



### General Description

EC4216C is a Linear LED Driver of 6-segment LED switch, and its current of each segment in  $P_{ow}=16V$  and  $V_D=75V$  can provide 118mA by Sink. In addition, it contains simple application circuit, every few external components (e.g. a bridge rectifier external resistor and a 4.7uF capacitor are required only in use of 6 Watts)and Negative Temperature Coefficient Output.

### Features

- ESOP8 package
- Simple application circuit
- Built-in 8V~18V Zener Diode Equivalent circuit, provides for internal circuit, without Start up HVNMOS, convenient for 110V/220V power use.

### Applications

- LED Bulbs

### Absolute Maximum Ratings

- $I_z=10mA$ .
- $P_{ow}=16.5V$ .
- D1~D6 Break Down Voltage=700V at  $P_{ow}=0V$ .
- Operating Temperature Range : -40°C to 120°C
- Storage Temperature Range : -40°C to 140°C
- ESD Level.....(H.B.M) 2KV  
(M.M) 200V

#### Note:

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional Operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability.

### Pin Configuration

Top View

Pin Number	Pin Name	Function
1	Pow	8V~18V Power
2	D1	Segment 1 Driver
3	D2	Segment 2 Driver
4	D3	Segment 3 Driver
5	D4	Segment 4 Driver
6	D5	Segment 5 Driver
7	D6	Segment 6 Driver
8	Vref	2.5V Reference & Set Power Voltage
Exposed Pad	Gnd	Ground

### Ordering Information

### EC4216C XX XX R

AA :

R : Tape Reel

6 Segment without OVP

Package :

MH : ESOP8

Part No.	Package Type	Marking Information	Remark
EC4216CAMHR	ESOP8	EC4216 LLLLAA YYWWT	<ol style="list-style-type: none"> <li>LLLLL : Lot No</li> <li>YYWW : Date Code</li> <li>T : Internal Tracking Code</li> <li>AA : 6 Segment without OVP</li> </ol>

### Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power	Pow	R1=22k, $V_{CC}=30\text{V}$ , D1~D6 Open	8.27	8.48	8.69	V
Reference Voltage	Vref	Pin8 Open	2.54	2.61	2.68	V
Leak Current	$I_{Leak}$	Pow=0V, $V_{(D1-D6)}=40\text{V}$		0.8	1.25	$\mu\text{A}$
Driver Current	$I_D$	Pow=8.48V, $V_D=75\text{V}$	105	120	135	mA
Quiescent Current	$I_Q$	R1=120k, D1~D6 Open, $V_i=110\text{V}_{rms}$		0.75		$\text{mA}_{rms}$
Switch Segment Current	$I_{sw}$	Pow=16V, $D_{N+1}$ current ( $I_{DN+1}$ ) to turn off $D_N$		12		mA
Vref Input Resistor	$R_i$	Pow Open, Pin8 to Gnd Resistor		88		k $\Omega$
Channel Resistor	$R_{ON}$	$V_{CC}=30\text{V}$ , $R_3=\infty$ , $C_1=4.7\mu\text{F}$	100	120	130	$\Omega$

### Functional Description

Traditional single-segment Linear LED Driver needs to use higher Driver LED Current in order to increase brightness when LED lights up, so the drawback is the low efficiency of LED. EC4216C is a six-segment Linear LED designed to improve the drawback of single-segment Drive LED. The six-segment switch LED Driver is to divide traditional single-segment LED into six segments, and then conducts segment by segment according to the input voltage changes (D1->D1+D2-> D1+D2+D3 .....). Such an arrangement can overcome the Forward bias of LED, allowing the LED to light up when the input voltage is low, and thus increase the efficiency of the LED, but also no Over Driver LED is required. EC4216C consists of two portions, one is Chip power; please refers to Application Circuit (Fig1). In the Application Circuit, an external resistor R3 is used to set the operating voltage of Chip and the output current for D1~D6. The set method is as follows: two resistors R9 (with value 192K) and R9A (with value 88k) are set between Chip Pin1 (Pow) and Pin8 (Vref), and a reference voltage 2.61V is on Pin8. The relationship among Pow, Vref, R9 and R9A is shown as formula 1.

