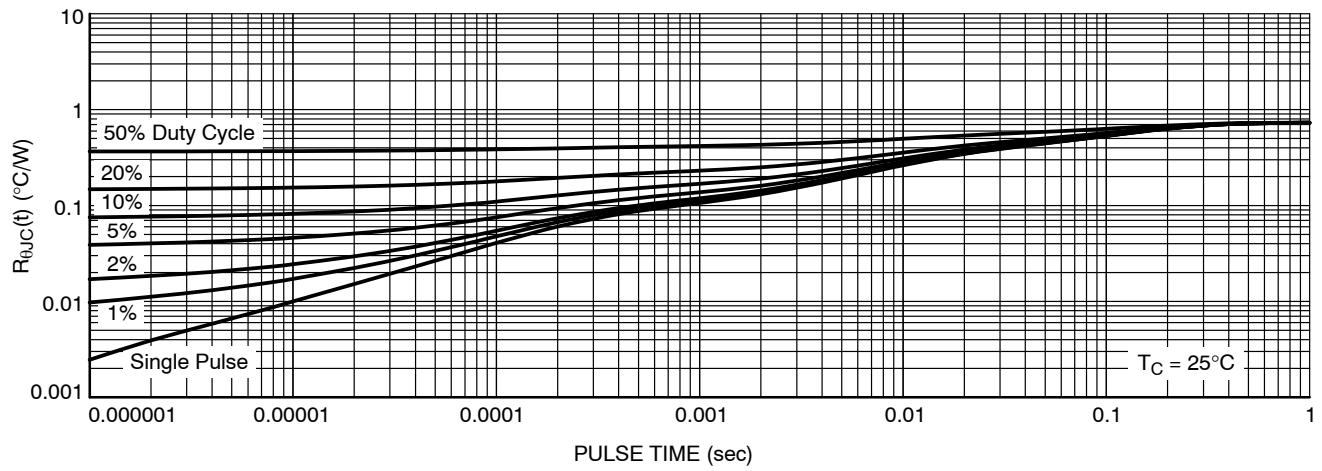
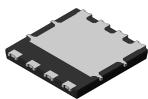


Figure 14. Thermal Characteristics – $R_{\theta JC}(t)$ ($^{\circ}\text{C}/\text{W}$)

DEVICE ORDERING INFORMATION

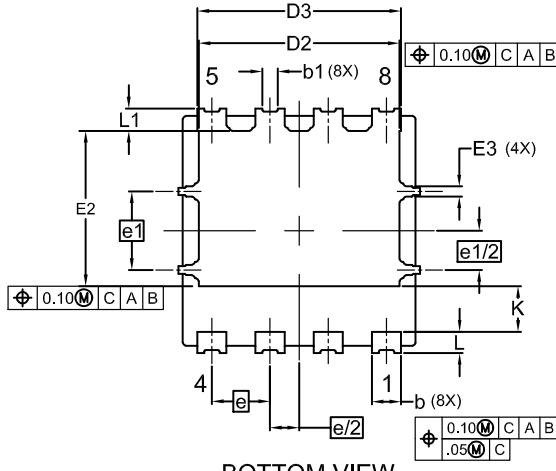
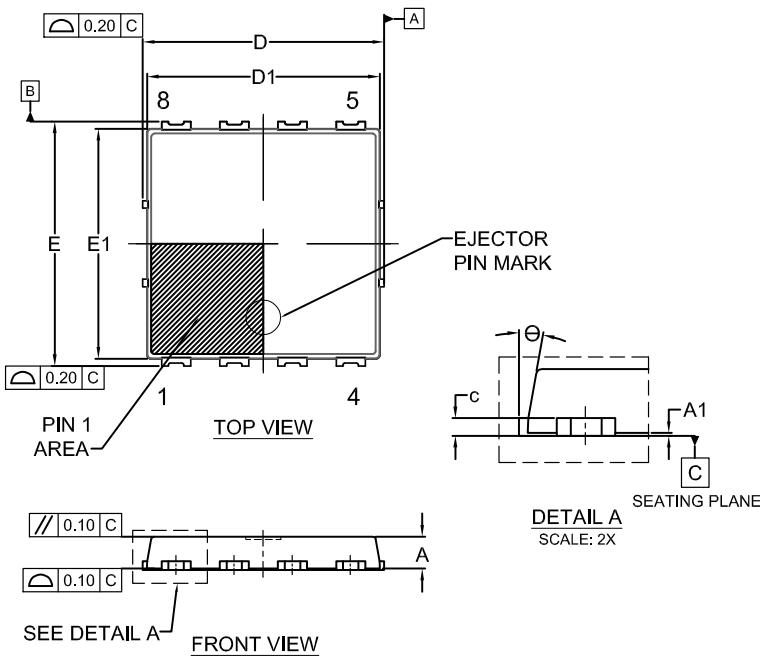
Device	Marking	Package	Shipping [†]
NTMTS0D7N04CTXG	0D7N04C	POWER 88 (Pb-Free)	3000 / Tape & Reel

