

# ON Semiconductor

## Is Now

The logo for onsemi, featuring the word "onsemi" in a dark teal, lowercase, sans-serif font. The letter "i" is stylized with a white dot and a teal vertical bar. A small orange triangle is positioned above the top right of the "i". A trademark symbol (TM) is located to the right of the logo.

To learn more about onsemi™, please visit our website at  
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# MOSFET – Power, Single N-Channel, TDFNW8 DUAL COOL® 150 V, 4.45 mΩ, 174 A



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

## NTMTSC4D3N15MC

### 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
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

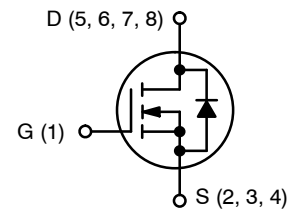
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter		Value	Unit	
$V_{DSS}$	Drain-to-Source Voltage		150	V	
$V_{GS}$	Gate-to-Source Voltage		$\pm 20$	V	
$I_D$	Continuous Drain Current $R_{\theta JC}$ (Note 2)	Steady State	$T_C = 25^\circ\text{C}$	174	A
$P_D$				Power Dissipation $R_{\theta JC}$ (Note 2)	293
$I_D$	Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^\circ\text{C}$	22	A
$P_D$				Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	5
$I_{DM}$	Pulsed Drain Current	$T_A = 25^\circ\text{C}$ , $t_p = 10 \mu\text{s}$	900	A	
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range		-55 to +175	$^\circ\text{C}$	
$I_S$	Source Current (Body Diode)		244	A	
$E_{AS}$	Single Pulse Drain-to-Source Avalanche Energy ( $I_L = 48.5 \text{ A}_{pk}$ , $L = 0.3 \text{ mH}$ )		354	mJ	
$T_L$	Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s)		260	$^\circ\text{C}$	

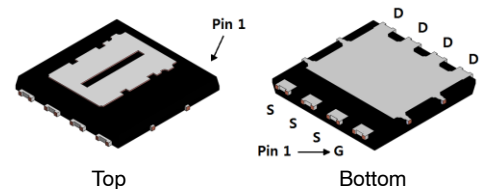
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad size, 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

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
150 V	4.45 mΩ @ 10 V	174 A
	5 mΩ @ 8 V	

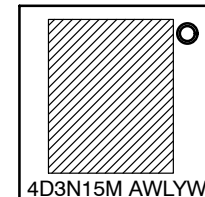


N-CHANNEL MOSFET



TDFNW8 8.3x8.4, 2P  
PQFN88  
CASE 507AS

### MARKING DIAGRAM



4D3N15M = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot Code  
Y = Year Code  
W = Work Week Code

### ORDERING INFORMATION

Device	Package	Shipping†
NTMTSC4D3N15MC	TDFNW8 (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.

# NTMTSC4D3N15MC

## THERMAL RESISTANCE RATINGS

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State (Note 2)	0.5	°C/W
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 2)	30	

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

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

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	150	–	–	V	
$V_{(BR)DSS} / T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$	–	49.84	–	$\text{mV}/^\circ\text{C}$	
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{ V}, V_{DS} = 120\text{ V}$	$T_J = 25^\circ\text{C}$	–	–	1	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$	–	–	10	$\mu\text{A}$
$I_{GSS}$	Gate-to-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	–	–	$\pm 100$	nA	

### ON CHARACTERISTICS (Note 3)

$V_{GS(TH)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 521\ \mu\text{A}$	2.5	3.6	4.5	V
$V_{GS(TH)} / T_J$	Negative Threshold Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$	–	–9.93	–	$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 95\text{ A}$	–	3.4	4.45	$\text{m}\Omega$
		$V_{GS} = 8\text{ V}, I_D = 47\text{ A}$	–	3.7	5	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 95\text{ A}$	–	177	–	S
$R_G$	Gate-Resistance	$T_A = 25^\circ\text{C}$	–	1.1	–	$\Omega$

