

**Features**

- High-accuracy reference voltage circuit ( $\pm 2\%$ ).
- Built-in short-circuit protection circuit.
- Built-in Undervoltage Lockout protection.
- Internal 2.5V Reference supply.
- Variable Dead time provides control over total Range.

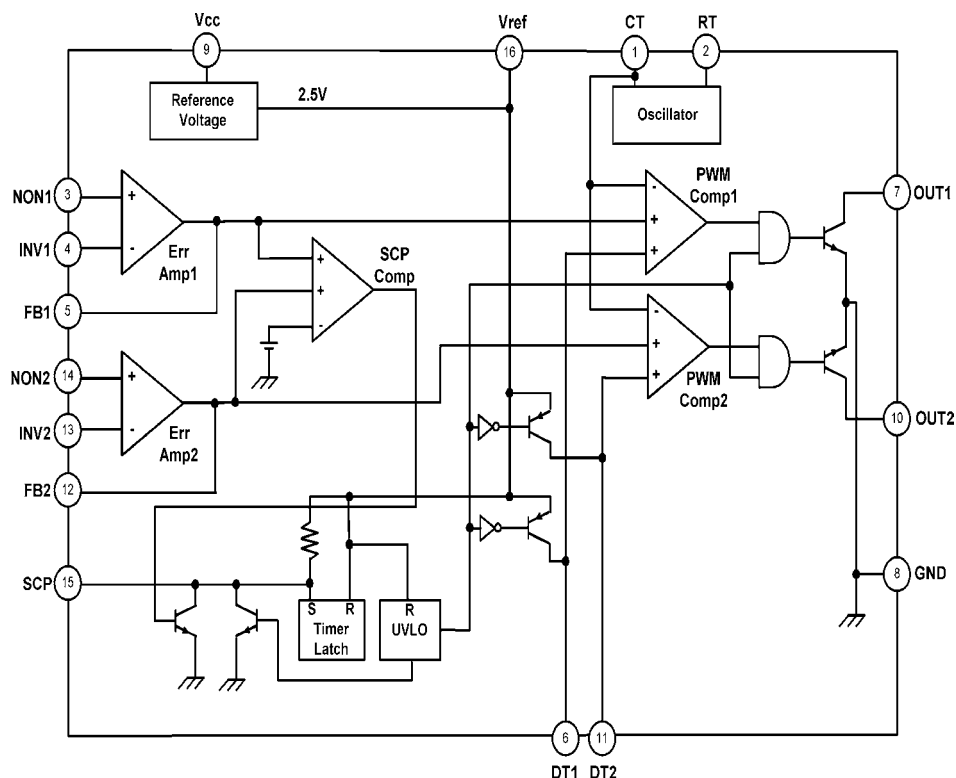
**Applications**

- LCD CCFL Backlight
- Portable equipment

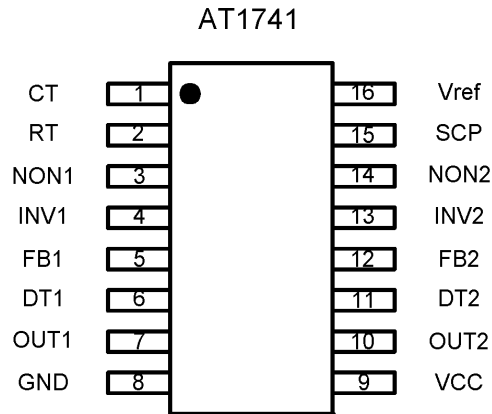
**General Description**

The AT1741 is 2-channel PWM switching regulator controllers that contains an on-chip 2.5V reference, two error amplifier, an adjustable oscillator, two dead-time comparators, under-voltage lockout circuitry and 2 common-emitter output. It is idea for step-up, step-down, and inverting converter.

