

# MOSFET - Power, Single N-Channel, Logic Level, $\mu$ 8FL

## 80 V, 5.3 m $\Omega$ , 79 A

### NTTFS5D6N08XL

#### Features

- 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

#### Typical Applications

- Synchronous Rectification (SR) in DC-DC and AC-DC
- Primary Switch in Isolated DC-DC Converter
- Motor Drives

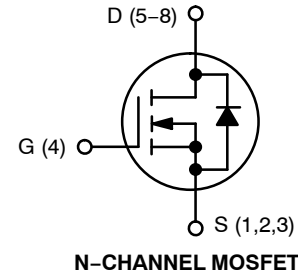
#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		$V_{DSS}$	80	V
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current (Notes 1, 2)	$T_C = 25^{\circ}\text{C}$	$I_D$	79	A
	$T_C = 100^{\circ}\text{C}$		56	
Power Dissipation (Note 1)	$T_C = 25^{\circ}\text{C}$	$P_D$	82	W
	$T_C = 100^{\circ}\text{C}$		41	
Pulsed Drain Current	$T_C = 25^{\circ}\text{C}$ , $t_p = 100\text{ }\mu\text{s}$	$I_{DM}$	290	A
Pulsed Source Current (Body Diode)		$I_{SM}$	290	
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 to +175	$^{\circ}\text{C}$
Source Current (Body Diode)		$I_S$	118	A
Single Pulse Avalanche Energy ( $I_{PK} = 34\text{ A}$ ) (Note 3)		$E_{AS}$	57	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^{\circ}\text{C}$

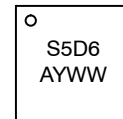
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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. Actual continuous current will be limited by thermal & electromechanical application board design.
3.  $E_{AS}$  of 57 mJ is based on  $T_J = 25^\circ\text{C}$ ;  $L = 0.1 \text{ mH}$ ,  $I_{AS} = 34 \text{ A}$ ,  $V_{DD} = 64 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ . 100% tested

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
80 V	5.3 m $\Omega$ @ 10 V	79 A
	7.7 m $\Omega$ @ 4.5 V	



#### MARKING DIAGRAM



S5D6 = Specific Device Code  
A = Assembly Location  
Y = Year Code  
WW = Work Week Code

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTTFS5D6N08XLTAG	WDFN8 ( $\mu$ 8FL)	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.

# NTTFS5D6N08XL

## THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.8	°C/W
Thermal Resistance, Junction-to-Ambient (Notes 4, 5)	$R_{\theta JA}$	46	

4. Surface-mounted on FR4 board using a 1 in<sup>2</sup>, 1 oz. Cu pad.

5.  $R_{\theta JA}$  is determined by the user's board design.

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

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

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	80			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$ . Referenced to $25^\circ\text{C}$		31		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 80\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 80\text{ V}, T_J = 125^\circ\text{C}$			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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 17\text{ A}$		4.3	5.3	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 14\text{ A}$		5.7	7.7	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 85\text{ }\mu\text{A}$	1.5		2.1	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 85\text{ }\mu\text{A}$		-6.4		mV/°C
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 17\text{ A}$		113		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}, f = 1\text{ MHz}$		1800		pF
Output Capacitance	$C_{OSS}$			450		
Reverse Transfer Capacitance	$C_{RSS}$			14		
Output Charge	$Q_{OSS}$			33		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 40\text{ V}; I_D = 17\text{ A}$		14		nC
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DD} = 40\text{ V}; I_D = 17\text{ A}$		28		
Threshold Gate Charge	$Q_{G(TH)}$			3		
Gate-to-Source Charge	$Q_{GS}$			5		
Gate-to-Drain Charge	$Q_{GD}$			4		
Gate Plateau Voltage	$V_{GP}$			2.7		V
Gate Resistance	$R_G$	$f = 1\text{ MHz}$		0.6		$\Omega$

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 0/10\text{ V}, V_{DD} = 40\text{ V},$ $I_D = 17\text{ A}, R_G = 2.5\text{ }\Omega$		10		ns
Rise Time	$t_r$			3		
Turn-Off Delay Time	$t_{d(OFF)}$			24		
Fall Time	$t_f$			3		

### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 17\text{ A}$		0.8	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 17\text{ A}, T_J = 125^\circ\text{C}$		0.7		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI/dt = 1000\text{ A}/\mu\text{s},$ $I_S = 17\text{ A}, V_{DD} = 40\text{ V}$		19		ns
Charge Time	$t_a$			11		
Discharge Time	$t_b$			8		
Reverse Recovery Charge	$Q_{RR}$			96		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.

