

Quasi-Resonant smps controller DESCRIPTION

Quasi-resonant zero-voltage switching (ZVS) topology.

Ripple reduction during light to moderate load while minimizing the range of operating frequency.

Ultra-low start up current and operating current.

Soft Start

Green-Mode operation

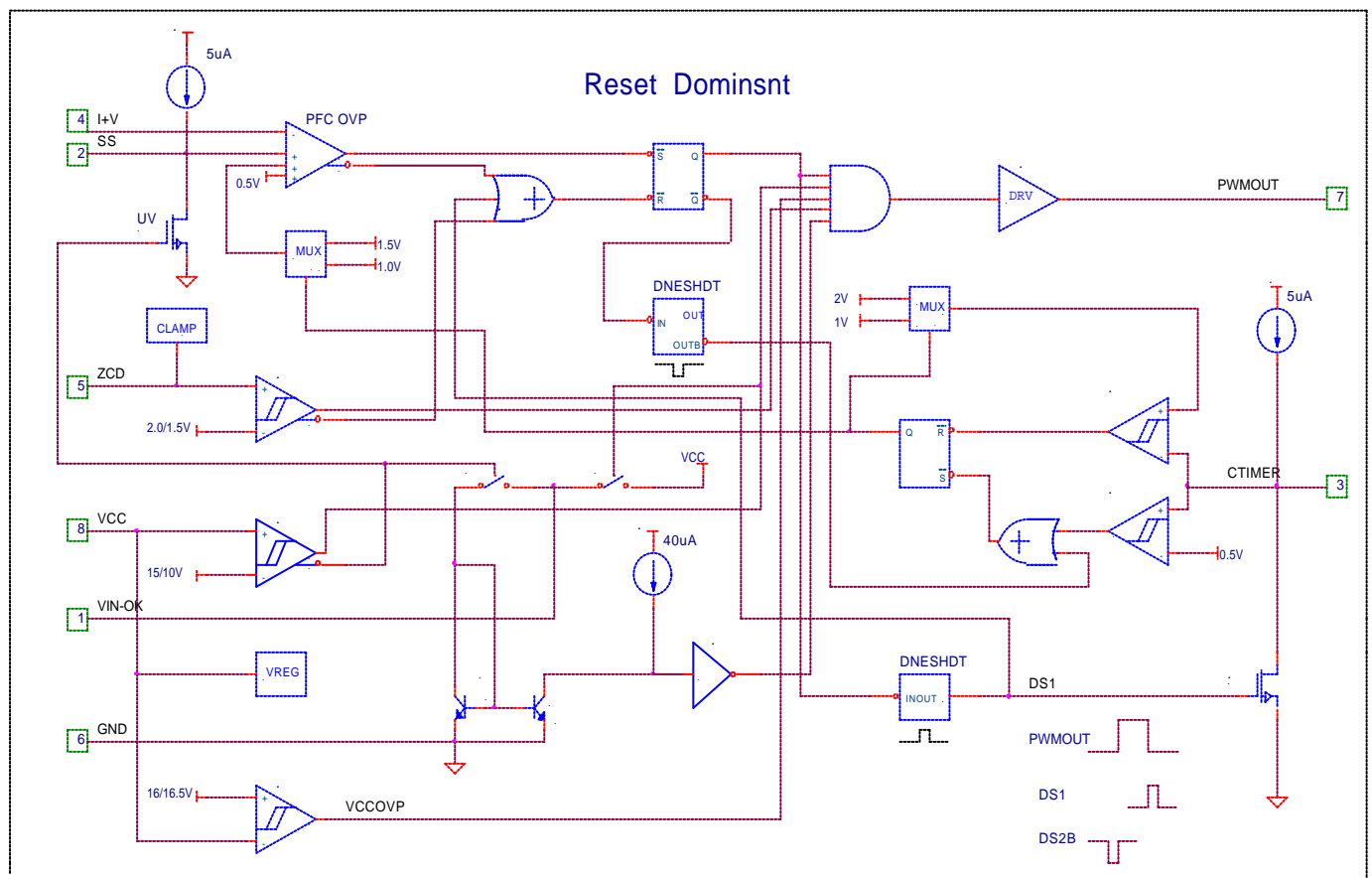
The CM6301 is a current-mode primary controller specifically tailored for offline Quasi-resonant ZVS fly-back converters. Load detect function minimizes the range of operating frequency during light to moderate load while reducing output ripple.

