

MOSFET - Power, Single N-Channel, DFN5/DFNW5 40 V, 4.5 mΩ, 78 A

NVMFS5C460NL

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- NVMFS5C460NLWF – Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	40	V
Gate-to-Source Voltage			V _{GS}	±20	V
Continuous Drain Current R _{θJC} (Notes 1, 3)	Steady State	T _C = 25°C	I _D	78	A
		T _C = 100°C		55	
Power Dissipation R _{θJC} (Note 1)		T _C = 25°C	P _D	50	W
		T _C = 100°C		25	
Continuous Drain Current R _{θJA} (Notes 1, 2, 3)	Steady State	T _A = 25°C	I _D	21	A
		T _A = 100°C		15	
Power Dissipation R _{θJA} (Notes 1, 2)		T _A = 25°C	P _D	3.6	W
		T _A = 100°C		1.8	
Pulsed Drain Current	T _A = 25°C, t _p = 10 μs		I _{DM}	396	A
Operating Junction and Storage Temperature Range			T _J , T _{stg}	–55 to +175	°C
Source Current (Body Diode)			I _S	56	A
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 5 A)			E _{AS}	107	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T _L	260	°C

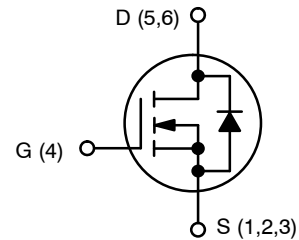
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

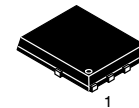
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	3.0	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	42	

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. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

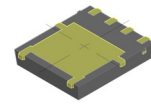
$V_{(BR)DS}$	$R_{DS(ON)}$ MAX	I_D MAX
40 V	4.5 mΩ @ 10 V	78 A
	7.2 mΩ @ 4.5 V	



N-CHANNEL MOSFET

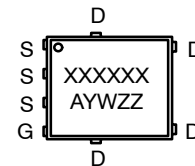


DFN5 (SO-8FL)
CASE 488AA



DFNW5
(FULL-CUT SO8FL WF)
CASE 507BA

MARKING DIAGRAM



XXXXXX = 5C460L
(NVMFS5C460NL) or
460LWF
(NVMFS5C460NLWF)

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

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NOTE: Some of the device on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5

NVMFS5C460NL

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			21		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 40 V		T _J = 25 °C	10	μA
				T _J = 125°C	250	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V			100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 40 μA	1.2		2.0	V
Threshold Temperature Coefficient	V _{GS(TH)} /T _J			-5.1		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 35 A		5.8	7.2	mΩ
		V _{GS} = 10 V, I _D = 35 A		3.7	4.5	
Forward Transconductance	g _{FS}	V _{DS} = 15 V, I _D = 35 A		72		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 25 V		1300		pF
Output Capacitance	C _{OSS}			530		
Reverse Transfer Capacitance	C _{RSS}			25		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 20 V; I _D = 35 A		23		nC
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 20 V; I _D = 35 A		11		nC
Threshold Gate Charge	Q _{G(TH)}			2.5		
Gate-to-Source Charge	Q _{GS}			4.7		
Gate-to-Drain Charge	Q _{GD}			3.0		
Plateau Voltage	V _{GP}			3.3		V

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DS} = 20 V, I _D = 35 A, R _G = 1 Ω		9.2		ns
Rise Time	t _r			3.4		
Turn-Off Delay Time	t _{d(OFF)}			17		
Fall Time	t _f			4.4		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 35 A	T _J = 25°C		0.86	1.2	V
			T _J = 125°C		0.75		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 35 A		29		ns	
Charge Time	t _a			14			
Discharge Time	t _b			14			
Reverse Recovery Charge	Q _{RR}			12		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.

4. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

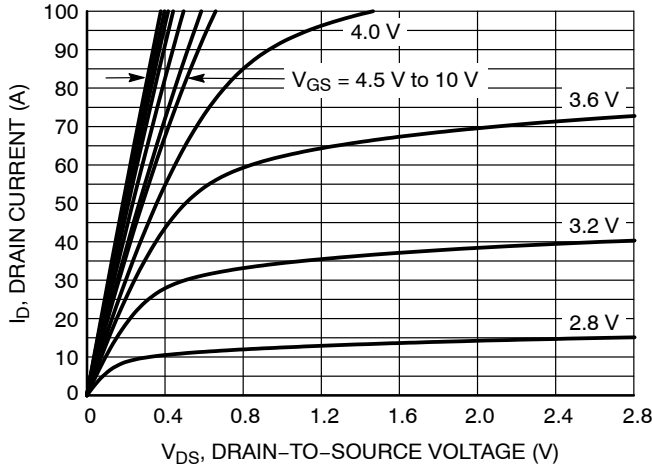


Figure 1. On-Region Characteristics

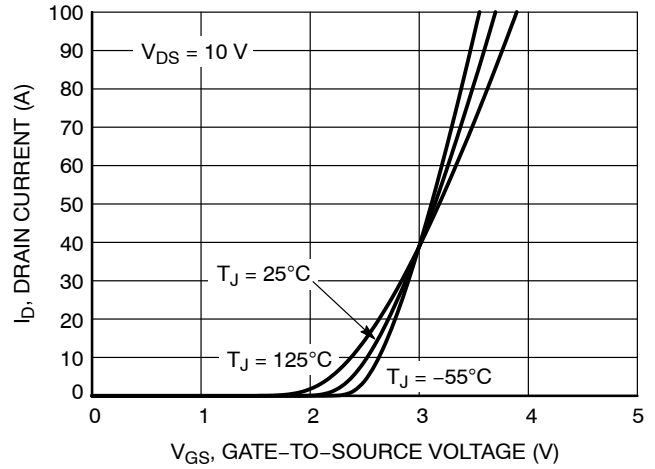


Figure 2. Transfer Characteristics

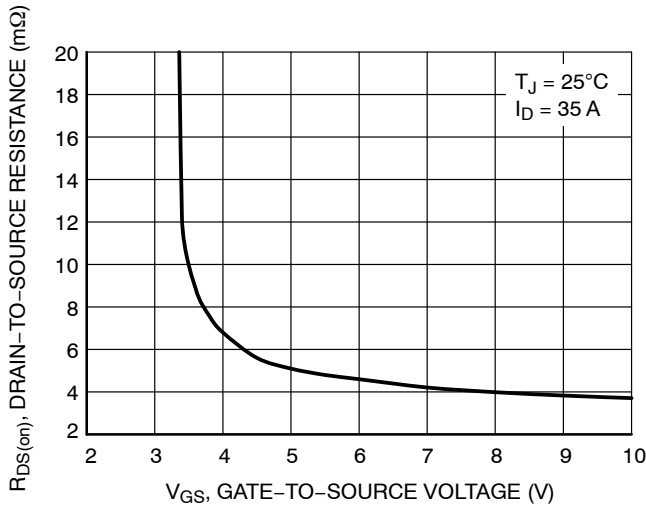


Figure 3. On-Resistance vs. Gate-to-Source Voltage

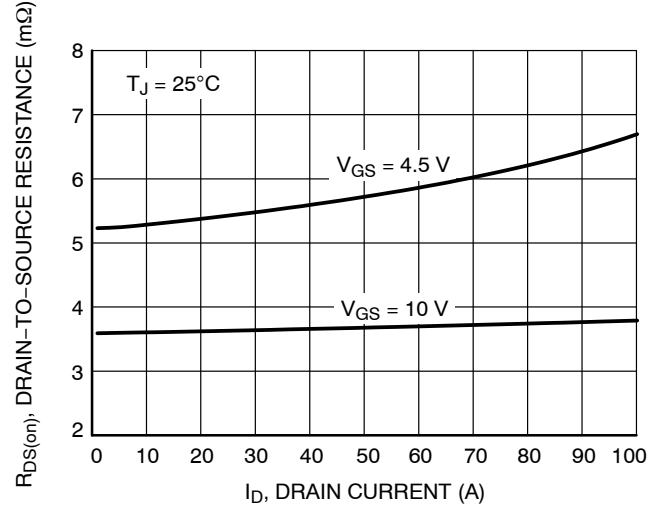


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

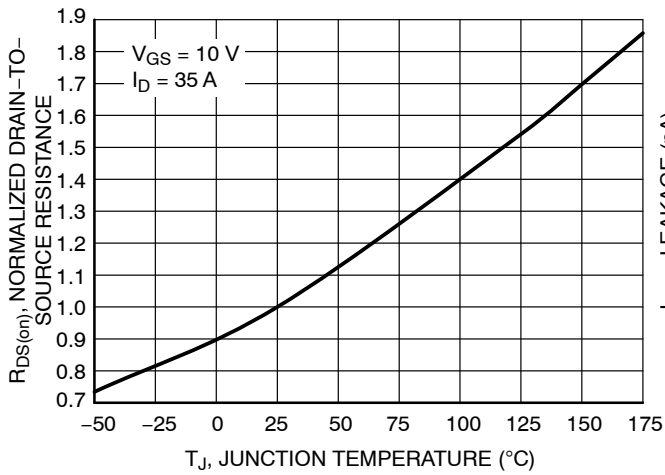


