

General Description

The SDC384X are high performance fixed frequency current-mode PWM controller series. These integrated circuits are optimized for off-line and DC-DC converter applications with minimum external components. They feature under-voltage lockout (UVLO) circuit with low start-up current, trimmed oscillator for precise duty cycle control, current sense comparator providing maximum current limiting and a totem pole output stage for increasing output current. In addition, these ICs also feature accurate protection against over-temperature, over-current and maximal output power.

The SDC3842 and SDC3844 have UVLO thresholds of 16V(ON) and 10V(OFF); The corresponding thresholds for SDC3843 and SDC3845 are 8.4V(ON) and 7.6V(OFF).

The SDC3842 and SDC3843 can operate approaching 100% duty cycle; SDC 3844 and SDC3845 can operate from zero to 50% duty cycle.

Features

- Start-up current: 0.15mA
- Low line regulation: 4mV
- Low load regulation: 4mV
- Operating frequency up to 500kHz
- High PWM frequency stability over a full temperature range: 2.5%
- High PWM frequency stability under a full supply voltage range: 0.2%
- Accurate over-temperature
- Protection with hysteresis
- UVLO with hysteresis
- Package: SOP-8, DIP-8

Applications

- Off-line converter
- DC-DC converter
- Voltage adapter
- CRT monitor power supply
- DVD/STB power supply

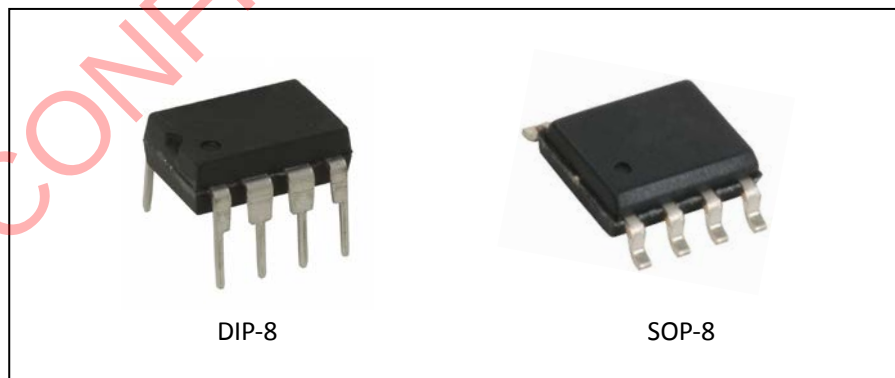


Figure 1. Package Type

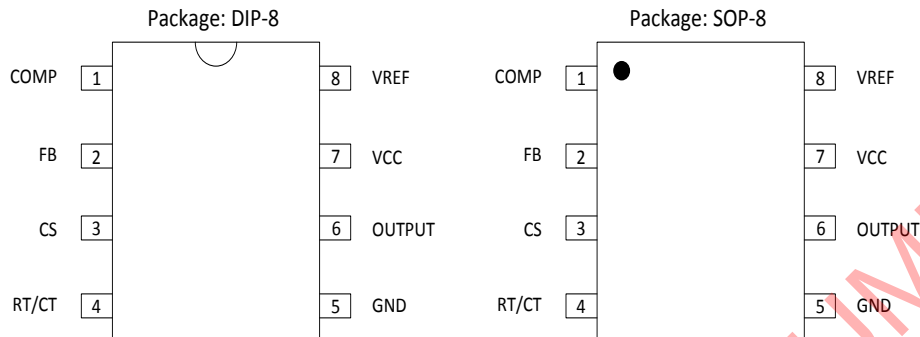
Pin Configuration


Figure 2. Pin Configuration

Pin Number	Pin Name	Function
1	COMP	This pin is the error amplifier output and is made available for loop compensation
2	FB	The inverting input of the error amplifier. It is normally connected to the switching power supply output through a resistor divider
3	CS	A voltage proportional to inductor current is connected to this input. The PWM uses this information to terminate the output switch conduction
4	RT/CT	The oscillator frequency and maximum output duty cycle are programmed by connecting resistor RT to VREF and capacitor CT to ground. Operation to 500 kHz is possible
5	GND	The combined control circuitry and power ground
6	OUTPUT	This output directly drives the gate of a power MOSFET. Peak currents up to 1.0 A are sourced and sunk by this pin
7	VCC	The positive supply of the control IC
8	VREF	This is the reference output. It provides charging current for capacitor CT through resistor RT