APPLICATIONS

TV/Monitor SMPS

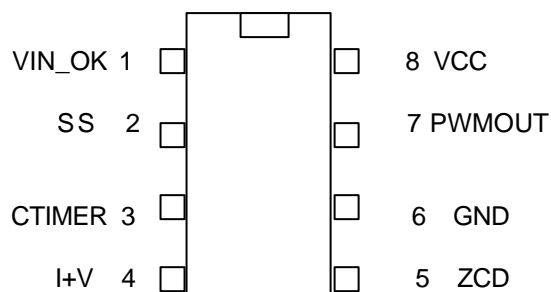
AC-DC Adapters/Chargers

BLOCK DIAGRAM



PIN CONFIGURATION

DIP-08 (P08)/SOP-08 (S08)
Top View



PIN DESCRIPTION

Pin Number	NAME	Function
1	VIN_OK	Dual function. During UVLO, this pin is used to power the VCC. During normal operation, this pin monitors the bus voltage through the resistor and enable the PWMOUT when the current through the resistor exceeds 40uA.
2	SS	Soft start function. Connecting a capacitor from this pin to ground accomplishes the soft start.
3	CTIMER	A timer that monitors the PMWOUT period and set the current limit threshold according to the period.
4	I+V	Summing point for error amplifier and current information.
5	ZCD	Zero crossing detect for performing ZVS.
6	GND	Ground.
7	PWMOUT	Gate driver output.
8	VCC	Supply voltage for the IC.

ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Parameters	Min.	Max.	Units
VCC		20	V
SS	GND-0.3	7.5	V
CTIMER	GND-0.3	7.5	V
I+V	GND-0.3	7.5	V
ZCD	GND-0.3	7.5	V
PWMOUT	GND-0.3	VCC+0.3	V
Peak PWMOUT CURRENT	-1	1	A
PWMOUT Energy Per Cycle		1.5	uJ
Junction Temperature		150	°C
Storage Temperature	-65	150	°C
Operating Temperature	-40	125	°C
Lead Temperature		260	°C
Thermal Resistance			
Plastic DIP		80	°C/W
Plastic SOIC		105	°C/W

Electrical Characteristics: Unless otherwise specified, these specifications apply VCC=+15V.

Symbol	Parameter	Test Condition	Min.	Typ.	Max	Unit
VCC	Operating Range		10		19	V
VCCon	Turn-on Threshold		14	15	16	V
VCCoff	Turn-off Threshold		9	10	11	V
HYS	Hysteresis		3.5	4	4.5	V
VCC_OV P	VCC over voltage threshold		17	18	19	V
	Hysteresis		1	2	3	V
Istart_up	Start-up current	Before turn-on; VCC<15V		50	80	uA
Iq	Quiescent Current	After turn-on		2.5	3.5	mA
Ictimer	Ctimer current		2.5	5	7.5	uA
Ctimer vth1	Timer upper threshold		1.75	2	2.25	V
Ctimer vth2	Timer lower threshold		0.75	1	1.25	V
Iss	Soft start current		2.5	5	7.5	uA
I+Vvth	Current limit Vth	CTIMER > 2V	0.9	1	1.1	V
I+Vvth	Current limit Vth	CTIMER < 1V	1.4	1.5	1.6	V
IZCD+	Source capability	VZCD=5.5V	2	3	4	mA
IZCD-	Sink capability	VZCD=0.25V	-4	-3	-2	mA
ZCDVTH +	Zero crossing threshold		1.75	2	2.25	V
ZCDVTH -	Zero crossing threshold		1.25	1.5	1.75	V
RDS(low)	Output low RDS on	VCC=12V		5	15	Ohm
RDS(hig h)	Output High RDS on	VCC=12V		15	20	Ohm
tr/tf	Rise and fall time	VCC=12V, CL=1000PF		50		nS