**Block Diagram**



**Pin Configuration**



**Ordering Information**

Part number	Package	Marking
AT1741	SOP16	AT1741S
-	-	-

**Pin Description**

Pin No.	Symbol	I/O	Description
1	CT	--	External timing capacitor
2	RT	--	External timing resistor
3	NON1	I	Positive input for error amplifier 1
4	INV1	I	Negative input for error amplifier 1
5	FB1	O	Error amplifier 1 output
6	DT1	I	Output 1 dead time / soft start setting
7	OUT1	O	Output 1
8	GND	--	Ground
9	Vcc	--	Power supply
10	OUT2	O	Output 2
11	DT2	I	Output 2 dead time / soft start setting
12	FB2	O	Error amplifier 2 output
13	INV2	I	Negative input for error amplifier 2
14	NON2	I	Positive input for error amplifier 2
15	SCP	--	Time latch setting
16	Vref	O	Reference voltage output (2.5V)

**Absolute Maximum Ratings**

(Ta=+25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>cc</sub>	30	V
Power dissipation	P <sub>d</sub>	500* <sup>1</sup>	mW
Operating temperture	T <sub>opr</sub>	-30~+85	°C
Storage temperture	T <sub>stg</sub>	-55~+125	°C
Output current	I <sub>o</sub>	120* <sup>2</sup>	mA
Output voltage	V <sub>o</sub>	30	V

\* 1 When mounted on 70mm×70mm×1.6mm glass epoxy board. Reduced by 6.5mw for each increase in Ta of 1°C over 25°C.

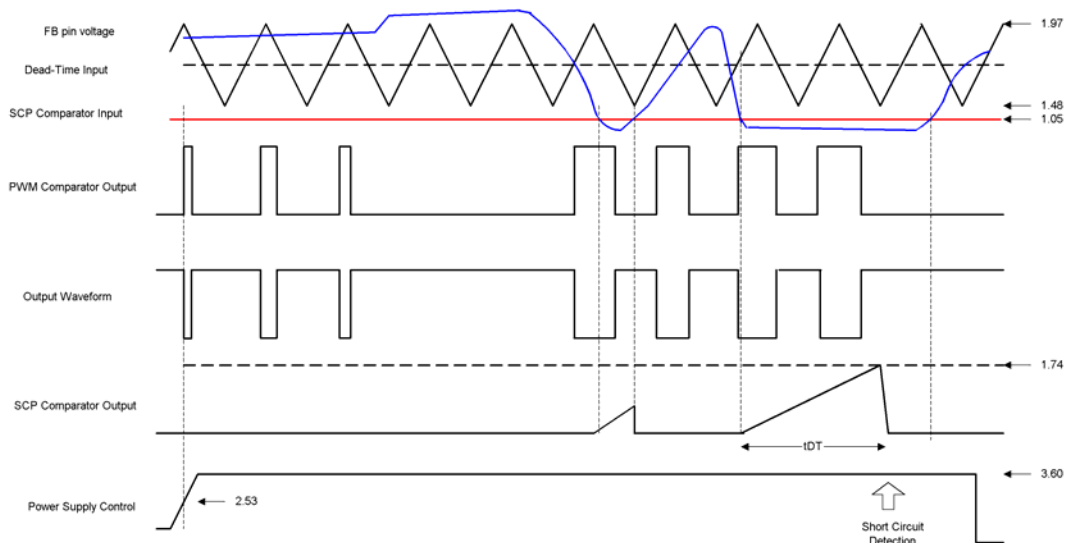
\* 2 Should not exceed Pd and values.

**Recommended Operating Conditions**

(Ta=+25°C)

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power supply voltage	V <sub>CC</sub>	3.6	6.0	25	V
Output current	I <sub>o</sub>	--	--	100	mA
Output voltage	V <sub>o</sub>	--	--	25	V
Error amplifier input voltage	V <sub>OM</sub>	0.3	--	1.6	V
Timing capacitor	C <sub>CT</sub>	100	--	15000	pF
Timing resistor	R <sub>RT</sub>	5.1	--	50	kΩ
Oscillator frequency	F <sub>OSC</sub>	10	--	800	kHz

