DIO8242F2
Adaptive 100/120Hz Current Ripple Remover
Max Input Current ≤ 120mA

Features

- Regulator for adaptive 100/120Hz current ripple remove
- Built-in zener diode for input voltage clamping
- Built-in 100V 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 ±1%
- SOT23-3，SOT89-3 and SOT223 packages

Descriptions

DIO8242F2 is a regulator for driving internal NMOSFET to remove the 100/120Hz LED string current ripple on AC/DC power.

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

Applications

- LED lighting

Ordering Information

Order Part Number	Top Marking		T_A		Package
DIO8242F2ST3	2013	Green	-40 to 125°C	SOT23-3	Tape & Reel,3000
DIO8242F2TC3	2013	Green	-40 to 125°C	SOT89-3	Tape & Reel,2500
DIO8242F2TD3	2013	Green	-40 to 125°C	SOT223	Tape & Reel,2500

DIO8242F2

Pin Assignment

SOT23-3

VC [1]

[3] LEDN

GND [2]

SOT89-3/SOT223

[1] [2] [3]

VC   LED N   GND

Figure 1 Top View

Pin Descriptions

Name	Description
GND	Power Ground
VC	LED Current Ripple Programming
LEDN	Connect to the Cathode of LED string

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.

Parameter		Rating	Unit
LEDN		100	V
VC		-0.3 to 6	V
Junction Temperature		150	°C
Lead Temperature		260	°C
Storage Temperature		-65 to 150	°C
Thermal Resistance / θ_{JA}	SOT23-3	220	°C/W
	SOT89-3	80	
	SOT223	50	
Thermal Resistance / θ_{JC}	SOT23-3	130	°C/W
	SOT89-3	25	
	SOT223	20	

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.

Parameter		Rating	Unit
LEDN		< 100	V
Junction Temperature (T_J)		125	°C
Under point VLEDN		0.8~1.2	V
Power consumption	SOT23-3	< 250	mW
	SOT89-3	< 650	
	SOT223	< 800	

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Electrical Characteristics

Typical value: Vcc=3.6V, T_A=25°C, unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_{ST}	Start-up Current				1	uA
V_{REF}	LEDN Compare Voltage			6		V
I_{CLMT}	LED Current Limit				120	mA
R_{DSON}	MOS Rdson			8		Ω
BV	Breakdown Voltage		100			V

Specifications subject to change without notice.

Typical Performance Characteristics

C_{VC}=1µF, C_{EC}=8.2µF, unless otherwise specified.