$$\text{Pow} = 2.61\text{V} + 2.61\text{V} \frac{R_9}{R} \dots \dots \text{formula 1}$$

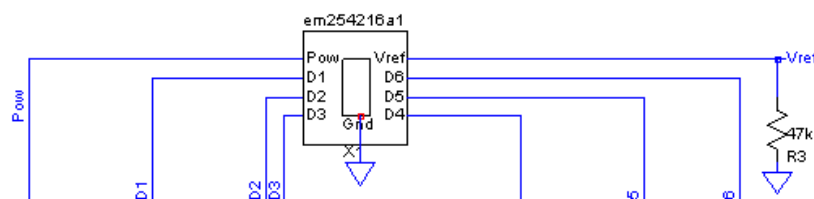


Fig-1 110V<sub>RMS</sub> Application Circuit

Therefore, where the external resistor R3 does not exist (Default),  $R=88k$ , and  $Pow=8.47V$ , and where  $R=38.5k$  ( $R3=68k/R9A$ ), the  $Pow=15.56V$ . The second portion includes Segment Switch Circuit and LED Current Driver. Six segments will be conducted sequentially according to Sine Wave changes. When Sine Wave is under positive slope changes, the conducting way is as follows: D1, D1+D2, D1+D2+D3, D1+D2+D3+D4, D1+D2+D3+D4+D5, and D1+D2+D3+D4+D5+D6, and when the Sine Wave is under negative slope changes, then the way is in the opposite direction. The switch of those segments is carried out by Segment Switch Circuit. The conditions to switch two segments is that where  $I_{D(N+1)} \geq 12mA$  is closed,  $D_{(N)}$  ....Segment is turned off. Drive Current is relevant to Pow voltage; in Default value, the external resistor R3 of application circuit does not exist,  $Pow=8.48V$ . Pow pin=0V 2V 4V 6V 8V 10V 12V 14V 16V which the maximum current of each Segment (D1~D6) is 120mA. As for the relationship between Drive Current and Pow, please refer to Fig2.