**Timing chart**



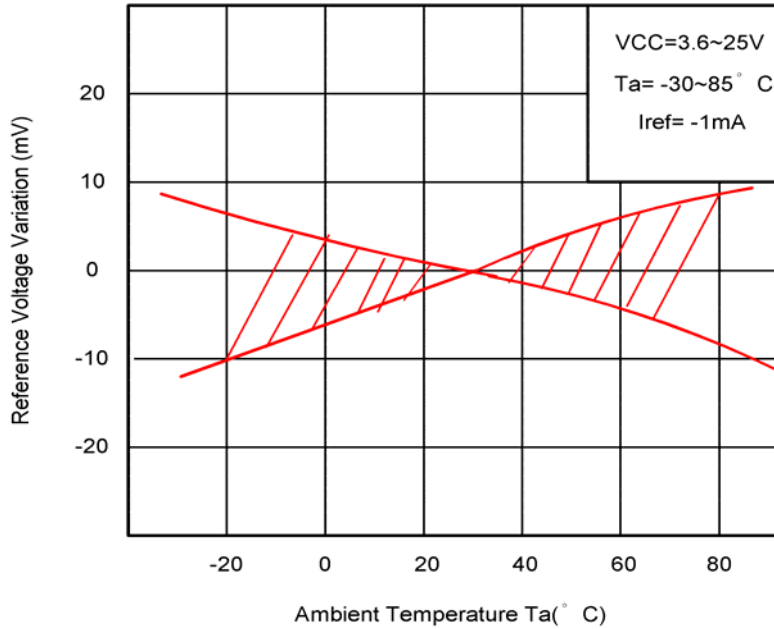
**Electrical Characteristics**

(unless otherwise noted, Ta=25°C, and Vcc=6V)

