ACE722

2A Step-down DC-DC Converter

Description

ACE722 is a current mode PWM step-down DC-DC converter, which has an internal 2A power switch. It has the wide input voltage range of 3.6V to 20V, so it can suit for regulating a wide variety of power source.

ACE722 make of a PWM control circuit, a reference voltage unit, an error amplifier, a protection circuit, Chip Enable circuit, and under voltage lockout circuit. A low ripple, high efficiency step-down DC-DC converter can be easily composed of this IC with only several external components, or an inductor, a diode and capacitors. Output Voltage can be adjusted with external resistors.

ACE722 has the cycle-by-cycle current limit circuit; current limiting provides protection against shorted output. The low current (<5uA) shutdown provides complete output disconnect, enabling easy power management in battery powered systems.

Features

- Range of Input Voltage: 3.6V~20V
- Built-in 90mΩ Power MOSFET
- <5uA Shutdown Current
- Oscillation Frequency: 500KHz
- High efficiency: 90%
- 2.5A Peak Current Limit Cycle by Cycle
- Operating Temperature Range: -40℃ ~85℃
- Demo Board Available

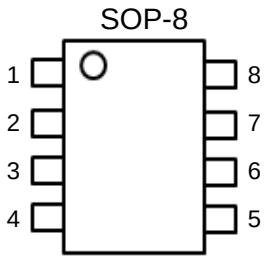
Application

- Power source for hand-held communication equipment, cameras video instruments such as VCRs, camcorders.
- Power source for battery-powered equipment
- Power source for household electrical appliance

Absolute Maximum Ratings

Parameter	Max	Unit
Supply Voltage	23	V
SW Pin Voltage	25	V
CE Pin Voltage	-0.3V to Vin+0.3V	V
FB Pin Voltage	-0.3V to 6V	V
Operating Ambient Temperature Range	-40 °C to 85 °C	°C
Storage temperature	- 65 °C to 150 °C	°C
Thermal resistance: θ_{JA}	150	°C/W

Packaging Type



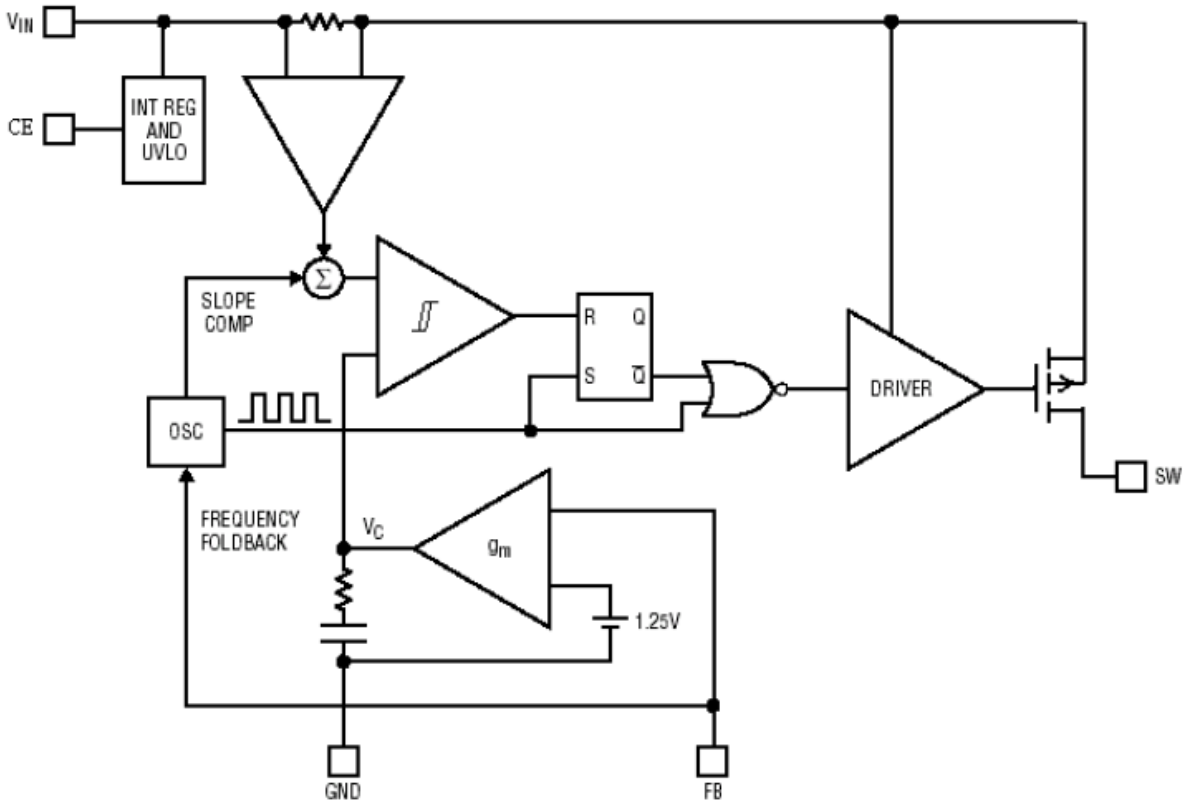
SOP-8	Description	Function
1	NC	Not Connected
2	VIN	Power Supply Pin
3	SW	Switching Node: PWM output connection to inductor
4	GND	Ground Pin
5	FB	Pin for Feedback Voltage
6	NC	Not Connected
7	CE	Chip Enable Pin (Active with “H”)
8	NC	Not Connected

