

NTMFS4821N

MOSFET – Power, Single, N-Channel, SO-8 FL 30 V, 58.5 A

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- Thermally Enhanced SO-8 Package
- These are Pb-Free Device

Applications

- Refer to Application Note AND8195/D
- CPU Power Delivery
- DC-DC Converters
- High Side Switching

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

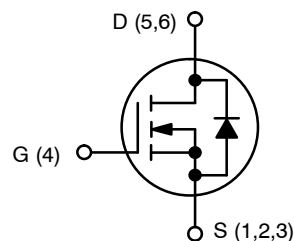
Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	30	V
Gate-to-Source Voltage			V _{GS}	±20	V
Continuous Drain Current R _{θJA} (Note 1)	Steady State	T _A = 25°C	I _D	13.8	A
		T _A = 85°C		10	
Power Dissipation R _{θJA} (Note 1)		T _A = 25°C	P _D	2.14	W
Continuous Drain Current R _{θJA} ≤ 10 sec		T _A = 25°C	I _D	22.4	A
		T _A = 85°C		16.1	
Power Dissipation R _{θJA} , t ≤ 10 sec		T _A = 25°C	P _D	5.61	W
Continuous Drain Current R _{θJA} (Note 2)		T _A = 25°C	I _D	8.8	A
		T _A = 85°C		6.4	
Power Dissipation R _{θJA} (Note 2)		T _A = 25°C	P _D	0.87	W
Continuous Drain Current R _{θJC} (Note 1)		T _C = 25°C	I _D	58.5	A
		T _C = 85°C		42.3	
Power Dissipation R _{θJC} (Note 1)		T _C = 25°C	P _D	38.5	W
Pulsed Drain Current	t _p =10μs	T _A = 25°C	I _{DM}	117	A
Current limited by package		T _A = 25°C	I _{Dmaxpkg}	100	A
Operating Junction and Storage Temperature			T _J , T _{STG}	-55 to +150	°C
Source Current (Body Diode)			I _S	38.5	A
Drain to Source dV/dt			dV/dt	6	V/ns



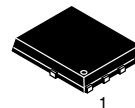
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	6.95 m Ω @ 10 V	58.5 A
	10.8 m Ω @ 4.5 V	

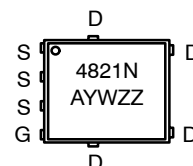


N-CHANNEL MOSFET



SO-8 FLAT LEAD
CASE 488AA
STYLE 1

MARKING DIAGRAM



A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4821NT1G	SO-8FL (Pb-Free)	1500 / Tape & Reel
NTMFS4821NT3G	SO-8FL (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 Specifications Brochure, BRD8011/D.

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

NTMFS4821N

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

Parameter	Symbol	Value	Unit
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 50\text{ V}$, $V_{GS} = 10\text{ V}$, $I_L = 24\text{ A}_{pk}$, $L = 0.3\text{ mH}$, $R_G = 25\ \Omega$)	EAS	86	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^{\circ}\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

NTMFS4821N

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3.25	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	58.3	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	144.1	
Junction-to-Ambient – $t \leq 10$ sec	$R_{\theta JA}$	22.3	

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.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			25		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.45	1.8	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$					mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V to } 11.5\text{ V}$	$I_D = 30\text{ A}$	5.3	6.95	m Ω
			$I_D = 15\text{ A}$	5.2		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	8.6	10.8	
			$I_D = 15\text{ A}$	8.4		
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 30\text{ A}$		54		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 12\text{ V}$		1400		pF
Output Capacitance	C_{OSS}			282		
Reverse Transfer Capacitance	C_{RSS}			136		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		10.7	16	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4		
Gate-to-Source Charge	Q_{GS}			4.1		
Gate-to-Drain Charge	Q_{GD}			3.8		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		25		nC

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		13.3		ns
Rise Time	t_r			38		
Turn-Off Delay Time	$t_{d(OFF)}$			16.6		
Fall Time	t_f			3.8		

3. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
4. Switching characteristics are independent of operating junction temperatures.

