PAM3108

MAXIMUM 1.5A, ULTRA LOW DROPOUT REGULATOR

Description

The PAM3108 is a high performance positive voltage regulator designed for use in applications requiring very low Input voltage and very low dropout voltage at up to 1.5A. It operates with a V_{IN} as low as 1.1V and V_{DD} voltage 3V with output voltage programmable as low as 0.8V. The significant feature includes ultra low dropout, ideal for applications where V_{OUT} is very close to V_{IN}. Additionally, there is an enable pin to further reduce power dissipation while shutdown. The PAM3108 provides excellent regulation over variations in line, load, temperature and provides a power OK signal to indicate if the voltage level of Vo reaches 90% of its rating value.

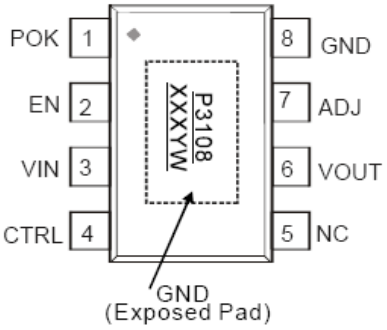
The PAM3108 is available with SOP-8 (Exposed Pad) and WDFN-10L 3x3 packages.

Features

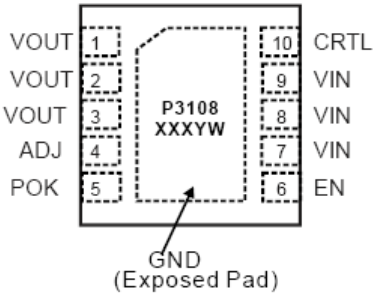
- Maximum 1.5A Low-Dropout Voltage Regulator
- High Accuracy Output Voltage ±1.5%
- Typically 150mV Dropout at 1.5A
- Power Good Output
- Output Voltage Pull Low Resistance when Disabled
- Thermal and Over Current Protection
- RoHS Compliant and 100% Lead (Pb)-Free

Pin Assignments

Top View
SOP-8(EP)



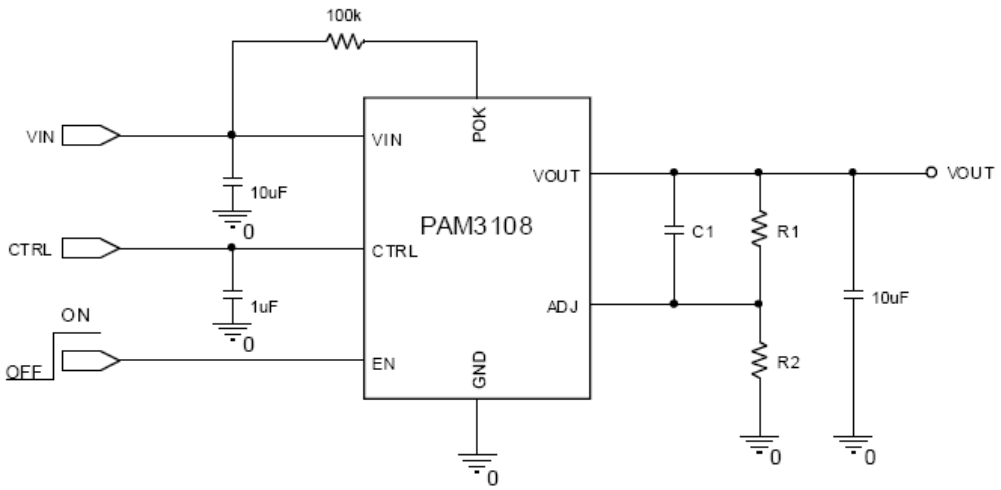
TOP VIEW
WDFN-10L 3x3



Applications

- Front Side Bus VTT (1.2V/1.5A)
- NoteBook PC Applications
- Motherboard Applications