Pin Description

ACE722 XX + H

- Halogen - free
- Pb - free
- FM : SOP-8

Block Diagram

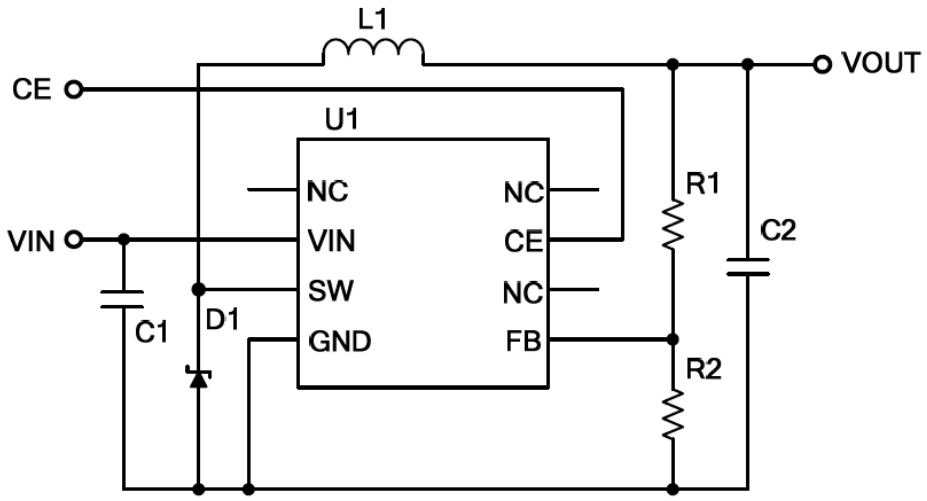


Electrical Characteristics

(Test Conditions: T_A=25℃, V_{IN}=12V, unless otherwise noted.)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Under Voltage Lockout	V_{UVLO}			3.35	3.6	V
Feedback Voltage	V_{FB}		1.225	1.25	1.275	V
FB Pin Bias Current	I_{FB}	V_{FB}=1.25V		150	600	nA
Supply Current	I_Q	V_{FB}=1.3V, V_{CE}=VIN		2		mA
Quiescent Current in Shutdown		V_{CE}=0V		2	5	uA
Reference Line Regulation	$\triangle V_{FB}/\triangle V$	V_{IN}=5V to 20V		0.08		%/V
Feedback Voltage Temperature Coefficient	$\triangle V_{FB}/\triangle T$	-40℃≦Topt≦85℃		±100		ppm/℃
Oscillator Frequency	F_{OSC}_MAX	V_{FB}=1.1Vvfb		500		KHz
Frequency Shift Threshold on FB Pin	F_{OSCTH}	F_{SW}=200K		0.44		V
Max Duty Cycle	D_{MX}			97		%
Switch Current Limit	I_{LIMIT}			2.5		A
Static P-Channel MOSFER On State Resistance	R_{ds_on}			90*		mΩ
Switch Leakage Current	I_{SW}				1	uA
CE “H” Input Current	I_{CEH}	V_{CE}=3V		6.7	15	uA
CE “L” Input Current	I_{CEL}	V_{CE}=0V		0.03	0.1	uA
CE “H” Input Voltage	V_{CEH}	V_{IN}=12V	1.8			V
CE “L” Input Voltage	V_{CEL}	V_{IN}=12V			0.4	V

