

NVTFS004N04C

MOSFET – Power, Single N-Channel 40 V, 4.9 mΩ, 77 A

Features

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVTFS004N04C – Wettable Flanks Product
- 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 $R_{\theta JC}$ (Notes 1, 2, 3, 4)	Steady State	$T_C = 25^\circ\text{C}$	I_D	77
		$T_C = 100^\circ\text{C}$		43
Power Dissipation $R_{\theta JC}$ (Notes 1, 2, 3)		$T_C = 25^\circ\text{C}$	P_D	55
		$T_C = 100^\circ\text{C}$		18
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3, 4)	Steady State	$T_A = 25^\circ\text{C}$	I_D	18
		$T_A = 100^\circ\text{C}$		13
Power Dissipation $R_{\theta JA}$ (Notes 1, 3)		$T_A = 25^\circ\text{C}$	P_D	3.2
		$T_A = 100^\circ\text{C}$		1.6
Pulsed Drain Current	$T_A = 25^\circ\text{C}$, $t_p = 10\ \mu\text{s}$	I_{DM}	338	A
Operating Junction and Storage Temperature Range		T_J , T_{stg}	-55 to +175	°C
Source Current (Body Diode)		I_S	45.5	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 5.2\ \text{A}$)		E_{AS}	122	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 (Note 1)

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 3)	$R_{\theta JC}$	2.7	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	47.4	

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. Ψ (Ψ) is used as required per JESD51-12 for packages in which substantially less than 100% of the heat flows to single case surface.
3. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
4. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

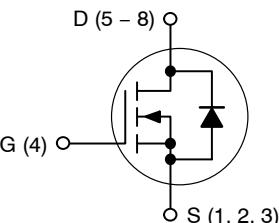


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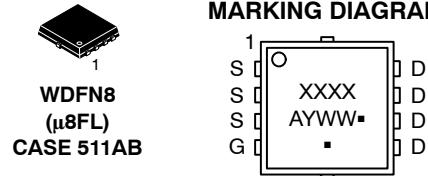
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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	4.9 mΩ @ 10 V	77 A

N-Channel



MARKING DIAGRAM



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
■ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

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

NVTFS004N04C

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

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
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 5)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 50 μA	2.5		3.5	V
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 35 A		4.1	4.9	mΩ
Forward Transconductance	g _{FS}	V _{DS} = 15 V, I _D = 35 A		57		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{iss}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 25 V		1150		pF
Output Capacitance	C _{oss}			600		
Reverse Transfer Capacitance	C _{rss}			25		
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 10 V, V _{DS} = 32 V, I _D = 35 A		3.7		nC
Gate-to-Source Charge	Q _{GS}			5.7		
Gate-to-Drain Charge	Q _{GD}			3.0		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 32 V, I _D = 35 A		18		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	t _{d(on)}	V _{GS} = 10 V, V _{DS} = 32 V, I _D = 35 A		12		ns
Rise Time	t _r			80		
Turn-Off Delay Time	t _{d(off)}			26		
Fall Time	t _f			8		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 35 A	T _J = 25°C		0.82	1.2	V
			T _J = 125°C		0.69		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 35 A			33		ns
Charge Time	t _a				16		
Discharge Time	t _b				17		
Reverse Recovery Charge	Q _{RR}				18		nC