### CHARGES & CAPACITANCES

$C_{ISS}$	Input Capacitance	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 75\text{ V}$	–	6514	–	$\text{pF}$
$C_{OSS}$	Output Capacitance		–	1750	–	
$C_{RSS}$	Reverse Transfer Capacitance		–	12.5	–	
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}, I_D = 95\text{ A}$	–	79	–	$\text{nC}$
$Q_{G(TH)}$	Threshold Gate Charge		–	21	–	
$Q_{GS}$	Gate-to-Source Charge		–	36	–	
$Q_{GD}$	Gate-to-Drain Charge		–	11	–	
$V_{GP}$	Plateau Voltage		–	5.8	–	
$Q_{OSS}$	Output Charge	$V_{GS} = 0\text{ V}, V_{DS} = 75\text{ V}$	–	225	–	$\text{nC}$

### SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 3)

$t_{d(ON)}$	Turn-On Delay Time	$V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}, I_D = 95\text{ A}, R_G = 6\ \Omega$	–	38	–	$\text{ns}$
$t_r$	Rise Time		–	11	–	
$t_{d(OFF)}$	Turn-Off Delay Time		–	48	–	
$t_f$	Fall Time		–	8	–	

### DRAIN-SOURCE DIODE CHARACTERISTICS

$V_{SD}$	Forward Diode Voltage	$V_{GS} = 0\text{ V}, I_S = 95\text{ A}$	$T_J = 25^\circ\text{C}$	–	0.86	1.2	V
			$T_J = 125^\circ\text{C}$	–	0.80	–	
$t_{RR}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 95\text{ A}$	–	85	–	$\text{ns}$	
$t_a$	Charge Time		–	58	–		
$t_b$	Discharge Time		–	38	–		
$Q_{RR}$	Reverse Recovery Charge		–	194	–		$\text{nC}$

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.