Table 1. Pin Description

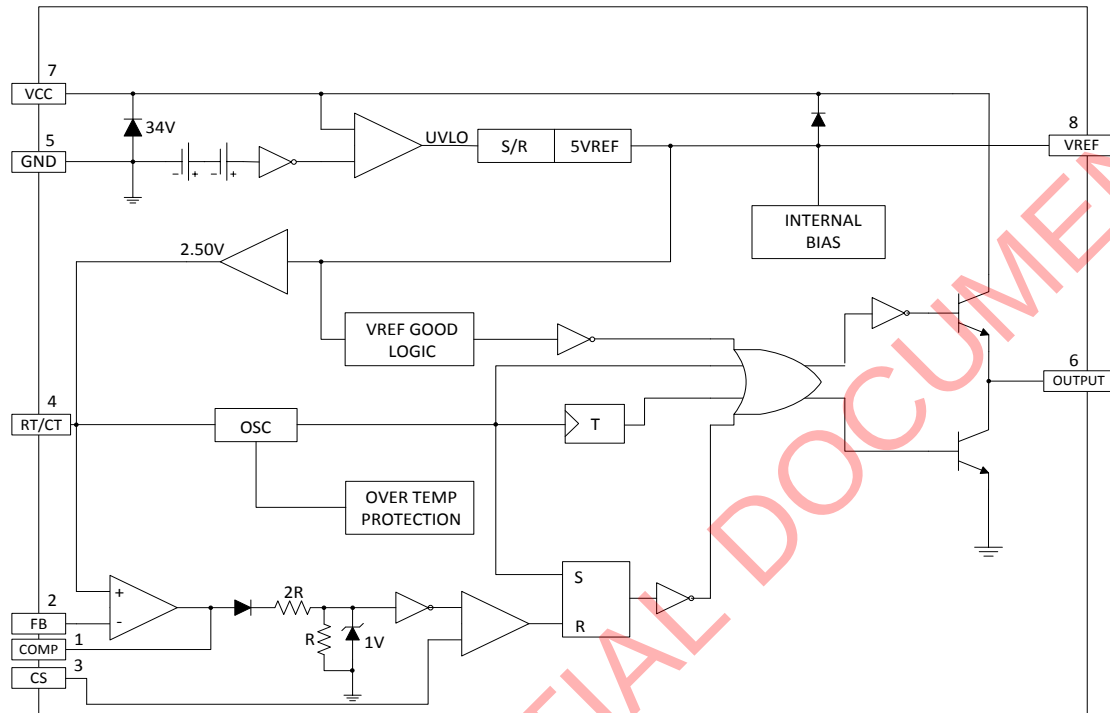
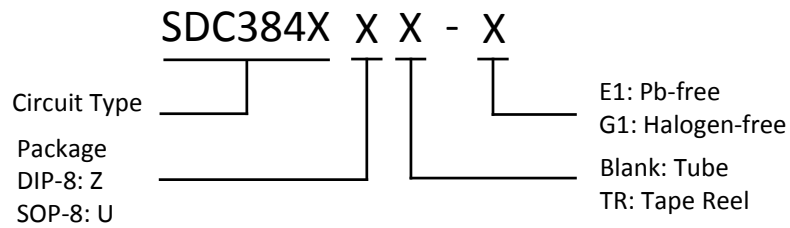
Functional Block Diagram


Figure 3. Functional Block Diagram

Ordering Information


Package	Temperature	Part Number		Marking ID		Packing Type
		Pb-free	Halogen-free	Pb-free	Halogen-free	
DIP-8	-40℃~85℃	SDC3842/3/4/5Z-E1	SDC3842/3/4/5Z-G1	SDC3842/3/4/5	SDC3842/3/4/5G	Tube
SOP-8	-40℃~85℃	SDC3842/3/4/5UTR-E1	SDC3842/3/4/5UTR-G1	SDC3842/3/4/5	SDC3842/3/4/5G	Tape Reel
SOP-8	-40℃~85℃	SDC3842/3/4/5U-E1	SDC3842/3/4/5U-G1	SDC3842/3/4/5	SDC3842/3/4/5G	Tube

Absolute Maximum Ratings (NOTE: Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device.)

