NTTFS005N02C

Product Preview

Power MOSFET

20 V, 75 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

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	20	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	I_D	19.4	A
		T_A = 85°C		14.5	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.16	W
Continuous Drain Current $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	I_D	28	A
		T_A = 85°C		21	
Power Dissipation $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	P_D	4.5	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	I_D	12.0	A
		T_A = 85°C		8.9	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.82	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	75	A
		T_C = 85°C		56	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	33	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	174	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to +150	°C
Source Current (Body Diode)			I_S	30	A
Drain to Source dV/dt			dV/dt	6.0	V/ns
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{DD} = 50 V, V_{GS} = 10 V, I_L = 41 A_{pk}, L = 0.1 mH, R_G = 25 Ω) (Note 3)			E_{AS}	84	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 = 29 A, E_{AS} = 42 mJ.

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

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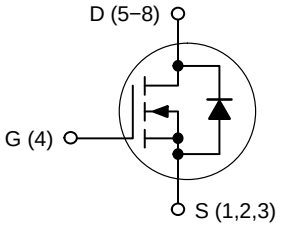
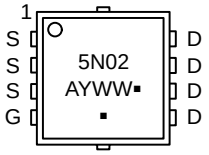
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
20 V	3.6 mΩ @ 10 V	75 A
	5.1 mΩ @ 4.5 V	

N−Channel MOSFET



WDFN8
(μ8FL)
CASE 511AB

MARKING DIAGRAM



5N02 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTTFS005N02CTAG	WDFN8 (Pb−Free)	1500 / 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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	3.8	°C/W
Junction−to−Ambient – Steady State (Note 4)	$R_{\theta JA}$	57.8	
Junction−to−Ambient – Steady State (Note 5)	$R_{\theta JA}$	151.9	
Junction−to−Ambient – (t ≤ 10 s) (Note 4)	$R_{\theta JA}$	27.6	

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.

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.

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		20			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				11.7		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 16 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	$V_{GS(TH)}/T_J$				5.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 30 A		2.9	3.6	mΩ
		V_{GS} = 4.5 V	I_D = 30 A		4.1	5.1	
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			68		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			1988		pF
Output Capacitance	C_{OSS}				1224		
Reverse Transfer Capacitance	C_{RSS}				71		
Capacitance Ratio	C_{RSS}/C_{ISS}	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz			0.036		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A			14.5		nC
Threshold Gate Charge	$Q_{G(TH)}$				2.9		
Gate−to−Source Charge	Q_{GS}				5.2		
Gate−to−Drain Charge	Q_{GD}				5.5		
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			31		nC
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			11		ns
Rise Time	t_r				30		
Turn−Off Delay Time	$t_{d(OFF)}$				20		
Fall Time	t_f				8.0		

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

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} = 10 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			8.0		ns
Rise Time	t_r				25		
Turn−Off Delay Time	$t_{d(OFF)}$				26		
Fall Time	t_f				5.0		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 A	T_J = 25°C		0.77	1.1	V
			T_J = 125°C		0.62		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIS/dt = 100 A/μs, I_S = 30 A			42.4		ns
Charge Time	t_a				21.1		
Discharge Time	t_b				21.3		
Reverse Recovery Charge	Q_{RR}				34.4		nC

