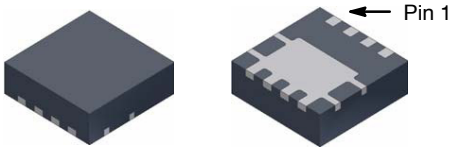
FDMC7570S

MOSFET – N-Channel, POWERTRENCH®, SyncFET™

25 V, 40 A, 2 mΩ

ON Semiconductor®

www.onsemi.com



Power 33
PQFN8
CASE 483AK

General Description

The FDMC7570S has been designed to minimize losses in power conversion application. Advancements in both silicon and package technologies have been combined to offer the lowest $R_{DS(on)}$ while maintaining excellent switching performance. This device has the added benefit of an efficient monolithic Schottky body diode.

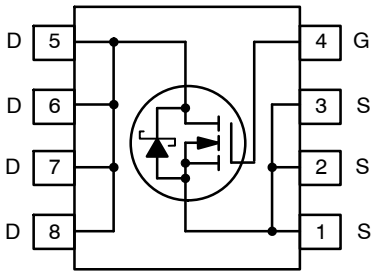
Features

- Max $R_{DS(on)}$ = 2 mΩ at V_{GS} = 10 V, I_D = 27 A
- Max $R_{DS(on)}$ = 2.9 mΩ at V_{GS} = 4.5 V, I_D = 21.5 A
- Advanced Package and Combination for Low $R_{DS(on)}$ and High Efficiency
- SyncFET Schottky Body Diode
- 100% UIL Tested
- These Devices are Pb−Free and are RoHS Compliant

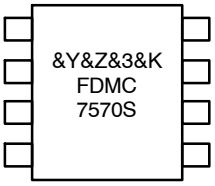
Applications

- Synchronous Rectifier for DC/DC Converters
- Notebook Vcore/GPU Low Side Switch
- Networking Point of Load Low Side Switch
- Telecom Secondary Side Rectification

PIN ASSIGNMENT



MARKING DIAGRAM



&Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= 3−Digit Data Code
&K	= 2−Digit Lot Traceability Code
FDMC7570S	= Specific Device Code

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Parameter	Symbol	Rating	Unit
Drain to Source Voltage	V_{DS}	25	V
Gate to Source Voltage (Note 4)	V_{GS}	±20	V
Drain Current – Continuous (Package limited) T_C = 25°C – Continuous (Silicon limited) T_C = 25°C – Continuous T_A = 25°C (Note 1a) – Pulsed	I_D	 40 132 27 120	A
Single Pulse Avalanche Energy (Note 3)	E_{AS}	144	mJ
Power Dissipation T_C = 25°C	P_D	59	W
Power Dissipation T_A = 25°C (Note 1a)		2.3	
Operating and Storage Junction Temperature Range	T_J, T_{STG}	−55 to +150	°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.

ORDERING INFORMATION

Device	Package	Shipping†
FDMC7570S	PGFN8 (Pb−Free)	3,000 / 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 CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.1	°C/W
Thermal Resistance, Junction to Ambient (Note 1a)	$R_{\theta JA}$	53	