Functional Description

CM6301 uses a pulse frequency modulation technique combined with quasi-resonant operation. The system always works in the boundary condition between CCM and

DCM during heavy load, but will be in DCM during moderate to light load. Flyback application circuit of CM6301 (See Figure 1).

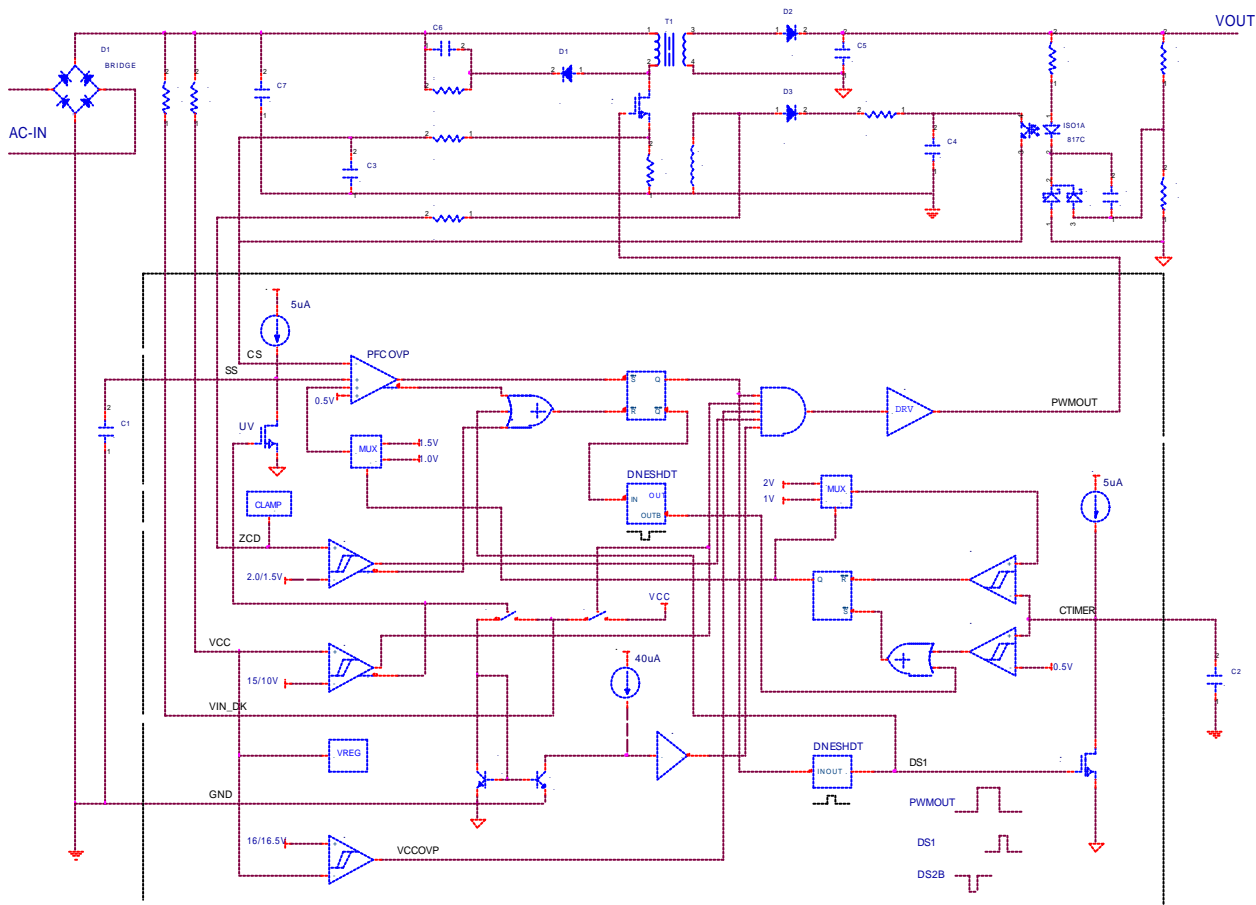


Figure 1. Application Circuit of CM6301 Using Flyback Topology

SUMMING COMPARATOR (I+V) (see Figure 3)

I+V pin is used for summing the current information and voltage information. The combined signal is compared to internally generated reference voltage (either 1.5V or

