



## DIO8242E

### Adaptive 100/120 Hz Current Ripple Remover Max Input Current $\leq 60$ mA

#### Features

- Regulator for adaptive 100/120 Hz current ripple remove
- Built-in zener diode for input voltage clamping
- Built-in 100 V power MOSFET
- Programmable amplitude LED current ripple
- Programmable maximum cathode voltage of LED
- Programmable maximum LED current
- Optimized for TRIAC dimming, 1% brightness without flicker
- The current ripple is less than  $\pm 1\%$
- SOT23-3, SOT89-3 packages

#### Descriptions

DIO8242E is a regulator for driving internal NMOSFET to remove the 100/120 Hz LED string current ripple on AC/DC power.

Patented control strategies are optimized for remover current ripple. Novel circuit design makes a lower BOM and high cost-effective for flickerless filament.

#### Applications

- LED lighting

#### Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T <sub>A</sub>	Package	
DIO8242EST3	1016	3	Green	-40 to 125°C	SOT23-3	Tape & Reel,3000
DIO8242ETC3	1016	3	Green	-40 to 125°C	SOT89-3	Tape & Reel,2500



## DIO8242E

Adaptive 100/120 Hz Current Ripple Remover Max Input Current ≤ 60 mA

### Pin Assignment

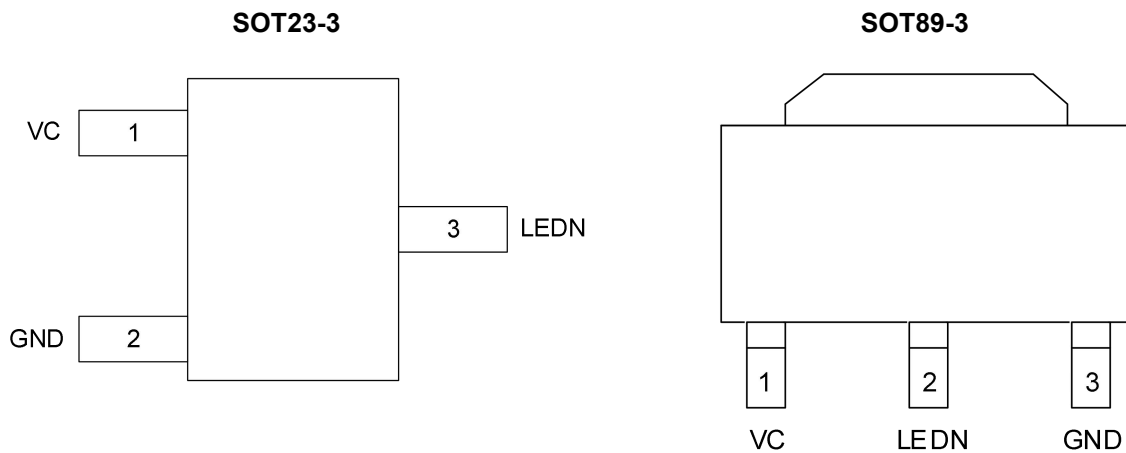


Figure 1. Top view

### Pin Descriptions

Pin Name	Description
GND	Power ground
VC	LED current ripple programming
LEDN	Connect to the cathode of LED string



## DIO8242E

Adaptive 100/120 Hz Current Ripple Remover Max Input Current ≤ 60 mA

### Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Rating” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter		Rating	Unit
$V_{LEDN}$	LEDN		100	V
$V_{VC}$	VC		-0.3 to 6	V
$T_J$	Junction temperature		150	°C
$T_L$	Lead temperature		260	°C
$T_{STG}$	Storage temperature		-65 to 150	°C
$R_{\theta JA}$	Thermal resistance	SOT23-3	220	°C/W
		SOT89-3	80	
$R_{\theta JC}$	Thermal resistance	SOT23-3	130	°C/W
		SOT89-3	25	

### Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter		Rating	Unit
$V_{LEDN}$	LEDN		< 100	V
$T_J$	Junction temperature		125	°C
	Under point $V_{LEDN}$		0.8~1.2	V
	Power consumption	SOT23-3	< 300	mW
		SOT89-3	< 650	

## Electrical Characteristics

Typical value:  $V_{CC} = 3.6\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise specified.