Parameter	Symbol	Value	Unit
Supply voltage	V_{CC}	30	V
Output current	I_O	± 1	A
Analog inputs (pin2/pin3)	V_A	-0.3~6.3	V
Error amp output sink current	I_{SINK}	10	mA
Power dissipation at $T_a < 25^\circ\text{C}$ (DIP-8)	P_D	1000	mW
Power dissipation at $T_a < 25^\circ\text{C}$ (SOP-8)	P_D	460	mW
Operating Junction Temperature	T_J	-40~150	$^\circ\text{C}$
Storage temperature	T_{STG}	-55~150	$^\circ\text{C}$
Lead temperature (soldering, 10s)	T_{LEAD}	260, 10s	$^\circ\text{C}$
Latch-up test per JEDEC 78	-	200	mA
ESD, HBM model per Mil-Std-883, Method 3015	HBM	2000	V
ESD, MM model per JEDEC EIA/JESD22-A115	MM	200	V

Table 2. Absolute Maximum Ratings

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Oscillation frequency	f_{OSC}	50	200	kHz
Operating temperature	T_a	-40	85	$^\circ\text{C}$

Table 3. Recommended Operating Conditions

Electrical Characteristics (Ta=25°C, V_{CC}=15.0V, RT=10kΩ, CT=3.3nF, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Section						
Reference output voltage	V _{REF}	I _{REF} =1mA	4.90	5.00	5.10	V
Line regulation	ΔV _V	V _{CC} =12V~25V	-	4	15	mV
Load regulation	ΔV _L	I _{REF} =1mA~20mA	-	4	15	mV
Short circuit output current	I _{SC}	V _{REF} =0V, Ta=25°C	-	-100	-180	mA
Temperature stability	ΔV _T	-	-	0.2	0.4	mV/°C
Under -Voltage Lockout Section						
Start threshold1	V _{ST}	SDC3842/3844	15	16	17	V
Start threshold2		SDC3843/3845	7.8	8.4	9.0	V
Min. operation voltage1	V _{OP}	SDC3842/3844	8.5	10	11.5	V
Min. operation voltage2		SDC3843/3845	7.0	7.6	8.2	V
Total Standby Current Section						
Start-up current	I _{ST}	V _{CC} =14V	-	0.15	0.30	mA
Operating supply current	I _{OP}	V _{FB} =0, V _{CS} =0, C _L =1nF	-	10	14	mA
Zener voltage	V _Z	I _{CC} =25mA	30	34	-	V
PWM Section						
Max. duty cycle1	D _{MAX}	SDC3842/3843	95	97	100	%
Max. duty cycle2		SDC3844/3845	46	48	50	%
Min. duty cycle	D _{MIN}	-	-	-	0	%
Oscillator Section						
Oscillation frequency	f _{OSC}	T _J =25°C	47	52	57	kHz
Oscillator amplitude	V _{OSC}	Pin RT/CT, peak to peak	-	1.7	-	V
Temperature stability	ΔF _T	-	-	2	-	%
Voltage stability	ΔF _V	V _{CC} =12V~25V	-	0.2	1	%
Discharge current	I _{DIS}	V _{RT} /V _{CT} =2V	8.5	-	10.5	mA
Error Amplifier Section						
Input voltage	V _I	V _{COMP} =2.5V	2.45	2.50	2.55	V
Output sink current	I _{SINK}	V _{COMP} =1.1V	2	6	-	mA
Output source current	I _{SOURCE}	V _{COMP} =5V	-0.5	-0.8	-	mA
High output voltage	V _{OH}	R _L =15kΩ to GND	5	6	-	V
Low output voltage	V _{OL}	R _L =15kΩ to pin REF	-	0.7	1.1	V
Voltage gain	G _V	V _O =2V~ 4V	65	90	-	dB
Power supply rejection ratio	PSRR	V _{CC} =12V~25V	60	70	-	dB
Current Sense Section						
Maximum input signal	V _{IMAX}	V _{COMP} =5V	0.9	1.0	1.1	V
Gain	G _V	V _{CS} =0V~0.8V	2.85	3	3.35	V/V
Power supply rejection ratio	PSRR	V _{CC} =12V~25V	-	70	-	dB
Delay to output	t _D	V _{CS} =0V~2V	-	150	300	ns