Typical Application

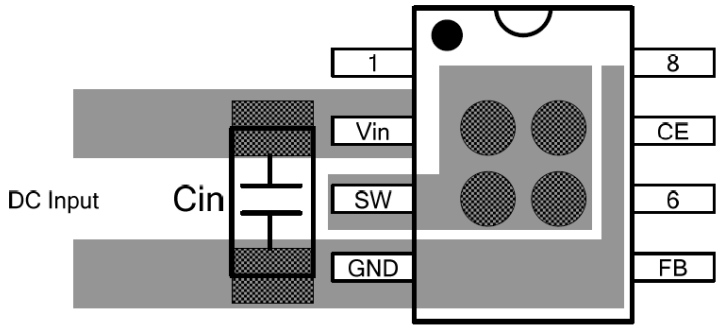


Demo Board Bom

No.	Reference	Type	Specification	Note
1	C1	Capacitor	MLCC 10uF; SMD 0805	
2	C2	Capacitor	MLCC 10uF; SMD 0805	
3	D1	Diode	SS34; 40V, 3A; SMD, Shielding	
4	L1	Inductor	10uH; 3A; SMD; Shielding	
5	IC1	IC	ACE722; SMD SOP-8	
6	R1	Resistor	SMD 0805; 30K; 1%	
7	R2	Resistor	SMD 0805; 10K; 1%	

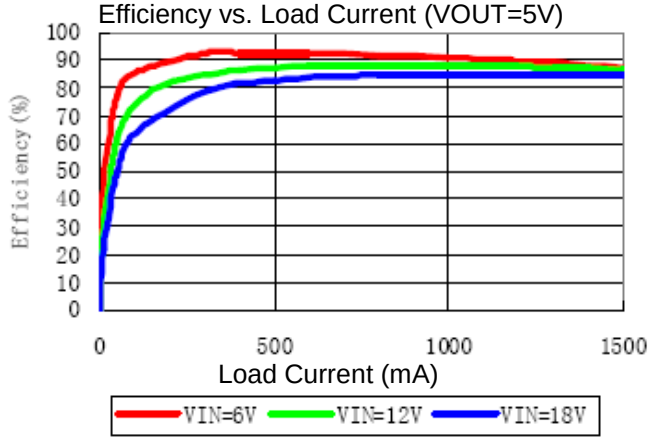
Layout consideration

- Careful PCB layout is critical to achieving low switching losses and clean, stable operation. The switching power stage requires particular attention. If possible, mount all the power components on one side of the board, with their ground terminals as close to one another as possible.
- Keep the high-current paths short, especially the distance between Cin and the Vin (GND) terminals. It is essential for stable, jitter-free operation, showing as the following figure. The ESR of Cin should be smaller enough and the capacitance of Cin should be large enough for filtering the switching noise across power path, a 10uF ceramic capacitor is recommended.
- Keep the trace connecting to SW terminal wide enough for heat dissipation, if possible, it is better to place some vias connected to the bottom copper for enhancement.
- Route high-speed switching nodes, for example SW terminal, away from sensitive analog trace (eg. FB terminal).

