NTTFS4C06N

Power MOSFET
30 V, 67 A, Single N−Channel, µ8FL

Features
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications
- DC−DC Converters
- Power Load Switch
- Notebook Battery Management

ON Semiconductor®

http://onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	4.2 mΩ @ 10 V	67 A
	6.1 mΩ @ 4.5 V	

N−Channel MOSFET

D (5−8)

G (4)

S (1,2,3)

MARKING DIAGRAM

WDFN8
(µ8FL)
CASE 511AB

S		D
S	4C06	D
S	AYWW■	D
G	■	D

4C06 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
■ = Pb−Free Package

(Note: Microdot may be in either location)

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	30	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{θJA}$ (Note 1)	Steady State	T_A = 25°C	I_D	18	A
		T_A = 85°C		13	
Power Dissipation $R_{θJA}$ (Note 1)		T_A = 25°C	P_D	2.16	W
Continuous Drain Current $R_{θJA}$ ≤ 10 s (Note 1)		T_A = 25°C	I_D	25.6	A
		T_A = 85°C		18.5	
Power Dissipation $R_{θJA}$ ≤ 10 s (Note 1)		T_A = 25°C	P_D	4.4	W
Continuous Drain Current $R_{θJA}$ (Note 2)		T_A = 25°C	I_D	11	A
		T_A = 85°C		8	
Power Dissipation $R_{θJA}$ (Note 2)		T_A = 25°C	P_D	0.81	W
Continuous Drain Current $R_{θJC}$ (Note 1)		T_C = 25°C	I_D	67	A
		T_C = 85°C		49	
Power Dissipation $R_{θJC}$ (Note 1)		T_C = 25°C	P_D	31	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 µs		I_{DM}	166	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to +150	°C
Source Current (Body Diode)			I_S	28	A
Drain to Source dV/dt			dV/dt	7	V/ns
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{DD} = 50 V, V_{GS} = 10 V, I_L = 37 A_{pk}, L = 0.1 mH, R_G = 25 Ω) (Note 3)			E_{AS}	68	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.
1. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size.
3. This is the absolute maximum ratings. Parts are 100% tested at T_J = 25°C, V_{GS} = 10 V, I_L = 20 A, E_{AS} = 20 mJ.

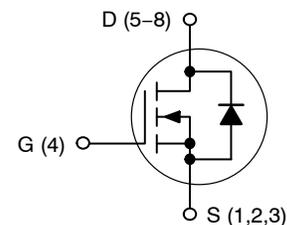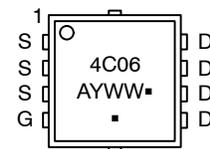### ORDERING INFORMATION

Device	Package	Shipping†
NTTFS4C06NTAG	WDFN8 (Pb−Free)	1500 / Tape & Reel
NTTFS4C06NTWG	WDFN8 (Pb−Free)	5000 / Tape & Reel

†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.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	4.1	
Junction−to−Ambient − Steady State (Note 4)	$R_{\theta JA}$	58	°C/W
Junction−to−Ambient − Steady State (Note 5)	$R_{\theta JA}$	154.3	
Junction−to−Ambient − (t ≤ 10 s) (Note 4)	$R_{\theta JA}$	28.3	

4. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
5. Surface−mounted on FR4 board using the minimum recommended pad size.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		30			V
Drain−to−Source Breakdown Voltage (transient)	$V_{(BR)DSSt}$	V_{GS} = 0 V, $I_{D(aval)}$ = 12.6 A, T_{case} = 25°C, $t_{transient}$ = 100 ns		34			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				14.4		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 6)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.3		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				3.8		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 30 A		3.4	4.2	mΩ
		V_{GS} = 4.5 V	I_D = 30 A		4.9	6.1	
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			58		S
Gate Resistance	R_G	T_A = 25°C			1.0		Ω
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			1683	3366	pF
Output Capacitance	C_{OSS}				841	1682	
Reverse Transfer Capacitance	C_{RSS}				40		
Capacitance Ratio	C_{RSS}/C_{ISS}	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz			0.023		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A			11.6	16.2	nC
Threshold Gate Charge	$Q_{G(TH)}$				2.6	3.6	
Gate−to−Source Charge	Q_{GS}				4.7	6.6	
Gate−to−Drain Charge	Q_{GD}				4.0	5.6	
Gate Plateau Voltage	V_{GP}				3.1		V
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 30 A			26	36	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.
6. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
7. Switching characteristics are independent of operating junction temperatures.