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

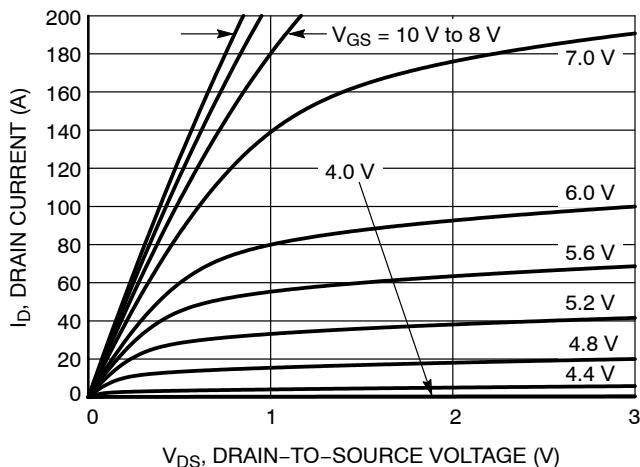


Figure 1. On-Region Characteristics

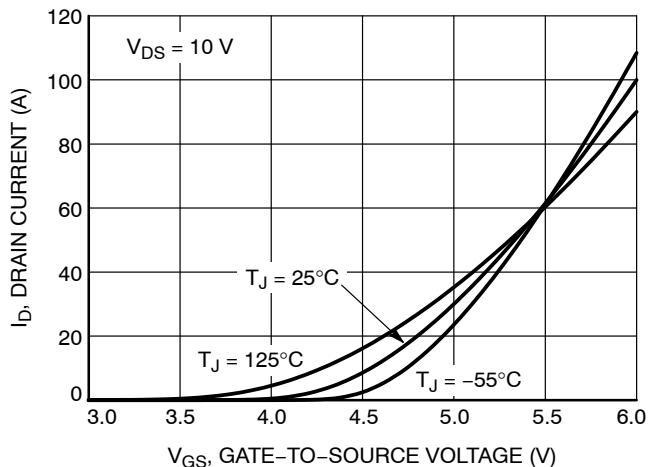


Figure 2. Transfer Characteristics

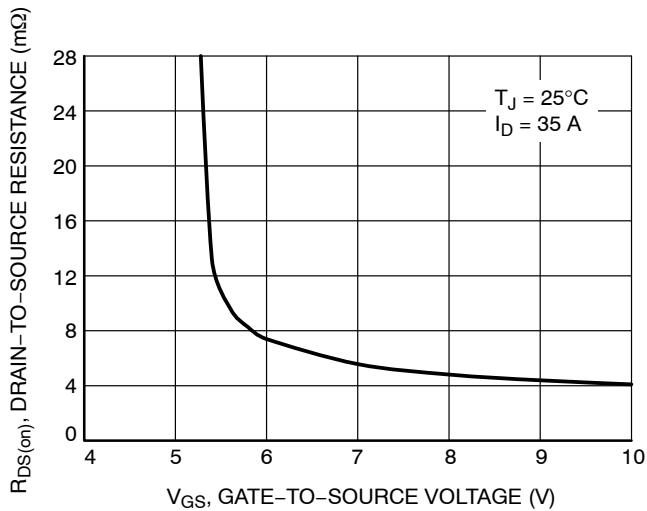


Figure 3. On-Resistance vs. Gate-to-Source Voltage

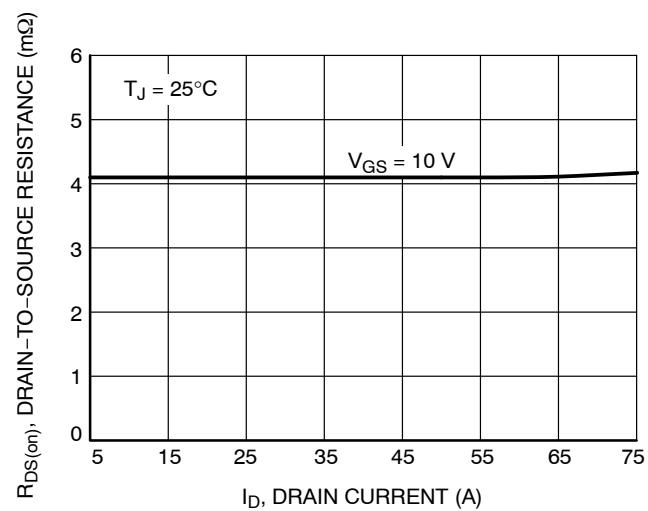