Current Mode PWM Controller
SDC3842/3843/3844/3845

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input bias current	I_{BIAS}	-	-	-3	-10	uA
Output Section						
Low output voltage	V_{OL}	$I_{SINK}=20mA$	-	0.1	0.4	V
Low output voltage		$I_{SINK}=200mA$	-	1.4	2.2	V
High output voltage	V_{OH}	$I_{SOURCE}=20mA$	13	14	-	V
High output voltage		$I_{SOURCE}=200mA$	12	13	-	V
Rise time	t_r	$T_J=25^{\circ}C, C_L=1nF$	-	50	150	ns
Fall time	t_f	$T_J=25^{\circ}C, C_L=1nF$	-	50	150	ns
Over-temperature Protect Section						
Shutdown temperature	T_S	-	-	155	-	$^{\circ}C$
Temperature hysteresis	T_{HYS}	-	-	25	-	$^{\circ}C$

Table 4. Electrical Characteristics

Typical Application

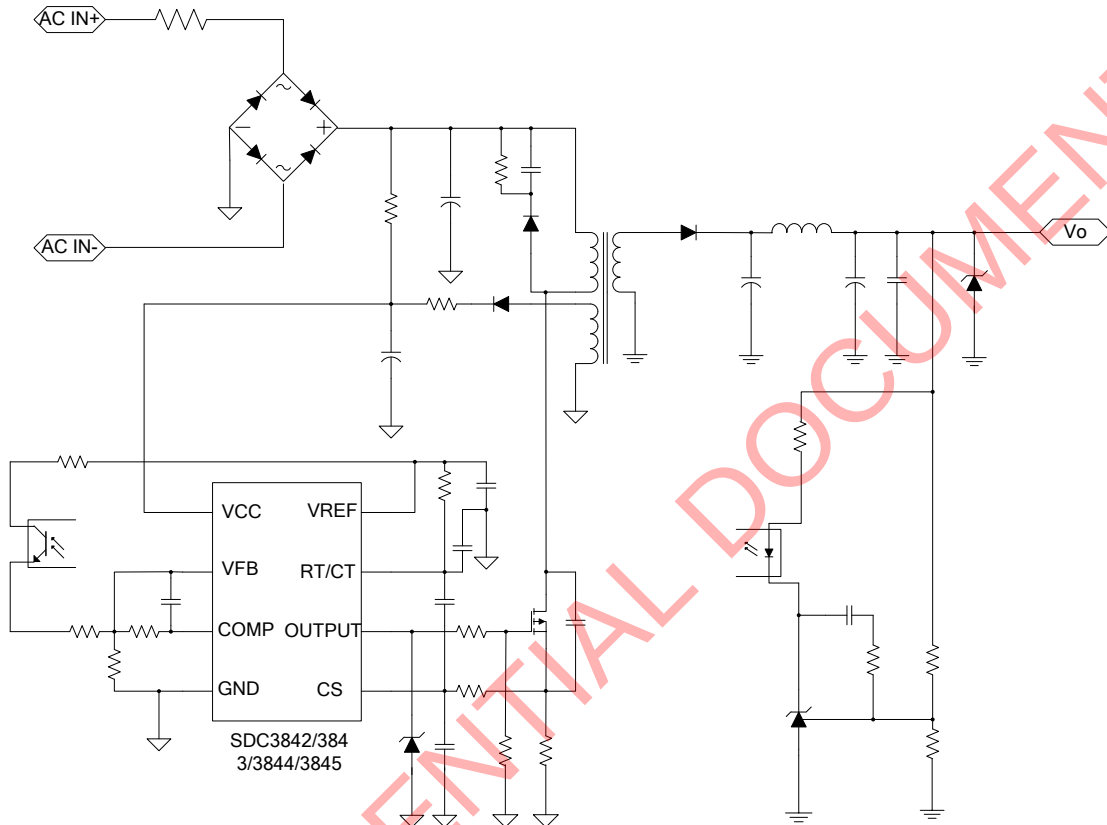


Figure 4. Typical Application

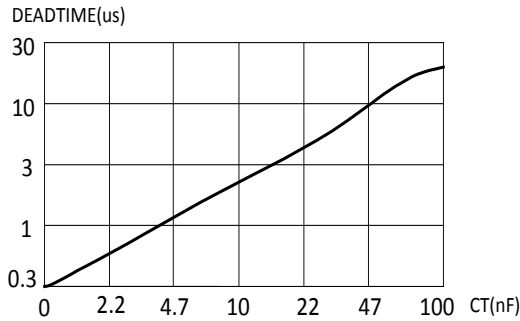
Typical Performance Characteristics


Figure 5. Dead time vs. Timing capacitor

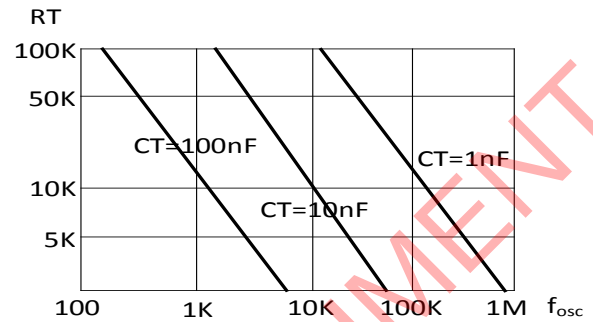


Figure 6. Timing resistor vs. Frequency