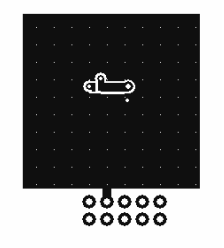
ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTIC						
Drain to Source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0 V	BV_{DSS}	25			V
Breakdown Voltage Temperature / Coefficient	I_D = 10 mA, referenced to 25°C	ΔBV_{DSS} / ΔT_J		21		mV/°C
Zero Gate Voltage Drain Current	V_{DS} = 20 V, V_{GS} = 0 V	I_{DSS}			500	μA
Gate to Source Leakage Current, Forward	V_{GS} = 20 V, V_{DS} = 0 V	I_{GSS}			100	nA
ON CHARACTERISTICS						
Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 1 mA	$V_{GS(th)}$	1.2	1.7	3	V
Gate to Source Threshold Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25°C	$\Delta V_{GS(th)}$ / ΔT_J		−4		mV/°C
Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 27 A	$R_{DS(on)}$		1.6	2	mΩ
	V_{GS} = 4.5 V, I_D = 21.5 A			2.4	2.9	
	V_{GS} = 10 V, I_D = 27 A, T_J = 125°C			2.2	2.8	
Forward Transconductance	V_{DS} = 5 V, I_D = 27 A	g_{FS}		154		S
DYNAMIC CHARACTERISTICS						
Input Capacitance	V_{DS} = 13 V, V_{GS} = 0 V, f = 1 MHz	C_{iss}		3315	4410	pF
Output Capacitance		C_{oss}		1010	1345	pF
Reverse Transfer Capacitance		C_{rss}		168	255	pF
Gate Resistance		R_g		1.2	2.1	Ω
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	V_{DD} = 13 V, I_D = 27 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	$t_{d(on)}$		14	26	ns
Rise Time		t_r		6.8	14	ns
Turn−Off Delay Time		$t_{d(off)}$		34	55	ns
Fall Time		t_f		4.5	10	ns
Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 13 V	Q_g		49	68	nC
Total Gate Charge	V_{GS} = 0 V to 4.5 V, V_{DD} = 13 V	Q_g		22	31	nC
Gate to Source Gate Charge	I_D = 27 A	Q_{gs}		10.8		nC
Gate to Drain “Miller” Charge		Q_{gd}		5.5		nC
DRAIN−SOURCE DIODE CHARACTERISTICS						
Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 27 A (Note 2)	V_{SD}		0.78	1.2	V
	V_{GS} = 0 V, I_S = 2 A (Note 2)			0.43	0.8	
Reverse Recovery Time	I_F = 27 A, di/dt = 300 A/μs	t_{rr}		30	48	ns
Reverse Recovery Charge		Q_{rr}		29	46	nC

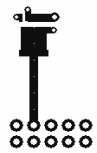
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR−4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 53°C/W when mounted on a 1 in^2 pad of 2 oz copper.



b) 125°C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.
3. E_{AS} of 144 mJ is based on starting T_J = 25°C, L = 1 mH, I_{AS} = 17 A, V_{DD} = 23 V, V_{GS} = 10 V. 100% test at L = 0.3 mH, I_{AS} = 25 A.
4. As an N−ch device, the negative Vgs rating is for lower duty cycle pulse occurrence only. No continuous rating is implied.

TYPICAL CHARACTERISTICS

(T_J = 25°C unless otherwise noted)