1.0V depending on the load). When the combined signal exceeds the reference voltage, the PWMOUT signal is set low and the external MOSFET is switched off.

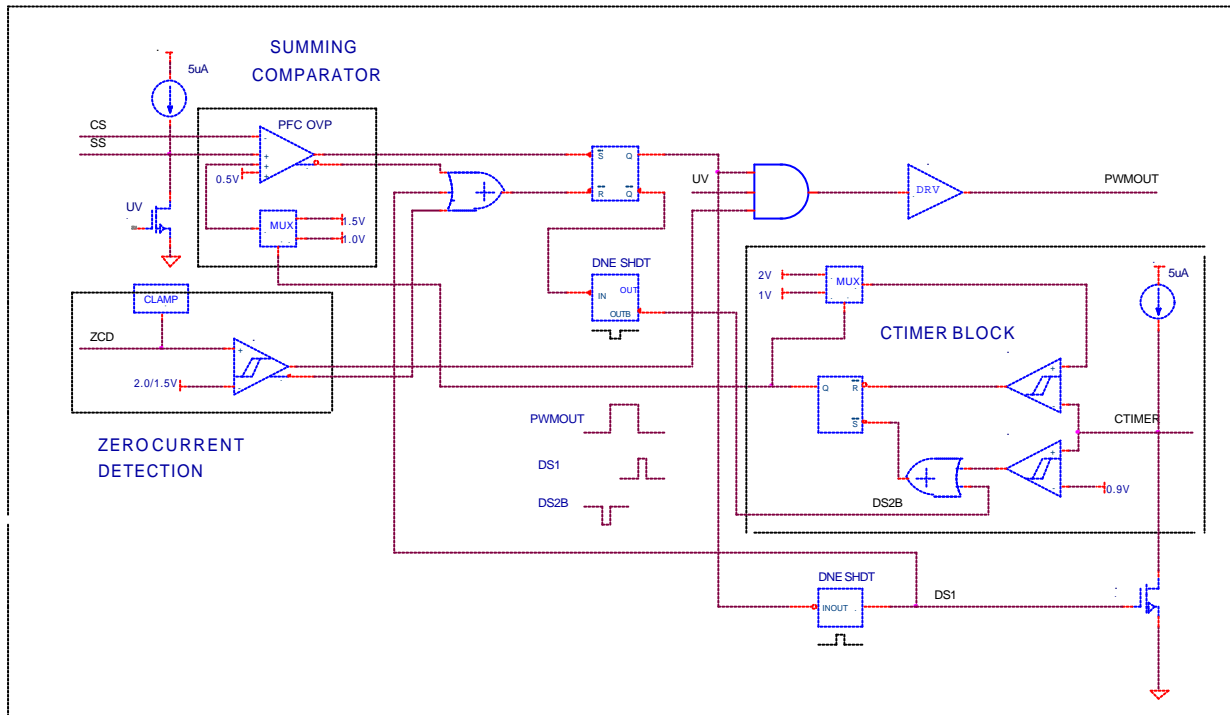


Figure 2. Summing Comparator; Zero Current Detection; Ctimer block

Zero Current Detection (ZCD) (see Figure 2)

The Zero Current Detection circuit turns on the external MOSFET if a negative edge falling below 1.5V is applied to ZCD pin while the voltage signal at I+V is also

below 0.5V. To ensure high noise immunity, a hysteresis of 0.5V is included in the ZCD block.