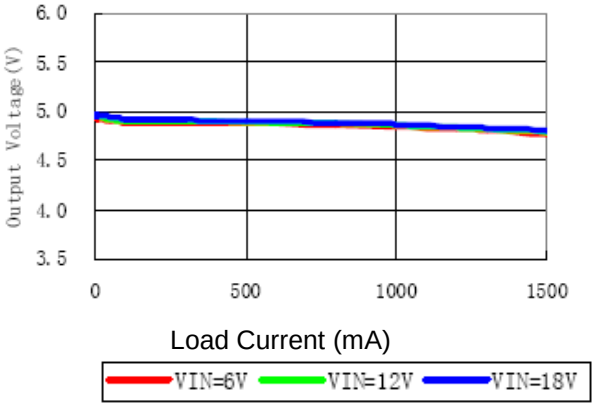


Demo Board Measurement

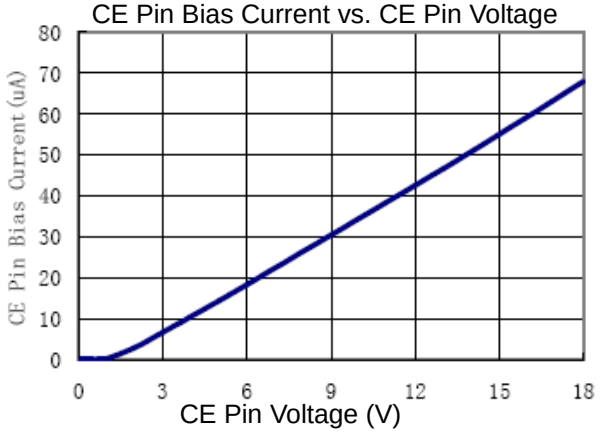
Efficiency vs. Load Current (VOUT=5V)



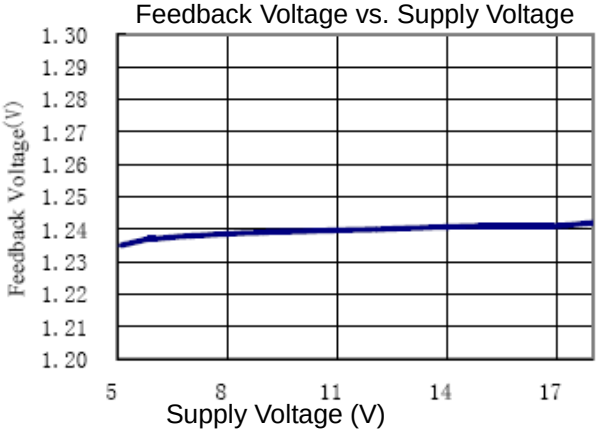
Load Regulation (VOUT=5V)