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 7)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			10		ns
Rise Time	t_r				32		
Turn−Off Delay Time	$t_{d(OFF)}$				18		
Fall Time	t_f				5.0		
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			8.0		ns
Rise Time	t_r				28		
Turn−Off Delay Time	$t_{d(OFF)}$				24		
Fall Time	t_f				3.0		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 A	T_J = 25°C		0.8	1.1	V
			T_J = 125°C		0.63		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIS/dt = 100 A/μs, I_S = 30 A			34		ns
Charge Time	t_a				17		
Discharge Time	t_b				17		
Reverse Recovery Charge	Q_{RR}				22		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.

6. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
7. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS
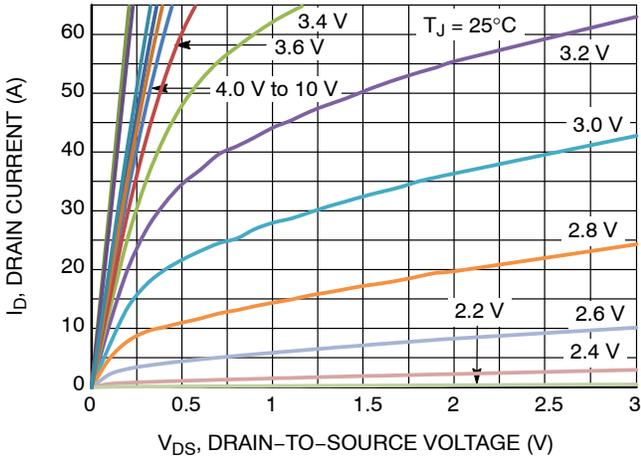
Figure 1. On−Region Characteristics
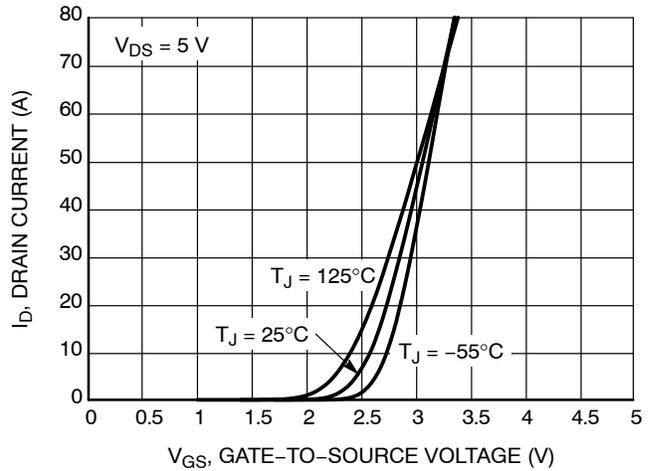
Figure 2. Transfer Characteristics
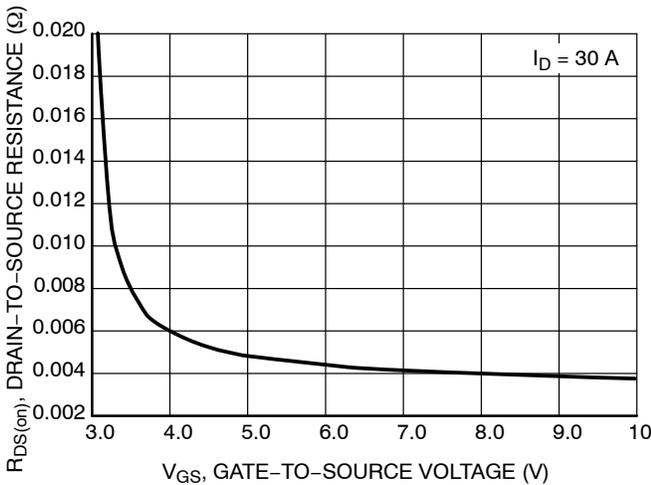
Figure 3. On−Resistance vs. V_{GS}
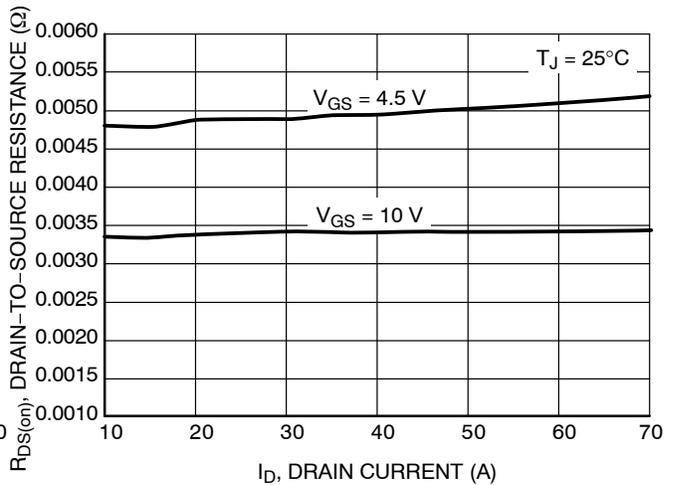
Figure 4. On−Resistance vs. Drain Current and Gate Voltage
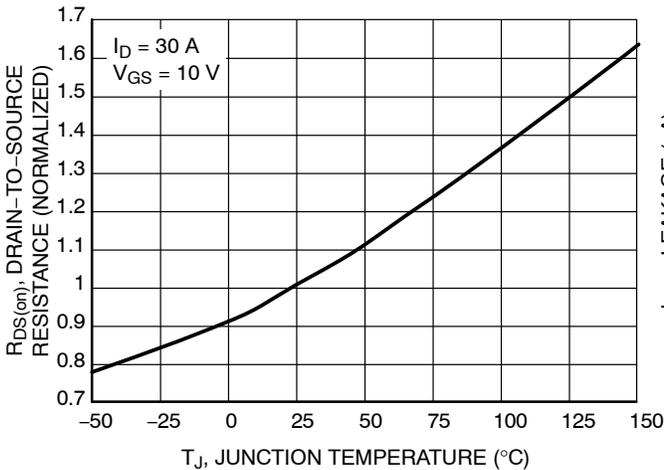
Figure 5. On−Resistance Variation with Temperature
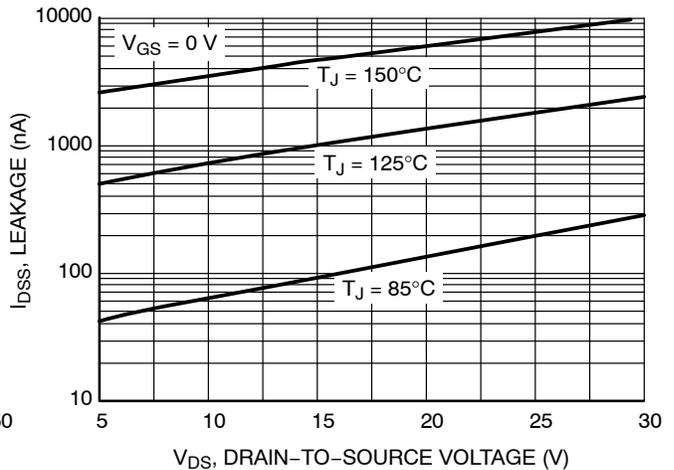
Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS
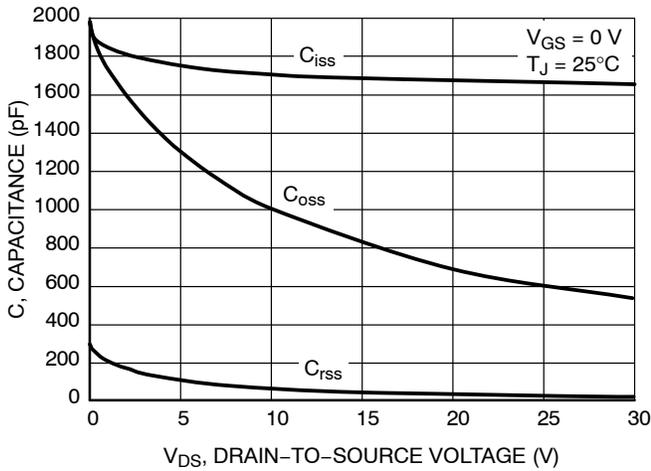
Figure 7. Capacitance Variation
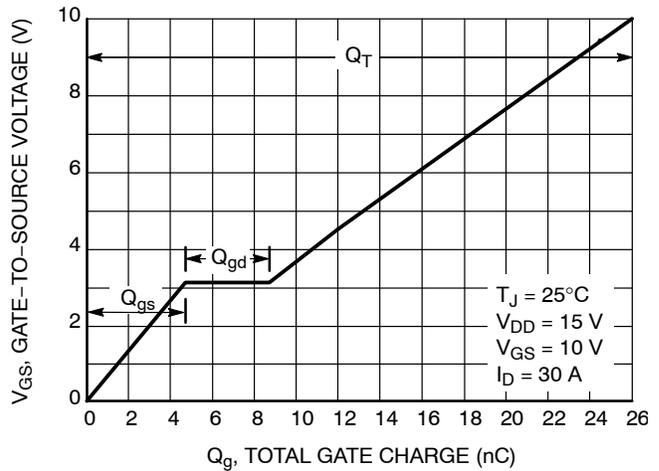
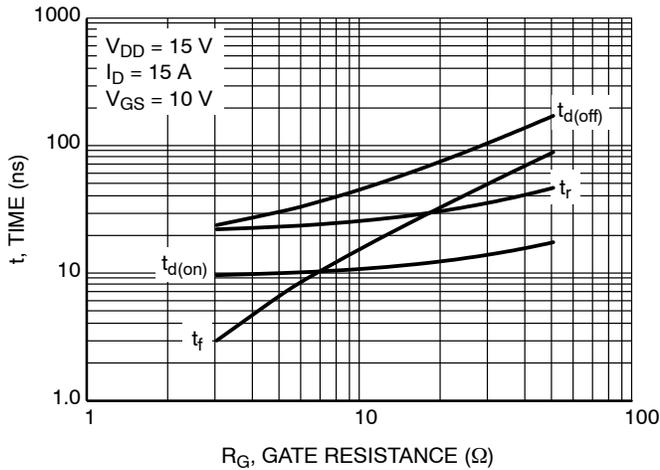**Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge**