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

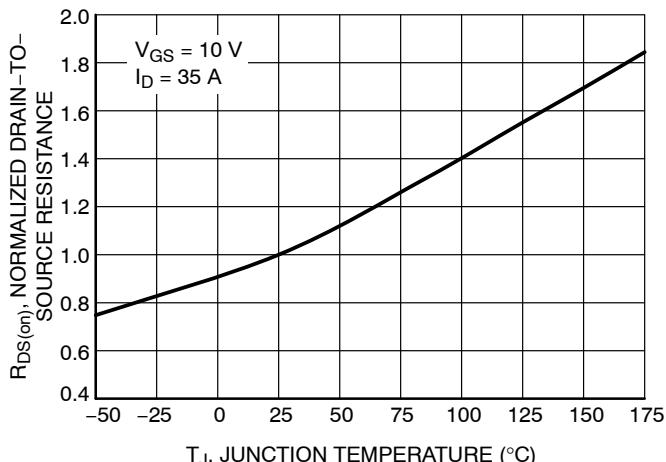


Figure 5. On-Resistance Variation with Temperature

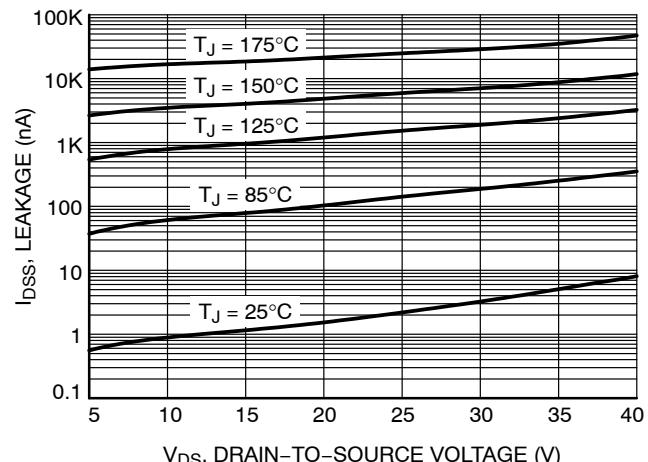


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

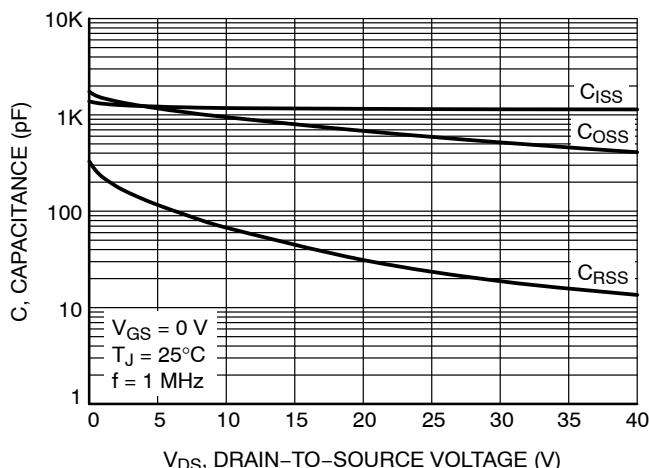


Figure 7. Capacitance Variation

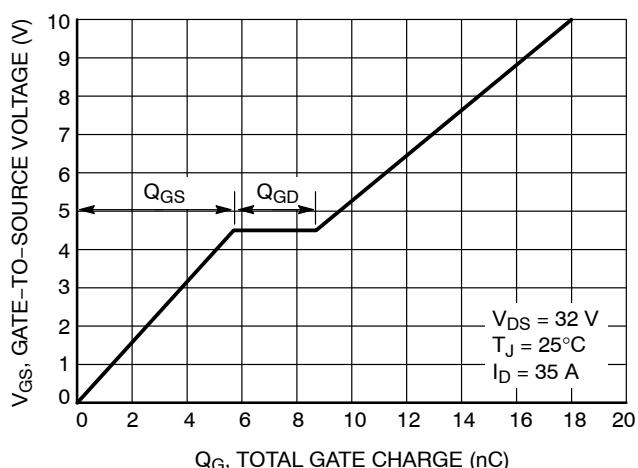