Typical Applications Circuit

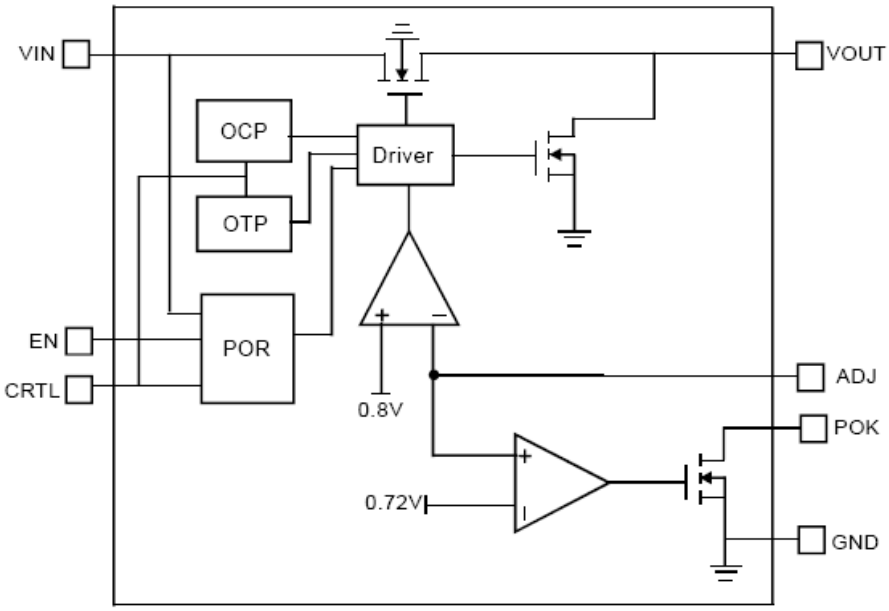


$V_O = 0.8V*(1+R1/R2)$

Pin Configuration and Description

Pin Name	Pin Number		Function
	SOP-8(EP)	W-DFN3x3-10	
VIN	3	7, 8, 9	Supply Input Voltage.
EN	2	6	Chip Enable (Active-High).
CTRL	4	10	Supply Voltage of ControlCircuitry.
POK	1	5	Power Good Open Drain Output.
ADJ	7	4	Set the output voltage by the feedback resistors. V_O = 0.8V x (R1 + R2)/R2.
VOUT	6	1, 2, 3	Output Voltage.
NC	5	—	No Internal Connection.
GND	8, Exposed Pad (9)	Exposed Pad (11)	Ground. The exposed pad must be soldered to a large PCB and connected to GND formaximum powe r dissipation.

Functional Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

Parameter	Rating	Unit
Input Voltage VIN, CTRL	6.0	V
Output Current	1.5	A
Output Pin Voltage	GND -0.3 to V_{IN} +0.3	V
Lead Soldering Temperature	260, (5sec)	°C
Storage Temperature	-65 to +150	°C
ESD Rating	Class B	—

Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Parameter	Rating	Unit
Max. Supply Voltage	5.5	V
Junction Temperature	-40 to +125	°C
Operation Temperature	-40 to +85	

Thermal Information

Parameter	Symbol	Package	Max	Unit
Thermal Resistance Junction to Case)	θ_{JC}	W-DFN3x3-10	8.5	°C/W
		SOP-8(EP)	11	
Thermal Resistance (Junction to Ambient)	θ_{JA}	W-DFN3x3-10	60	
		SOP-8(EP)	90	
Internal Power Dissipation (@T_A = 25°C)	P_D	W-DFN3x3-10	1600	mW
		SOP-8(EP)	1100	