Figure 9. Resistive Switching Time Variation vs. Gate Resistance
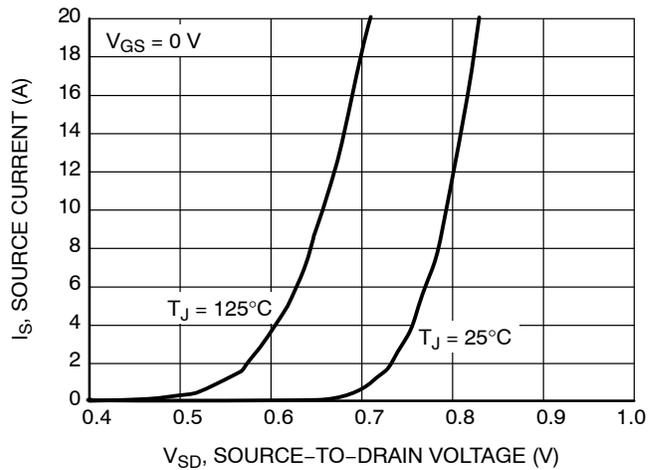
Figure 10. Diode Forward Voltage vs. Current
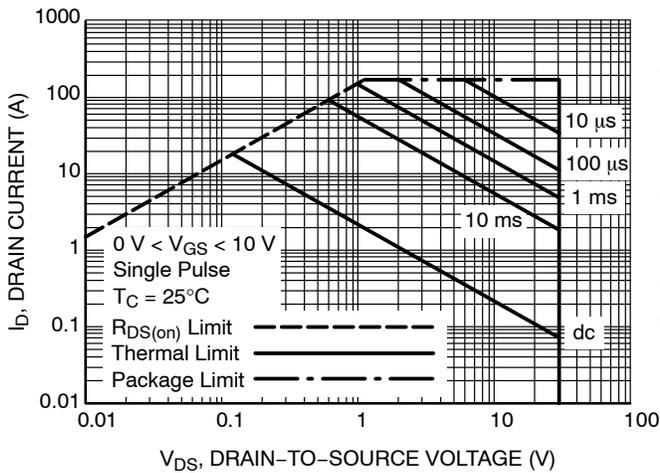
Figure 11. Maximum Rated Forward Biased Safe Operating Area
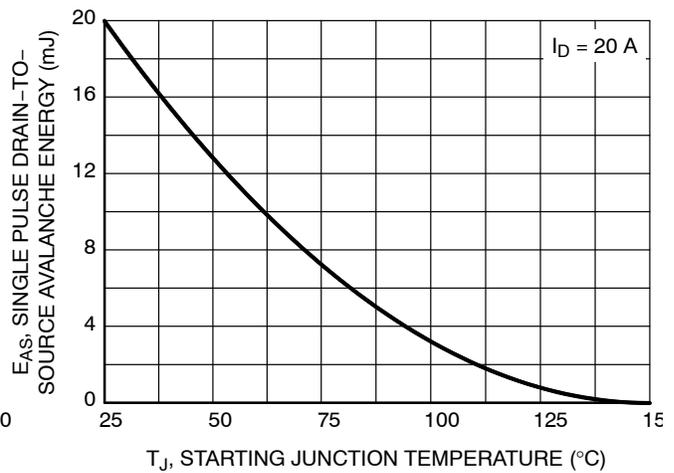
Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

