



ACE701CA

Small Package PFM Control Step-Up DC/DC Converter

Description

The ACE701CA Series is a CMOS PFM-control step-up switching DC/DC converter. The PFM controller allows the duty ratio to be automatically switched according to the load (light load: 66%, high output current: 78%), enabling products with a low ripple over a wide range, high efficiency, and high output current. With the ACE701CA Series, a step-up switching DC/DC converter can be configured by using an external coil, capacitor, and diode. The built-in MOSFET is turned off by a protection circuit when the voltage at the LX pin exceeds the limit to prevent it from being damaged. This feature, along with the mini package and low current consumption, makes the ACE701CA Series ideal for applications such as the power supply unit of portable equipment.

Features

- Low voltage operation: Startup at 0.9 V min. ($I_{OUT} = 1 \text{ mA}$) guaranteed
- Duty ratio: 66/78%, built in auto switching type PFM controller
- External parts: Coil, capacitor, diode
- Output voltage: Settable to between 1.8V to 6.0 V in 0.1 V steps
- Accuracy of $\pm 2\%$
- High efficiency : $\pm 85\%$ (typ.)
- Standard function (product type A)
- Shutdown function (product type C,D)
- External transistor type available (product type B · D)

Application

- Digital cameras
- Electronic notebooks and PDAs
- Portable CD/MD players
- Cameras, video equipment
- Communications equipment
- Power supply for microcomputers

Absolute Maximum Ratings

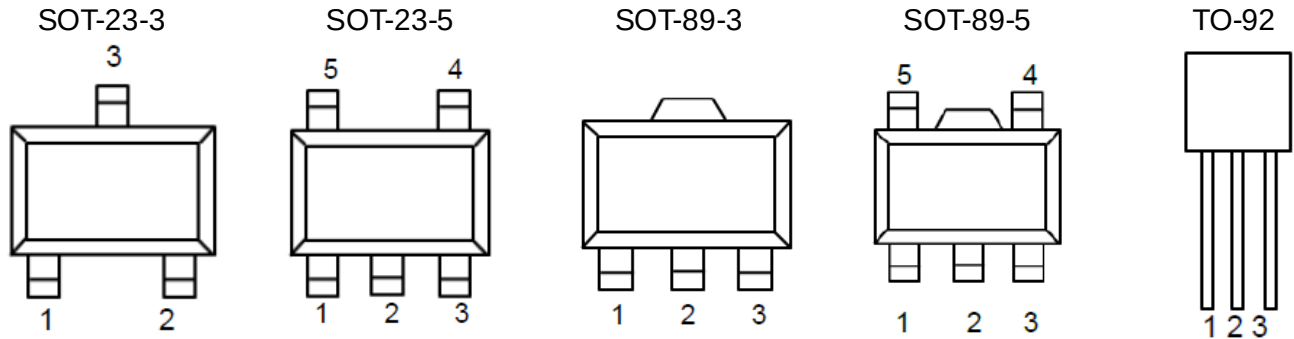
Parameter		Symbol	Max	Unit
V_{OUT} pin voltage		V_{OUT}	$V_{SS}-0.3 \sim V_{SS}+8$	V
EN pin voltage		EN	$V_{SS}-0.3 \sim V_{SS}+8$	V
LX pin voltage		V_{LX}	$V_{SS}-0.3 \sim V_{SS}+8$	V
LX pin current		I_{LX}	1000	mA
Power dissipation	SOT-23-3	PD	250	mW
	SOT-23-5		250	mW
	SOT-89-3		500	mW
	TO-92		500	mW
Operating temperature		T_{opr}	$-40 \sim +85$	$^{\circ}\text{C}$
Storage temperature		T_{stg}	$-40 \sim +125$	$^{\circ}\text{C}$
Soldering Temperature & Time		T_{solder}	260 $^{\circ}\text{C}$, 10s	