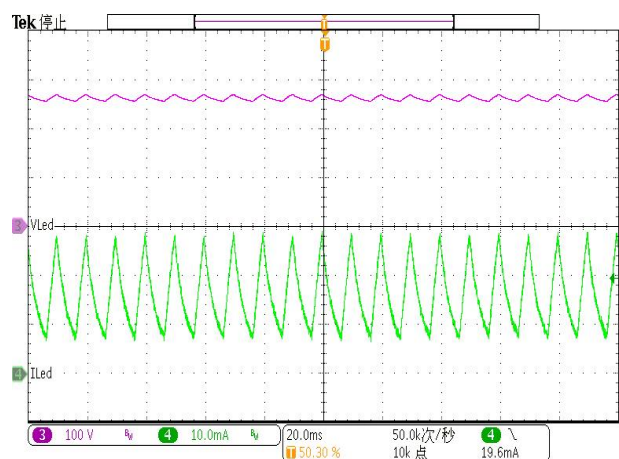
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{ST}$	Start-up current				1	$\mu\text{A}$
$V_{REF}$	LEDN compare voltage			9		V
$I_{CLMT}$	LED current limit				60	mA
$R_{DS(ON)}$	MOS $R_{DS(ON)}$			16		$\Omega$
BV	Breakdown voltage		100			V

### Note:

(1) Specifications subject to change without notice.

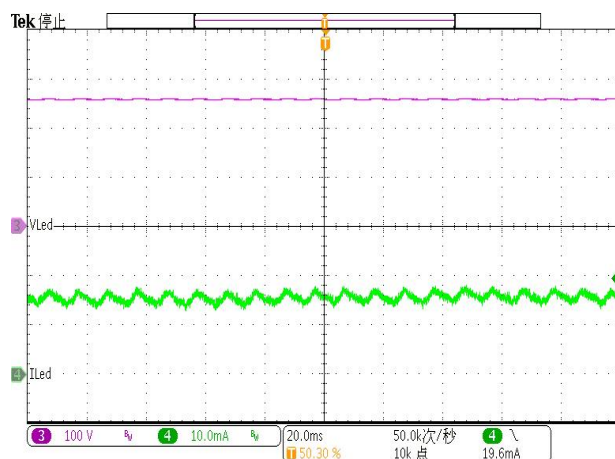
## Typical Performance Characteristics

$C_{VC} = 1\text{ }\mu\text{F}$ ,  $C_{EC} = 8.2\text{ }\mu\text{F}$ , unless otherwise specified.



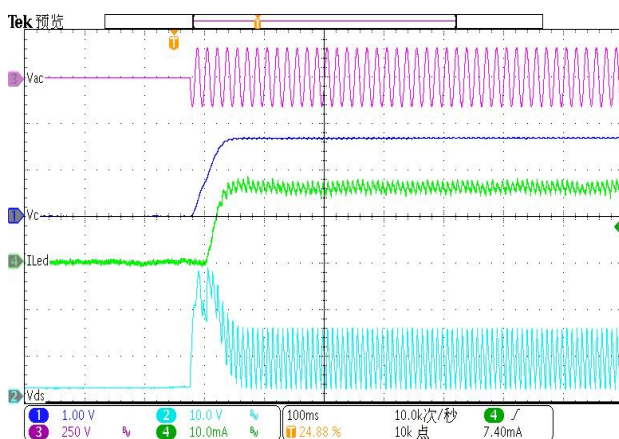
( $V_{AC} = 220\text{ V}$ ,  $V_{LED} = 250\text{ V}$ ,  $I_{LED} = 15\text{ mA}$ )

Figure 2. LED current ripple without DIO8242E



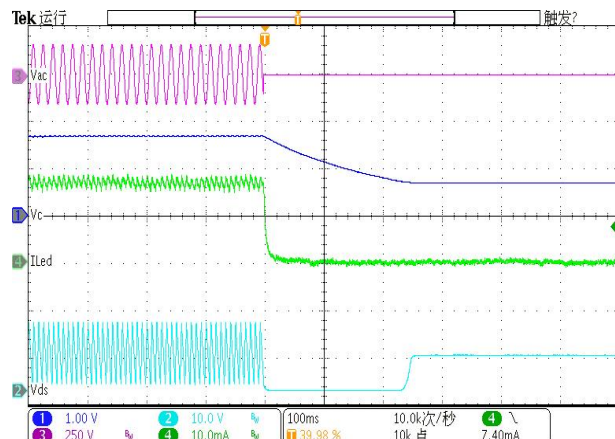
( $V_{AC} = 220\text{ V}$ ,  $V_{LED} = 250\text{ V}$ ,  $I_{LED} = 15\text{ mA}$ )

Figure 3. LED current ripple with DIO8242E



( $V_{AC} = 120\text{ V}$ ,  $V_{LED} = 125\text{ V}$ ,  $I_{LED} = 15\text{ mA}$ )