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

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

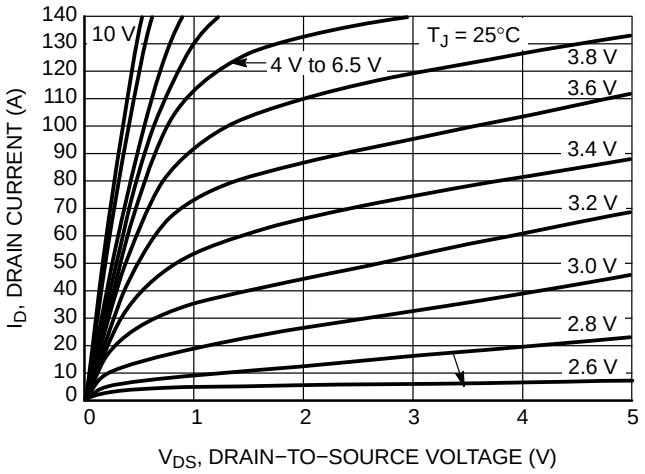


Figure 1. On−Region Characteristics

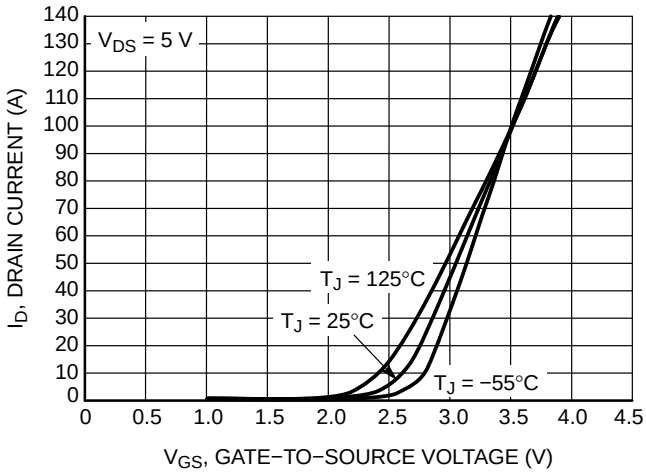


Figure 2. Transfer Characteristics

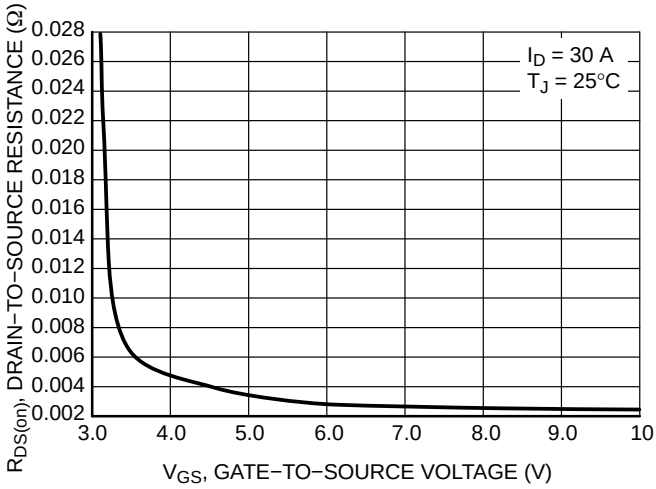


Figure 3. On−Resistance vs. V_{GS}

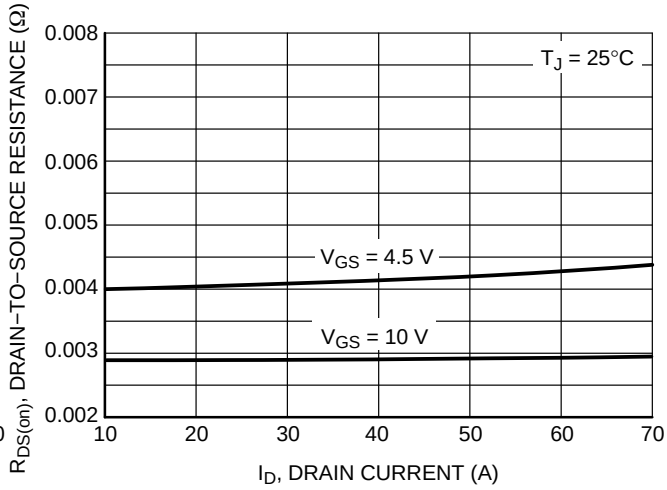


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