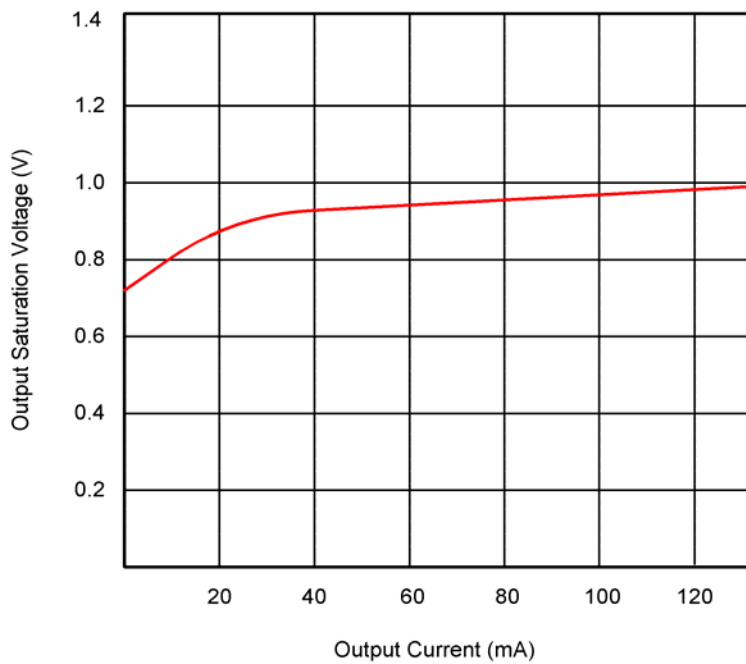
Parameter	Symbol	Condition	Values			Unit	
			Min.	Typ.	Max.		
Reference voltage block	Output voltage	Vref	Iref=1mA	2.45	2.5	2.55	V
	Input stability	V <sub>DLI</sub>	Vcc=3.6~25V	--	1	10	mV
	Load stability	V <sub>DLO</sub>	Iref=0~5mA	--	1	10	mV
Triangular wave oscillator	Oscillation frequency	Fosc	R <sub>RT</sub> =10kΩ, C <sub>CT</sub> =220pF	320	400	480	kHz
	Frequency deviation	F <sub>DV</sub>	Vcc=3.6~25V	--	1	--	%
Protection circuit	Threshold voltage	V <sub>IT</sub>	--	1.48	1.64	1.80	V
	Standby voltage	V <sub>STB</sub>	No pull up	--	50	100	mV
	Latch voltage	V <sub>LT</sub>	No pull up	--	30	100	mV
	Source current	I <sub>SCP</sub>	--	1.5	2.5	3.5	μA
	Comparator threshold voltage	V <sub>CT</sub>	Pin 5, Pin 12	0.9	1.05	1.2	V
Rest period adjustment circuit	Input threshold voltage (fosc=10kHz)	V <sub>I0</sub>	Duty cycle=0%	1.79	1.97	2.15	V
		V <sub>I100</sub>	Duty cycle=100%	1.32	1.48	1.64	V
	On duty cycle	D <sub>ON</sub>	Divide Vref using 13 kΩ and 27 kΩ	45	55	65	%
	Input bias current	I <sub>BDT</sub>	DT1, DT2=2.0V	--	0.1	1	μA
	Latch mode source current	I <sub>DT</sub>	DT1, DT2=0V	200	560	--	μA
	Latch input voltage	V <sub>DT</sub>	I <sub>DT</sub> =40 μA	2.28	2.48	--	V
Low-voltage input miss-operation prevention circuit	Threshold voltage	V <sub>UT</sub>	--	--	2.53	--	V
Error amplifier	Input offset voltage	V <sub>IO</sub>	--	--	--	6	mV
	Input offset current	I <sub>IO</sub>	--	--	--	30	nA
	Input bias current	I <sub>IB</sub>	--	--	15	100	nA
	Open circuit gain	AV	--	70	85	--	dB
	Common-mode input voltage range	V <sub>OM</sub>	Vcc=3.6~25V	0.3	--	1.6	V
	Common-mode rejection ratio	CMRR	--	60	80	--	dB
	Maximum output voltage	V <sub>OH</sub>	--	2.3	2.5	--	V
	Minimum input voltage	V <sub>OL</sub>	--	--	0.7	0.9	V
	Output sink current	I <sub>OI</sub>	FB=1.25V	3	20	--	mA
Output source current	I <sub>OO</sub>	FB=1.25V	45	75	--	μA	
PWM comparator	Input threshold voltage (fosc=10kHz)	V <sub>I0</sub>	Duty cycle=0%	1.79	1.97	2.15	V
		V <sub>I100</sub>	Duty cycle=100%	1.32	1.48	1.64	V
Output block	Saturation voltage	V <sub>SAT</sub>	I <sub>o</sub> =75mA	--	0.8	1.2	V
	Leak current	I <sub>REAK</sub>	V <sub>o</sub> =25V	--	0	5	μA
Total device	Standby current	I <sub>CCS</sub>	When output is off	--	1.3	1.8	mA
	Average current consumption	I <sub>CCA</sub>	R <sub>RT</sub> =10 kΩ	--	1.6	2.3	mA

**Timing Curve**

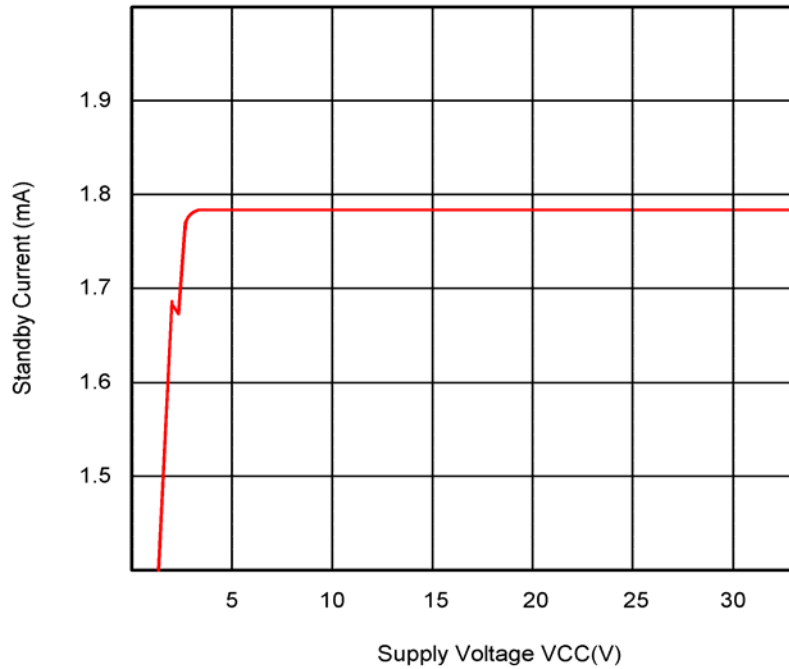
Ambient Temperature vs. Reference Voltage Variation