LED Current Ripple without DIO8242F2
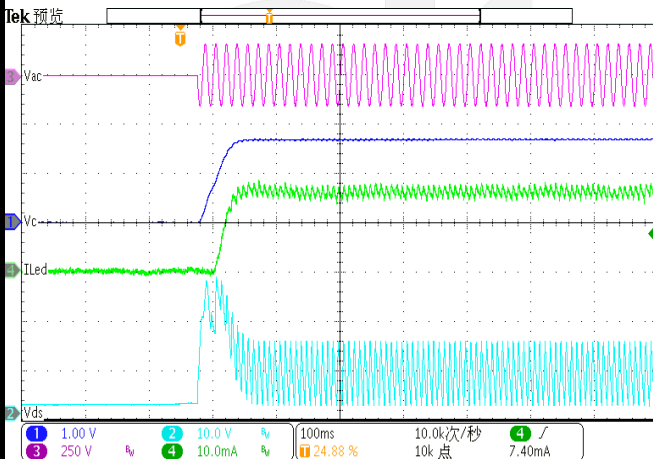(V_{AC}=220V,V_{LED}=250V,I_{LED}=15mA)
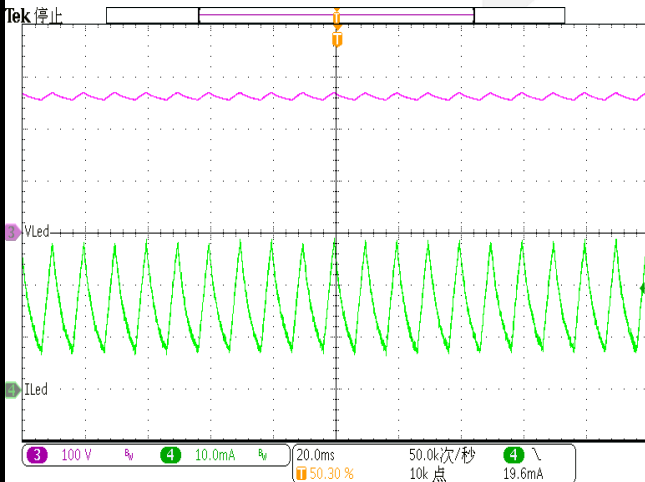
LED Current Ripple with DIO8242F2
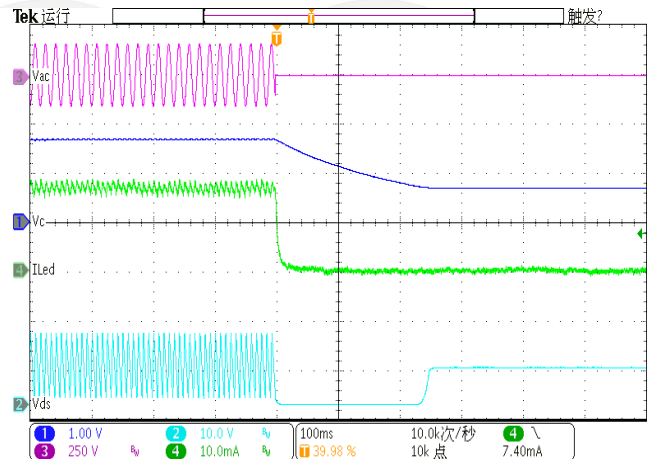(V_{AC}=220V,V_{LED}=250V,I_{LED}=15mA)
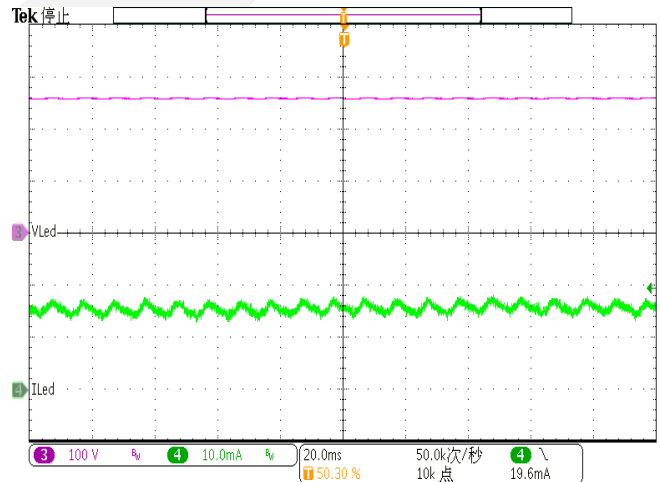
AC Source Power ON
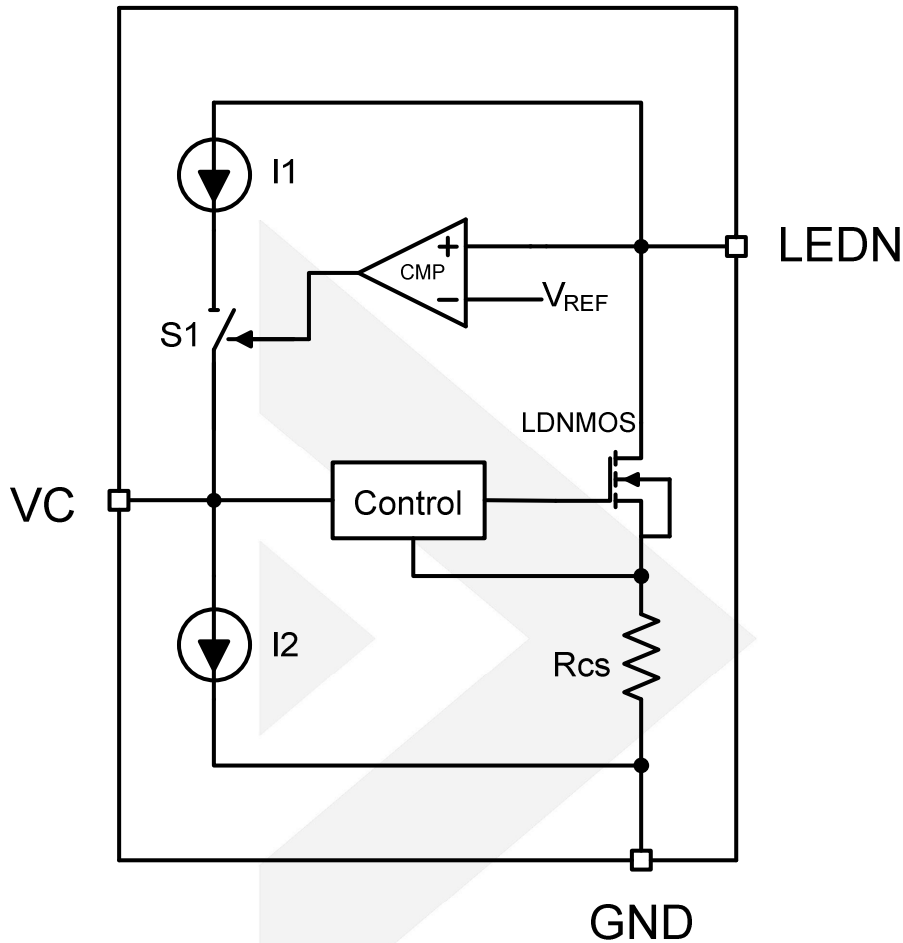(V_{AC}=120V,V_{LED}=125V,I_{LED}=15mA)