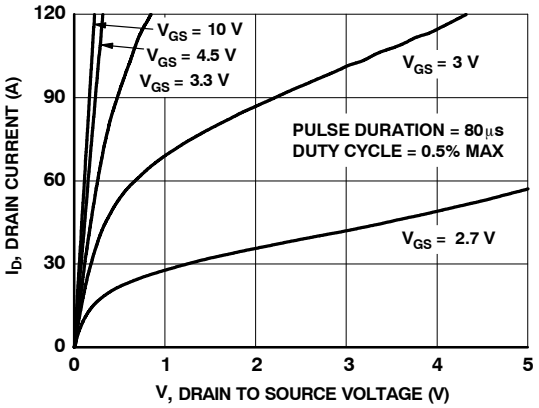


Figure 1. On−Region Characteristics

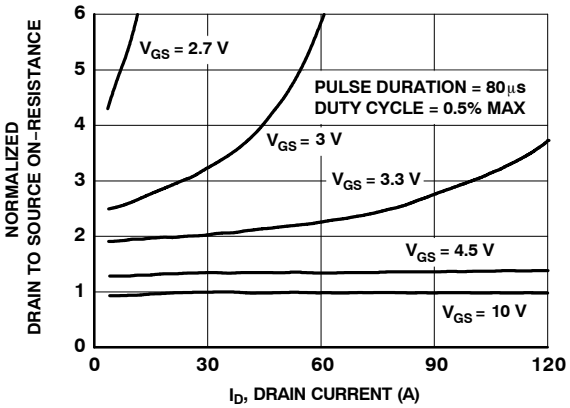


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

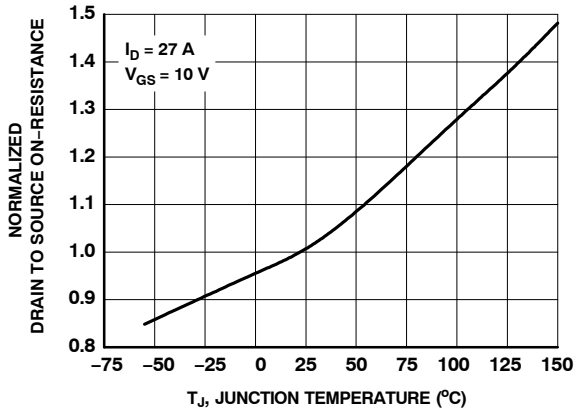


Figure 3. Normalized On−Resistance vs. Junction Temperature

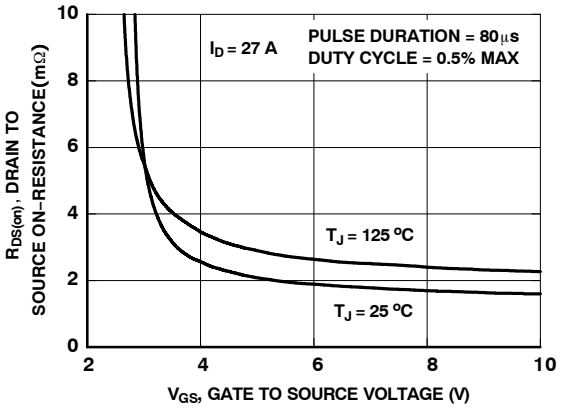


Figure 4. On−Resistance vs. Gate to Source Voltage

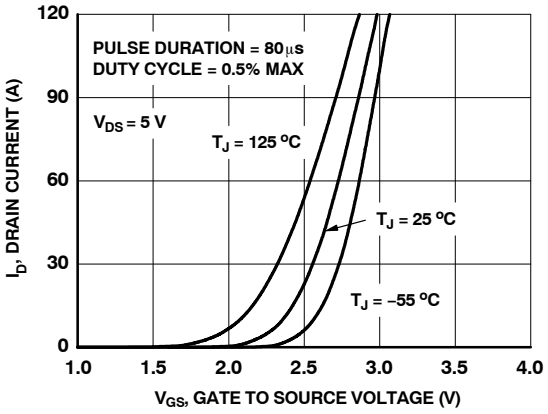


Figure 5. Transfer Characteristics

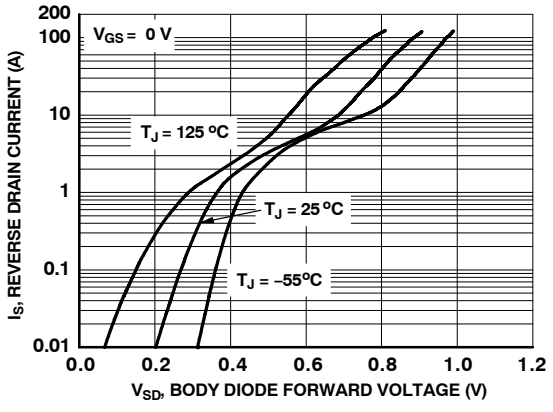


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (continued)

(T_J = 25°C unless otherwise noted)