Figure 5. On-Resistance Variation with Temperature

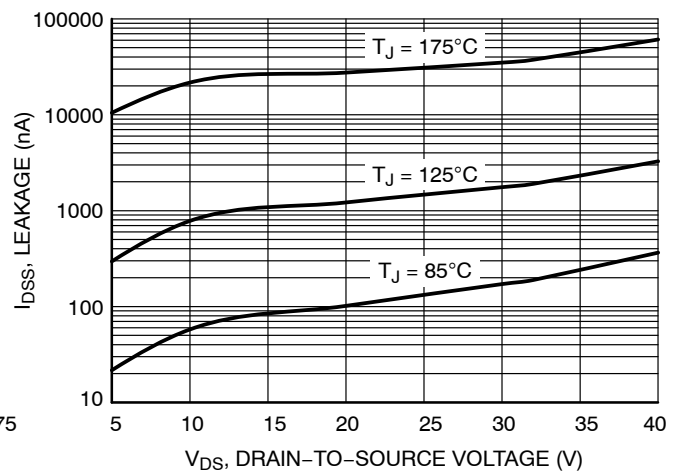


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

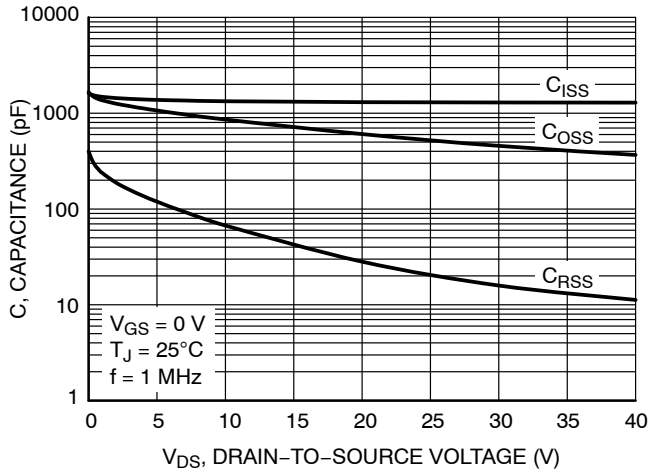


Figure 7. Capacitance Variation

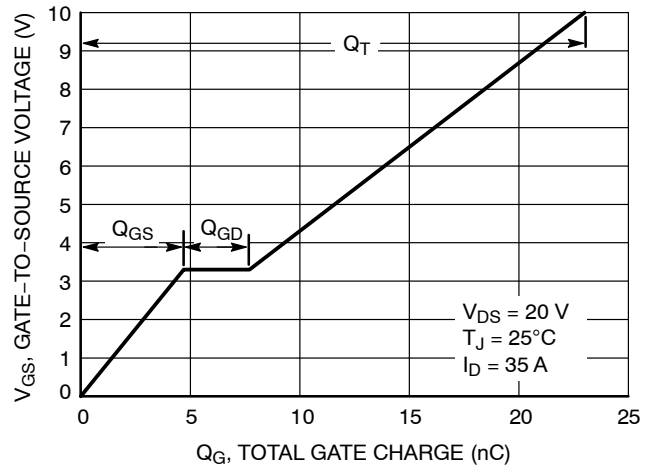


Figure 8. Gate-to-Source vs. Total Charge

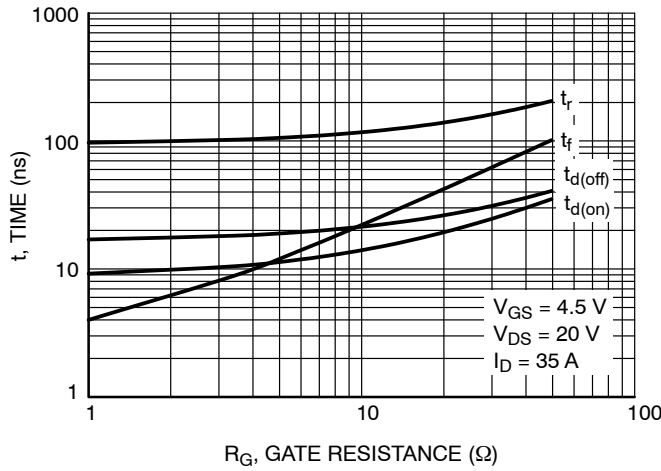


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

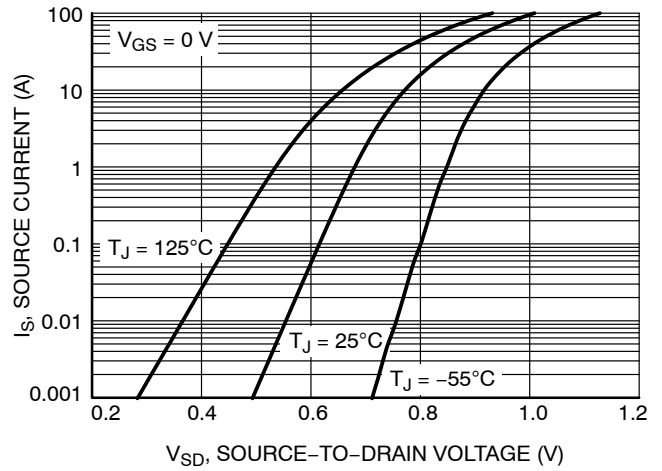