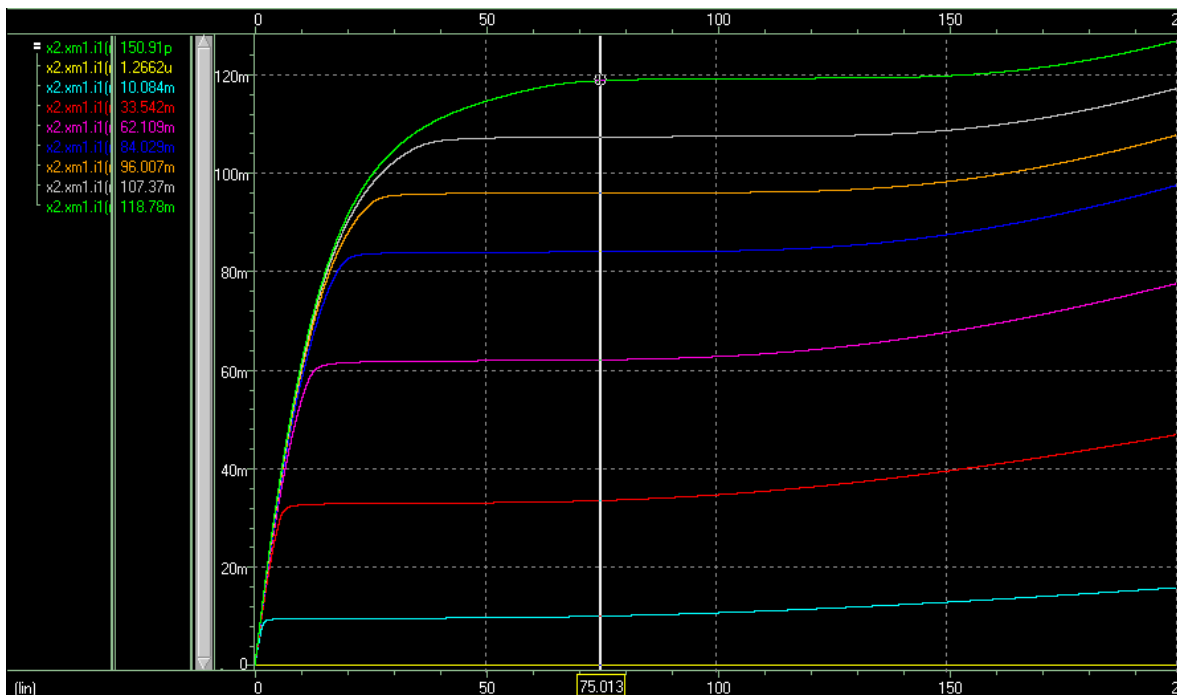
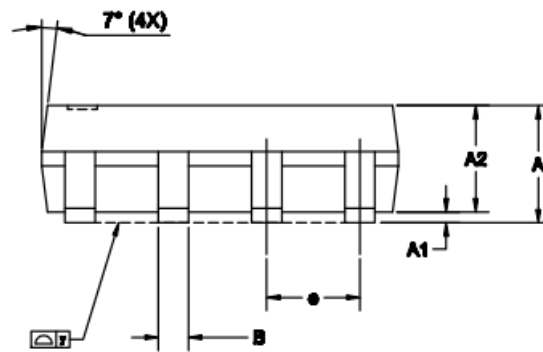
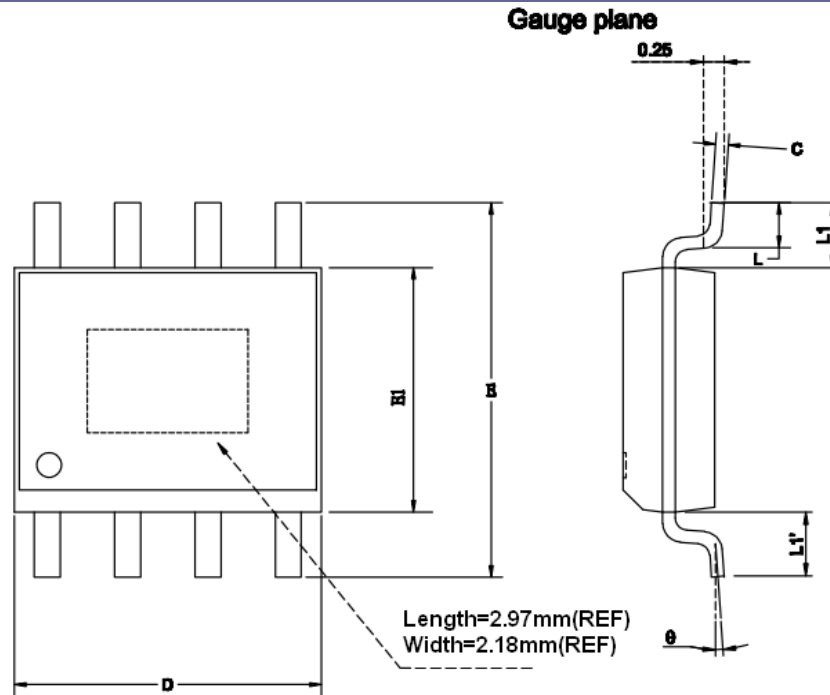


Fig2 D<sub>1-6</sub> Drive Current with Pow pin

## Outline Dimensions

### ESOP8



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.40	1.50	1.60	0.055	0.059	0.063
A1	0.00	—	0.10	0.000	—	0.004
A2	—	1.45	—	—	0.057	—
B	0.33	—	0.51	0.013	—	0.020
C	0.19	—	0.25	0.007	—	0.010
D	4.80	—	5.00	0.189	—	0.197
E1	3.80	3.90	4.00	0.150	0.153	0.157
e	—	1.27	—	—	0.050	—
E	5.80	6.00	6.20	0.228	0.236	0.244
L	0.40	—	1.27	0.016	—	0.050
y	—	—	0.10	—	—	0.004
θ	0°	—	8°	0°	—	8°
L1-L1'	—	—	0.12	—	—	0.005
L1	1.04REF			0.041REF		