3. Switching characteristics are independent of operating junction temperatures

# NTMTSC4D3N15MC

## TYPICAL CHARACTERISTICS

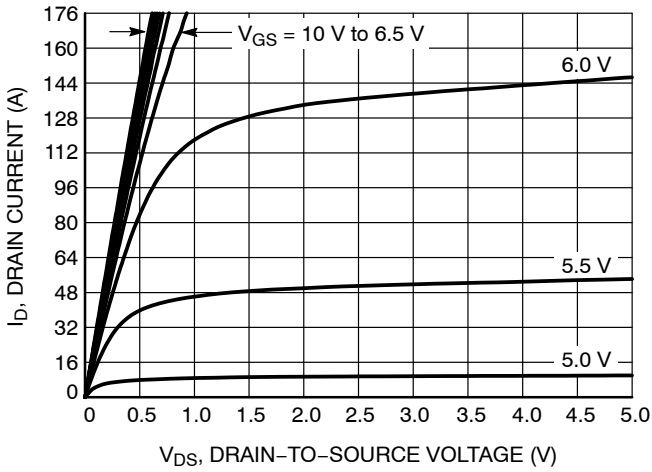


Figure 1. On-Region Characteristics

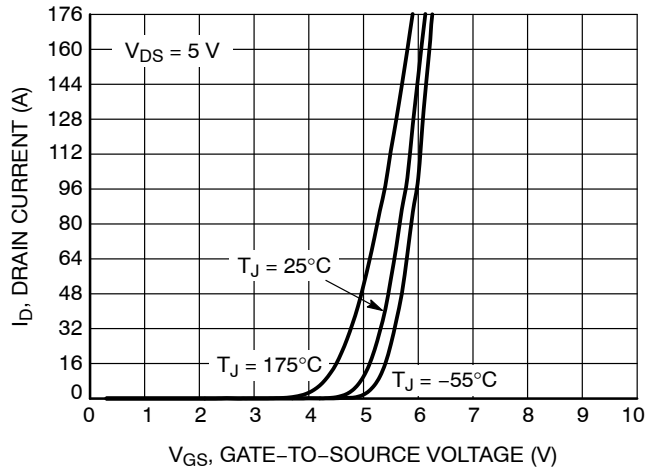


Figure 2. Transfer Characteristics

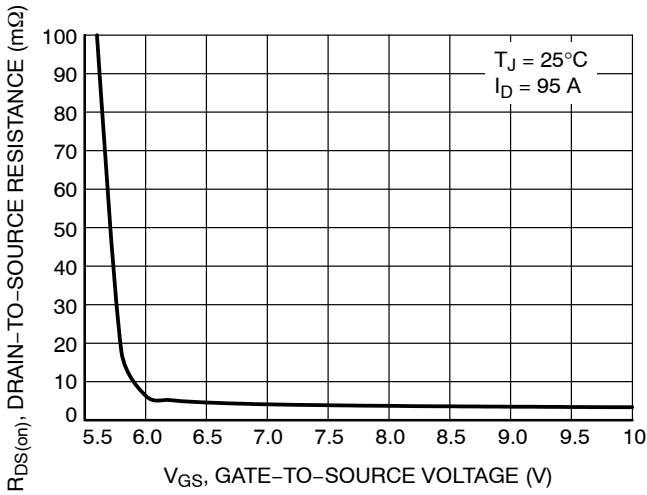


Figure 3. On-Resistance vs. Gate-to-Source Voltage

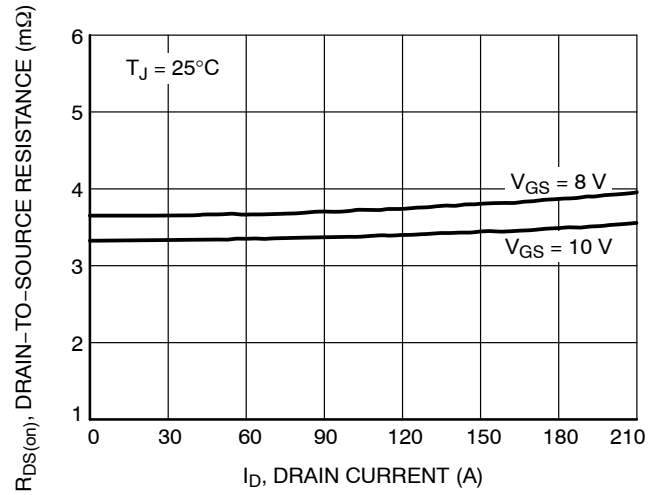


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

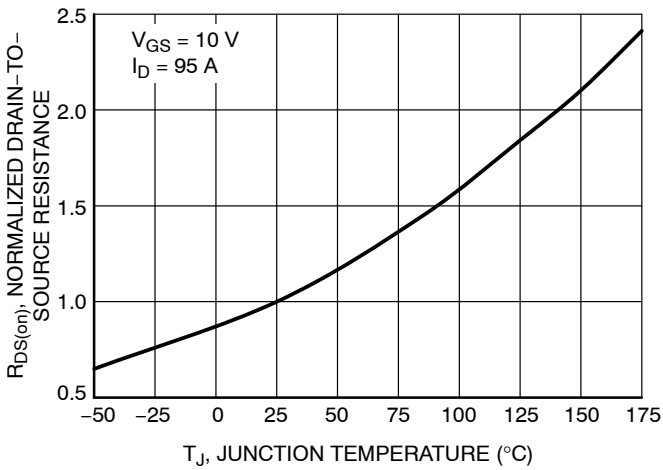