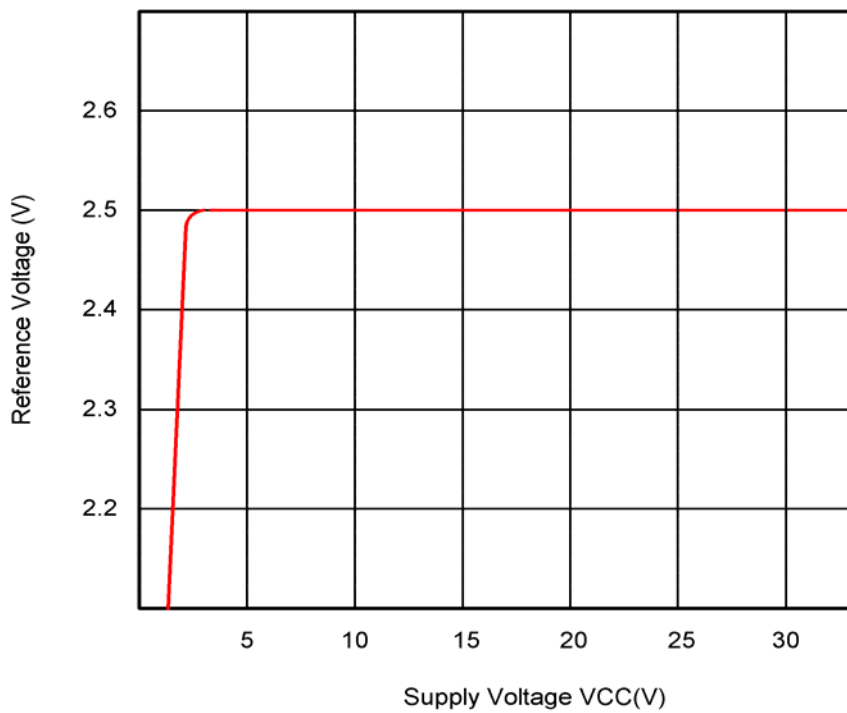
Output Saturation Voltage vs. Output Current