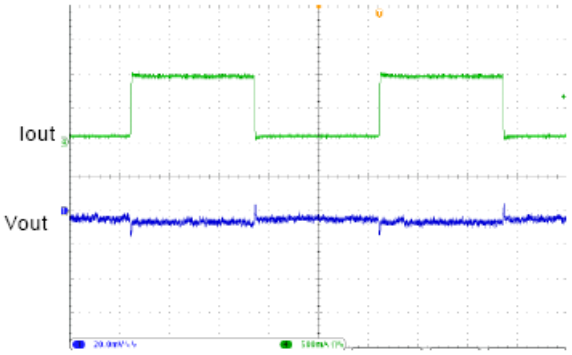
Electrical Characteristics (@T_A = +25°C, V_{IN} = V_O +0.5V, V_{CTRL} = V_{EN} = 5V, C_{IN} = C_O = 10μF, unless otherwise specified.)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Units
VIN Input Voltage	V_{IN}	V_{OUT} = V_{REF}		1.1		5.5	V
CTRL Input Voltage	V_{CTRL}			3		5.5	V
POR Threshold	V_{TH_CTRL}			2.5	2.7		V
	V_{TH_VIN}			0.8	0.9		
POR Hysteresis	V_{YHS_CTRL}				0.4		
	V_{YHS_VIN}				0.5		
Quiescent Current	I_Q	I_O = 0mA			0.5	1.2	mA
CTRL Input Current in Shutdown	I_{SD_CTRL}	V_{EN} = 0V			5		μA
CTRL Input Current in Shutdown	I_{SD_VIN}	V_{EN} = 0V				1	μA
Output Voltage Accuracy	V_O	I_O = 1mA to 1.5A		-1.5		1.5	%
Current Limit	I_O				3		A
Short Current	I_{SHORT}	V_O = 0V			1		A
Feedback Voltage	V_{REF}	V_O = V_{REF}		0.788	0.8	0.812	V
Feedback Leakage Current	I_{REF}					20	nA
Dropout Voltage	V_{DROP}	I_O = 1A			100		mV
		I_O = 1.5A			150		
Line Regulation	LNR	I_O = 1mA, V_{IN} = V_O =0.5V to 5.5V		-0.15	0.1	0.15	%/V
Load Regulation	LDR	V_{IN} = V_O +1V, I_O = 1mA to 1.5A		-2.0	+0.2	+2.0	%
VOUT Pull Low Resistor	R_{PL}	V_{EN} = 0V			100		Ω
Temperature Coefficient	T_C	I_O = 1mA			40		ppm/°C
Over Temperature Shutdown	OTS	I_O = 1mA			170		°C
Over Temperature Hysteresis	OTH	I_O = 1mA			40		°C
Power Supply Ripple Rejection	PSRR	V_{PP} = 200mV	f = 100Hz		65		dB
			f = 1kHz		60		
EN Bias Current	I_{EN}	V_{EN} = VCTRL = 5V			5		μA
EN Input High Threshold	V_{IH}	V_{IN} = 2.5V to 5V		1.5			V
EN Input Low Threshold	V_{IL}	V_{IN} = 2.5V to 5V				0.3	V
POK Threshold Voltage	V_{TH_OK}	V_{REF} Rising		90		94	%
POK Hysteresis				3	10		%
POK Pull_Low Voltage		POK sinks 5mA Current			0.2	0.4	V
POK Delay Time	T_{DELAY}	From V_{REF} = V_{TY_OK} to rising edge of the V_{POK}		1	2	4	mS

Notes: 1. Output current is limited by P_D, maximum I_O = $P_D/(V_{IN(MAX)} – V_O)$.

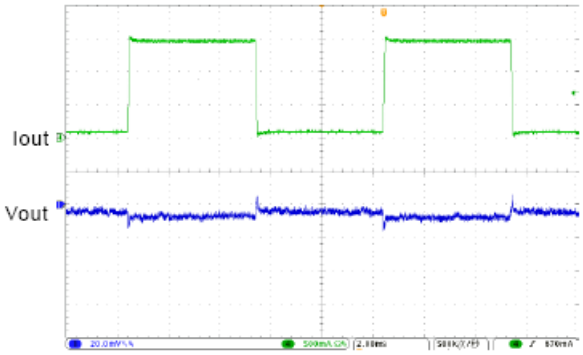
Typical Performance Characteristics (@T_A = +25°C, C_{IN} = C_O = 10μF, unless otherwise specified.)