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Packaging Type

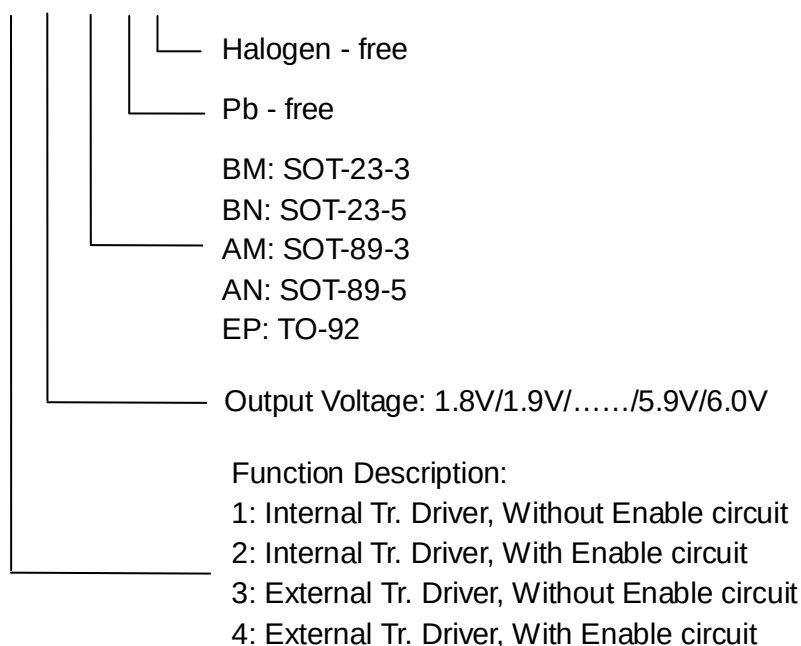


Pin Configuration

SOT-23-3	SOT-23-5	SOT-89-3	SOT-89-5	TO-92	Description	Function
1	2	2	2	2	V_{OUT}	Output voltage pin
2	4	1	5	1	V_{SS}	GND pin
3	5	3	4	3	LX/EXT	External inductor connection pin
	1		3		EN	Shutdown pin "H": Normal operation "L": Step-up stopped
	3		1		NC	No connection