Figure 4. AC source power ON

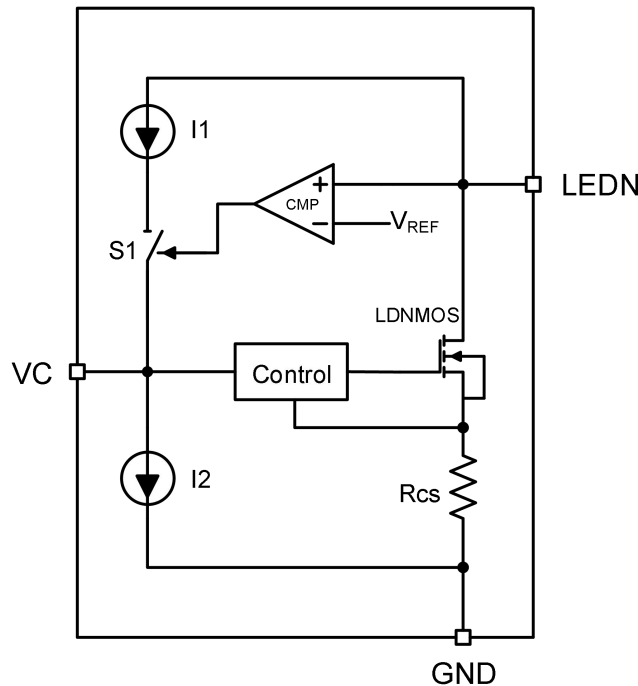


( $V_{AC} = 120\text{ V}$ ,  $V_{LED} = 125\text{ V}$ ,  $I_{LED} = 15\text{ mA}$ )

Figure 5. AC source power OFF

Adaptive 100/120 Hz Current Ripple Remover Max Input Current  $\leq 60\text{ mA}$

## Block Diagram



## Function Description

The DIO8242E is designed for driving one LED string and removing the 100/120 Hz LED current ripple.

### Theory of operation

The LED string and DIO8242E are both supplied by an AC/DC current source. The drain of internal NMOSFET is connected to the cathode of LED string. A sensing resistor  $R_{cs}$  is connected between the source of NMOSFET and GND. The DIO8242E drives NMOSFET to transfer the LED current ripple to voltage ripple on NMOSFET, and ensures the constant voltage across LED string and the constant current flow through LED string. The scalable adaptive function of DIO8242E can regulate the cathode voltage of LED string to minimum to improve the efficiency of the system.

### Current ripple removing

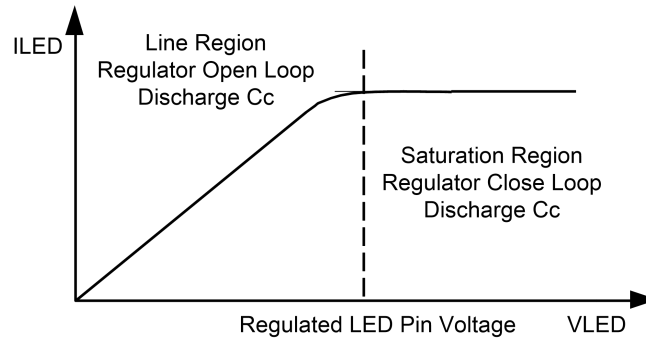
The capacitor  $C_C$  between  $V_C$  and GND is an integral capacitor. DIO8242E transform the voltage on  $C_C$  to a reference voltage. The current regulator regulates LED current via negative feedback control.

$C_C$  should be large enough in order to remove the current ripple of the LED string. However, too large capacitor may slow down the dynamic response.

### Adaptive regulation

The DIO8242E controls the voltage on  $C_C$  by monitoring the operation state of built-in N-MOSFET. The efficiency of system is relatively low when N-MOSFET always works in the saturation region. The DIO8242E detects it and charges  $C_C$  to raise the  $V_{VC}$  and  $I_{LED}$ , then the output voltage of power supply is reduced, and the voltage drop on N-MOSFET decreases.

Conversely, when N-MOSFET is working in the linear region, LED current regulation loop is open. The DIO8242E detects it and discharges  $C_C$  to reduce the  $V_{VC}$  and  $I_{LED}$ , then the output voltage of power supply is raised, and the LED current regulation loop is closed.