NTMFS4821N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		8.2		ns
Rise Time	t_r			20		
Turn-Off Delay Time	$t_{d(OFF)}$			23		
Fall Time	t_f			3.1		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.85	1.0	V
			$T_J = 125^\circ\text{C}$		0.74		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			11		ns
Charge Time	t_a				7.5		
Discharge Time	t_b				3.5		
Reverse Recovery Charge	Q_{RR}				2.0		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		1.3		nH
Drain Inductance	L_D			0.005		
Gate Inductance	L_G			1.84		
Gate Resistance	R_G		0.5	1.1	2.0	Ω

3. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

NTMFS4821N

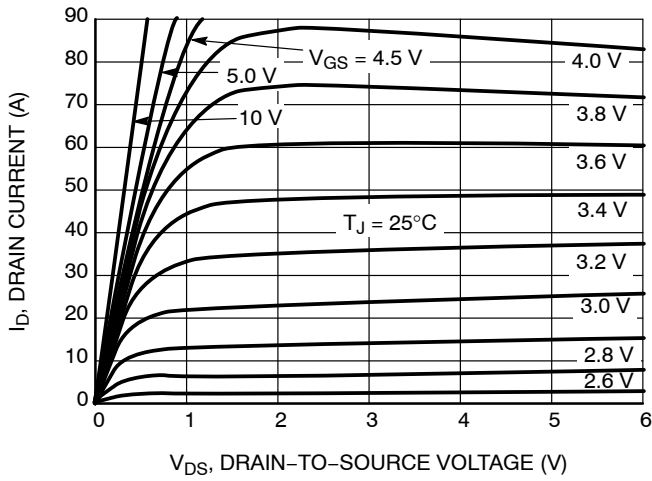


Figure 1. On-Region Characteristics

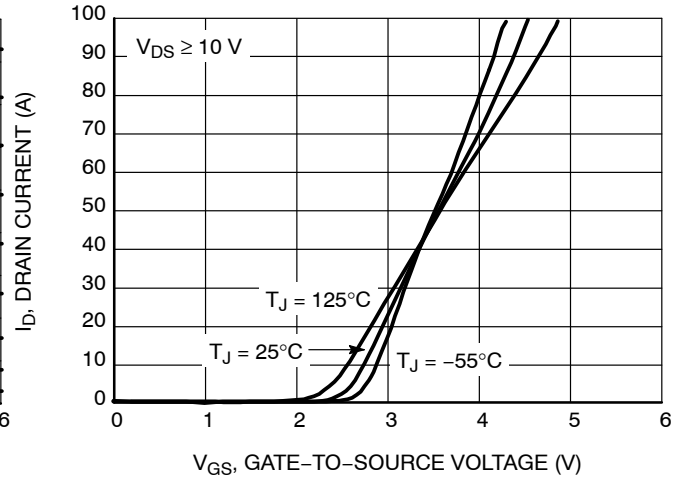


Figure 2. Transfer Characteristics

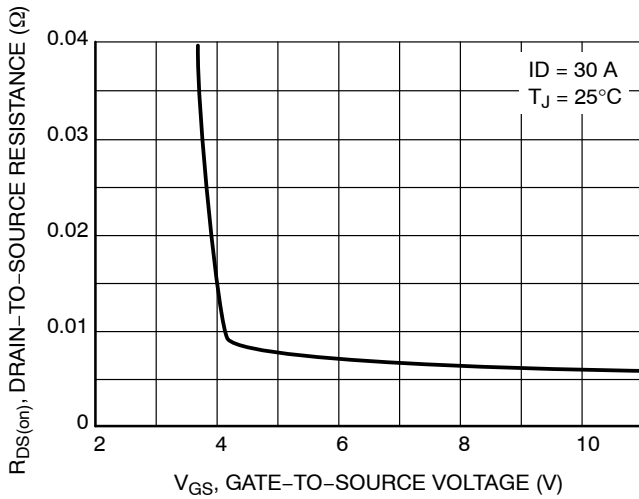


Figure 3. On-Resistance vs. Gate-to-Source Voltage

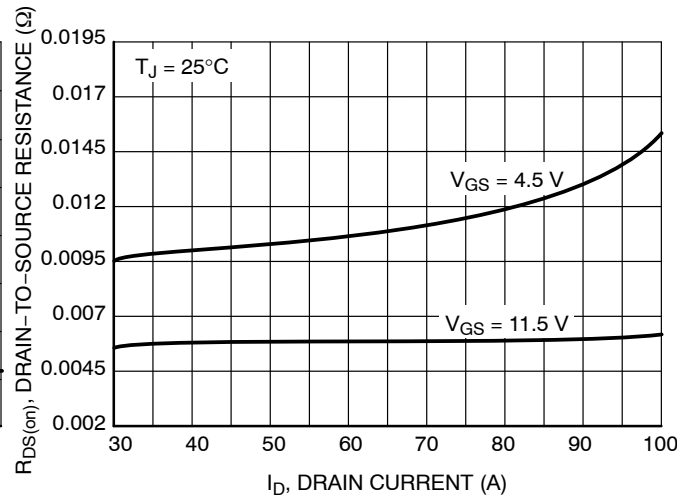


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