1. Load Transient Response



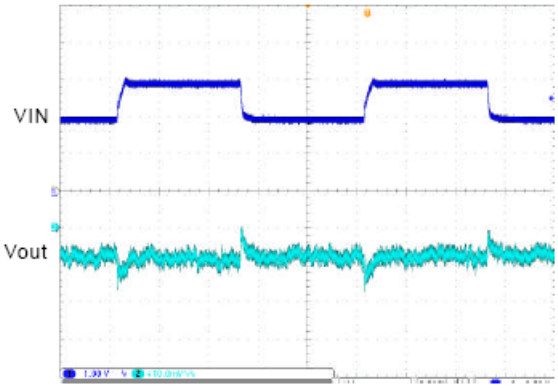
Vctrl=5V,Vin=1.8V,Vo=1.2V,Io=0.1~1A

2. Load Transient Response



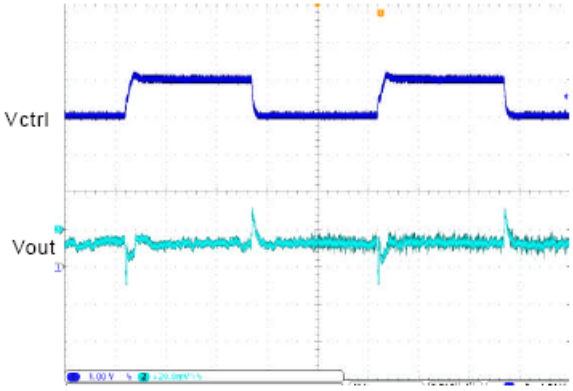
Vctrl=5V,Vin=1.8V,Vo=1.2V,Io=0.1~1.5A

3 Line Transient Response



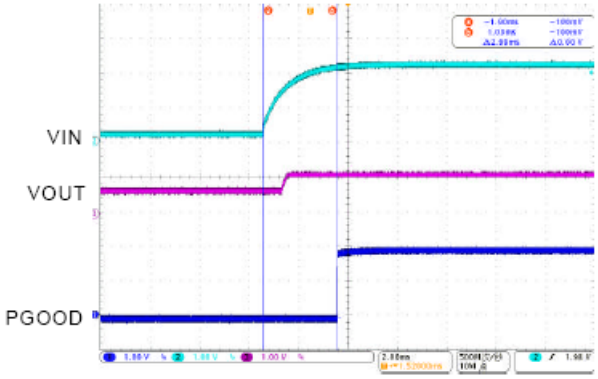
Vctrl=5V,Vin=2~3V,Vo=1.2V,Io=100mA

4. Line Transient Response



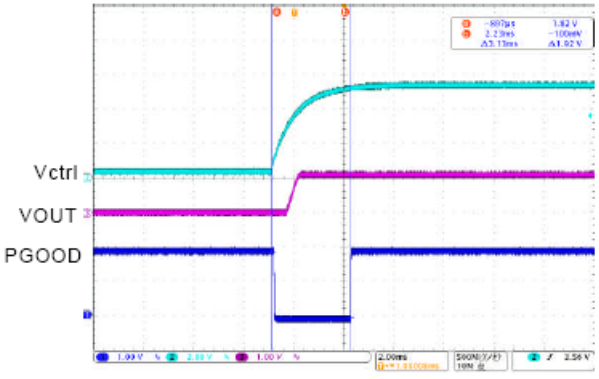
Vctrl=4~5V,Vin=2V,Vo=1.2V,Io=100mA

5. Start Up from VIN



Vctrl=5V,Vin=2V,Vo=1.2V,Io=1.5A

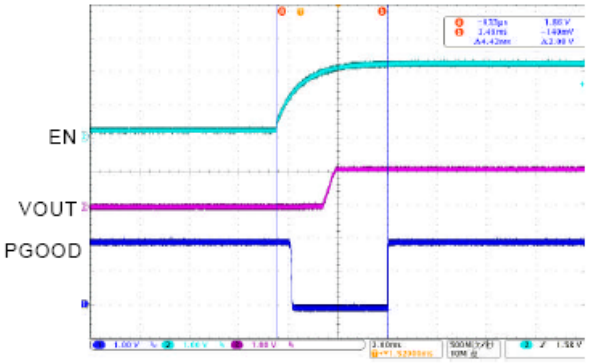
6. Start Up from CTRL



Vctrl=5V,Vin=2V,Vo=1.2V,Io=1.5A

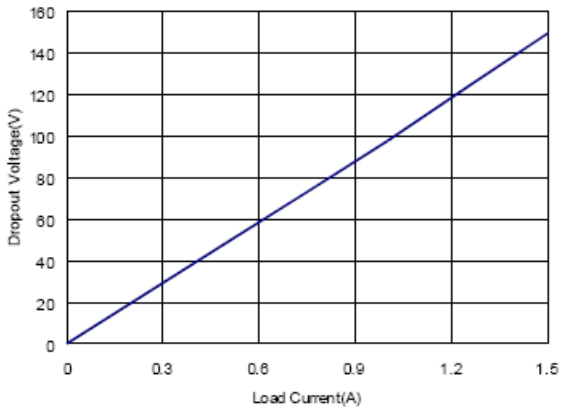
Typical Performance Characteristics (cont.) (@T_A = +25°C, C_{IN} = C_O = 10µF, unless otherwise specified.)