AC Source Power OFF
(V_{AC}=120V,V_{LED}=125V,I_{LED}=15mA)

Block Diagram

Function Description

DIO8242F2 is designed for driving one LED string and removing the 100/120Hz LED current ripple.

Theory of Operation

The LED string and DIO8242F2 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 Rcs is connected between the source of NMOSFET and GND. DIO8242F2 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 DIO8242F2 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 VC and GND is an integral capacitor.   DIO8242F2 transform the voltage on Cc 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.

DIO8242F2

Adaptive Regulation

DIO8242F2 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. DIO8242F2 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. DIO8242F2 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.
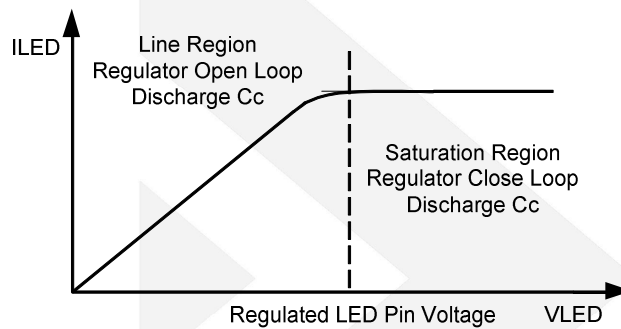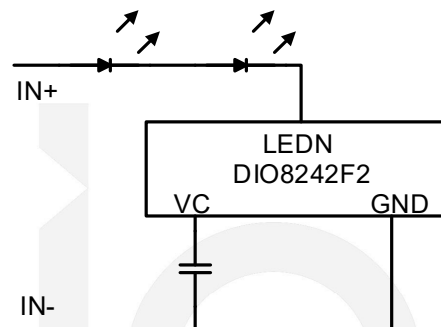

PCB Design Guideline

1. DIO8242F2 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

DIO8242F2 design guide:

1. 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.
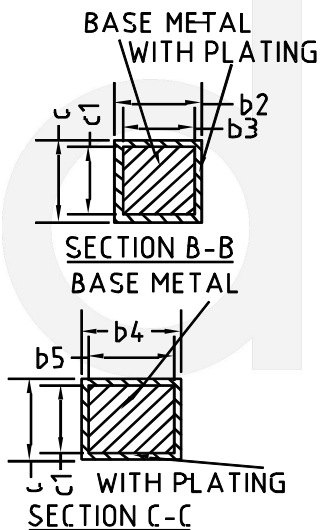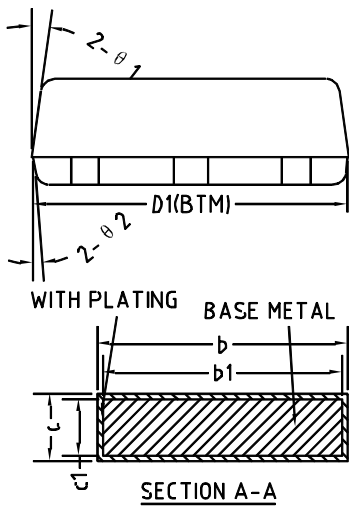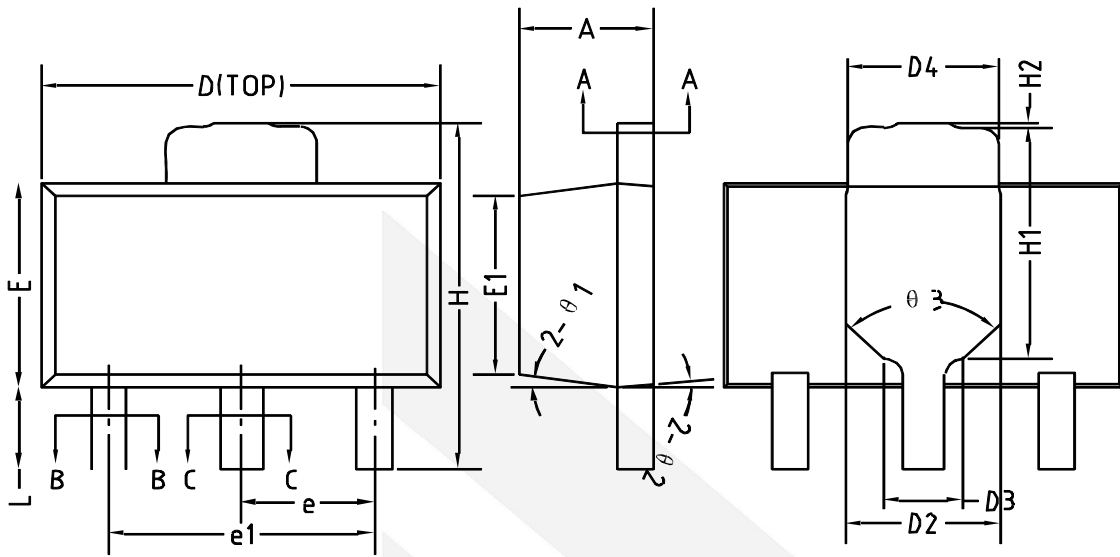
DIO8242F2

Physical Dimensions: SOT23-3

SECTION B-B
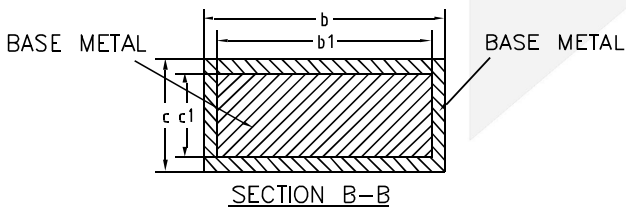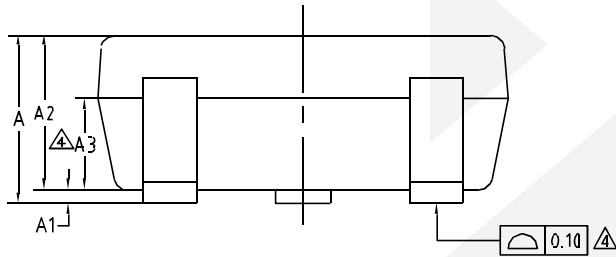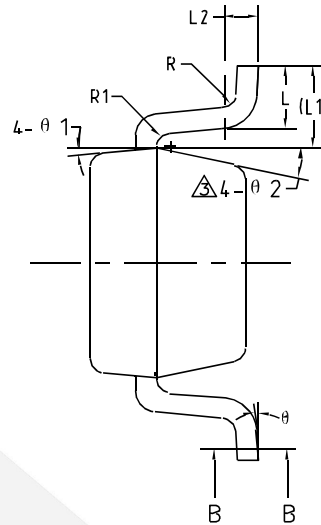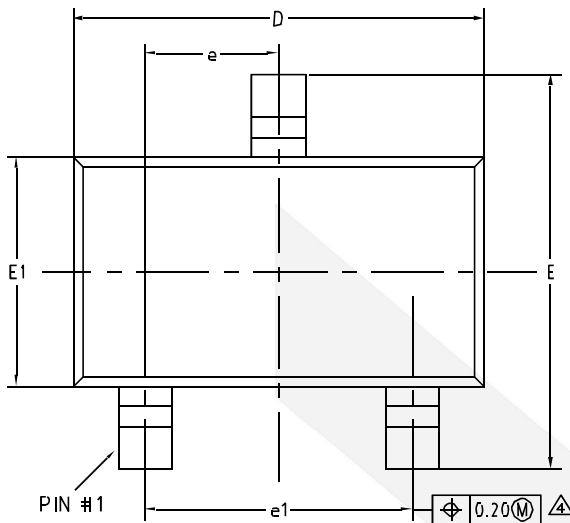
COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	MIN	NOM	MAX
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.50
b1	0.36	0.38	0.45
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59REF		
L2	0.25BSC		
R	0.05	-	-
R1	0.05	-	0.20
Θ	0°	-	8°
Θ1	3°	5°	7°
Θ2	6°	-	14°