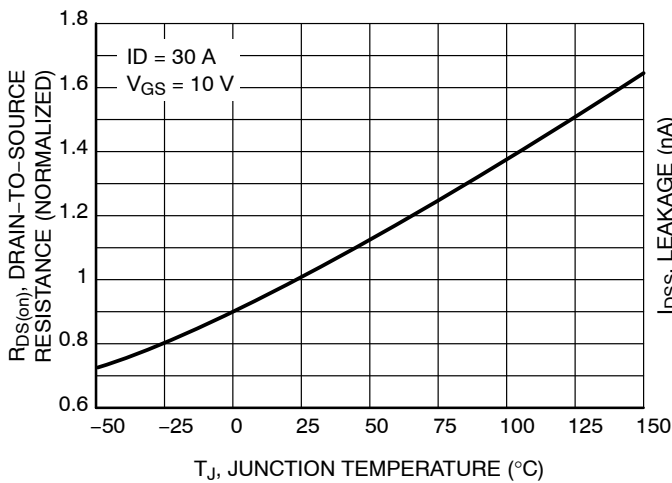


Figure 5. On-Resistance Variation with Temperature

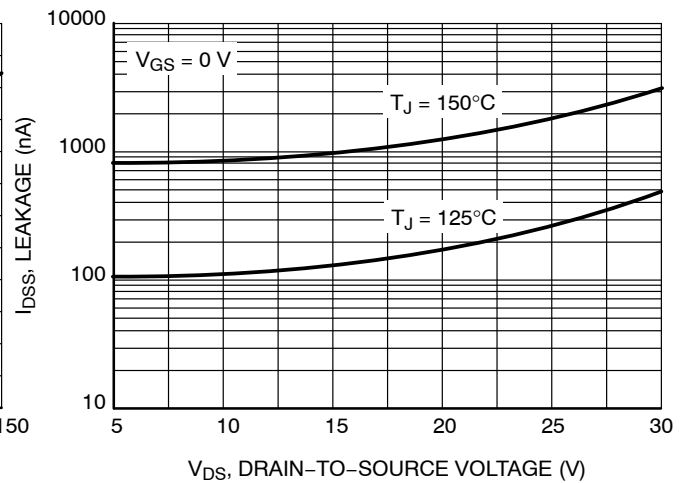


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTMFS4821N

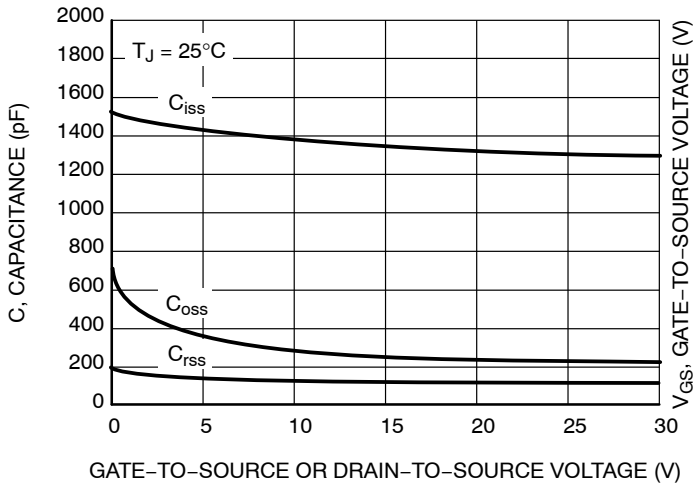


Figure 7. Capacitance Variation

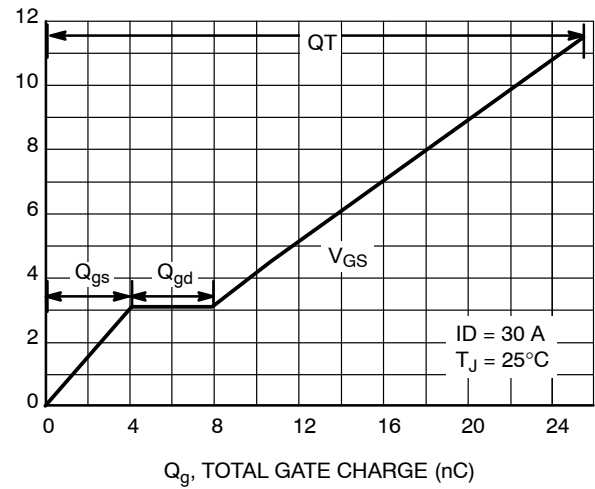


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

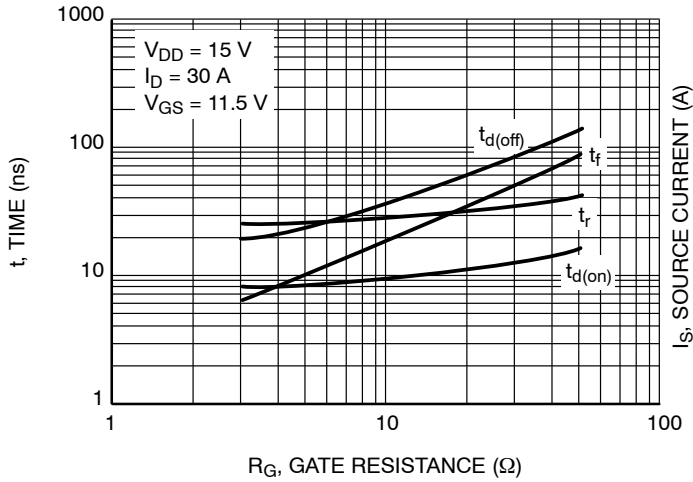


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