7. Start Up from EN

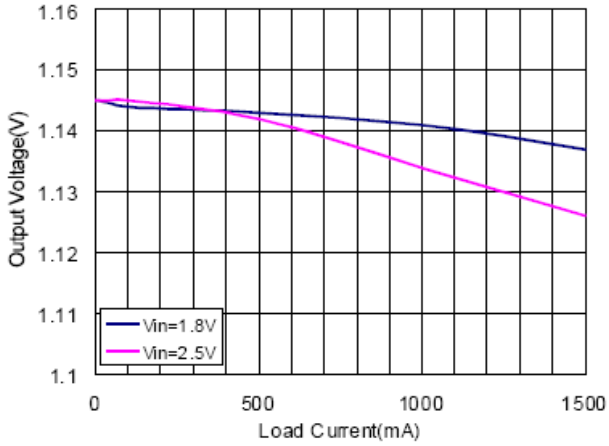


Vctrl=5V,Vin=2V,Ven=0~2V,Vo=1.2V,Io=1.5A

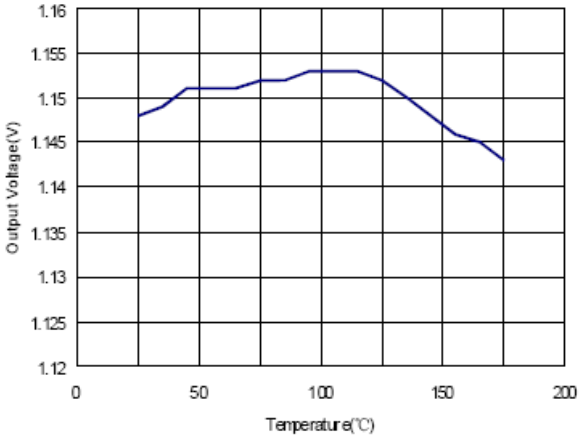
8. Dropout Voltage VS Load Current



9. Output Voltage VS Load Current



10. Output Voltage VS Temperature



Application Information

Capacitor Selection and Regulator Stability

Similar to any low dropout regulator, the external capacitors used with the PAM3108 must be carefully selected for regulator stability and performance.

A capacitor C_{IN} of more than 10μF can be employed in the input pin, while there is no upper limit for the capacitance of C_{IN}. Please note that the distance between C_{IN} and the input pin of the PAM3108 should not exceed 0.5 inch. Ceramic capacitors are suitable for the PAM3108. Capacitors with larger values and lower ESR (equivalent series resistance) provide better PSRR and line-transient response.

The PAM3108 is designed specifically to work with low ESR ceramic output capacitors in order to save space and improve performance. Using an output ceramic capacitor whose value is >10μF with ESR5>mΩ ensures stability.

Shutdown Input Operation

The PAM3108 is shut down by pulling the EN input low, and is turned on by tying the EN input to CTRL or leaving the EN input floating.

Input-Output (Dropout) Voltage

A regulator's minimum input-output voltage difference (or dropout voltage) determines the lowest usable supply voltage. The PAM3108 has a typical 150mV dropout voltage.

Current Limit and Short Circuit Protection

The PAM3108 features a current limit, which monitors and controls the gate voltage of the pass transistor. The output current can be limited to 3A by regulating the gate voltage. The PAM3108 also has a built-in short circuit current limit.

Thermal Considerations

Thermal protection limits power dissipation in the PAM3108. When the junct ion temperature exceeds 170°C, the OTP (Over Temperature Protection) starts the thermal shutdown and turns the pass transistor off. The pass transistor resumes operation after the junction temperature drops below 130°C.