Figure 10. Diode Forward Voltage vs. Current

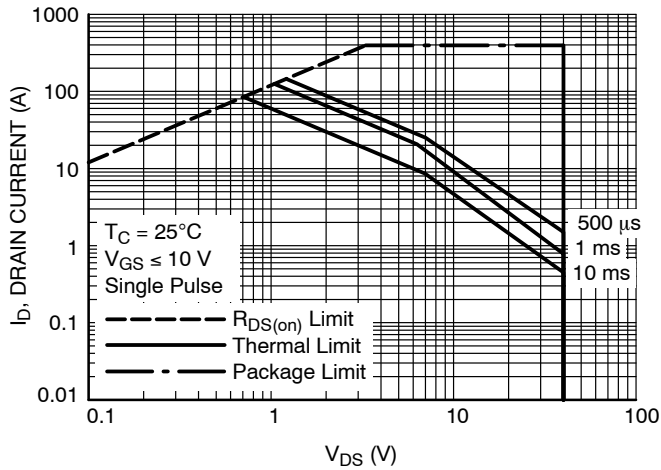


Figure 11. Safe Operating Area

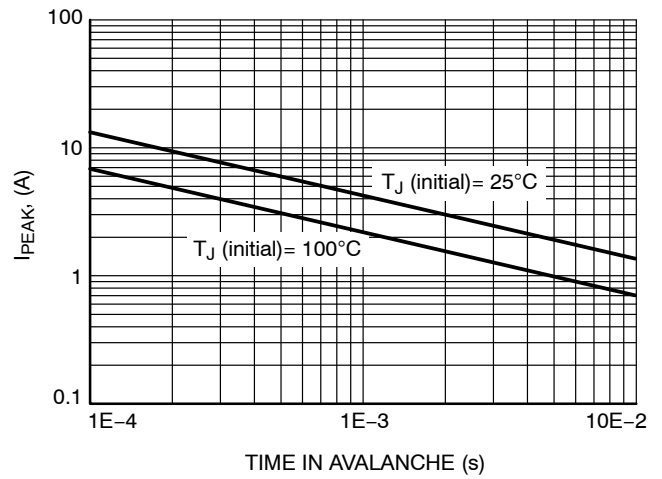


Figure 12. I_{PEAK} vs. Time in Avalanche

NVMFS5C460NL

TYPICAL CHARACTERISTICS

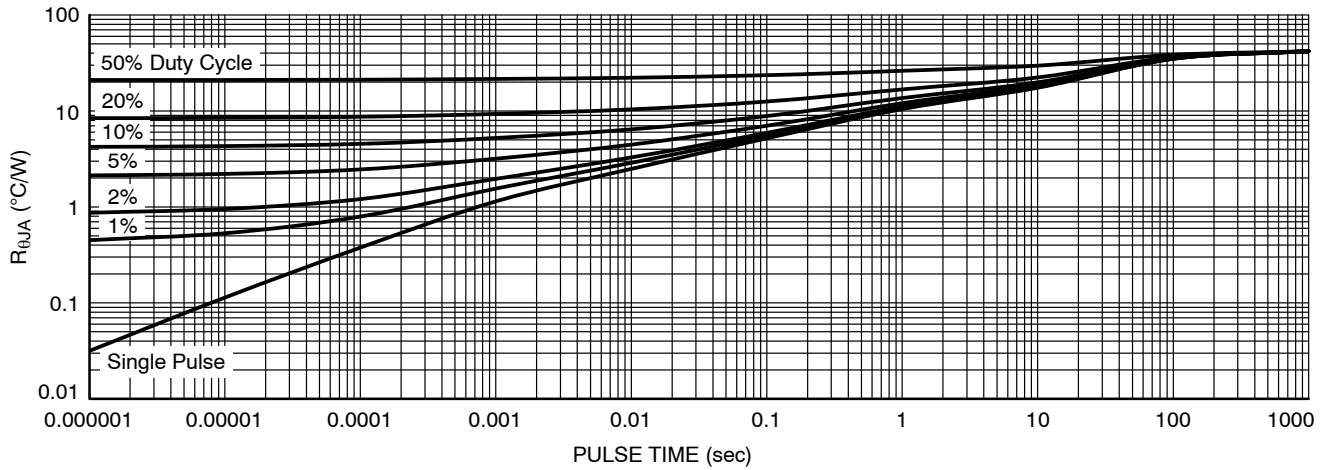


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMFS5C460NLT1G	5C460L	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C460NLWFT1G	460LWF	DFNW5 (Pb-Free, Wettable Flanks)	1500 / Tape & Reel
NVMFS5C460NLAFT1G	5C460L	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C460NLAFT1G-YE	5C460L	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C460NLWFAFT1G	460LWF	DFNW5 (Pb-Free, Wettable Flanks)	1500 / Tape & Reel
NVMFS5C460NLWFET1G	460LWF	DFNW5 (Pb-Free, Wettable Flanks)	1500 / Tape & Reel
NVMFS5C460NLWFET3G	460LWF	DFNW5 (Pb-Free, Wettable Flanks)	5000 / Tape & Reel