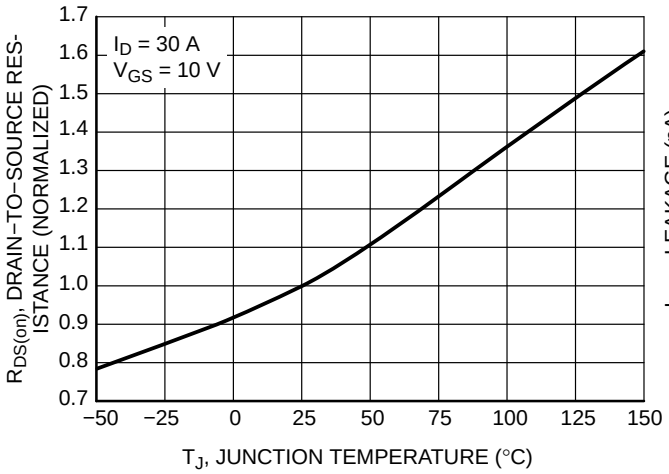


Figure 5. On−Resistance Variation with Temperature

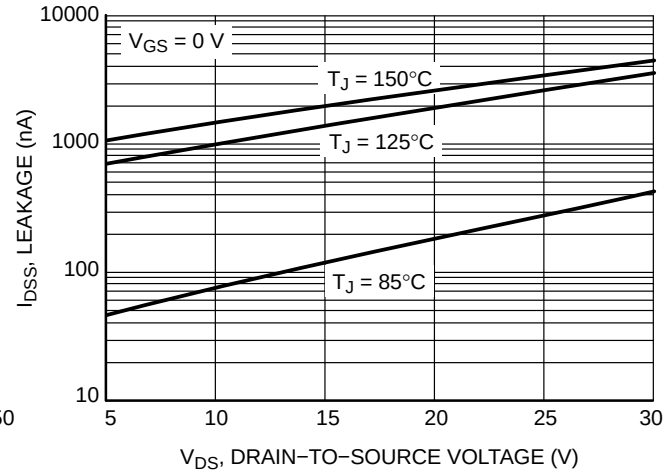


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

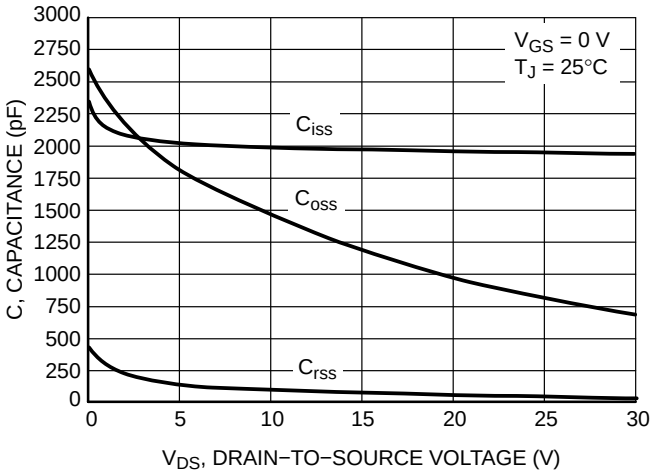


Figure 7. Capacitance Variation

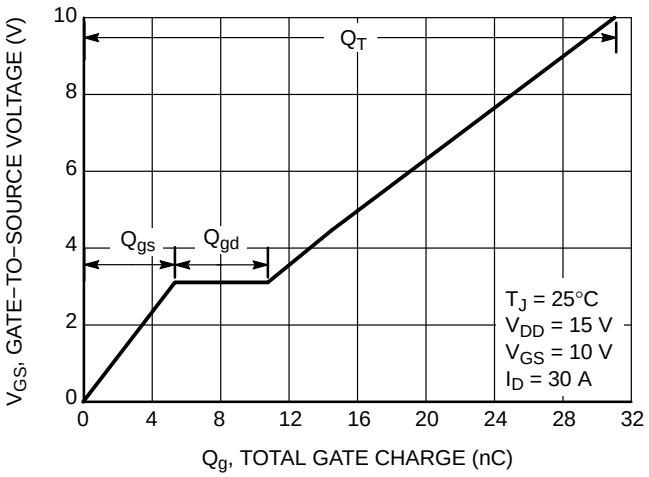


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

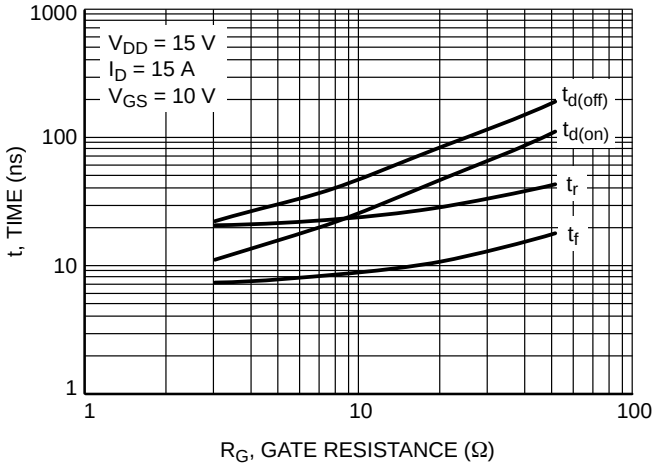


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