TYPICAL CHARACTERISTICS

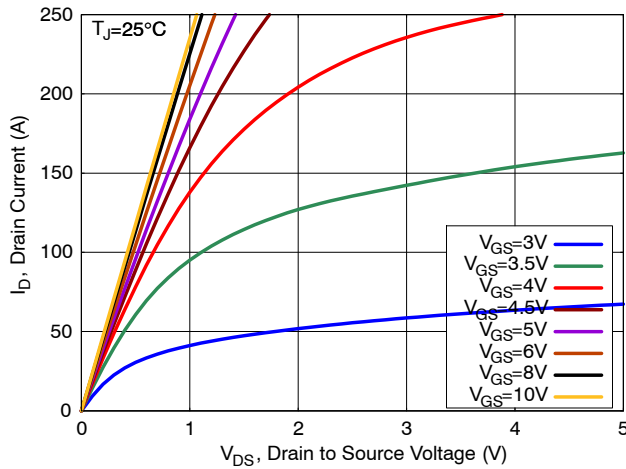


Figure 1. On-Region Characteristics

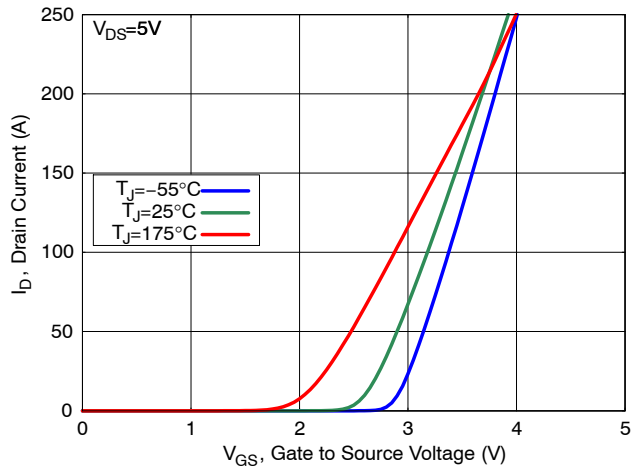


Figure 2. Transfer Characteristics

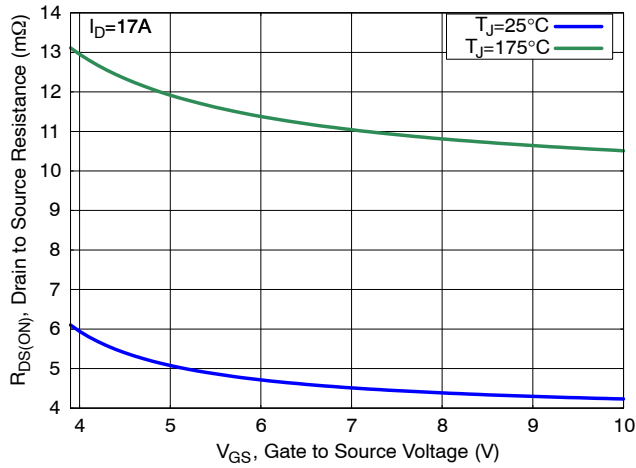


Figure 3. On-Resistance vs. Gate Voltage

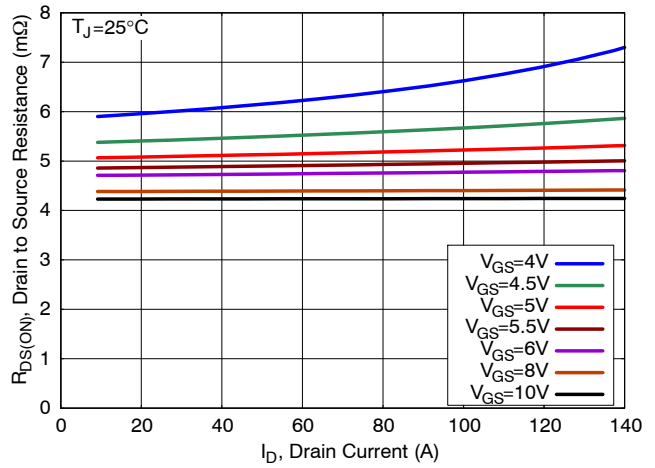


Figure 4. On-Resistance vs. Drain Current