DISCONTINUED (Note 5)

Device	Package Type	Package	Shipping [†]
NVMFS5C460NLT3G	5C460L	DFN5 (Pb-Free)	5000 / Tape & Reel
NVMFS5C460NLWFT3G	460LWF	DFNW5 (Pb-Free, Wettable Flanks)	5000 / Tape & Reel
NVMFS5C460NLWFAFT3G	460LWF	DFNW5 (Pb-Free, Wettable Flanks)	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](#).

6. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.



SCALE 2:1

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

DATE 25 JUN 2018

NOTES:

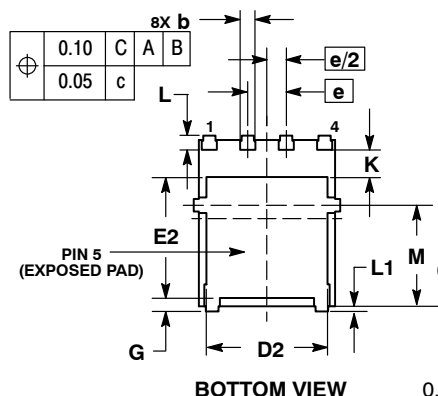
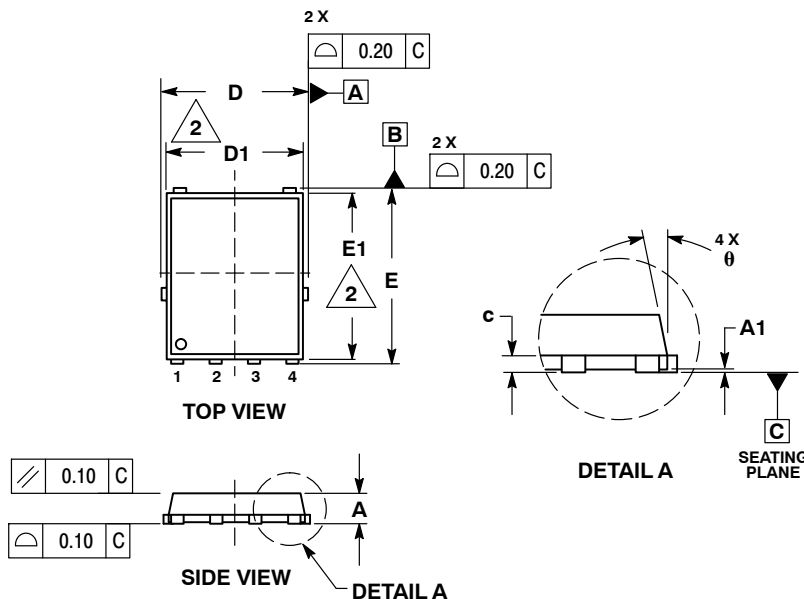
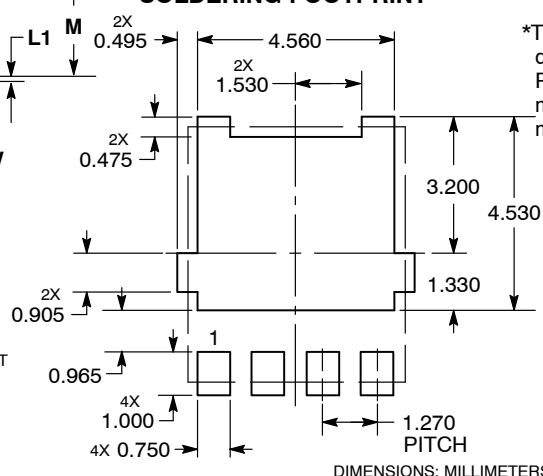
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

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

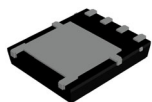
STYLE 1:
PIN 1: SOURCE
2: SOURCE
3: SOURCE
4: GATE
5: DRAIN

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.