Figure 8. Gate-to-Source Voltage vs. Total Charge

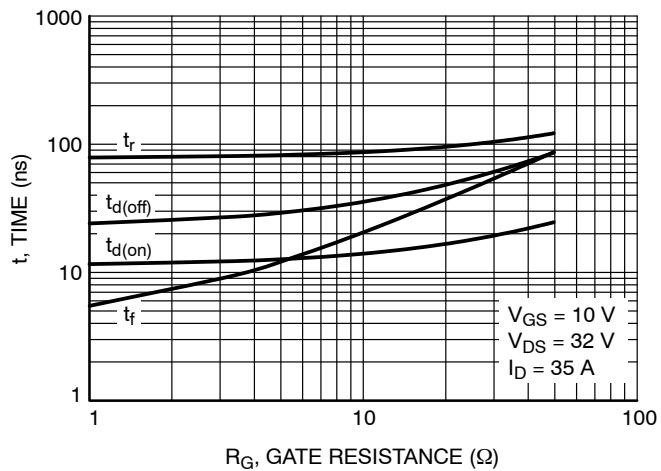


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

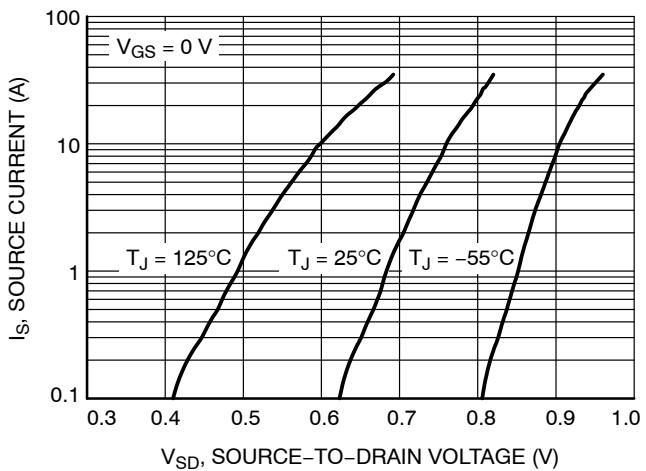


Figure 10. Diode Forward Voltage vs. Current

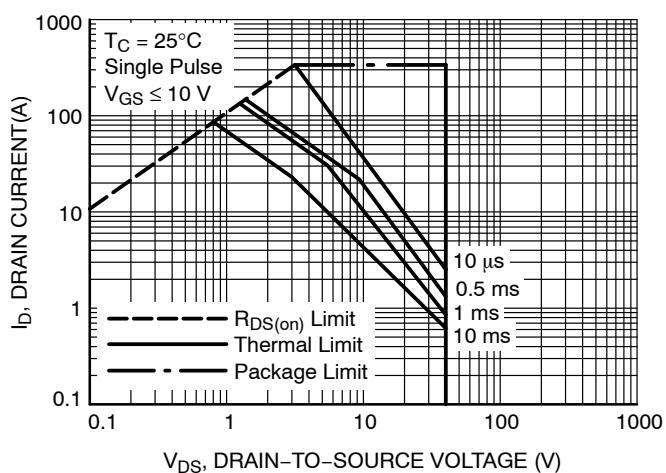
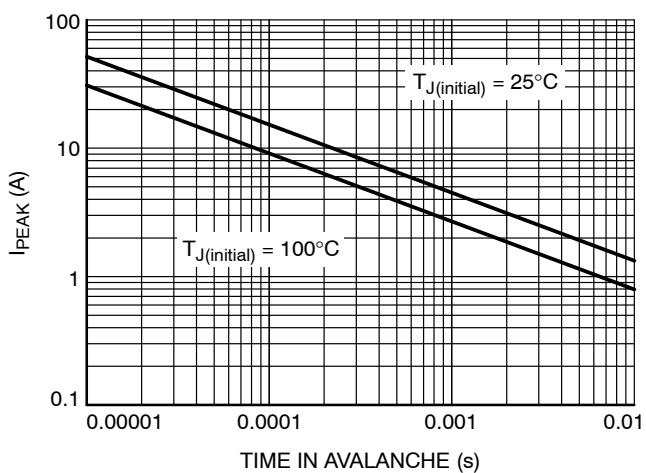
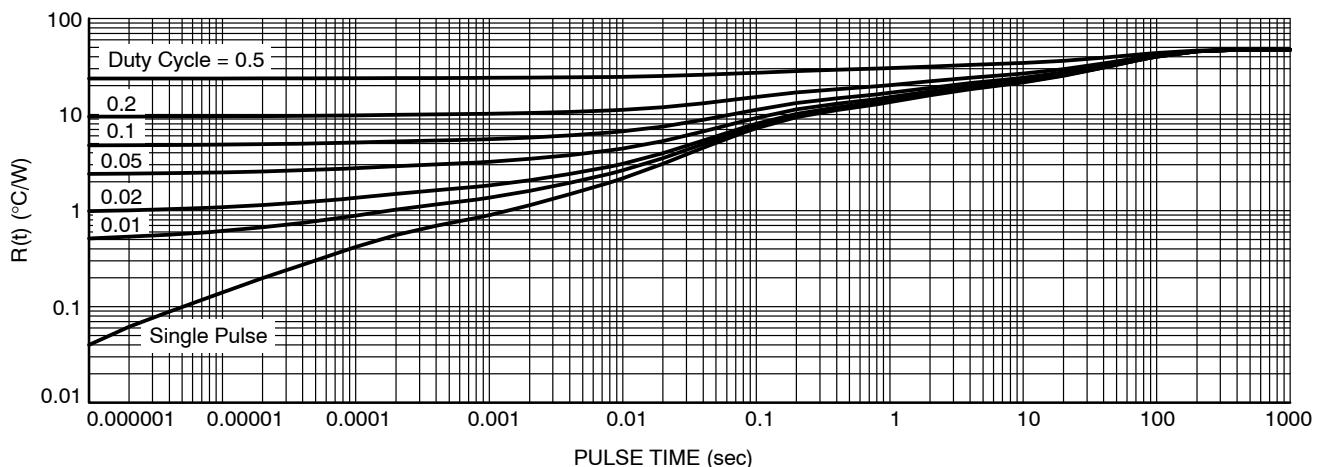