CTIMER Block

CTIMER block is used to minimize the range of operating frequency. Every time PWMOUT signal goes high, CTIMER pin is discharged momentarily and then is charged with 5uA current. During transition from heavy to light load, switching frequency of the external MOSFET reduces. To further minimize the reduction in frequency as the load gets lighter, the CTIMER pin is compared to 2V internal reference. When CTIMER exceeds 2V, the reference voltage in the summing comparator block is latched to 1.0V from

1.5V. The lowering of the reference voltage in the summing comparator will reduce the further reduction in frequency during light load. When the load goes up, the frequency of the external MOSFET will increase and the peak value of the CTIMER will reduce. When the peak value of the CTIMER is below 0.9V, the reference voltage in the Summing Comparator will be latched back to 1.5V to minimize the increase in operating frequency. (See Figure 3)

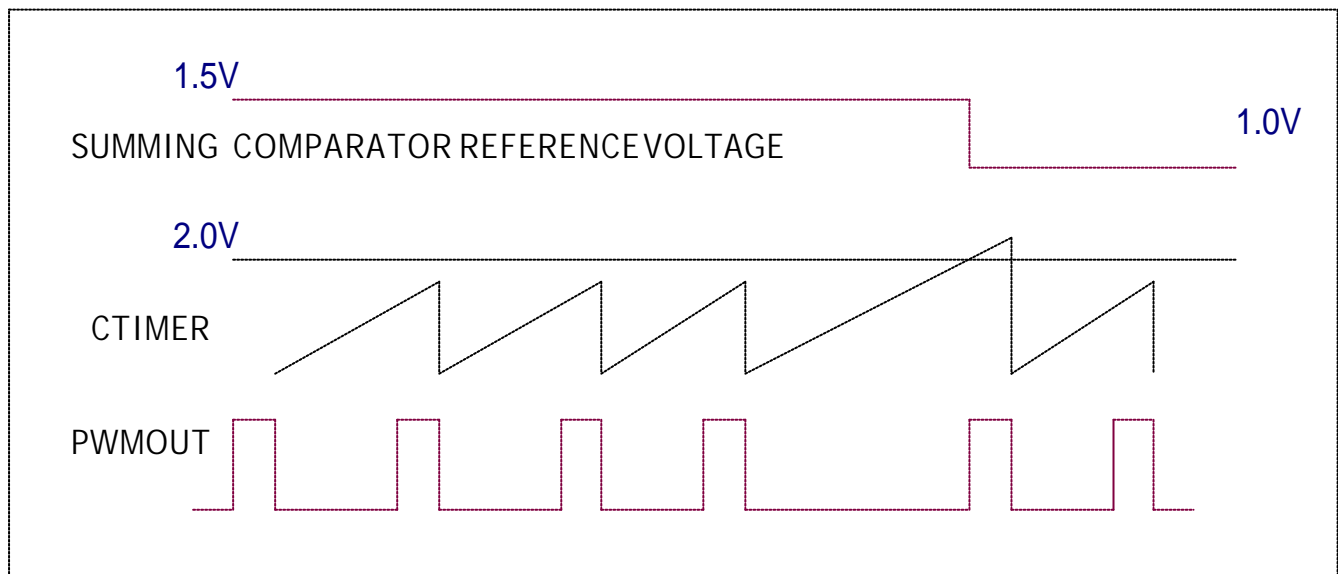


Figure 3

Gate Driver (PWMOUT)

The driving capability of turning on the external MOSFET is 15 Ohms while turning off the external MOSFET is 5 Ohms. UVLO condition ensures that the external MOSFET is off during Under-Voltage Lockout.(See Figure 4)

Over Voltage Protection (VCC)

When the voltage at VCC exceeds 18V, the PWMOUT is disable to protect the IC and the power supply.