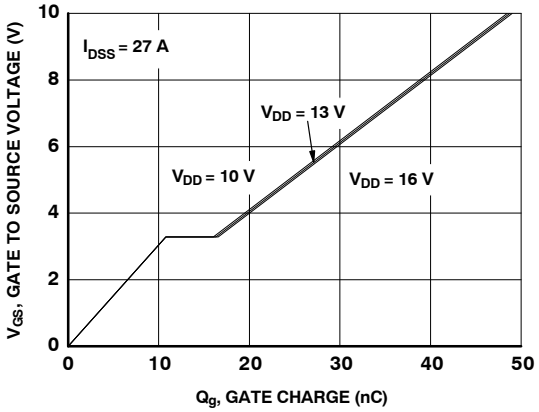


Figure 7. Gate Charge Characteristics

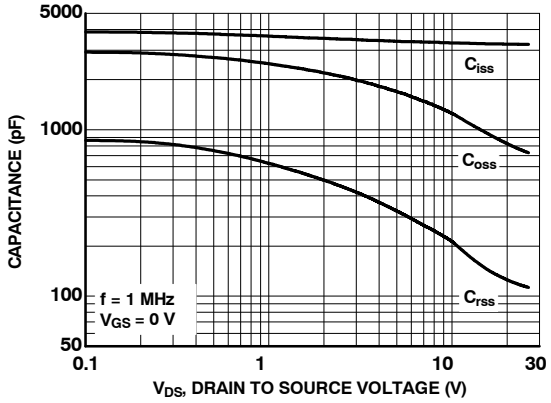


Figure 8. Capacitance vs Drain to Source Voltage

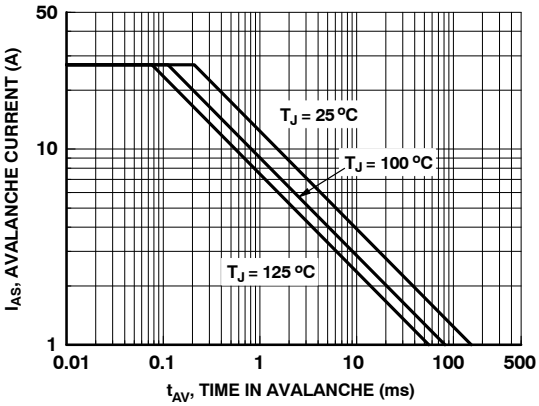


Figure 9. Unclamped Inductive Switching Capability

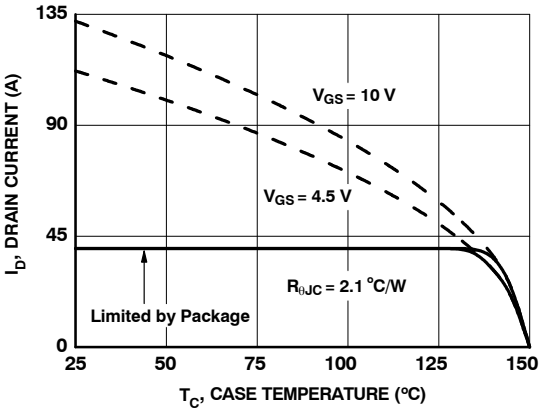


Figure 10. Maximum Continuous Drain Current vs Case Temperature

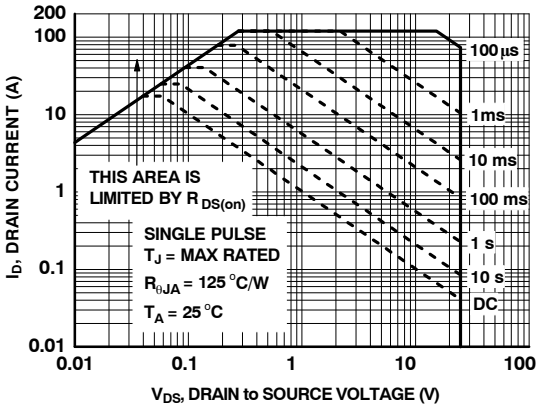


Figure 11. Forward Bias Safe Operating Area

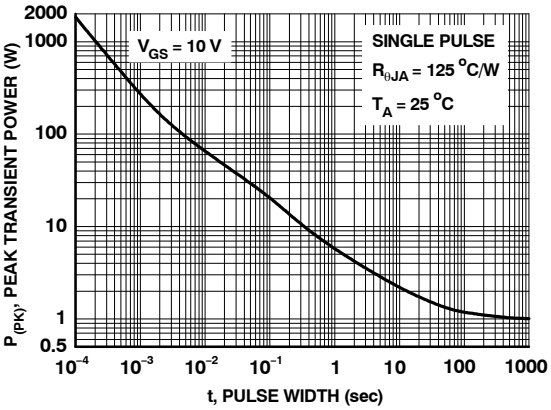