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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

TYPICAL CHARACTERISTICS**Figure 13. Thermal Characteristics****DEVICE ORDERING INFORMATION**

Device	Marking	Package	Shipping [†]
NVTFS004N04CTAG	04NC	WDFN8 (Pb-Free)	1500 / Tape & Reel
NVTFWS004N04CTAG	04NW	WDFN8 (Pb-Free, Wettable Flanks)	1500 / 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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®

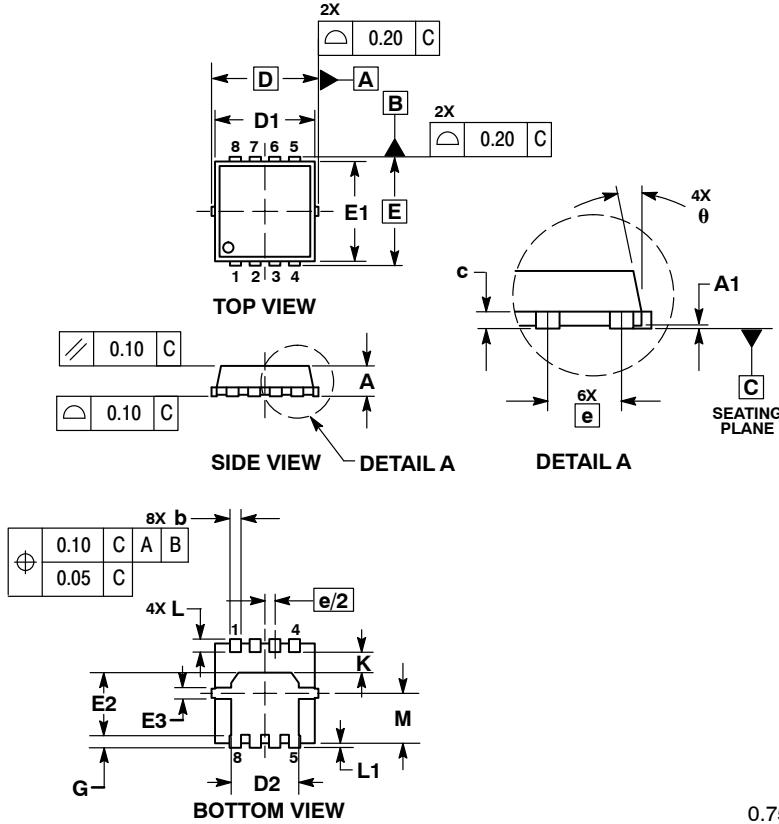


WDFN8 3.3x3.3, 0.65P
CASE 511AB
ISSUE D

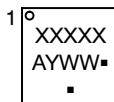
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SCALE 2:1



GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
■ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking.

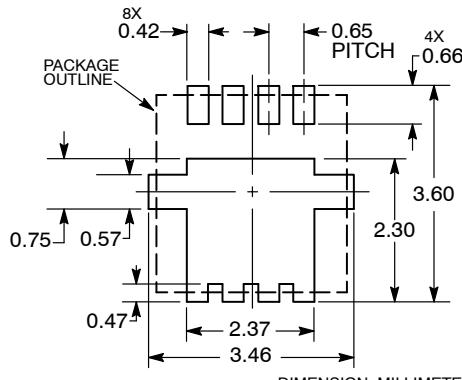
Pb-Free indicator, "G" or microdot "■", may or may not be present.

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

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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