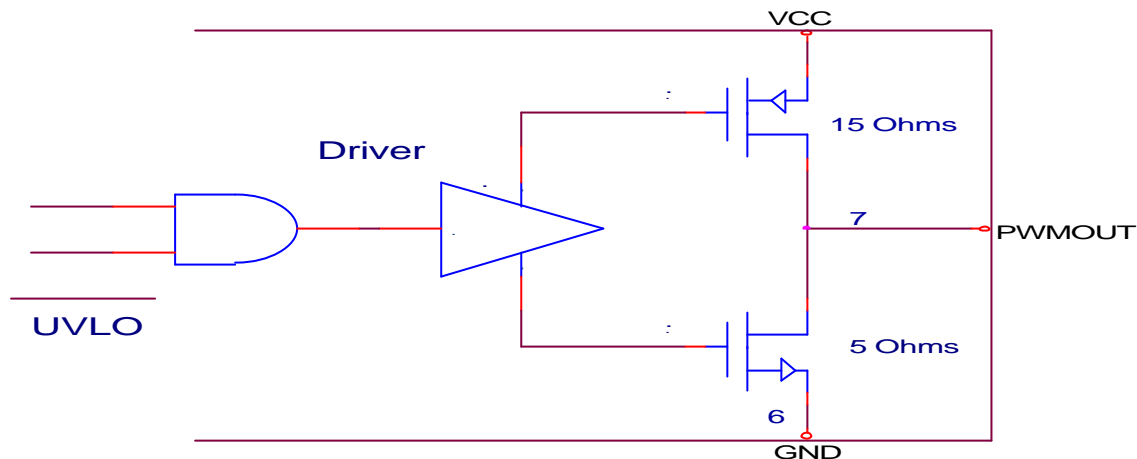


Figure 4

VIN_OK Block

VIN_OK pin serves as two functions. During UVLO, VIN_OK is connected to VCC through internal switch so that the resistor which is connected from the bus voltage to the VIN_OK pin can be used as a bleed

resistor to start up the IC. During normal operation, PWMOUT is enabled when the current through the VIN_OK pin is greater than 40uA.(See Figure 5)

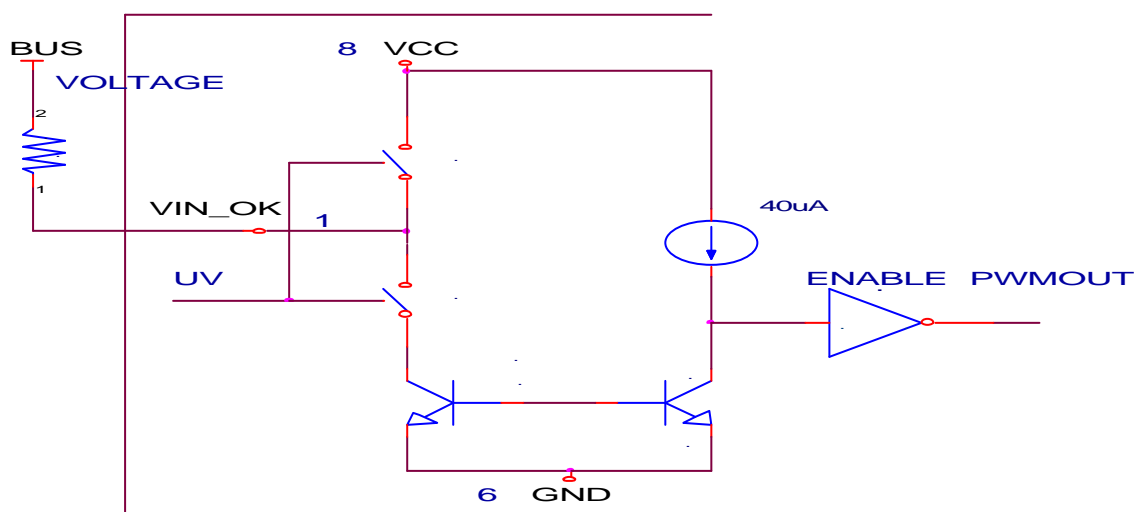
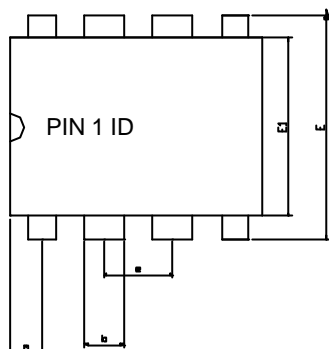