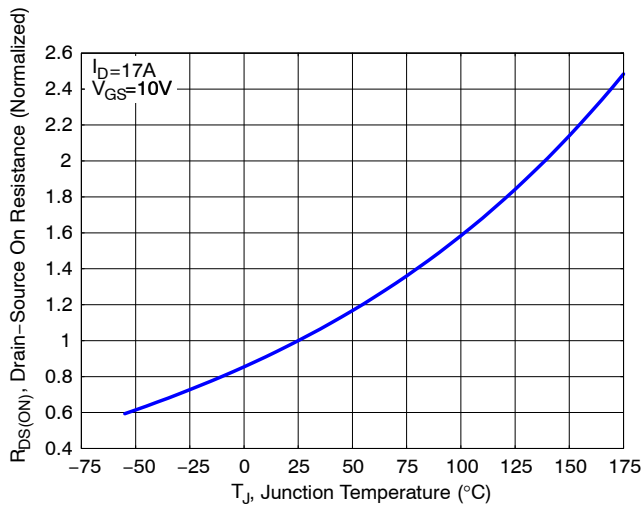


Figure 5. Normalized ON Resistance vs. Junction Temperature

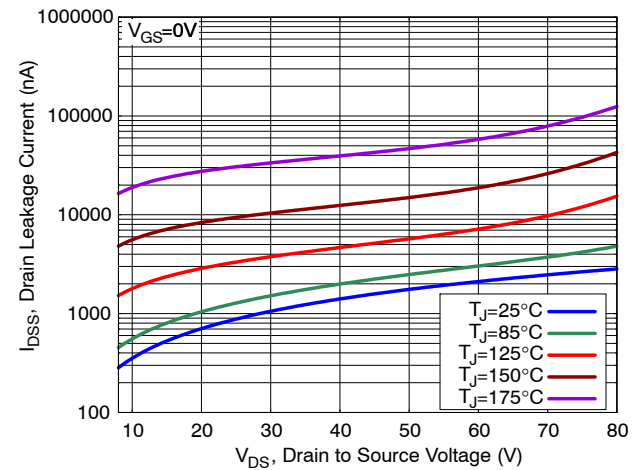


Figure 6. Drain Leakage Current vs. Drain Voltage

TYPICAL CHARACTERISTICS

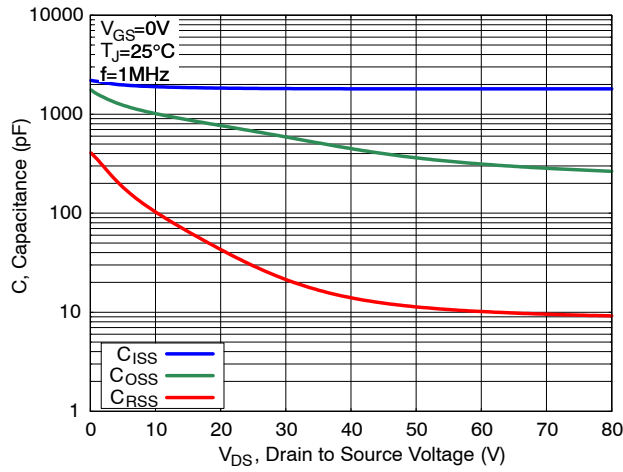


Figure 7. Capacitance Characteristics