Physical Dimensions: SOT89-3

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
$\theta 1$	6°	8°	10°
$\theta 2$	3°	5°	7°
$\theta 3$	85°	90°	95°

Physical Dimensions: SOT223

BTM E-MARK
ø1.00 DEPTH 0.10±0.05

0.25BSC

WITH PLATING / BARE METAL
SECTION F-F&G-G
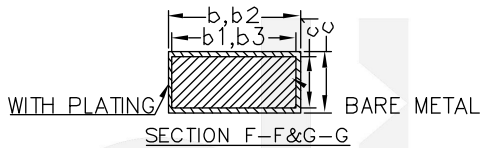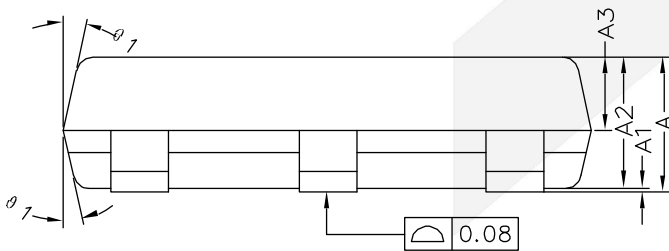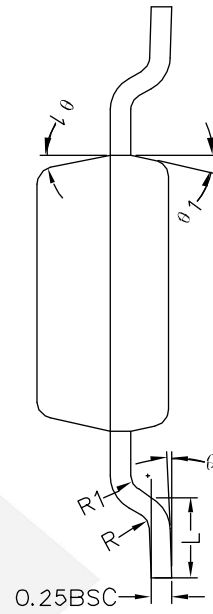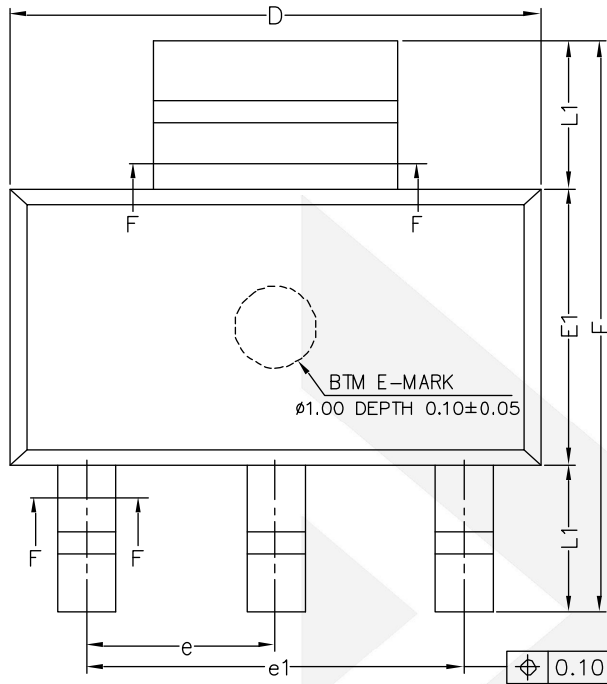
COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	MIN	NOM	MAX
A	-	-	1.80
A1	0.02	-	0.10
A2	1.50	1.60	1.70
A3	0.80	0.90	1.00
b	0.67	-	0.80
b1	0.66	0.71	0.76
b2	2.96	-	3.09
b3	2.95	3.00	3.05
c	0.24	-	0.35
c1	0.23	0.25	0.30
D	6.43	6.48	6.58
E	6.80	7.00	7.20
E1	3.30	3.38	3.53
e	2.25	2.30	2.35
e1	4.50	4.60	4.70
L	0.80	1.00	1.20
L1	1.81REF		
R	0.10	-	-
R1	0.10	-	-
Θ	0°	-	8°
Θ1	10°	12°	14°

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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.

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