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (continued)

(T_J = 25°C unless otherwise noted)

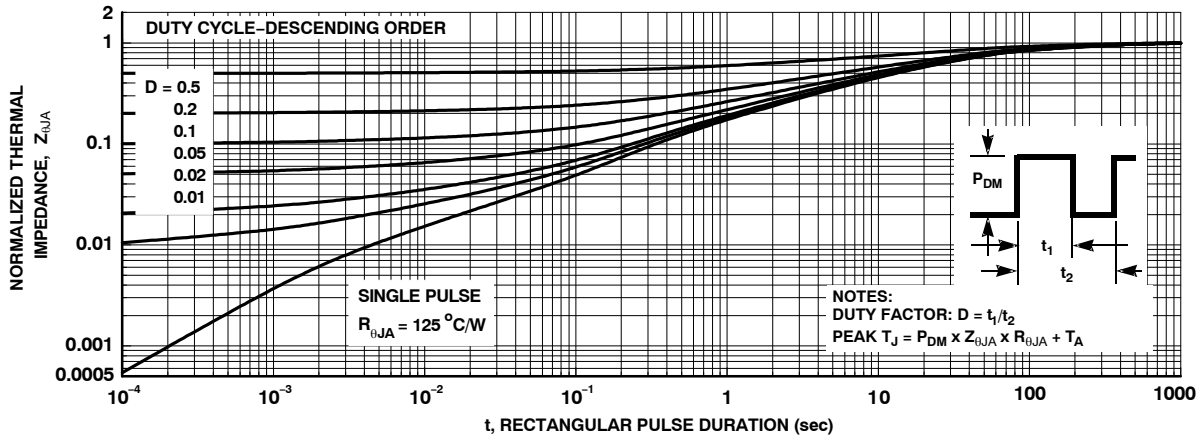


Figure 13. Junction−to−Ambient Transient Thermal Response Curve

SyncFET SCHOTTKY BODY DIODE CHARACTERISTICS

ON Semiconductor's SyncFET process embeds a Schottky diode in parallel with POWERTRENCH MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 14 shows the reverses recovery characteristic of the FDMC7570S.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