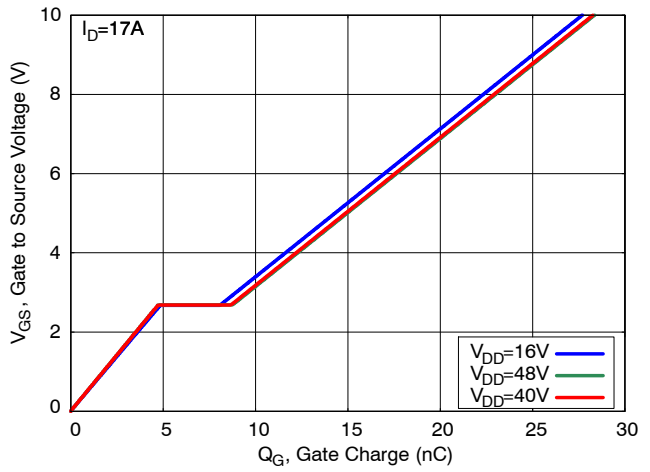


Figure 8. Gate Charge Characteristics

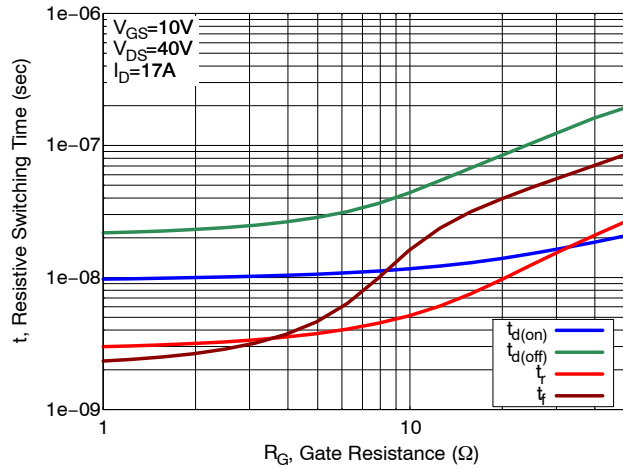


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

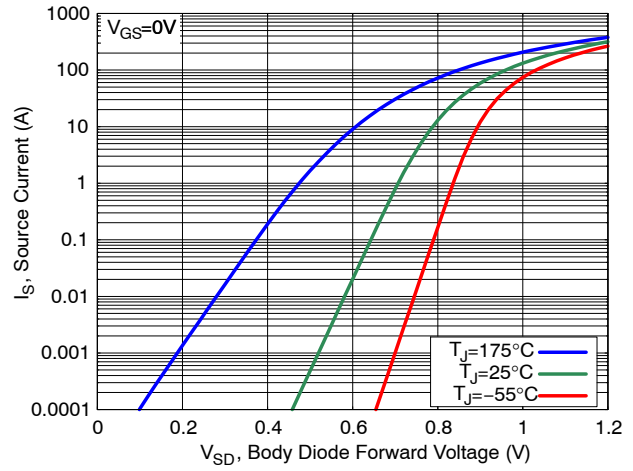


Figure 10. Diode Forward Characteristics

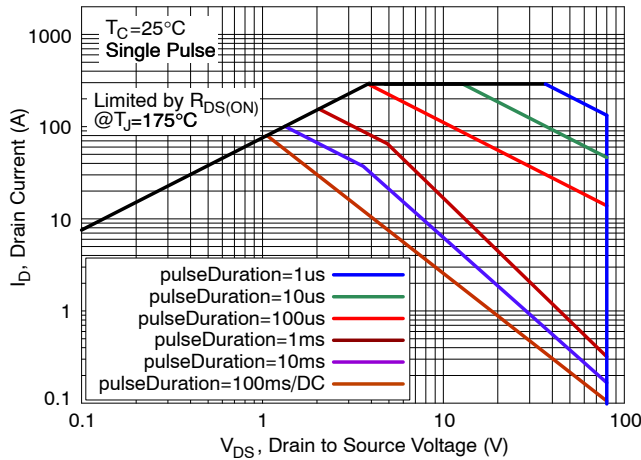


Figure 11. Safe Operating Area (SOA)