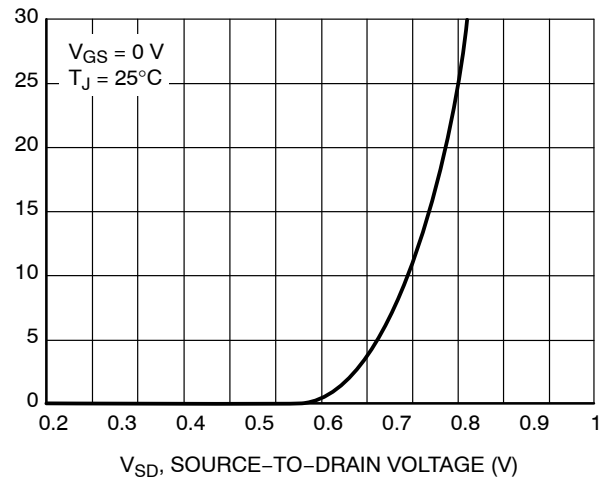


Figure 10. Diode Forward Voltage vs. Current

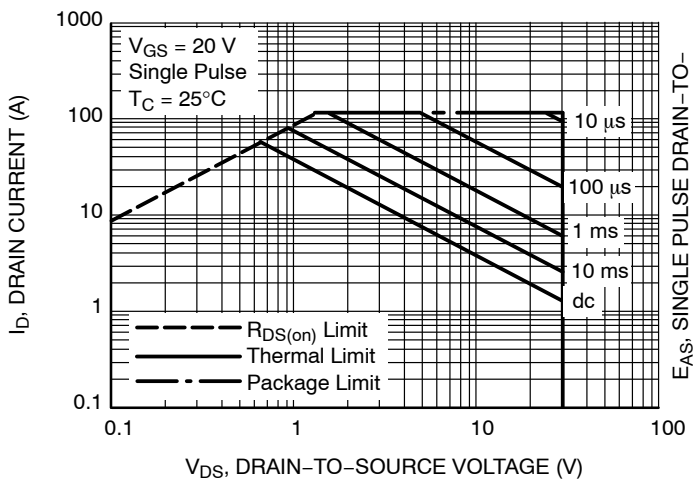


Figure 11. Maximum Rated Forward Biased Safe Operating Area

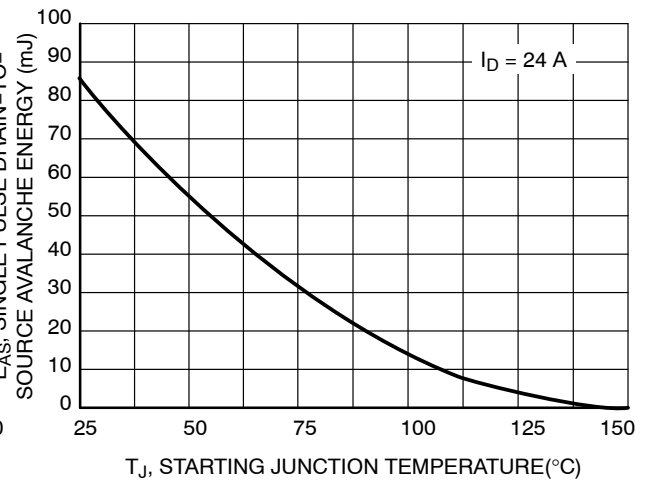


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

NTMFS4821N

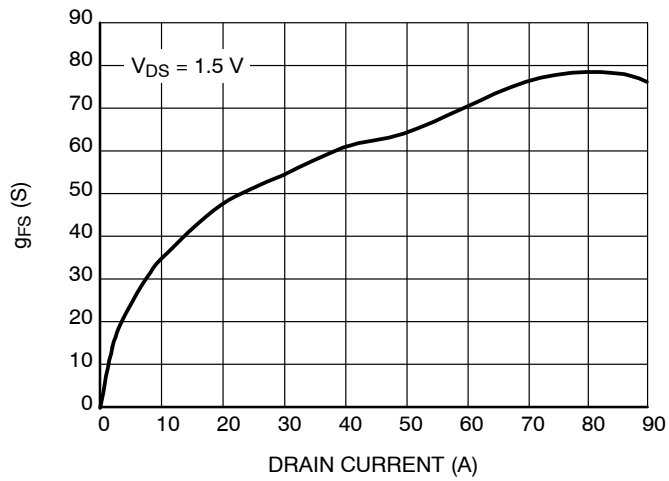


Figure 13. g_{FS} vs. Drain Current

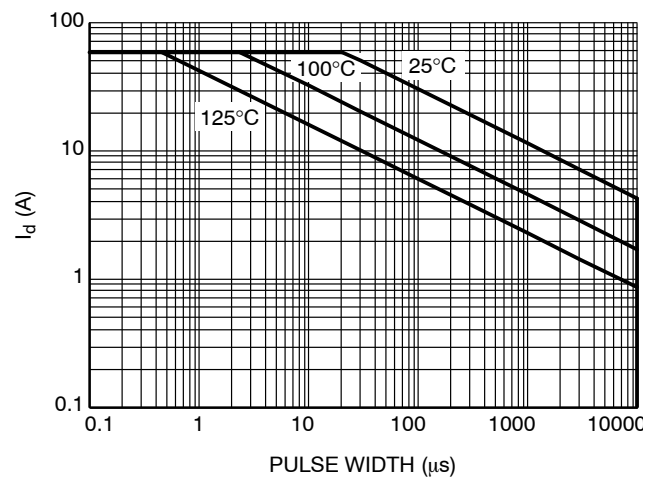
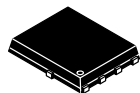