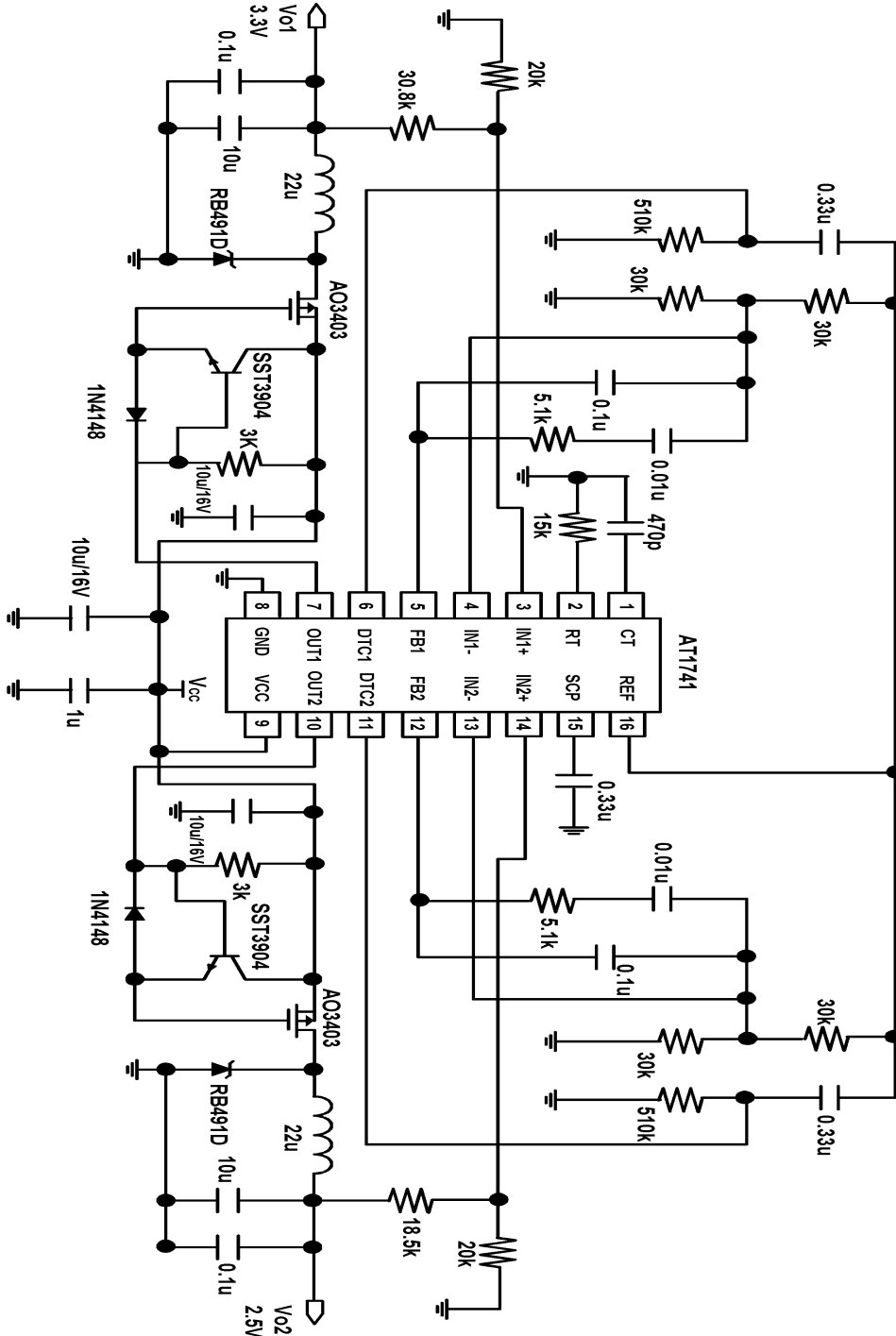
Standby Current vs. Supply Voltage



Supply Voltage vs. Reference voltage



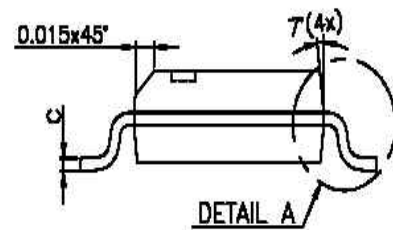
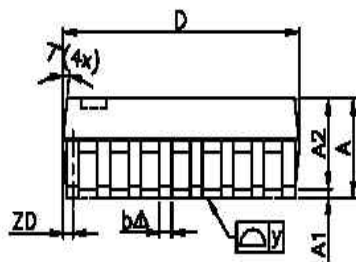
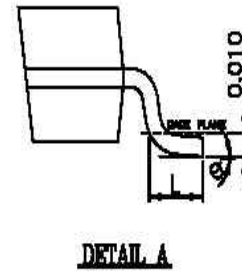
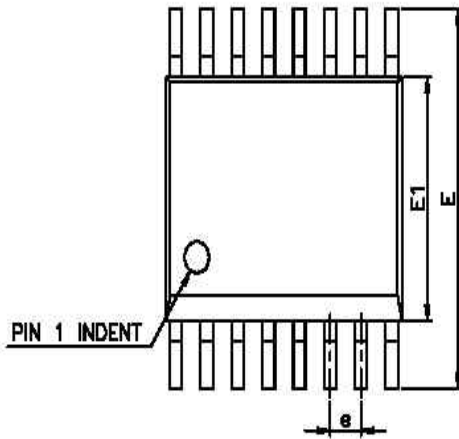
Application Circuit: Step-Down converter