Figure 13. Thermal Response
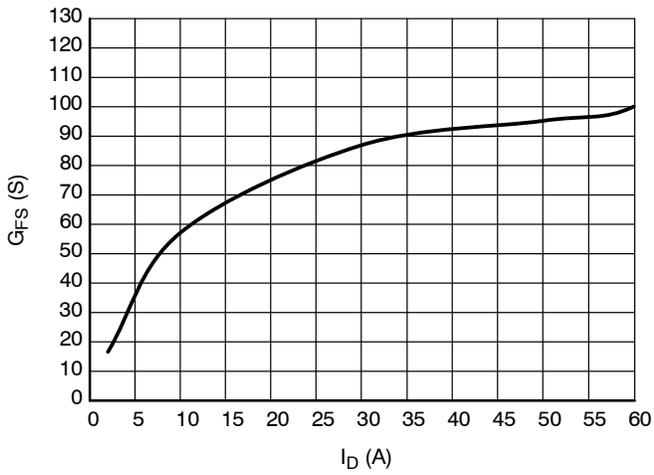
Figure 14. G_FS vs. I_D
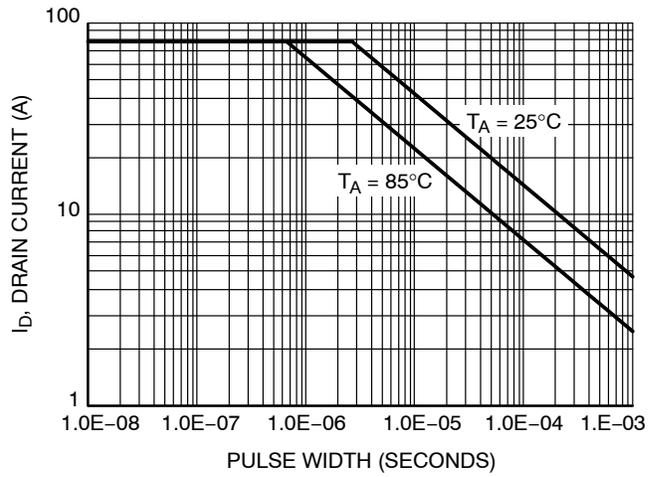
Figure 15. Avalanche Characteristics