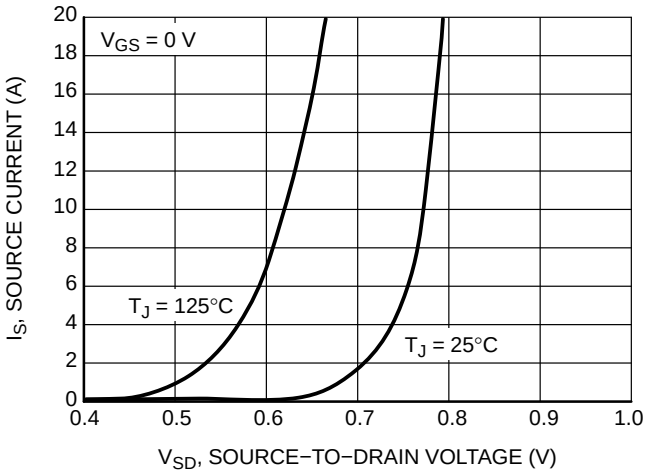


Figure 10. Diode Forward Voltage vs. Current

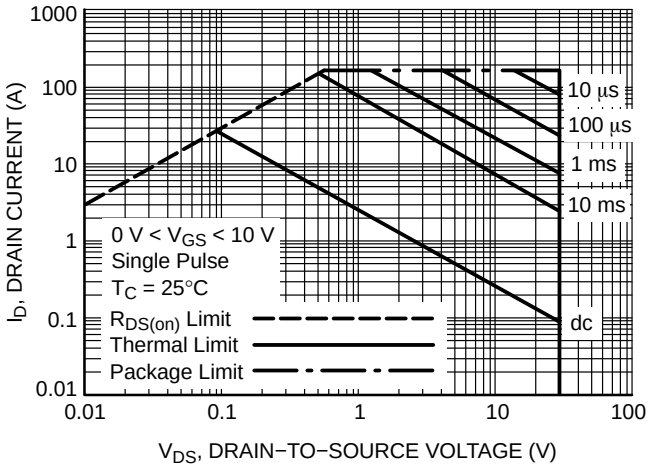


Figure 11. Maximum Rated Forward Biased Safe Operating Area

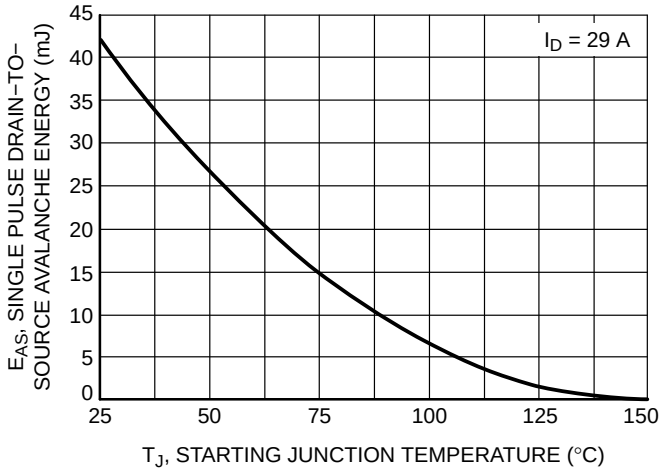


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS

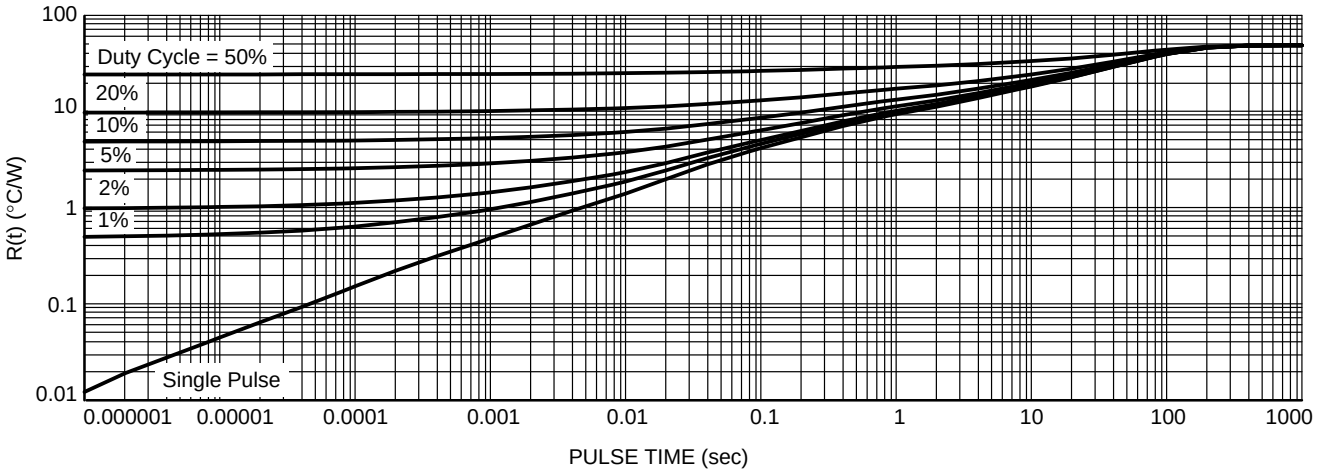


Figure 13. Thermal Response

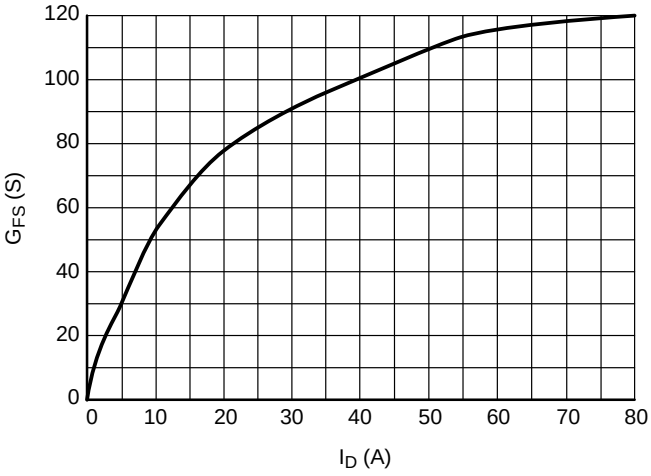


Figure 14. G_{FS} vs. I_D

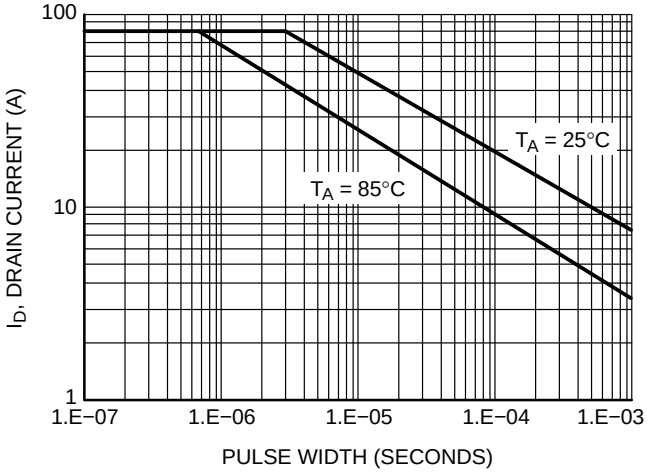