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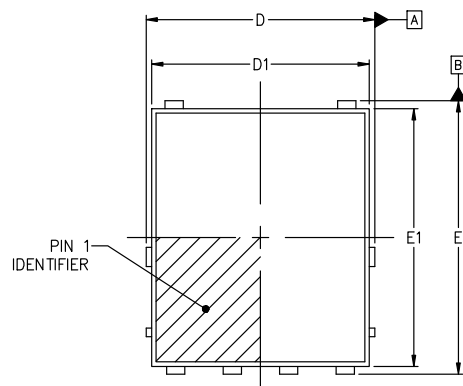


DFNW5 4.90x5.90x1.00, 1.27P

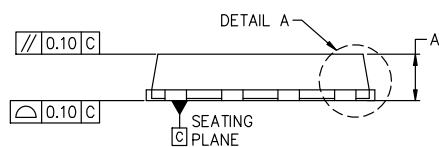
CASE 507BE

ISSUE B

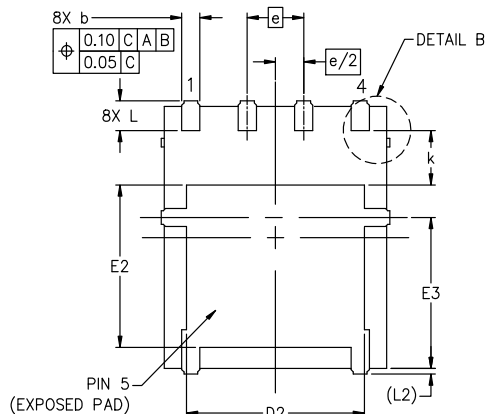
DATE 19 SEP 2024



TOP VIEW

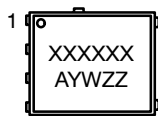


SIDE VIEW



BOTTOM VIEW

GENERIC
MARKING DIAGRAM*

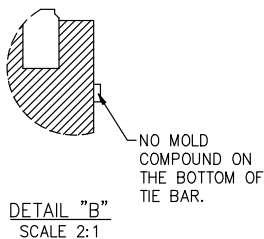
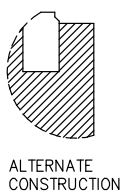
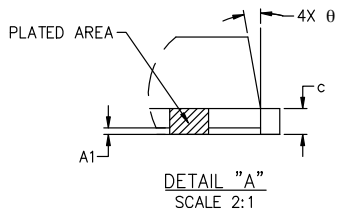


XXXXXX = Specific Device Code
A = Assembly Location
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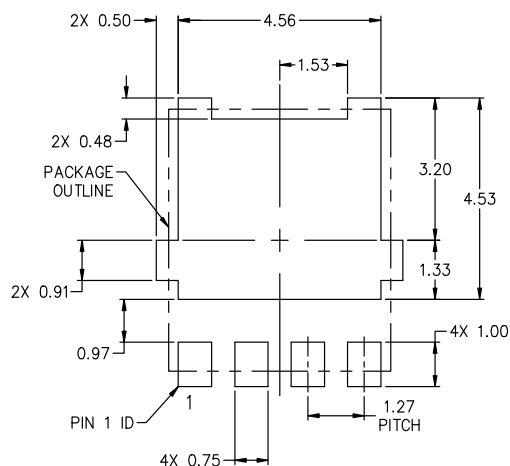
*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. THIS PACKAGE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.



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
E3	3.00	3.40	3.80
e	1.27 BSC		
k	1.20	1.35	1.50
L	0.51	0.57	0.71
L2	0.15 REF.		
θ	0°	6°	12°



RECOMMENDED MOUNTING FOOTPRINT*
*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

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DESCRIPTION:	DFNW5 4.90x5.90x1.00, 1.27P	PAGE 1 OF 1

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