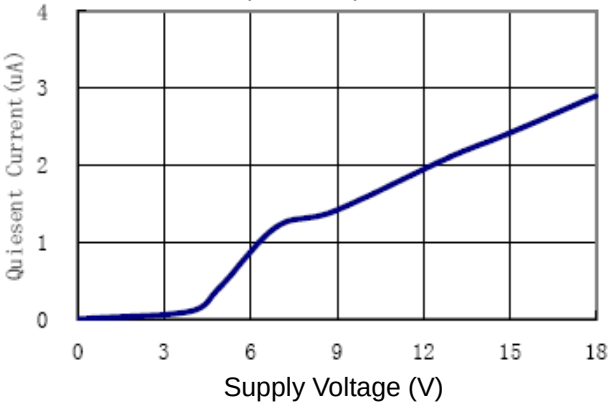
CE Pin Bias Current vs. CE Pin Voltage



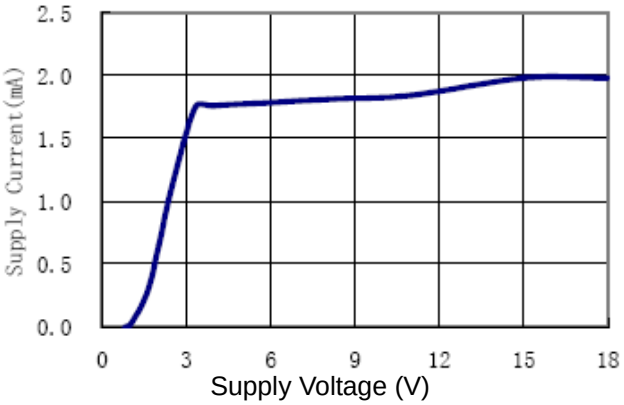
Feedback Voltage vs. Supply Voltage



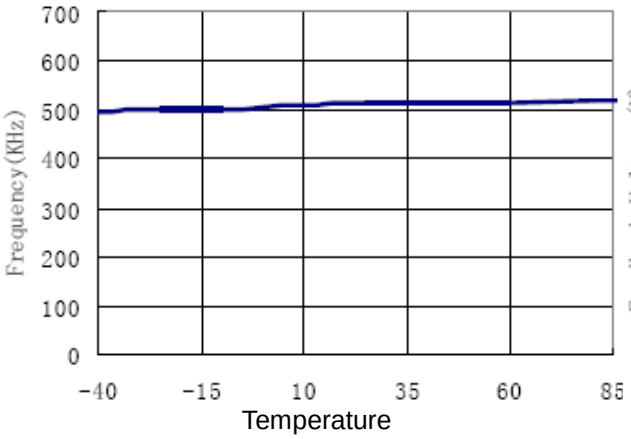
Quiesent Current vs. Supply Voltage
(VCE=0V)



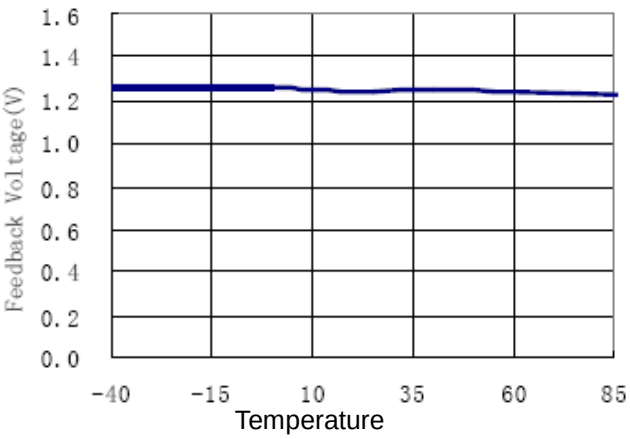
Supply Current vs. Supply Voltage
(VFB=1.3V, VCE=VIN)