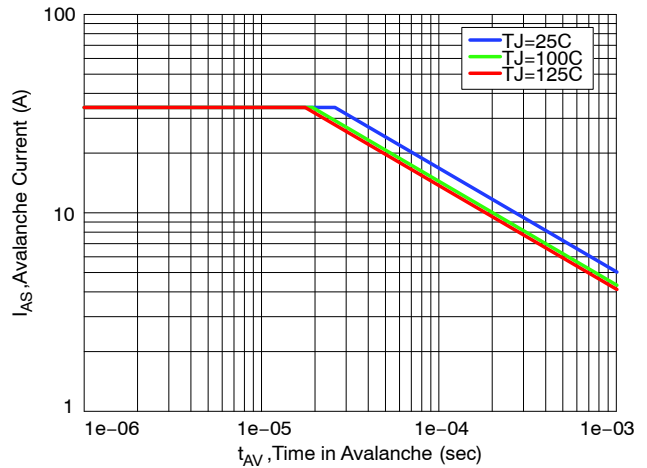
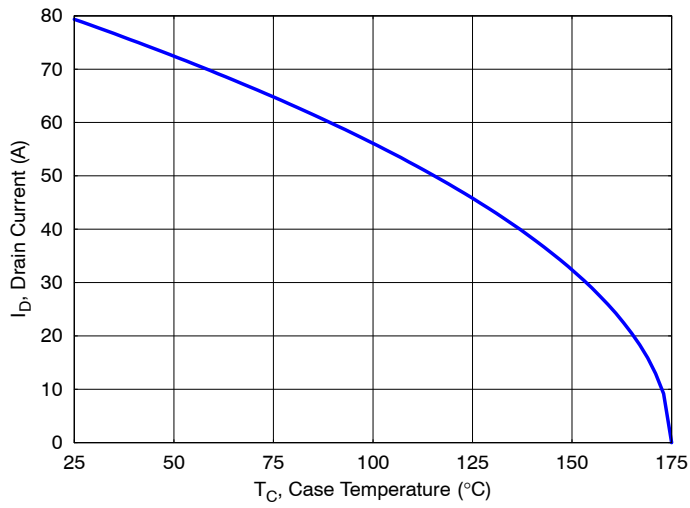


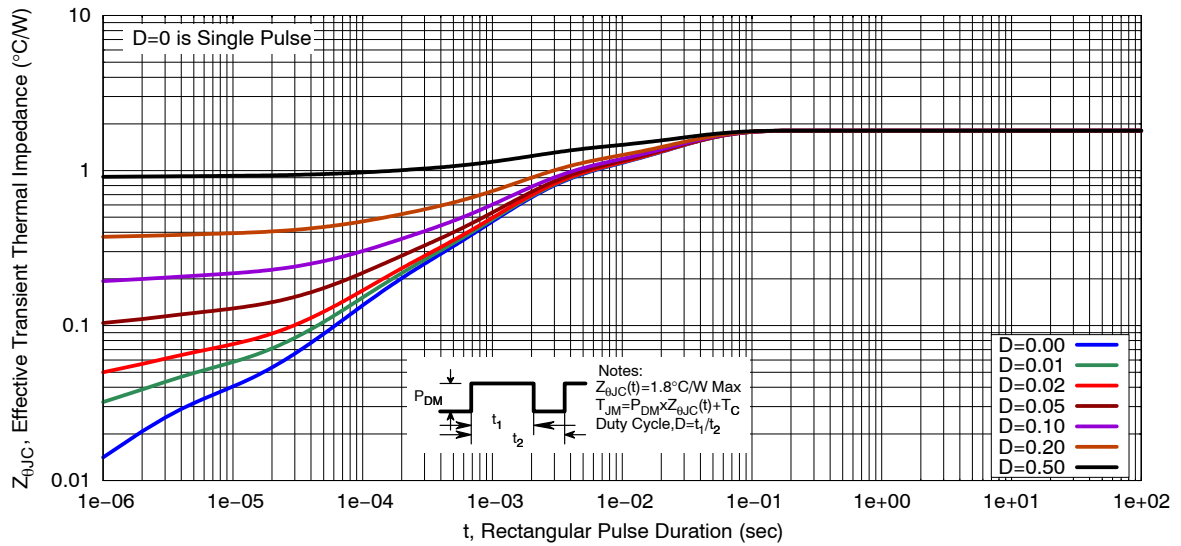
Figure 12. Avalanche Current vs. Pulse Time (UIS)