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PACKAGE DIMENSIONS

WDFN8 3.3x3.3, 0.65P
CASE 511AB
ISSUE D
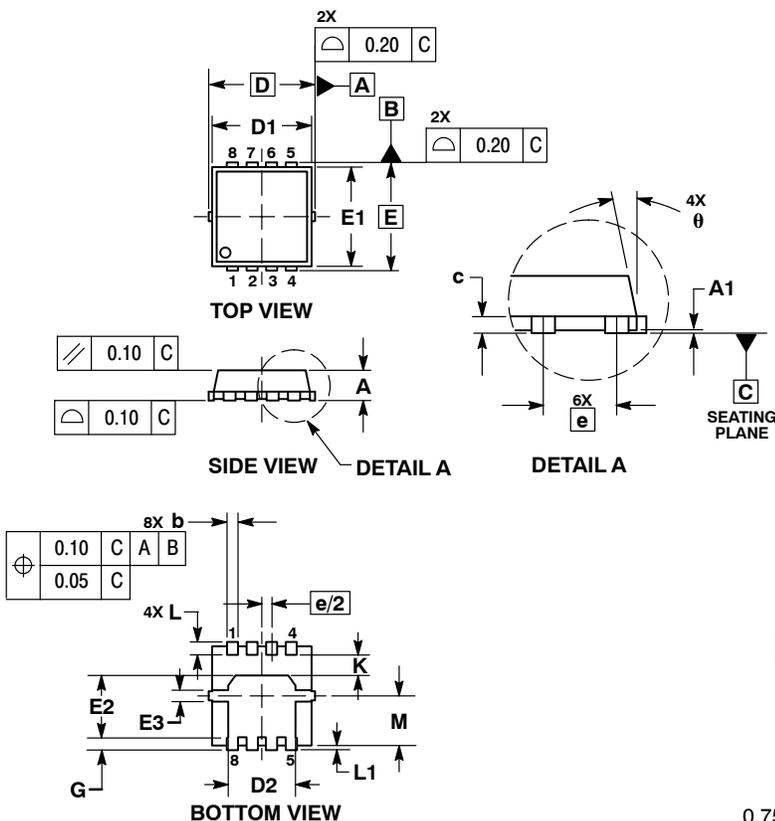
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	---	0.05	0.000	---	0.002
b	0.23	0.30	0.40	0.009	0.012	0.016
c	0.15	0.20	0.25	0.006	0.008	0.010
D	3.30 BSC			0.130 BSC		
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
E	3.30 BSC			0.130 BSC		
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	0.23	0.30	0.40	0.009	0.012	0.016
e	0.65 BSC			0.026 BSC		
G	0.30	0.41	0.51	0.012	0.016	0.020
K	0.65	0.80	0.95	0.026	0.032	0.037
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
M	1.40	1.50	1.60	0.055	0.059	0.063
θ	0 °	---	12 °	0 °	---	12 °

TOP VIEW

SIDE VIEW

DETAIL A

DETAIL A

SEATING PLANE

BOTTOM VIEW

SOLDERING FOOTPRINT*
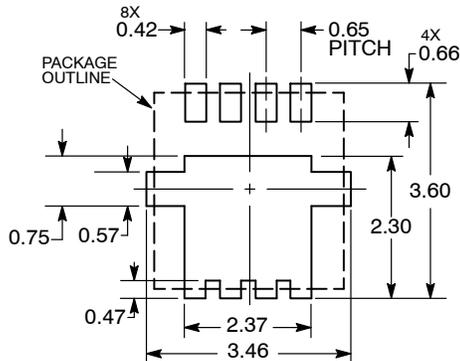
DIMENSION: MILLIMETERS

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

NTTFS4C06N/D