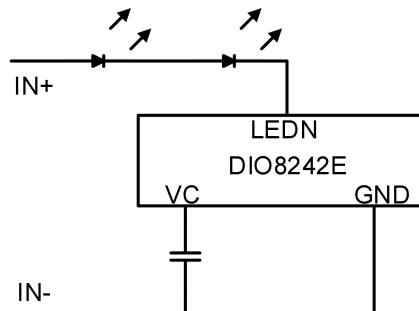


## PCB design guideline

1. The DIO8242E should be placed far away from the power devices for better thermal performance.
2. The area of LED current loop should be as small as possible.

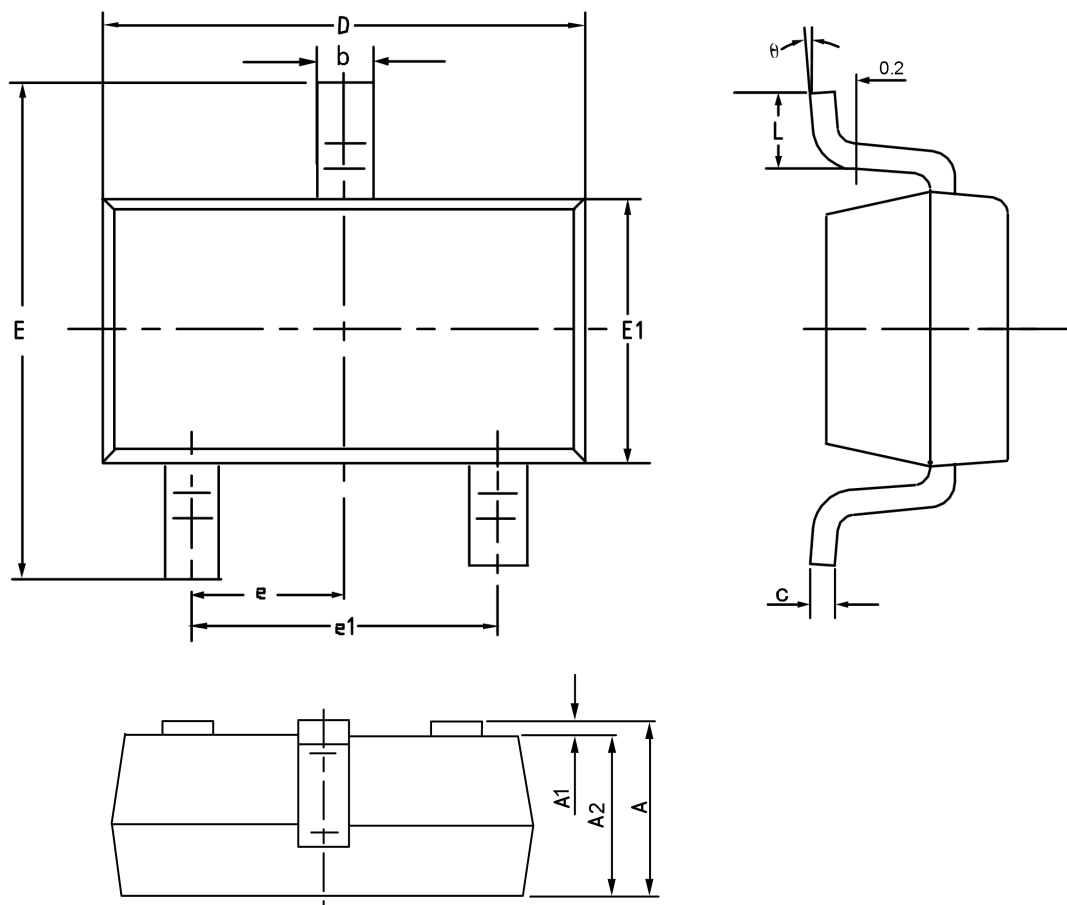
## Application Information

The DIO8242E design guide:



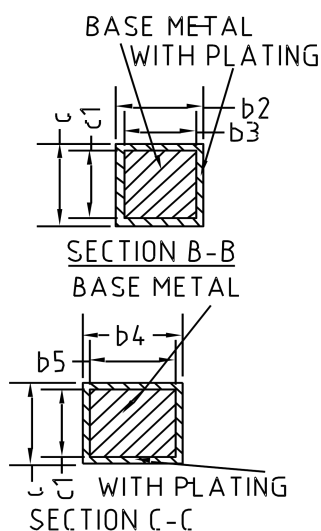
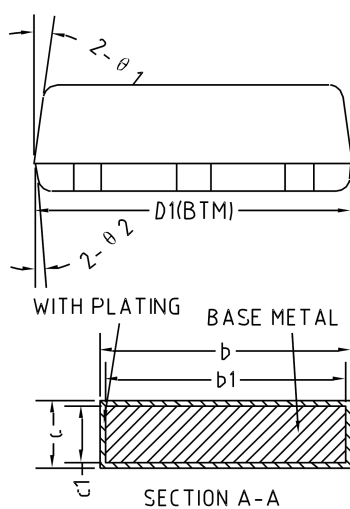
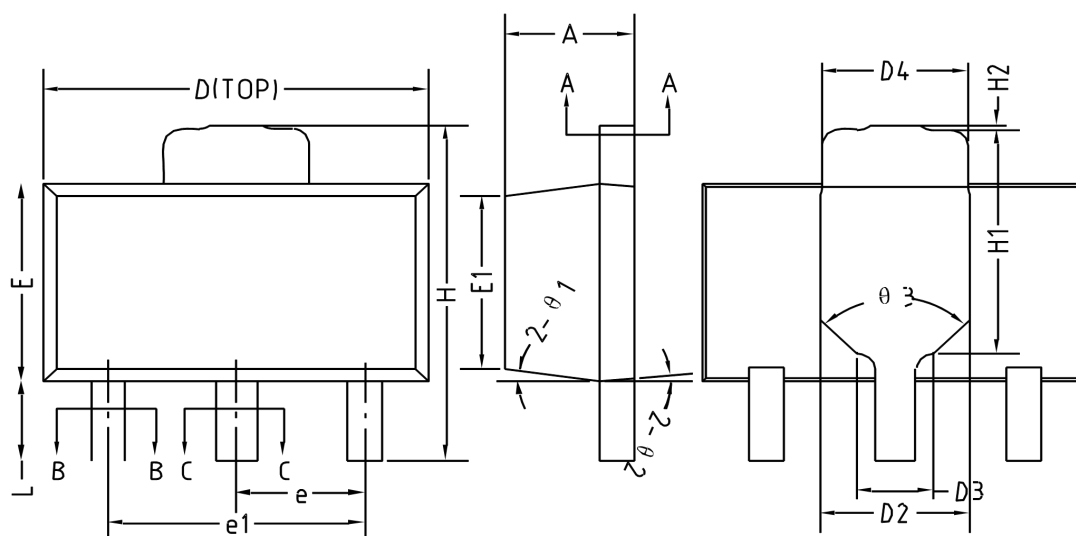
The value of the capacitor between  $VC$  and  $GND$  can determine the final amplitude of the current ripple. It should be large enough in order to remove the current ripple of the LED string. However, too large capacitor may low down the dynamic response.

## Physical Dimensions: SOT23-3



Common Dimensions (Units of measure = Millimeter)		
Symbol	Min	Max
A	1.05	1.25
A1	0.00	0.10
A2	1.05	1.15
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E1	1.50	1.70
E	2.65	2.95
e	0.95 BSC	
e1	1.80	2.00
L	0.30	0.60
$\theta$	0°	8°

## Physical Dimensions: SOT89-3



Common Dimensions (Units of measure = Millimeter)			
Symbol	Min	Nom	Max.
A	1.40	1.50	1.60
b	1.68	-	1.77
b1	1.67	1.70	1.73
b2	0.38	-	0.47
b3	0.37	0.40	0.43
b4	0.46	-	0.55
b5	0.45	0.48	0.51
c	0.40	-	0.44
c1	0.39	0.40	0.41
D	4.40	4.50	4.60
D1	4.35	4.45	4.55
D2	1.60	1.75	1.90
D3	0.75	0.90	1.05
D4	1.60	1.70	1.80
E	2.40	2.50	2.60
E1	2.13	-	2.19
e	1.50BSC		
e1	3.00BSC		
H	4.05	-	4.25
H1	2.70	-	3.00
H2	0	-	0.10
L	0.89	-	1.20
θ1	6°	8°	10°
θ2	3°	5°	7°
θ3	85°	90°	95°

Adaptive 100/120 Hz Current Ripple Remover Max Input Current ≤ 60 mA





## DIO8242E

Adaptive 100/120 Hz Current Ripple Remover Max Input Current  $\leq 60$  mA

### CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as, cell phone, handheld products, laptop, and medical equipment and so on. Dioo's product families include analog signal processing and amplifying, LED drivers and charger IC. Go to <http://www.dioo.com> for a complete list of Dioo product families.

For additional product information or full datasheet, please contact with our sales department or representatives.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[DIOO:](#)

[DIO8242F2TC3](#) [DIO8242ETC3](#) [DIO8242EST3](#)