Figure 5. On-Resistance Variation with Temperature

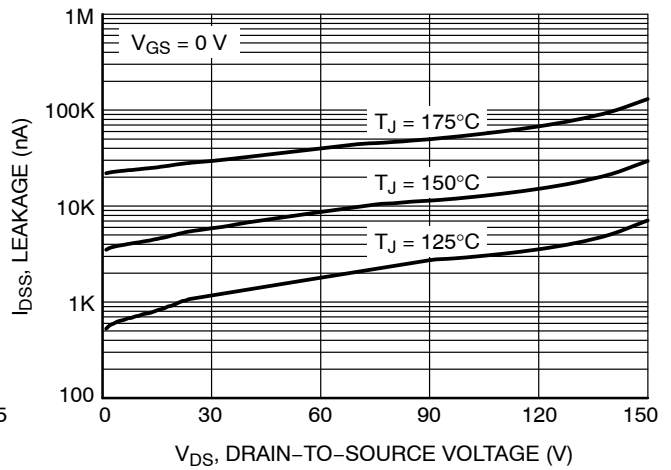


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTMTSC4D3N15MC

## TYPICAL CHARACTERISTICS

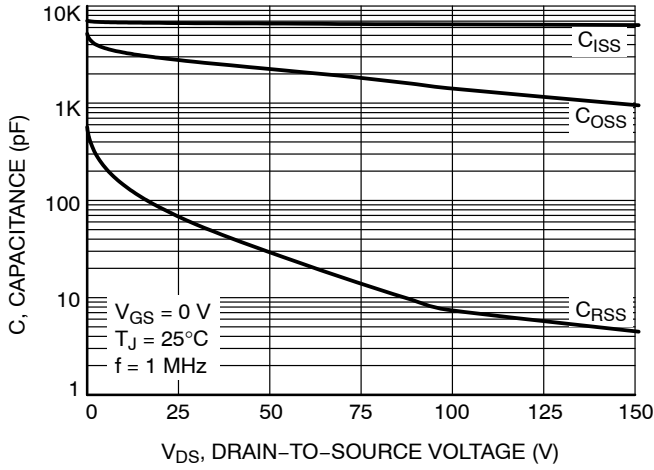


Figure 7. Capacitance Variation

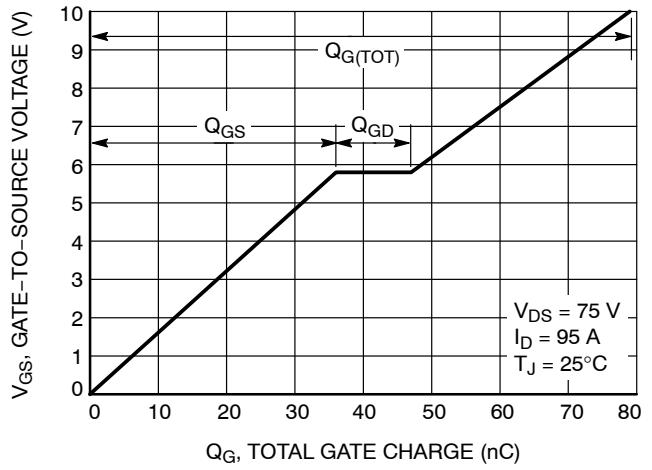


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

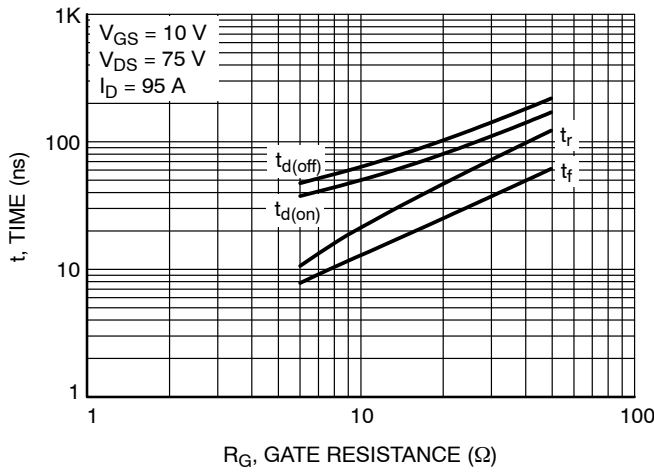


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

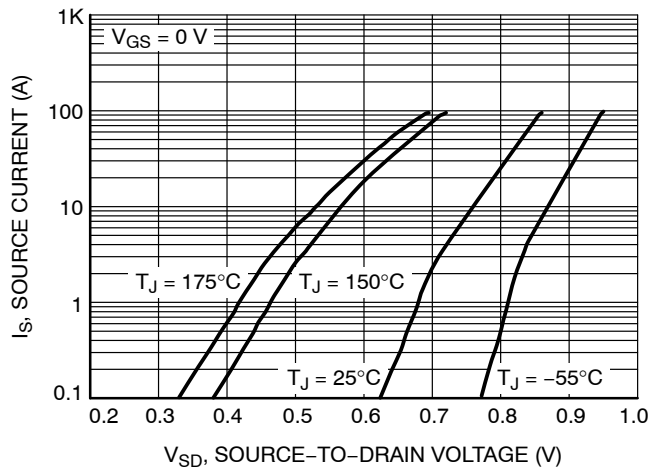