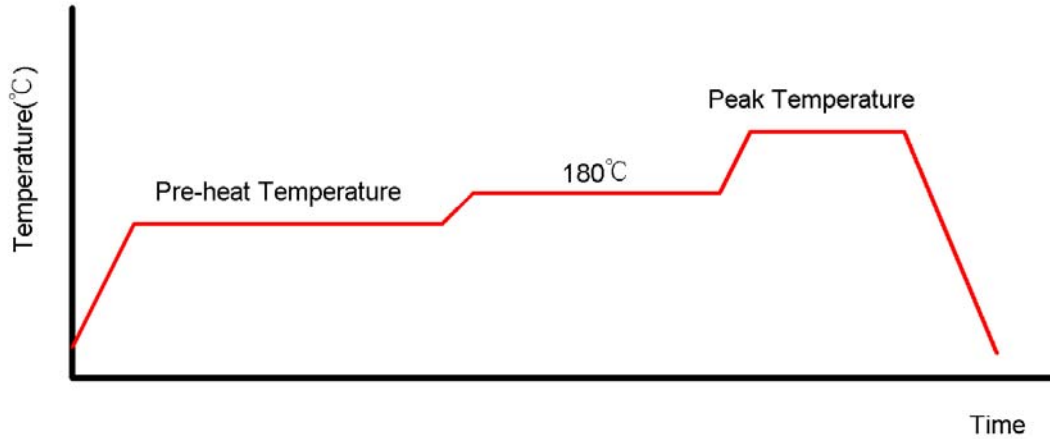
**Package Outline 16-pin SOP**



SYMBOL	MILLIMETERS			INCHES		
	MIN	TYP	MAX	MIN	TYP	MAX
A	-	-	2.0	-	-	0.079
A1	0.05	-	-	0.002	-	-
A2	1.65	1.75	1.85	0.065	0.069	0.073
b	0.25	-	0.55	0.010	-	0.022
C	0.09	0.15	0.21	0.004	0.006	0.008
D	9.90	10.20	10.50	0.390	0.402	0.413
ZD	-	0.20	-	-	0.008	-
E	7.40	7.80	8.20	0.291	0.307	0.323
E1	5.00	5.30	5.60	0.197	0.209	0.220
L	0.55	0.75	0.95	0.022	0.030	0.038
e	1.27 BASIC			0.050 BASIC		
y	0.10	-	-	0.005	-	-
θ	0°	4°	8°	0°	4°	8°

**Reflow Condition (IR/Convection or VPR Reflow)**

Reference JEDEC Standard J-STD-020A



**Classification Reflow Profiles**

	Convection or IR/Convection	VPR
Average Heating Rate(180°C to peak)	5°C/second max.	10°C/second max.
Preheat Temperature(125±20°C)	120 seconds max.	
Temperature maintained above 180°C	10~150 seconds	
Time within 5°C of actual Peak Temperature	10~20 seconds	60 seconds
Peak Temperature Range(Note 1)	219~225°C or 235~240°C	219~225°C or 235~240°C
Cooling Rate	6°C /second max.	10°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	

\*1 The maximum peak temperatures for IR and VP reflow are depending on package dimensions.

**Package Reflow Conditions**

Pkg. Thickness ≥2.5mm and all bags	Pkg. Thickness <2.5mm and Pkg. Volume ≥350 mm <sup>3</sup>	Pkg. Thickness <2.5mm and Pkg. Volume <350 mm <sup>3</sup>
Convection 219~225°C		Convection 235~240°C
VPR 219~225°C		VPR 235~240°C
IR/Convection 219~225°C		IR/Convection 235~240°C