For continuous operation, the junction temperature should be maintained below +125°C. The power dissipation is defined as:

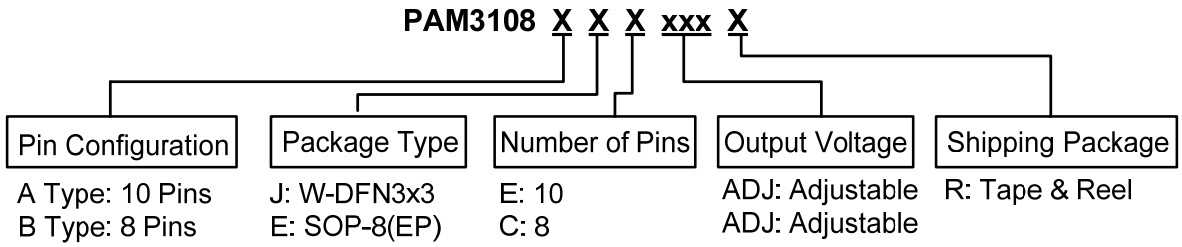
$$P_D = (V_{IN} - V_{OUT}) * I_O + V_{IN} * I_{GND}$$

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surrounding airflow and temperature difference between junction and ambient. The maximum power dissipation can be calculated by the following formula:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

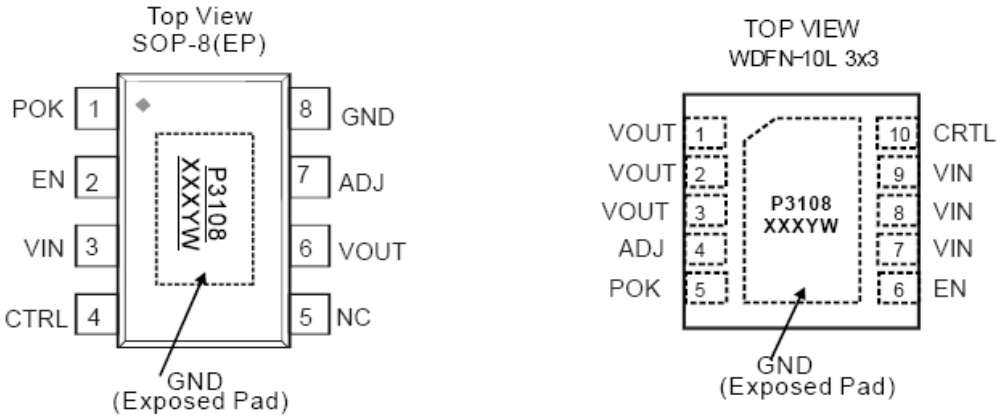
Where $T_{J(MAX)}$ is the maximum allowable junction temperature +125°C, T_A is the ambient temperature and is the thermal resistance from the junction to the ambient.

Ordering Information



Part Number	Output Voltage	Package Type	Output Voltage
PAM3108AJEADJR	ADJ	W-DFN3x3-10	3000 Units/Tape&Reel
PAM3108BECADJR	ADJ	SOP-8(EP)	2500 Units/Tape&Reel

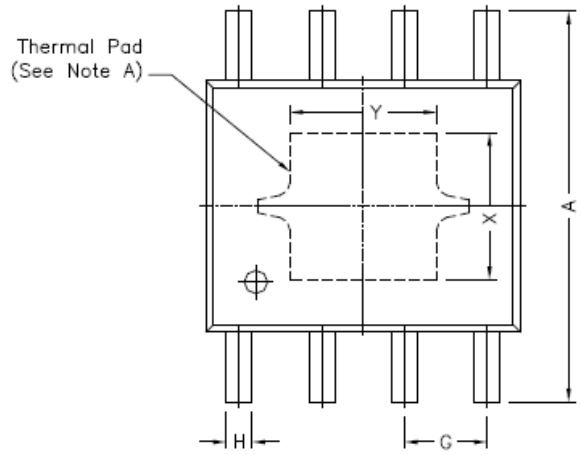
Marking Information



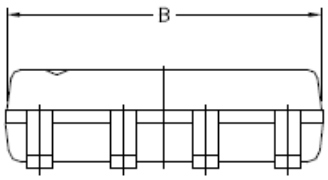
X: Internal Code
Y: Year
W: Week

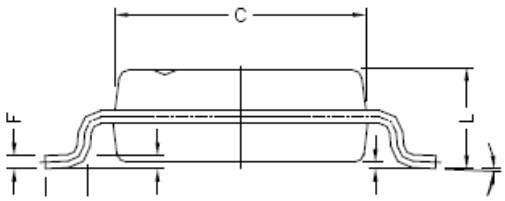
Package Outline Dimensions (All dimensions in mm.)