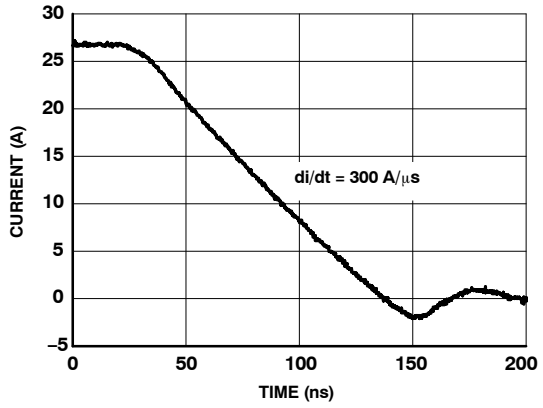


Figure 14. FDMC7570S SyncFET Body Diode Reverse Recovery Characteristic

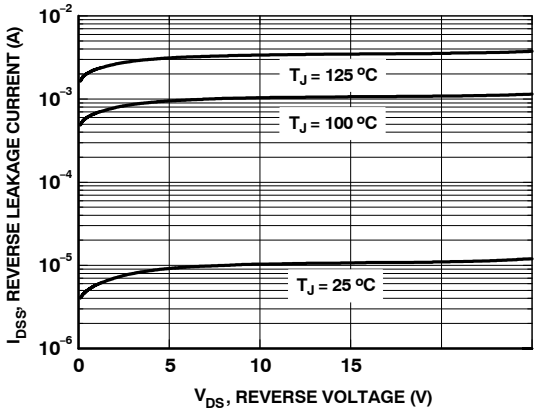
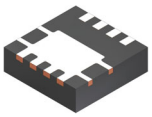


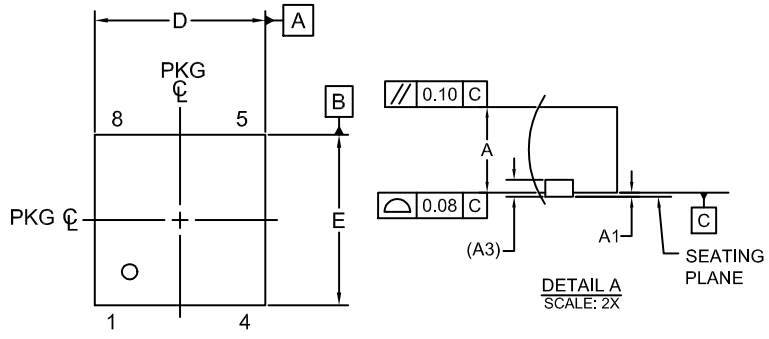
Figure 15. SyncFET Body Diode Reverse Leakage vs. Drain−Source Voltage

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

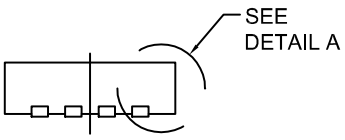


PQFN8 3.3X3.3, 0.65P
CASE 483AK
ISSUE B

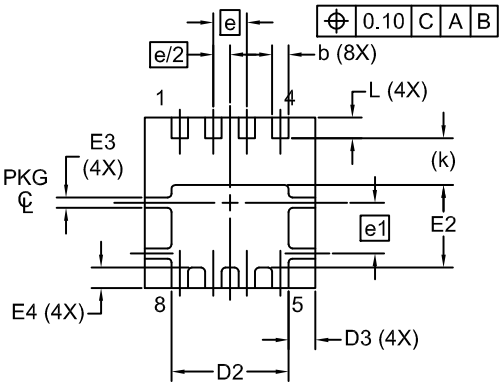
DATE 12 OCT 2021



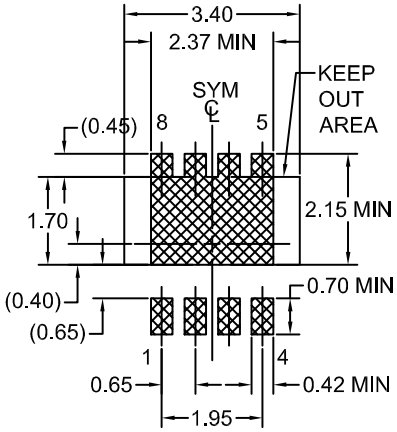
TOP VIEW



FRONT VIEW



BOTTOM VIEW



LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
A3	0.20 REF		
b	0.27	0.32	0.37
D	3.20	3.30	3.40
D2	2.17	2.27	2.37
D3	0.42	0.52	0.62
E	3.20	3.30	3.40
E2	1.50	1.60	1.70
E3	0.10	0.20	0.30
E4	0.29	0.39	0.49
e	0.65 BSC		
e/2	0.325 BSC		
e1	0.98 BSC		
k	0.91 REF		
L	0.30	0.40	0.50

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DESCRIPTION:	**PQFN8 3.3X3.3, 0.65P**	**PAGE 1 OF 1**

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