Figure 10. Diode Forward Voltage vs. Current

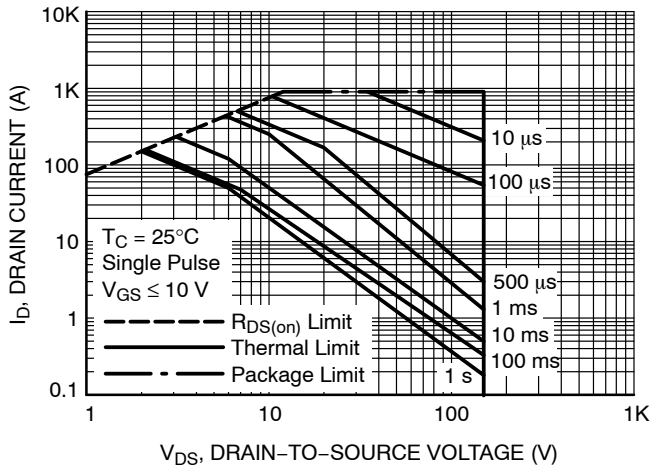


Figure 11. Safe Operating Area

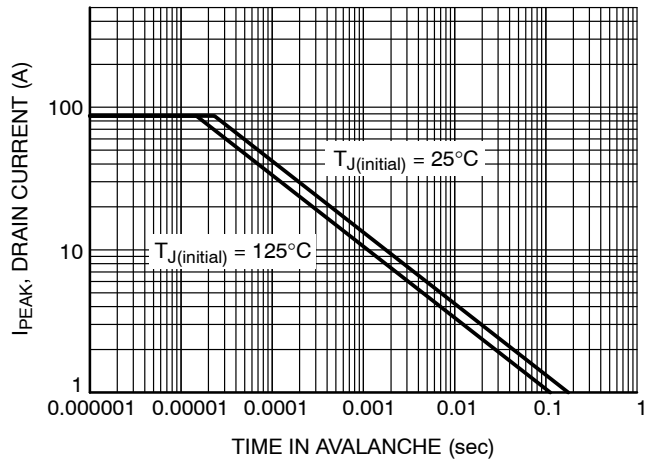


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NTMTSC4D3N15MC

## TYPICAL CHARACTERISTICS

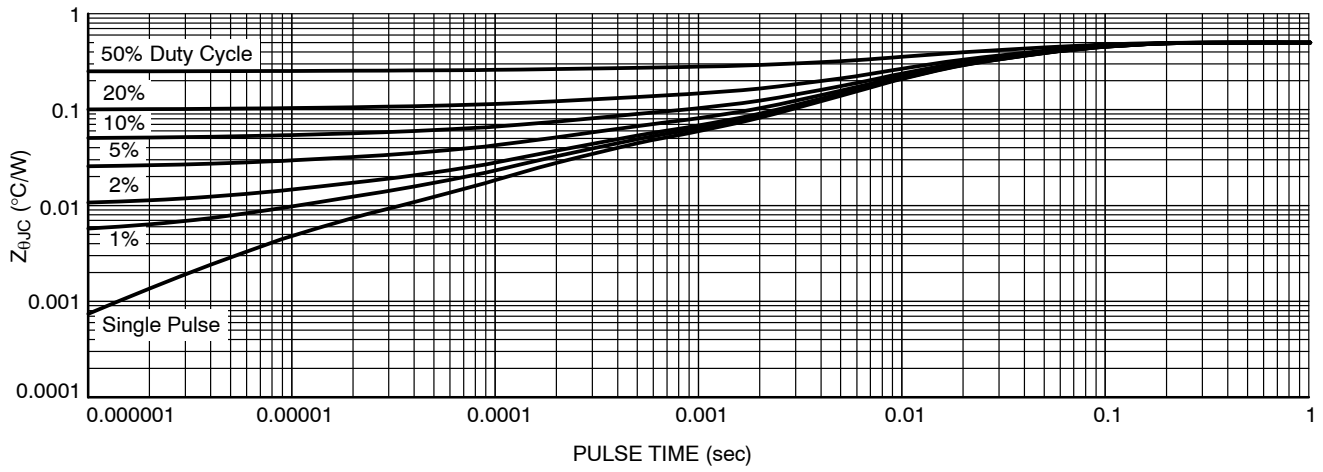
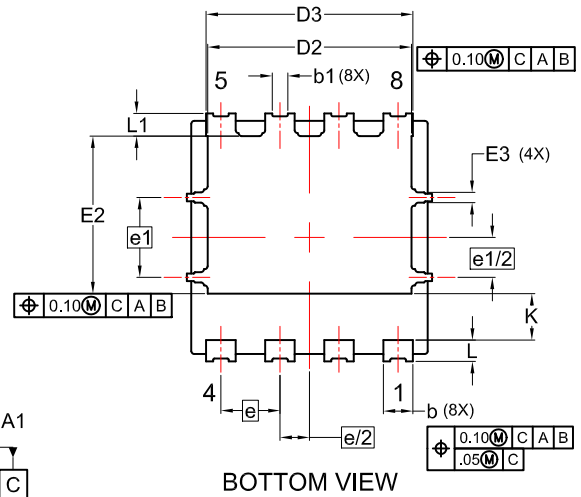
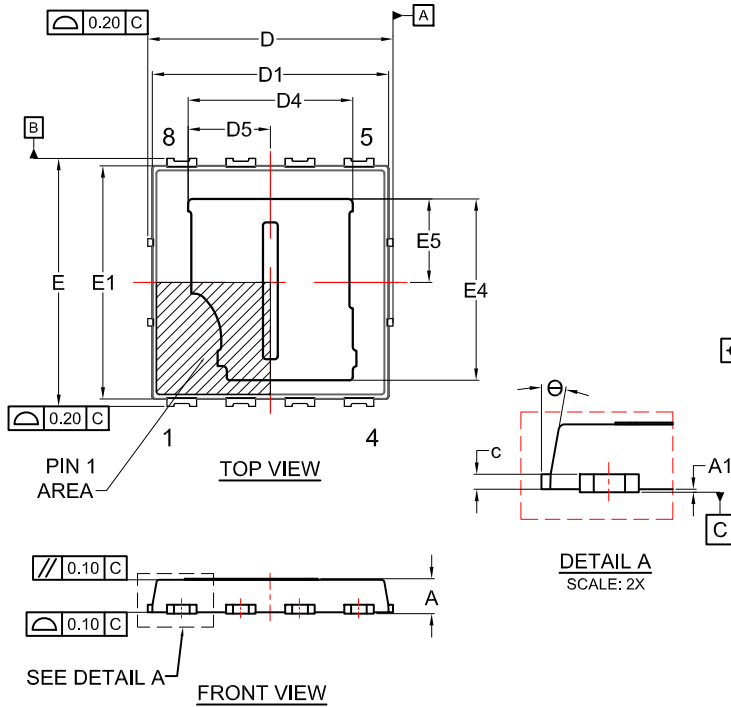


Figure 13. Thermal Characteristics

# NTMTSC4D3N15MC

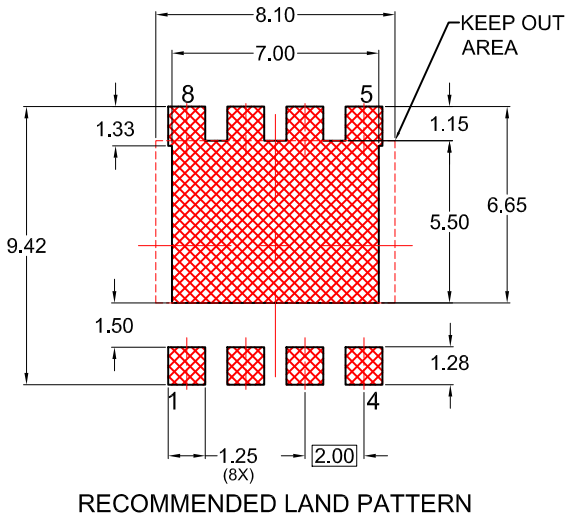
## PACKAGE DIMENSIONS

TDFNW8 8.3x8.4, 2P  
CASE 507AS  
ISSUE A




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.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.82	0.92	1.02
A1	0.00	---	0.05
b	0.90	1.00	1.10
b1	0.43	0.53	0.63
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
D4	5.47	5.57	5.67
D5	2.69	2.79	2.89
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
E4	6.03	6.13	6.23
E5	2.72	2.82	2.92
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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