Ordering information

ACE701CA X XX XX + H

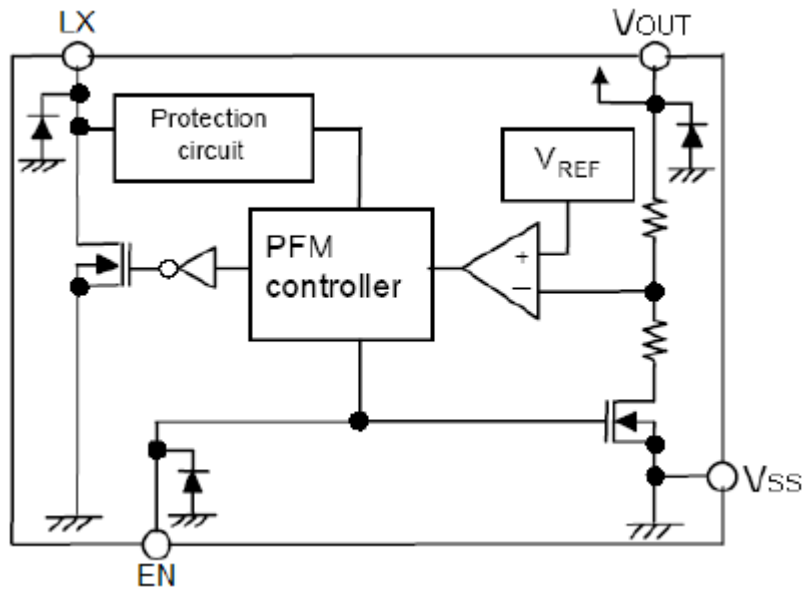




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Block Diagram





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Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output voltage	V_{OUT}		$V_{OUT(S)} \times 0.98$	V_{OUT}	$V_{OUT(S)} \times 1.02$	V
Input voltage	V_{IN}				6	V
Operation start voltage	V_{ST1}	$I_{OUT} = 1 \text{ mA}$			0.9	V
Oscillation start voltage	V_{ST2}	No external parts, voltage applied to V_{OUT} LX pulled up to V_{OUT} via 300Ω resistor			0.8	V
Current consumption 1	I_{SS1}	$V_{OUT} = 0.95 \times V_{OUT}$	$V_{OUT} : 3.0\text{V}$	20	40	uA
			$V_{OUT} : 5.0\text{V}$	30	60	uA
Current consumption 2	I_{SS2}	$V_{OUT} = V_{OUT} + 0.5 \text{ V}$		6	10	uA
Current consumption during shutdown	I_{SSS}	$V_{EN} = 0 \text{ V}$			1.0	mA
Switching current	I_{SW}	$V_{LX} = 0.4 \text{ V}$	100	200		uA
Switching transistor leakage current	I_{SWQ}	No external parts, $V_{LX} = V_{OUT} = 8 \text{ V}$, $V_{EN} = 0 \text{ V}$			1.0	uA
Line regulation	ΔV_{OUT1}	$V_{IN} = 0.4 \times V_{OUT} \sim 0.6 \times V_{OUT}$		20	50	mV
Load regulation	ΔV_{OUT2}	$I_{OUT} = 10 \text{ } \mu\text{A} \sim 50\text{mA}$		20	50	mV
Maximum Oscillation frequency	fosc	$V_{OUT} = 0.95 \times V_{OUT}$, measure waveform at LX pin		100		Khz
Duty ratio 1	Duty1	$V_{OUT} = 0.95 \times V_{OUT}$, measure waveform at LX pin	70	78	85	%
Duty ratio 2	Duty2	Measure waveform at LX pin with light load		66		%
Efficiency	EFFI			85		%
Shutdown pin input voltage	V_{SH}	$V_{OUT} = 0.95 \times V_{OUT}$, judge oscillation at LX pin	0.75			V
	V_{SL1}	$V_{OUT} = 0.95 \times V_{OUT}$, judge stop at LX pin			0.3	V
Shutdown pin input current	I_{SH}	$V_{EN} = 6\text{V}$	-0.1		0.1	uA
	I_{SL}	$V_{EN} = 0\text{V}$	-0.1		0.1	uA

Remark :

$V_{IN} = V_{OUT(S)} \times 0.6$ applied, $I_{OUT} = V_{OUT(S)} / 250 \text{ } \Omega$

Shutdown function built-in type: EN pin is connected to V_{OUT}

V_{ST1} only is suitable for ACE701CA A/C

$V_{OUT(S)}$ specified above is the set output voltage value, and V_{OUT} is the typical value of the actual output voltage.



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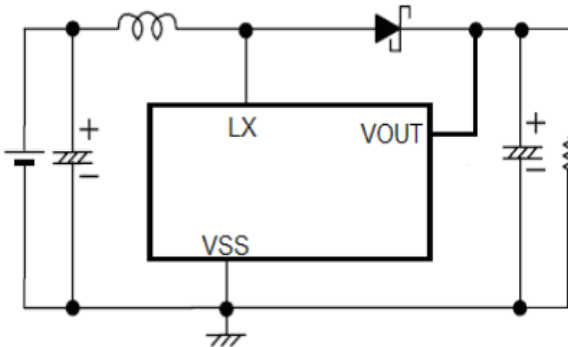
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Standard Circuits

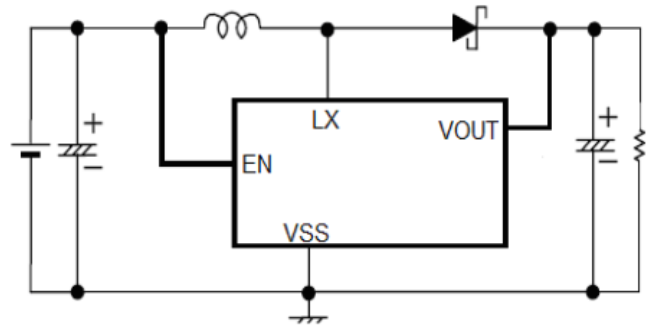
Component: Inductor : 47uH(Sumida)
Capacitor : 47uF/16V(Tantalum)
NMOS : ACE7400

Diode : IN5817 、IN5819
Transistor : 2SD1628G 、2SD3279
Base Resistor(Rb) : 1K Ω

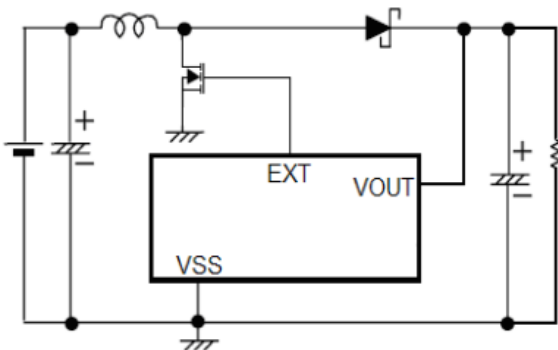
1、ACE701CA-1 Circuits :