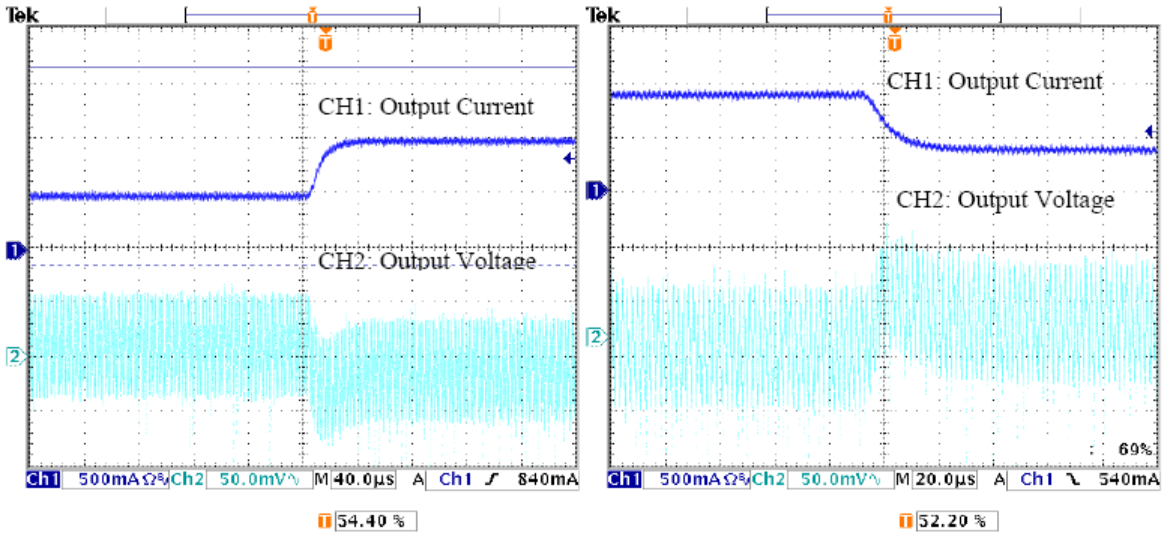
Frequency vs. Temperature



Feedback Voltage vs. Temperature

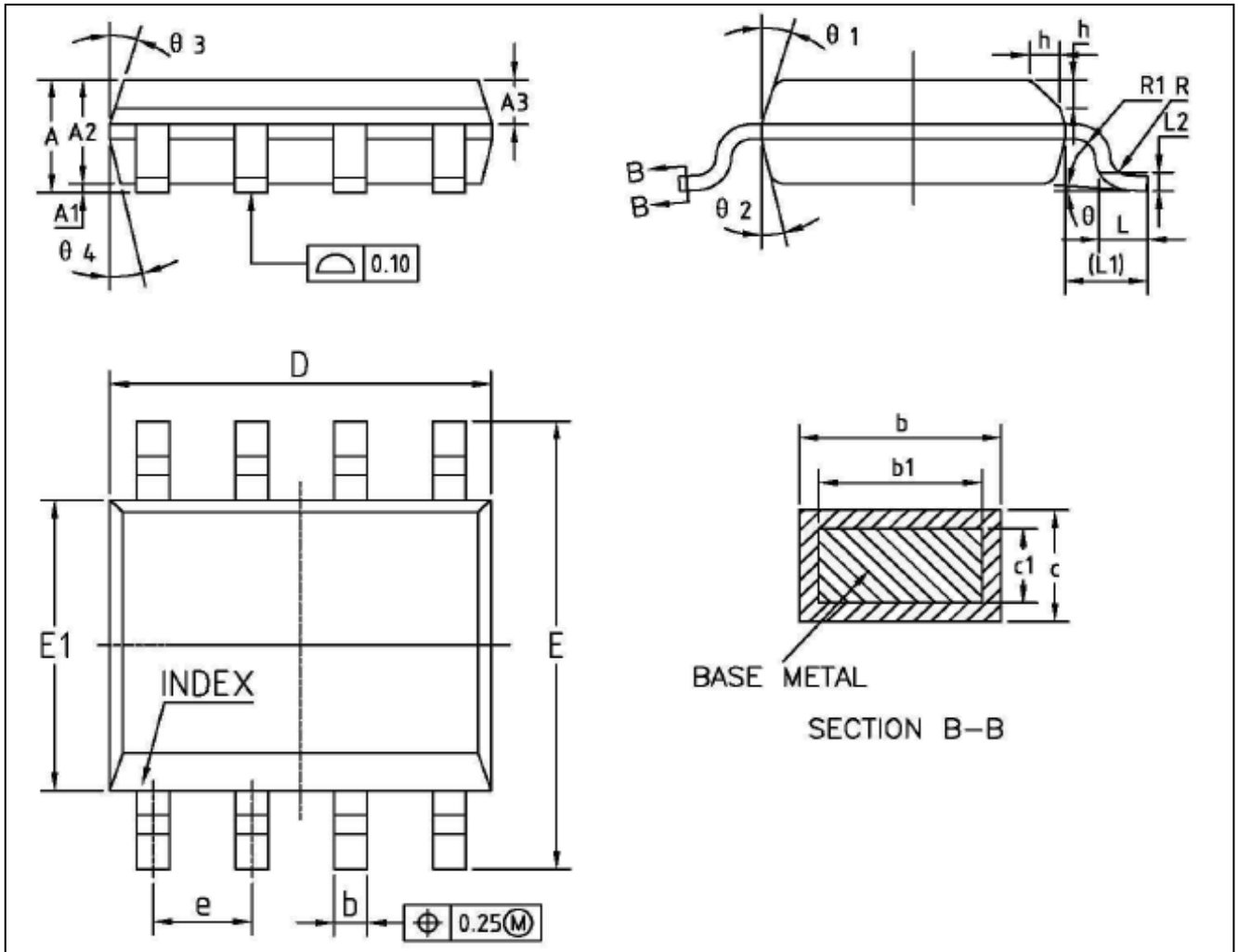


Transient Loading Response



Packing Information

SOP-8



Symbol	Dimension (mm)			Symbol	Dimension (mm)		
	MIN	NOM	MAX		MIN	NOM	MAX
A	-	-	1.77	D	4.7	4.9	5.1
A1	0.08	0.18	0.28	E	5.8	6	6.2
A2	1.2	1.4	1.6	E1	3.7	3.9	4.1
A3	0.55	0.65	0.75	e	1.27BSC		
b	0.39	-	0.48	L	0.5	0.65	0.8
b1	0.38	0.41	0.43	L1	1.05BSC		
c	0.21	-	0.26	θ	0	-	8°

Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As sued herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and shoes failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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