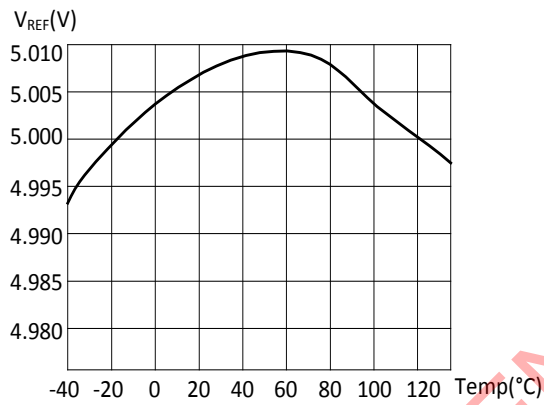


Figure 7. Reference voltage vs. Temperature

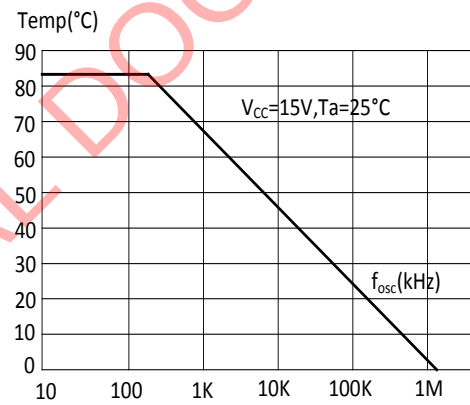
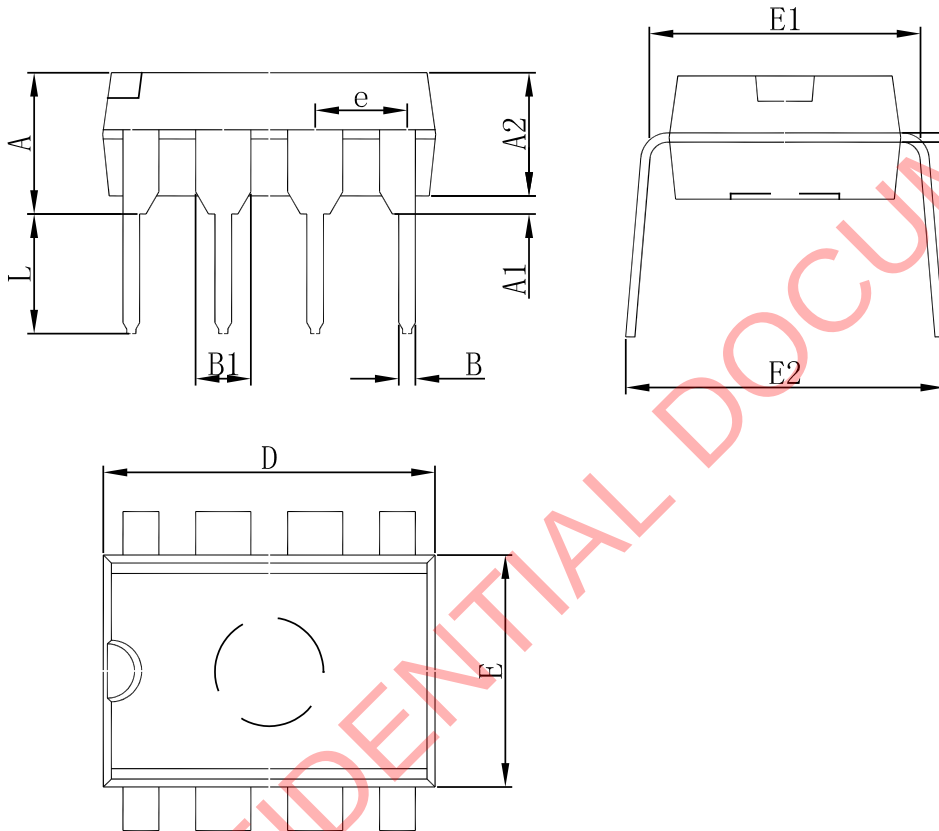
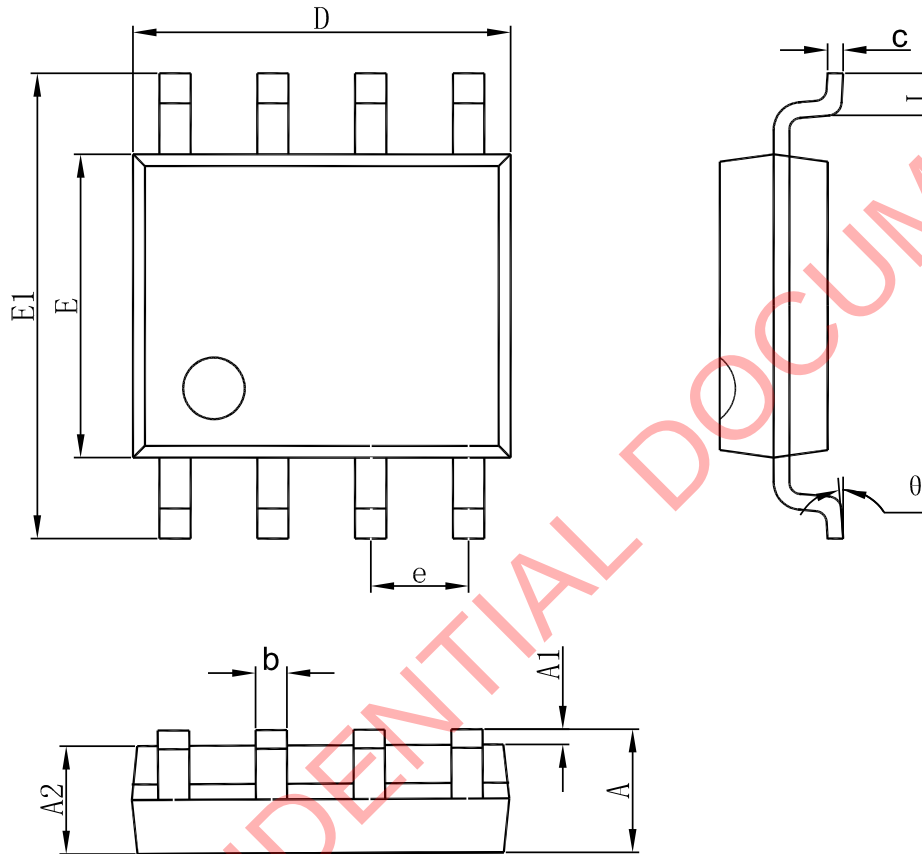


Figure 8. Error amplifier open-loop frequency response

Package Dimension
DIP-8


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

SOP-8


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



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