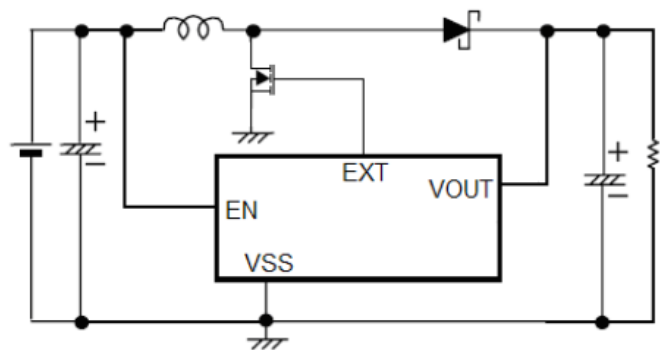
2、ACE701CA-2 Circuits :



3、ACE701CA-3 Circuits:



4、ACE701CA-4 Circuits





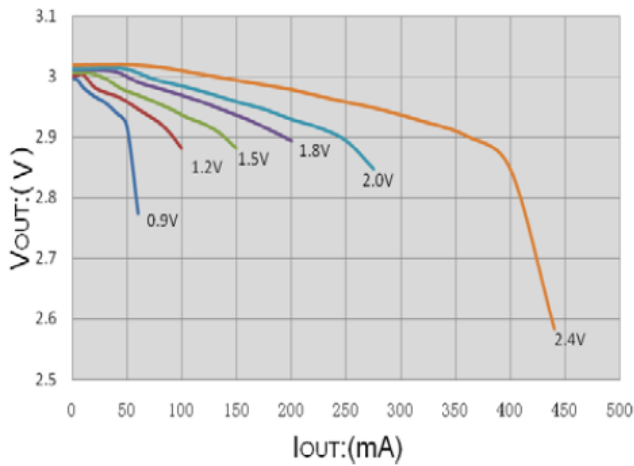
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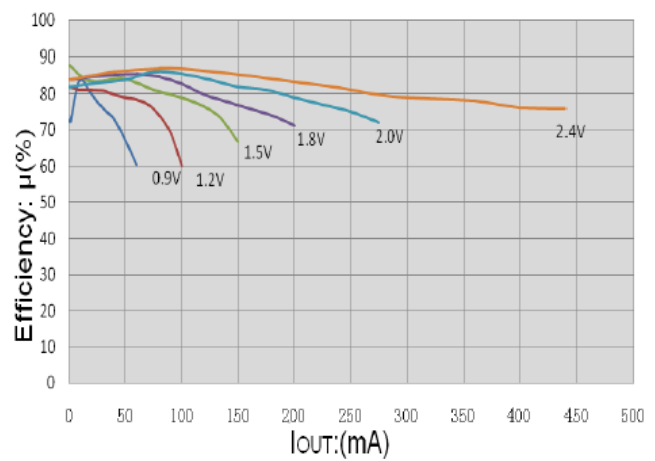
Typical Performance Characteristics

1. ACE701CA-1 Circuits $V_{OUT}: 3V$

a、 V_{OUT} vs. I_{OUT} :

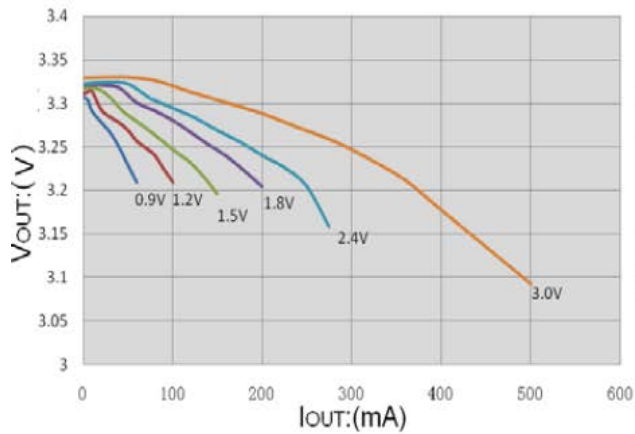


b、Efficiency vs. I_{OUT} :

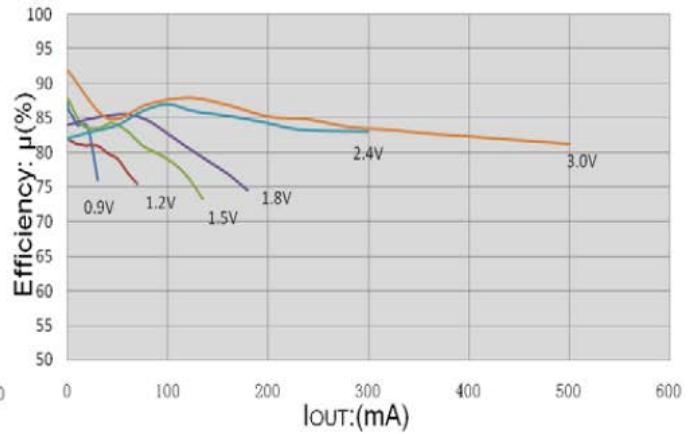


2. ACE701CA-1 Circuits $V_{OUT}: 3.3V$

a、 V_{OUT} vs. I_{OUT} :



b、Efficiency vs. I_{OUT} :



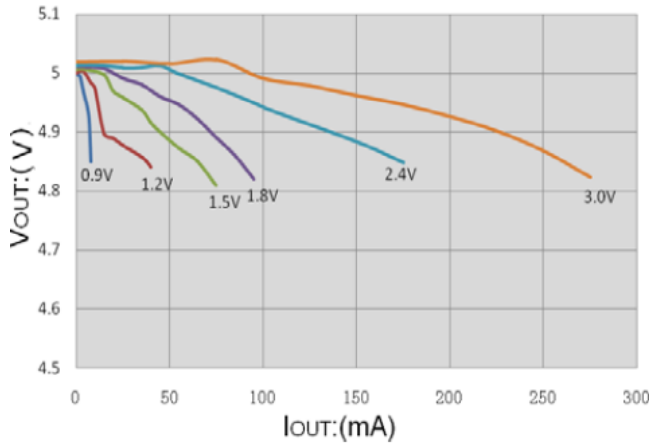


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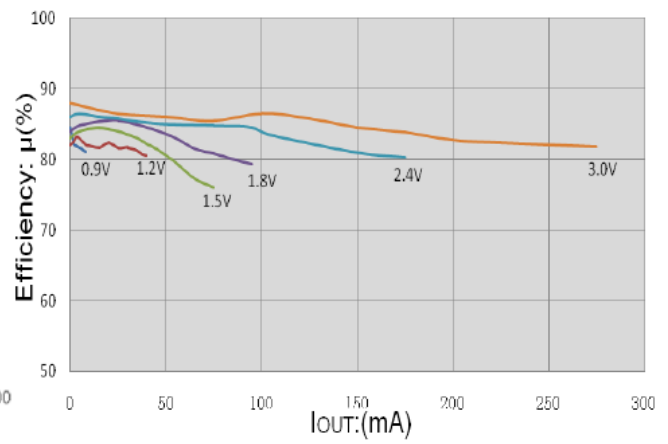
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3. ACE701CA-1 Circuits Vout:5V

a、 V_{OUT} vs. I_{OUT} :

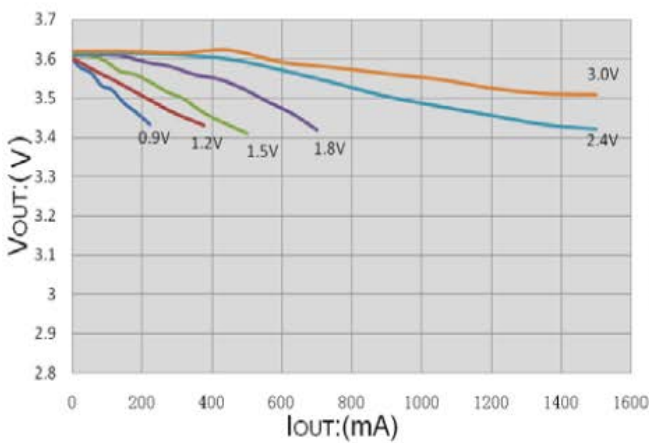


b、Efficiency vs. I_{OUT} :

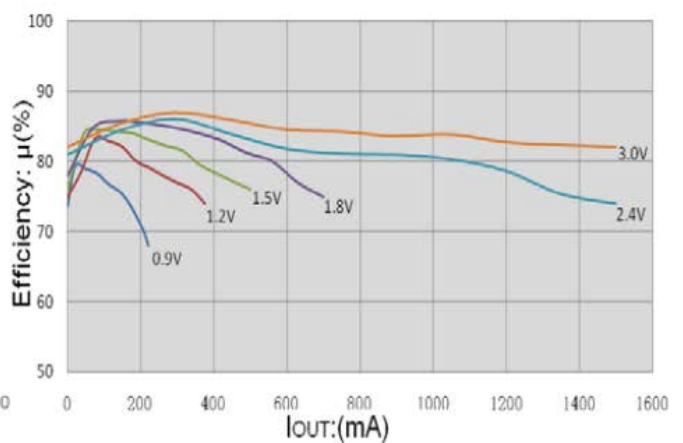


4. ACE701CA-3 Circuits Vout:3.6V

a、 V_{OUT} vs. I_{OUT} :

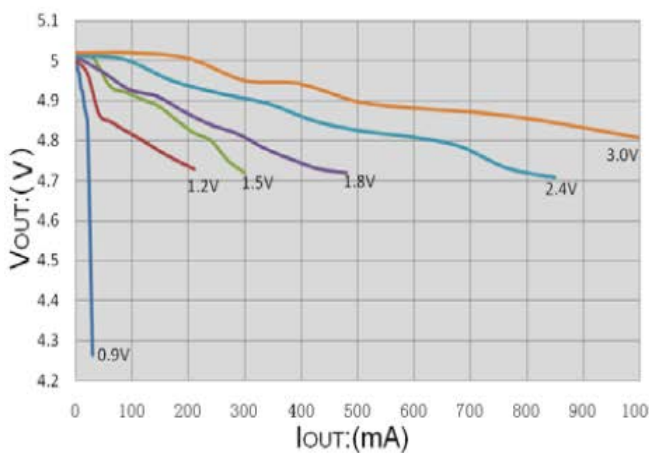


b、Efficiency vs. I_{OUT} :

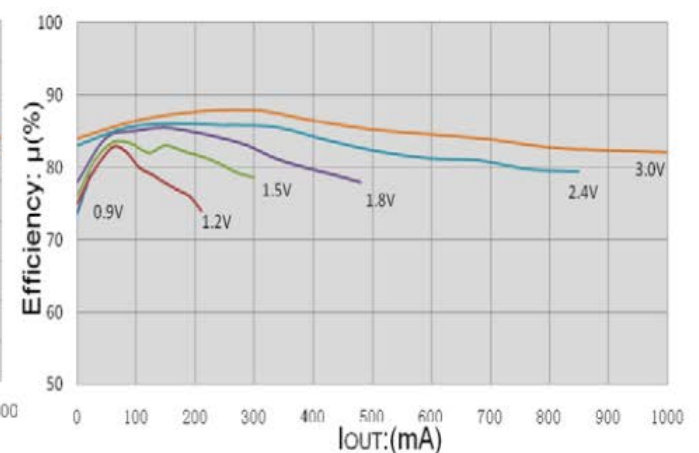


5. ACE701CA-3 Circuits Vout:5V

a、 V_{OUT} vs. I_{OUT} :



b、Efficiency vs. I_{OUT} :



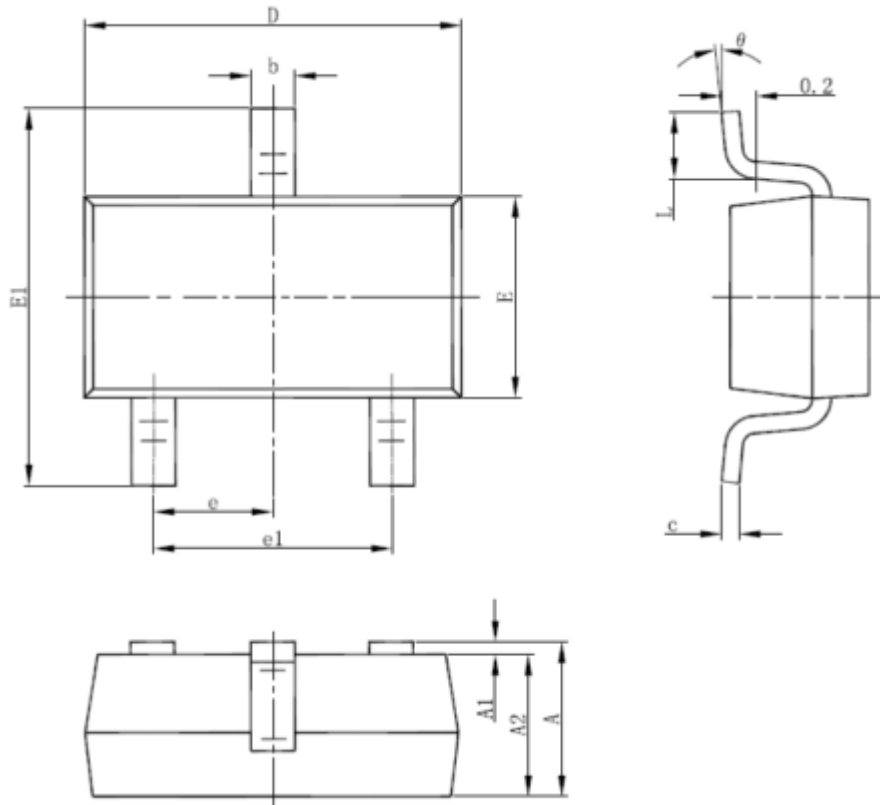


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Packing Information

SOT-23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

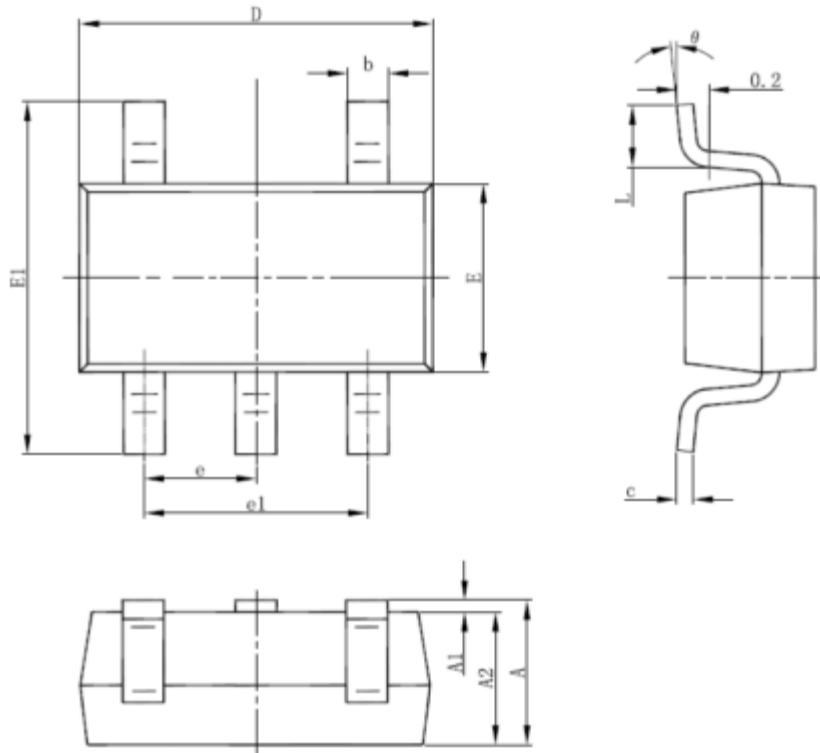


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Packing Information

SOT-23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

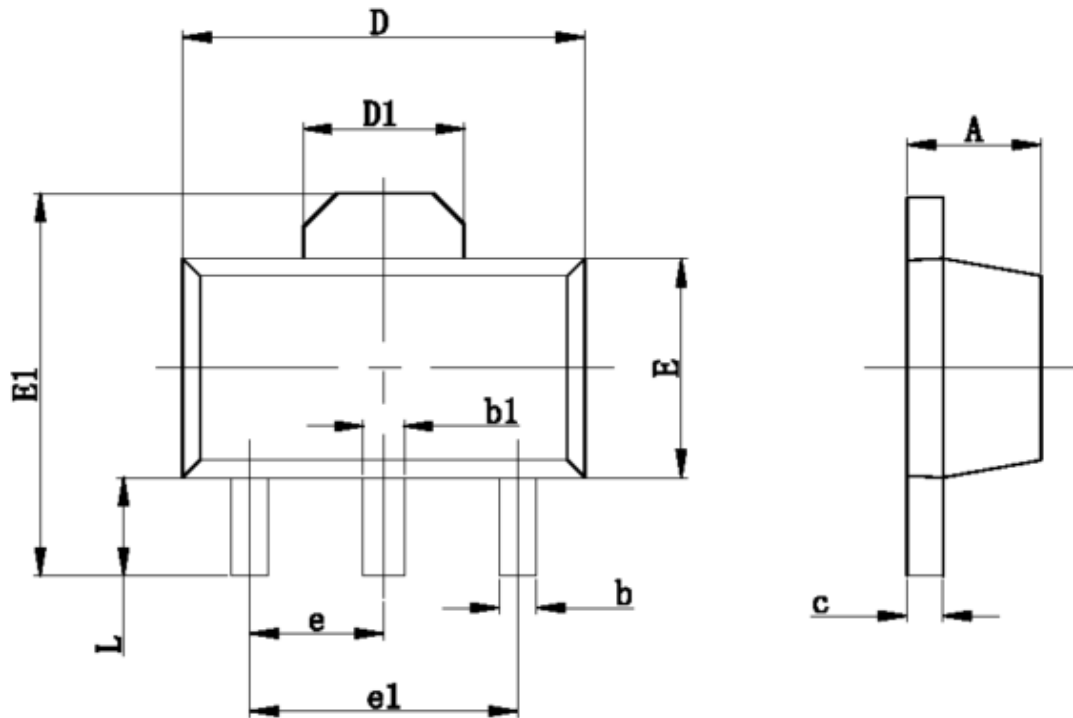


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Packing Information

SOT-89-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP	
e1	3.000 TYP		0.118TYP	
L	0.900	1.200	0.035	0.047

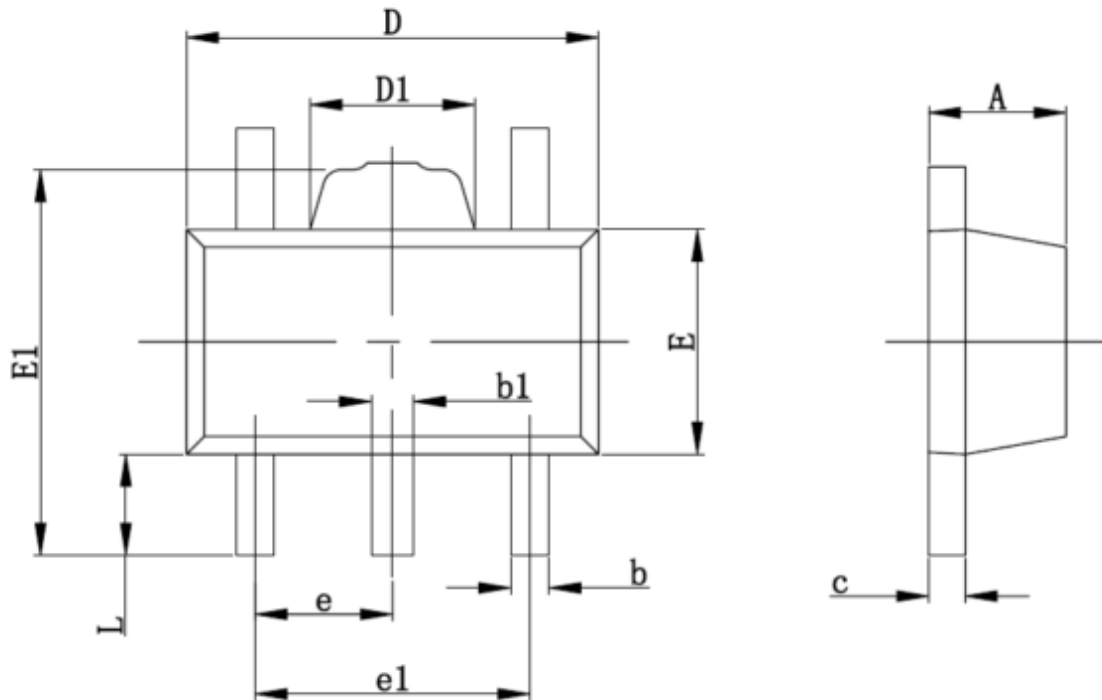


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Packing Information

SOT-89-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500TYP		0.060TYP	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043

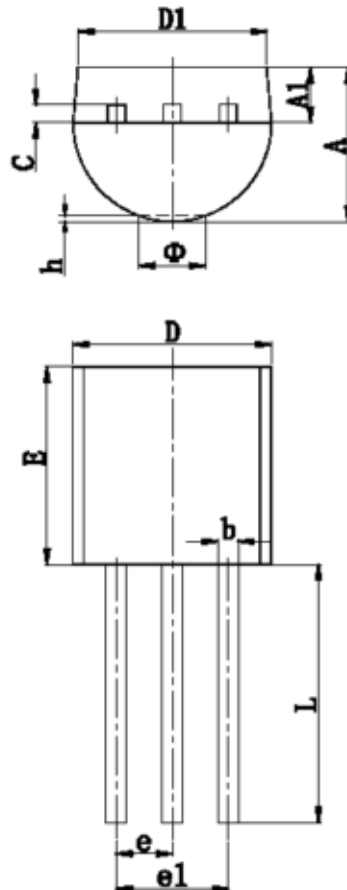


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Packing Information

TO-92



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015



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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 whose 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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