SOP-8(EP)



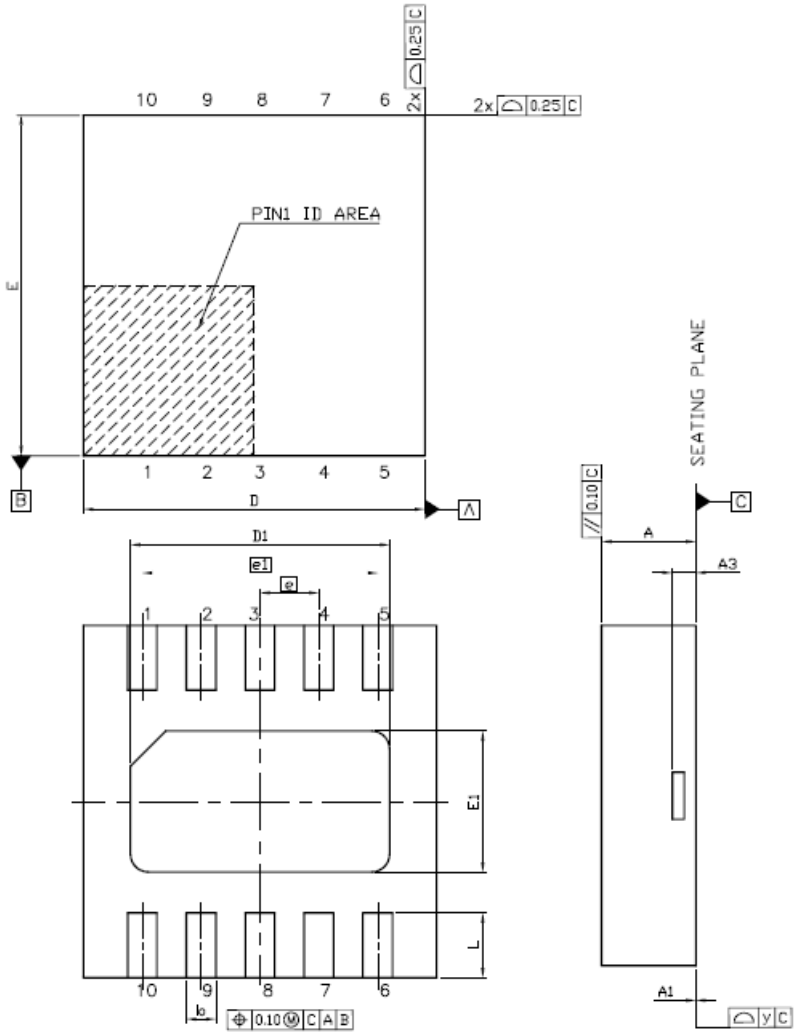
REF.		DIMENSIONS Millimeters Min.	Max.
A		5.80	6.20
B		4.80	5.00
C		3.80	4.00
D		0°	8°
E		0.40	0.90
F		0.19	0.25
M		0	0.15
H		0.35	0.49
L		1.35	1.75
G		1.27 TYP.	
Option1	X	2.28	
	Y	2.28	
Option2	X	2.41	
	Y	3.30	





Package Outline Dimensions (cont.) (All dimensions in mm.)

W-DFN3x3-10



SYMBOL	DIMENSION (MM)		
	MIN	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3		0.203 REF	
b	0.18	0.25	0.30
D	2.90	3.00	3.10
D1	2.10	2.20	2.30
E	2.90	3.00	3.10
E1	1.10	1.20	1.30
L	0.45	0.55	0.65
e		0.50 BASIC	
e1		2.00 BASIC	
y	0		0.08

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