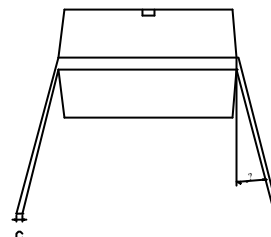
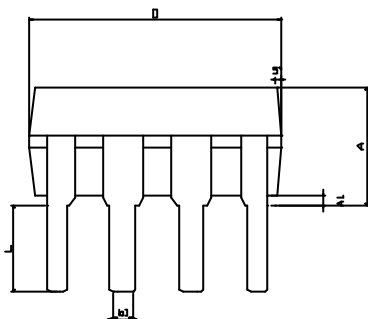
Figure 5

PACKAGE DIMENSION

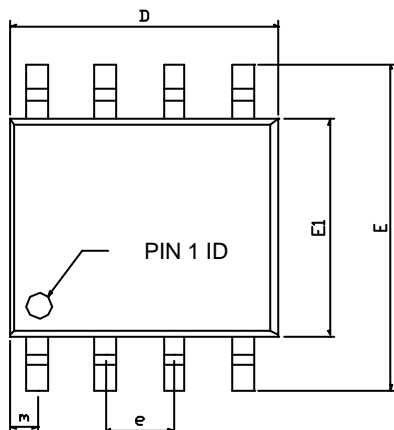
8-PIN PDIP (P08)



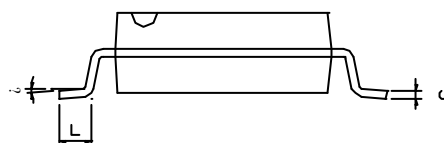
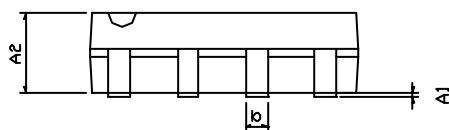
SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	4.32	---	---	0.170
A1	0.38	---	---	0.015	---	---
b	1.40	---	1.65	0.055	---	0.065
b1	0.40	---	0.50	0.016	---	0.020
C	0.20	---	0.31	0.008	---	0.012
D	9.27	---	9.77	0.365	---	0.385
E	7.48	---	8.25	0.295	---	0.325
E1	6.09	---	6.61	0.240	---	0.260
e	---	2.54	---	---	0.100	---
L	3.18	---	---	0.125	---	---
m	0.50	---	---	0.02	---	---
?	0	---	15	0	---	15



8-Pin SOP (S08)



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	0.10	---	0.25	0.004	---	0.010
A2	1.40	---	1.55	0.055	---	0.061
b	0.30	---	0.51	0.012	---	0.020
C	0.15	---	0.28	0.006	---	0.010
D	4.60	---	5.08	0.181	---	0.199
E	5.79	---	6.20	0.228	---	0.244
E1	3.76	---	4.01	0.148	---	0.158
e	---	1.27	---	---	0.050	---
L	0.38	---	0.69	0.015	---	0.035
m	0.43	---	0.69	0.017	---	0.027
?	0°	---	8°	0°	---	8°



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