[†]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.



TDFNW8 8.30x8.40x1.10, 2.00P
CASE 507AP
ISSUE E

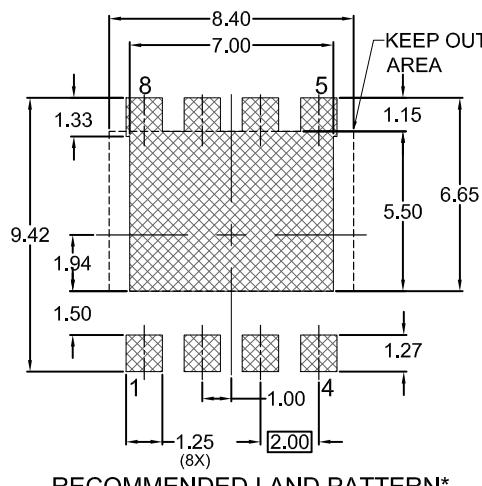
DATE 08 MAY 2024



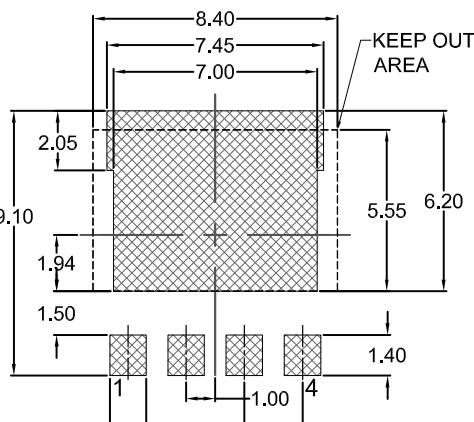
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS.

"A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.



RECOMMENDED LAND PATTERN*



UNIVERSAL LAND PATTERN*

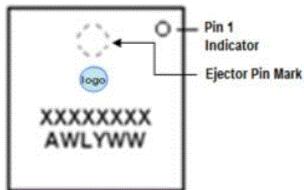
*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.00	1.10	1.20
A1	0.00	—	0.05
b	0.90	1.00	1.10
b1	0.35	0.45	0.55
c	0.23	0.28	0.33
D	8.20	8.30	8.40
D1	7.90	8.00	8.10
D2	6.80	6.90	7.00
D3	6.90	7.00	7.10
E	8.30	8.40	8.50
E1	7.80	7.90	8.00
E2	5.24	5.34	5.44
E3	0.25	0.35	0.45
e	2.00	BSC	
e/2	1.00	BSC	
e1	2.70	BSC	
e1/2	1.35	BSC	
K	1.50	1.57	1.70
L	0.64	0.74	0.84
L1	0.67	0.77	0.87
Θ	0°	—	12°

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**GENERIC
MARKING DIAGRAM***



XXXX = Specific Device Code

A = Assembly Location

WL = Wafer Lot Code

Y = Year Code

WW = Work Week Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

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