Figure 14. Avalanche Characteristics



SCALE 2:1

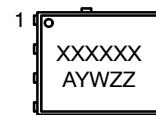
DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE N

DATE 25 JUN 2018

NOTES:

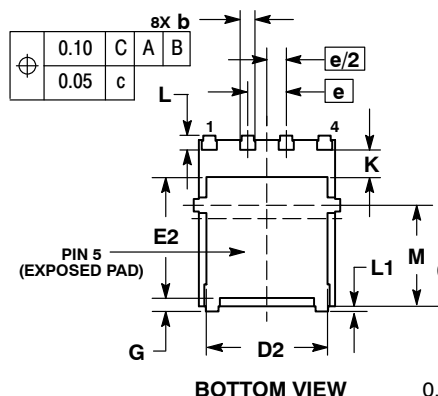
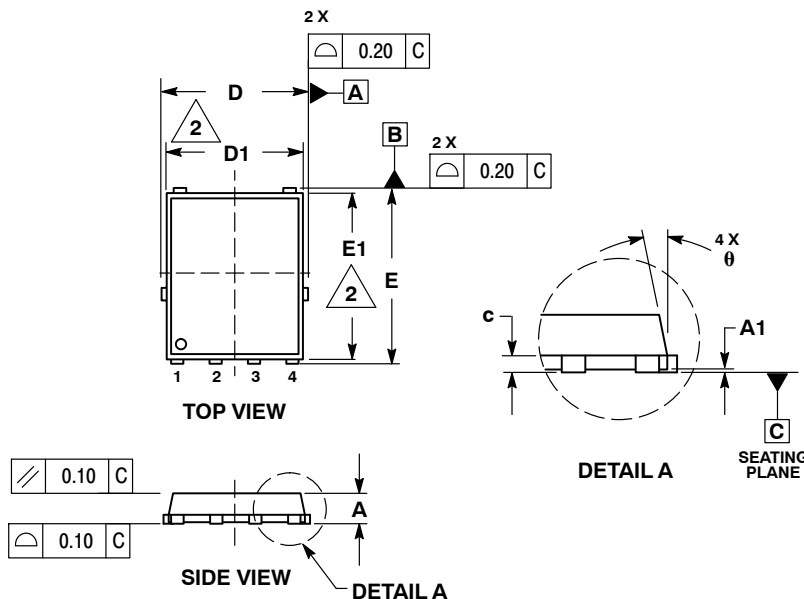
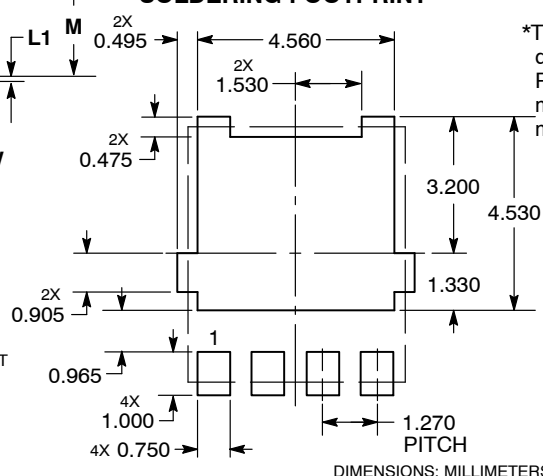
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ	0°	---	12°

GENERIC
MARKING DIAGRAM*


XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*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.


RECOMMENDED
SOLDERING FOOTPRINT*


DIMENSIONS: MILLIMETERS

STYLE 1:
PIN 1: SOURCE
2: SOURCE
3: SOURCE
4: GATE
5: DRAIN

STYLE 2:
PIN 1: ANODE
2: ANODE
3: ANODE
4: NO CONNECT
5: CATHODE

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

DOCUMENT NUMBER:	98AON14036D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DFN5 5x6, 1.27P (SO-8FL)	PAGE 1 OF 1

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales