



■ Features

- Automatic AC/DC voltage measurement with LED bar & hazardous indication.
- LED Display for AC/DC 12V / 24V / 48V / 120V / 230V / 480V / 690V.
- Automatically Wake-up detection.
- Automatically Input detection.
- Automatically Power off.
- Low quiescent current < 10 μ A.
- Low operation current < 1mA.
- Maximum input voltage 1000 Vac/dc.
- 3V Operating power.
- Basic test function with battery power :
 - * Voltage measurement.
 - * Continuity measurement.
 - * Single pole phase test (ELV).
 - * Double-Pole rotary filed test.
 - * Torch switch on / off.
 - * Vibrator control.
 - * Self-test function.
 - * Buzzer control.
 - * Over Voltage warning.
- Compliance with IEC 61243-3.
- 64pin LQFP (7mm X 7mm) package.

■ Application

- Voltage and Continuity tester.

■ Description

The ES117 IC is a voltage and continuity detecting IC, which provides an AC/DC voltage detection, and the terminal impedance conditions. When powers on the IC, it will stay in the standby mode, and it will automatically wakes up, if the voltage signal or impedance conditions is detected in the terminal. The ES117 IC will switch to the proper operating mode according to the terminal inputs detected. This ES117 IC also provides a LED light signal to display the input voltage detected, and accompanied with a high voltage warning beeper sound to inform the operator during the testing operation.

The ES117 IC can be powered either from a battery or from the testing probe. When powered with battery, this IC provides full function operation. On the other hand, when ES117 is powered with testing probe, this IC provides limited test function, such as AC/DC voltage test, and the corresponding LED display only.

There are 3 audible frequencies of the beeper sound to inform the user. As higher voltage level is detected, the sound out audible frequency is higher. Moreover, the IC provides a high intensity LED driving current for lighting application, this function will last for 30 seconds if shortly pressing down the torch push button to be initialized.

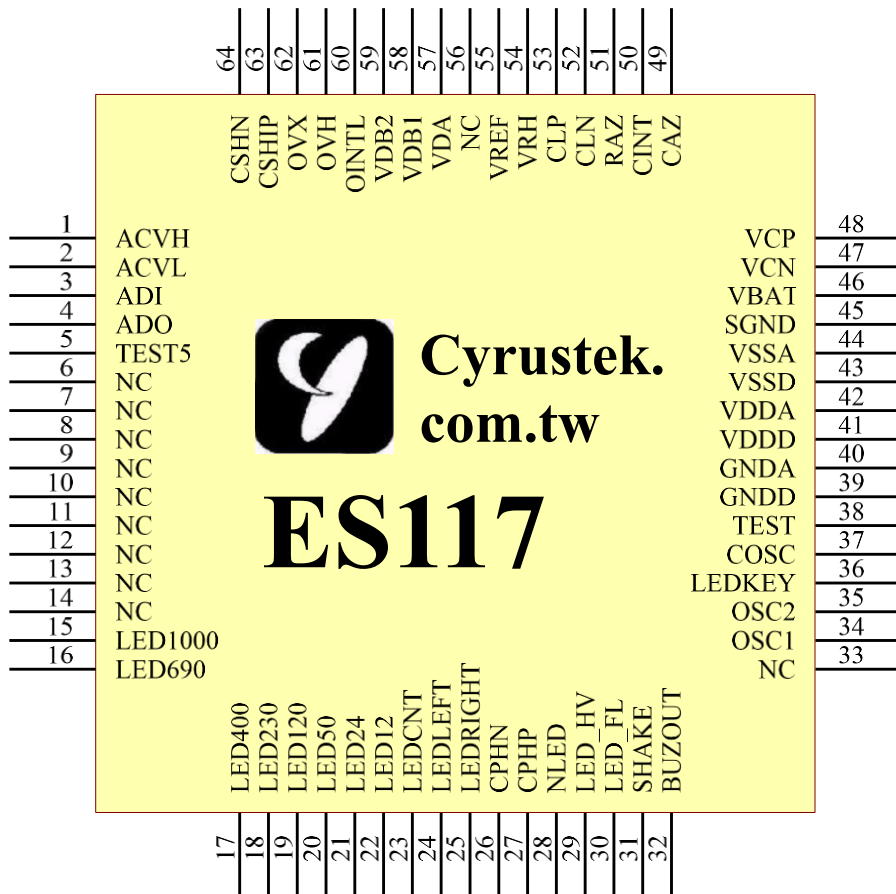


In addition to the voltage measurement function, the ES117 IC also provides continuity measurement function, single-pole phase test function, double-pole rotary filed test function, vibrational warning, and the torch function. In order to guarantee the safe operation for user, the ES117 also provides the self-test function to check whether the LED display will function well or not. The self-test function is initiated by pressing down the torch key for over 2 seconds. As initiated, all the LEDs will be flashed for 1 second. After this step, the IC will go into standby mode again.

The ES117 is packed in a small outline package, LQFP64 with body size 7mm x 7mm.

■ Pin Assignment

- 64pin LQFP (7mm X 7mm) package.





■ Pin Description

Pin No	Symbol	Type	Description
1	ACVH	O	Rectified signal high input in ACV mode. Connect to positive output of external AC to DC converter.
2	ACVL	O	Rectified signal low input in ACV mode. Connect to negative output of external AC to DC converter.
3	ADI	I	Negative input of internal AC-to-DC OPAMP.
4	ADO	O	Output of internal AC-to-DC OPAMP.
5	TEST5	O	Buffer output of internal AC-to-DC OPAMP.
6 ~ 14	NC	-	Keep floating.
15	LED1000	O	Connected to V _{SSD} for 690V application.
16	LED690	O	Indication output when input voltage is close to 690V.
17	LED400	O	Indication output when input voltage is close to 400V.
18	LED230	O	Indication output when input voltage is close to 230V.
19	LED120	O	Indication output when input voltage is close to 120V.
20	LED50	O	Indication output when input voltage is close to 50V.
21	LED24	O	Indication output when input voltage is close to 24V.
22	LED12	O	Indication output when input voltage is close to 12V.
23	LEDCNT	O	Indication output when input terminals are at low impedance.
24	LEDLEFT	O	Indication output when the phase rotation of input AC voltage is counter clockwise.
25	LEDRIGHT	O	Indication output when the phase rotation of input AC voltage is clockwise.
26	CPHN	I / O	Positive AC-couple capacitor connection for phase sequence measurement.
27	CPHP	I / O	Negative AC-couple capacitor connection for phase sequence measurement.
28	NLED	O	Indication output when input voltage is negative.
29	LED_HV	O	Indication output when input is high voltage.
30	LED_FL	O	Output control of flashlight.
31	SHAKE	O	Output control of vibration motor.
32	BUZOUT	O	Output control of buzzer.
33	NC	O	Keep floating.
34	OSC1	I	Crystal oscillator input connection.
35	OSC2	O	Crystal oscillator output connection.
36	LEDKEY	I	Pulse to V- to enable/disable Torch function. Pulse to V- larger than two seconds to enable self-test function.
37	COSC	O	Output control for the clock rate of 7660.



■ Pin Description (Continued)

Pin No	Symbol	Type	Description
38	TEST	O	Output connection of the touch point for phase sequence test.
39	GNDD	P / G	Digital ground.
40	GNDA	P / G	Analog ground.
41	VDDD	P	Positive supply voltage of digital circuit.
42	VDDA	P	Positive supply voltage of analog circuit.
43	VSSD	P	Negative supply voltage of digital circuit.
44	VSSA	P	Negative supply voltage of analog circuit.
45	SGND	G	Signal ground input.
46	VBAT	I	Input of internal low battery detection circuit.
47	VCN	I / O	Negative capacitor connection for bridge rectifier.
48	VCP	I / O	Positive capacitor connection for bridge rectifier.
49	CAZ	O	Auto-zero capacitor connection of ADC.
50	CINT	O	Integral capacitor connection of ADC.
51	RAZ	O	Buffer output pin in AZ and ZI phase.
52	CLN	I / O	Negative connection for reference capacitor of ADC.
53	CLP	I / O	Positive connection for reference capacitor of ADC.
54	VRH	O	Output of band-gap voltage reference. Typically $-1.23V$.
55	VREF	O	Output of band-gap voltage reference. Typically $-200mV$.
56	NC	-	Not connected.
57	VDA	I	Measurement Input. Connect to a precise $10M\Omega$ resistor.
58	VDB1	I	Voltage measurement $\div 5000$ attenuator.
59	VDB2	I	Measurement Input. Connect to a precise $10M\Omega$ resistor.
60	OINTL	I	ADC input of resistance measurement.
61	OVH	O	Output connection for resistance measurement and short detection.
62	OVX	I	Sense input for resistance measurement and short detection.
63	CSHP	I / O	Positive AC-coupled capacitor connection for phase sequence and frequency measurement.
64	CSHN	I / O	Negative AC-coupled capacitor connection for phase sequence and frequency measurement.



■ Absolute Maximum Ratings

Characteristic	Rating
Operation Voltage	± 3.6V
AGND/DGND	AGND/DGND ≥ (V- -0.5V)
Digital Input	V- -0.6V to DGND +0.6V
Probe Input Voltage	1000V
Power Dissipation. Flat Package	500mW
Operating Temperature	0°C to 70°C
Storage Temperature	-25°C to 125°C
ESD HBM	2KV

■ Electrical Characteristics

TA=25°C, V_{BAT} = ±3.0V

Parameter	Symbol	Test Condition	Min.	Typ.	Max	Units
Power Supply	V _{BAT}	±3.0V	±2.75	±3.0	±3.25	V
Operating Supply Current In Voltage Mode	I _{DD}	Normal Operation	---	1.0	---	mA
	I _{SS}	In Sleep Mode	---	10	30	μA
Input Impedance		690V _{AC}	---	200K	---	Ω
Xtal	OSC1,2	4MHz	---	---	100	ppm
LED Display		Response Time	---	0.58	0.6	Sec.
Voltage Test	LED12	LED – 12V	---	6	---	V
	LED24	LED – 24V	---	18	---	V
	LED50	LED – 50V	---	38	---	V
	LED120	LED – 120V	---	90	---	V
	LED230	LED – 230V	---	173	---	V
	LED480	LED – 480V	---	360	---	V
	LED690	LED – 690V	---	518	---	V
High Voltage Indicator	LED HV	AC	---	38	---	V _{AC}
		DC	---	90	---	V
Buzzer	BZOUT	V _{AC} : 38V ~ 230V	---	1	---	Hz
		V _{DC} : 90V ~ 230V	---	1	---	Hz
		230V ~ 347V	---	2	---	Hz
		347V ~ 480V	---	3.3	---	Hz
		480V ~ 1000V	---	5	---	Hz
Continuity Test	BZOUT	Beeper - On	---	---	1M	Ω
		Response Time	100m	---	---	Sec.
	LEDCNT	LED - On	---	---	1M	Ω
	V _{ia} / V _{ib}	ProbeV _{ia} – ProbeV _{ib}	---	---	1M	Ω



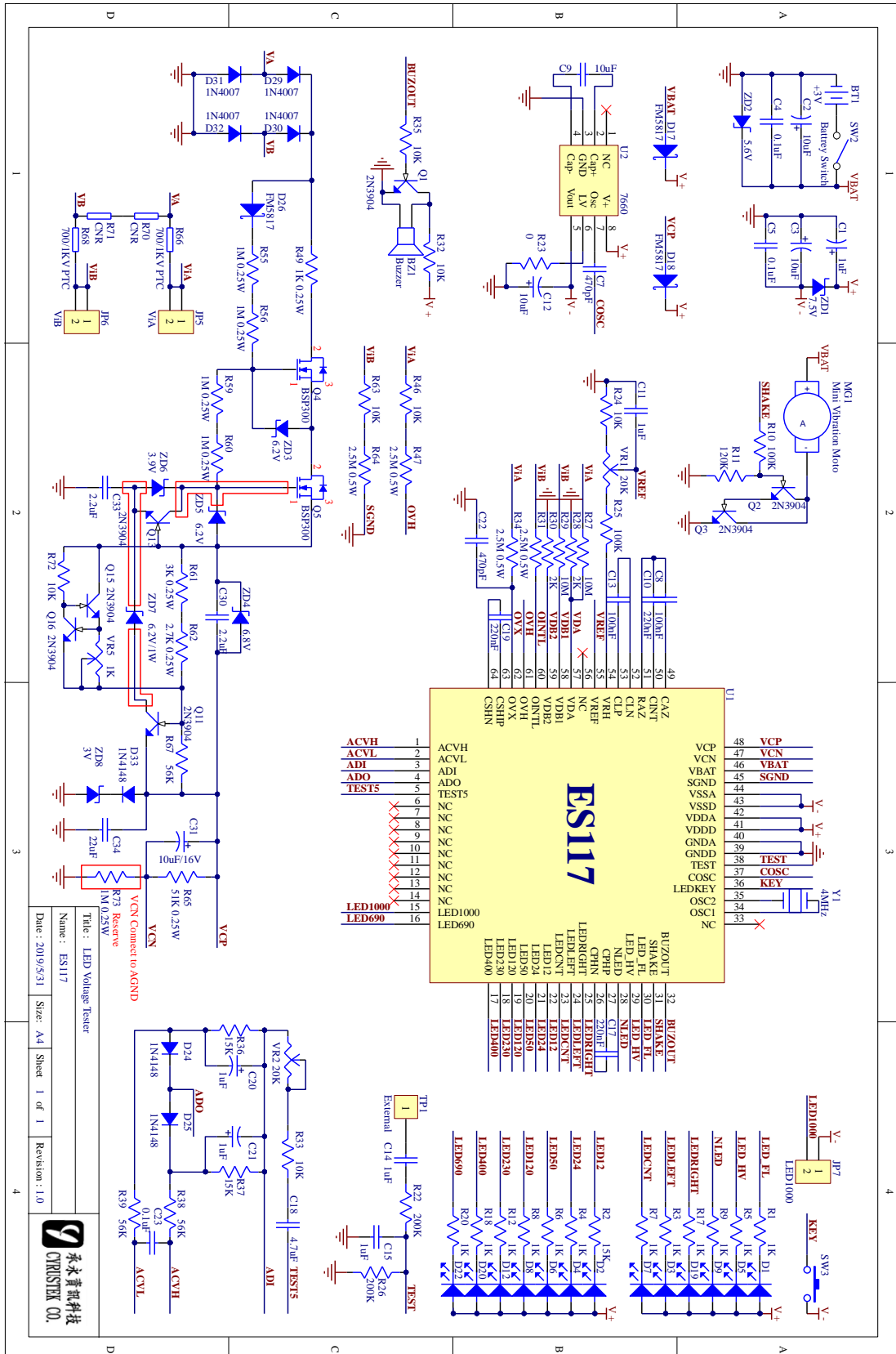
■ Electrical Characteristics (Continued)

TA=25°C, V_{BAT} = ±3.0V

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Single Pole Phase Test		V – Range	80	---	690	V _{AC}
		Hz - Range	40	---	1K	Hz
DoublePolePhaseRotation Test		V – Range	80	---	690	V _{AC}
		Hz - Range	40	---	1K	Hz
Vibration Motor		Control Level Low	---	---	GNDD + 0.2	V
		Control Level High	V _{BAT} - 0.2	---	---	V
		V – Range	80	---	690	V _{AC}
		Hz - Range	40	---	1K	Hz
		V – Range	80	---	690	V _{DC}
Torch	LED FL	Duration	---	30	---	Sec.



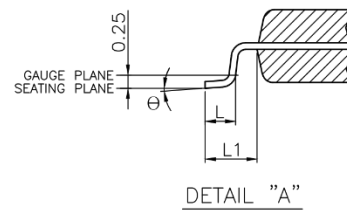
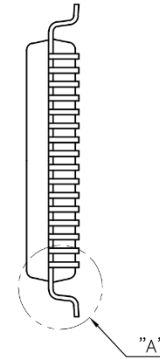
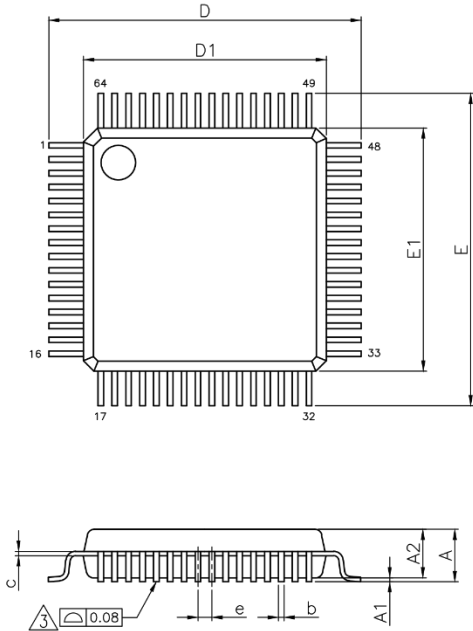
Application Circuit





■ Package Information

● 64pin LQFP Outline drawing



● Dimension parameters

VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.60
A1	0.05	—	0.15
A2	1.35	1.40	1.45
b	0.13	0.18	0.23
c	0.09	—	0.20
D	9.00 BSC		
D1	7.00 BSC		
e	0.40 BSC		
E	9.00 BSC		
E1	7.00 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
θ	0°	3.5°	7°

NOTES:

1. JEDEC OUTLINE : MS-026 BBD
2. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PER SIDE. D1 AND E1 ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUM b DIMENSION BY MORE THAN 0.08mm.