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## TYPICAL CHARACTERISTICS



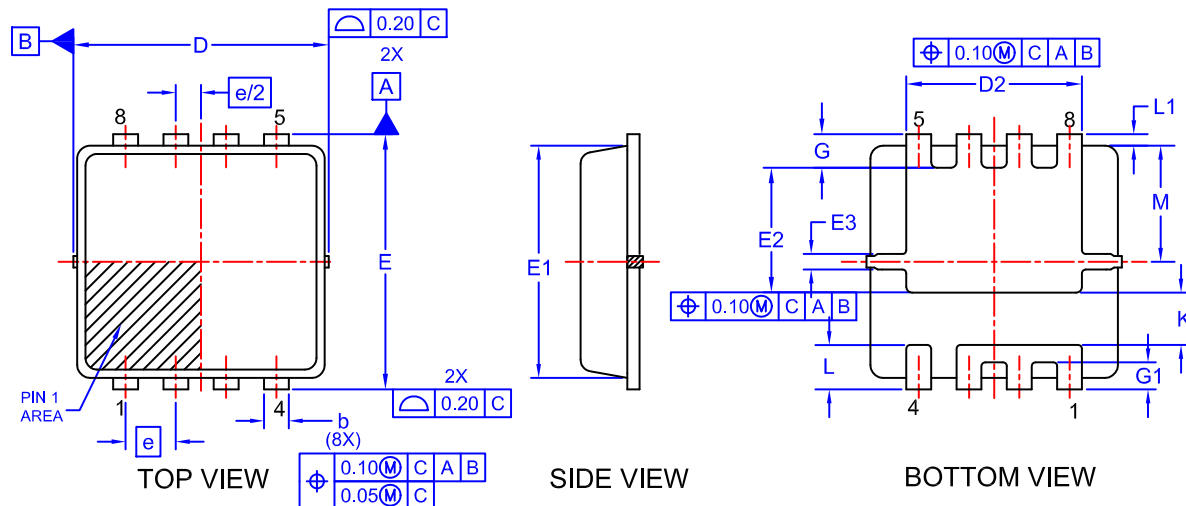
**Figure 13. Maximum Current vs. Case Temperature**



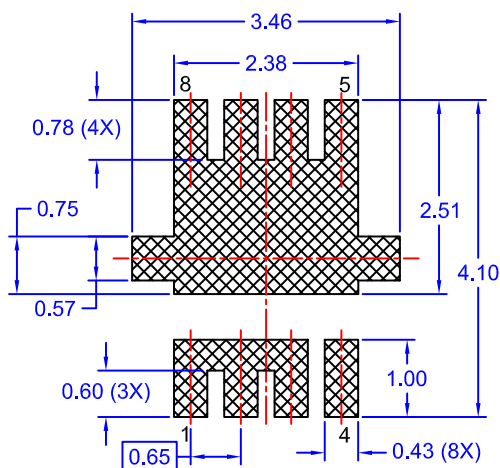
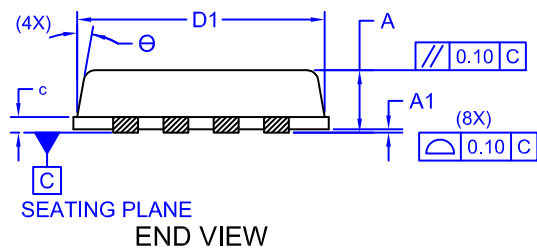
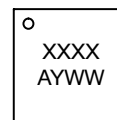
**Figure 14. Transient Thermal Response**

**WDFN8 3.3x3.3, 0.65P**  
CASE 511DY  
ISSUE A

DATE 21 AUG 2018


**NOTES:**

1. CONTROLLING DIMENSION: MILLIMETERS
2. DIMENSIONS D1 & E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.


**GENERIC MARKING DIAGRAM\***


XXXX = Specific Device Code  
A = Assembly Location  
Y = Year Code  
WW = Work Week Code

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	-	0.05
b	0.23	0.33	0.43
c	0.15	0.20	0.25
D	3.20	3.30	3.40
D1	2.95	3.13	3.30
D2	1.98	2.20	2.40
E	3.20	3.30	3.40
E1	2.80	3.00	3.15
E2	1.40	1.60	1.80
E3	0.15	0.25	0.40
e	0.65 BSC		
G	0.30	0.43	0.55
G1	0.25	0.35	0.45
K	0.55	0.75	0.95
L	0.35	0.52	0.65
L1	0.06	0.15	0.30
M	1.35	1.50	1.60
Θ	0	-	12

\*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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