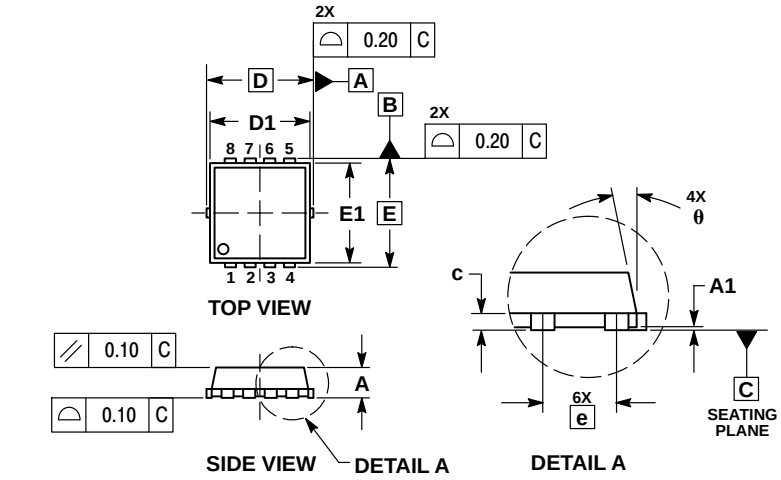


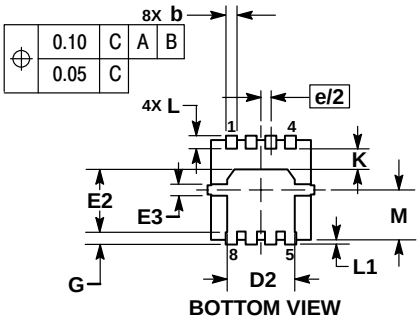
Figure 15. Avalanche Characteristics

NTTFS005N02C

PACKAGE DIMENSIONS

WDFN8 3.3x3.3, 0.65P
CASE 511AB
ISSUE D

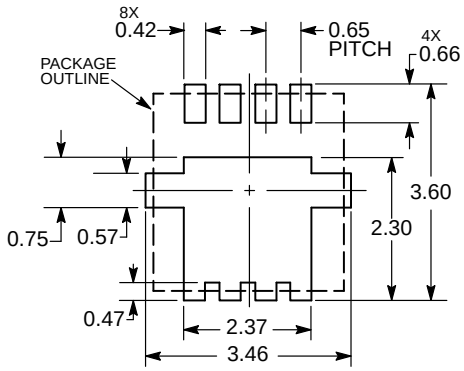




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	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 °

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.

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