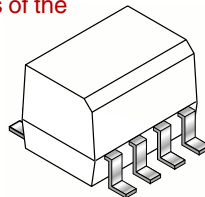


DESCRIPTION

The FOD2712 Optically Isolated Amplifier consists of the popular RC431A precision programmable shunt reference and an optocoupler. The optocoupler is a gallium arsenide (GaAs) light emitting diode optically coupled to a silicon phototransistor. The reference voltage tolerance is 1%. The current transfer ratio (CTR) ranges from 100% to 200%.



It is primarily intended for use as the error amplifier/reference voltage/optocoupler function in isolated ac to dc power supplies and dc/dc converters.

When using the FOD2712, power supply designers can reduce the component count and save space in tightly packaged designs. The tight tolerance reference eliminates the need for adjustments in many applications.

The device comes in a compact 8-pin small outline package.

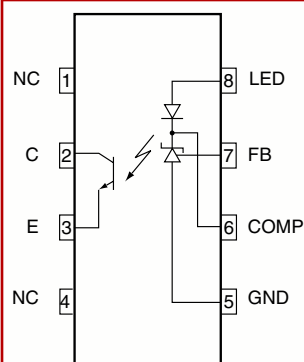
FEATURES

- Optocoupler, precision reference and error amplifier in single package
- 1.240V $\pm$ 1% reference
- CTR 100% to 200%
- 2,500V RMS isolation
- VDE approval 136616
- BSI approval 8661 and 8662
- UL approval E90700
- CSA approval 1113643

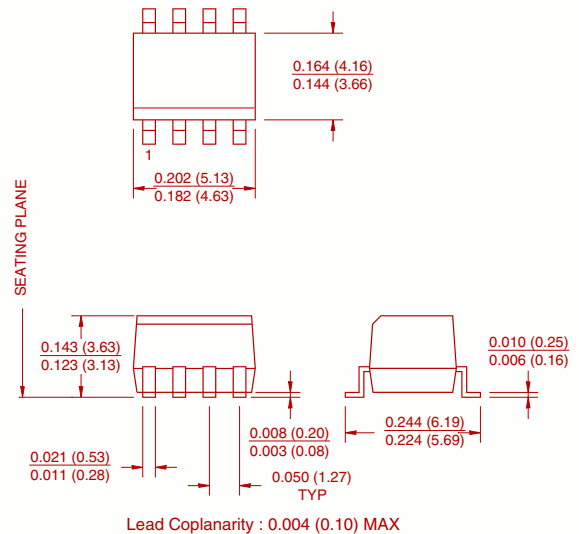
APPLICATIONS

- Power system for workstations
- Telecom central office supply
- Telecom bricks

FUNCTIONAL BLOCK DIAGRAM



PACKAGE DIMENSIONS



NOTE

All dimensions are in inches (millimeters)

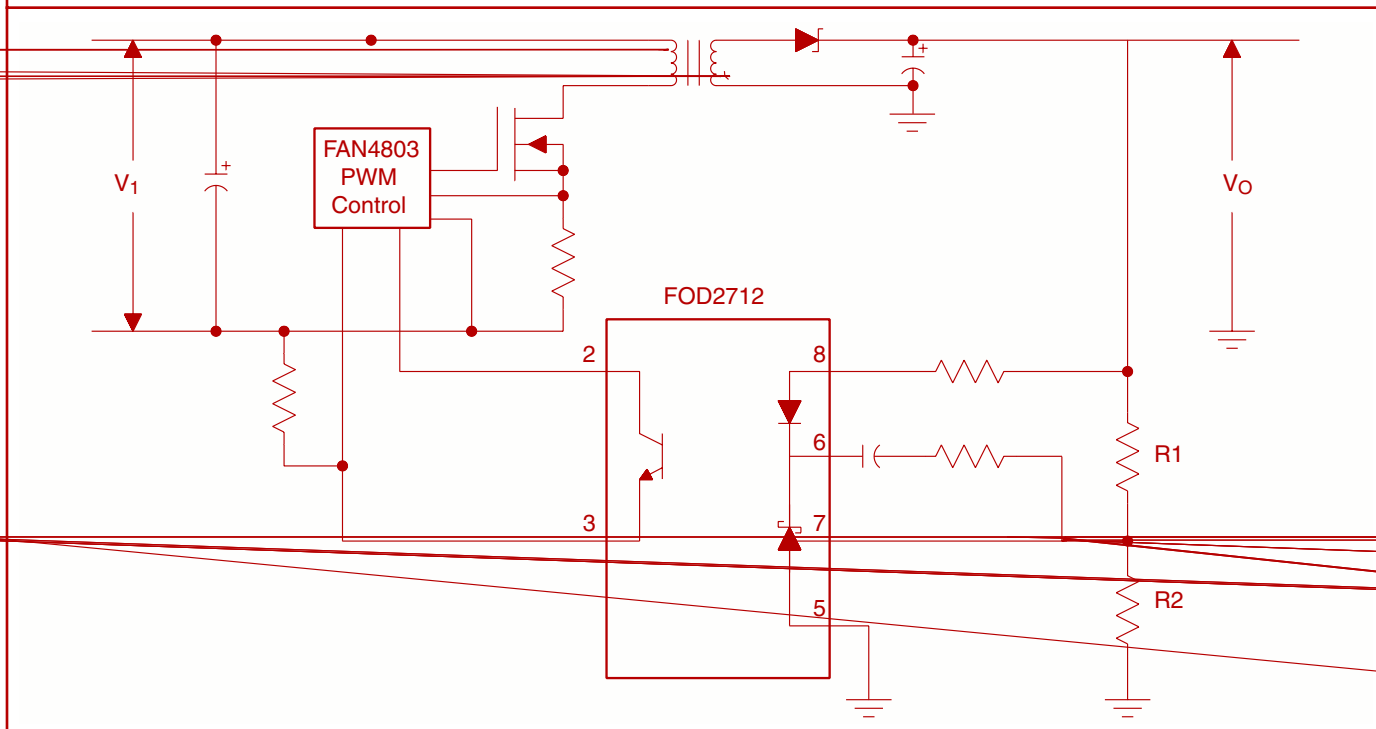
PIN DEFINITIONS

Pin Number	Pin Name	Pin function description
1	NC	Not connected
2	C	Phototransistor Collector
3	E	Phototransistor Emitter
4	NC	Not connected
5	GND	Ground
6	COMP	Error Amplifier Compensation. This pin is the output of the error amplifier. *
7	FB	Voltage Feedback. This pin is the inverting input to the error amplifier
8	LED	Anode LED. This pin is the input to the light emitting diode.

* The compensation network must be attached between pins 6 and 7.

FOD2712

TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Parameter	Symbol	Value	Units
Storage Temperature	T_{STG}	-55 to +125	$^\circ\text{C}$
Operating Temperature	T_{OPR}	-40 to +85	$^\circ\text{C}$
Reflow Temperature Profile (refer to fig. 21)			
Input Voltage	V_{LED}	13.2	V
Input DC Current	I_{LED}	20	mA
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Collector Voltage	V_{ECO}	7	V
Collector Current	I_C	50	mA
Input Power Dissipation (note 1)	PD1	145	mW
Transistor Power Dissipation (note 2)	PD2	85	mW
Total Power Dissipation (note 3)	PD3	145	mW

Notes

1. Derate linearly from 25°C at a rate of $2.42 \text{ mW}/^\circ\text{C}$
2. Derate linearly from 25°C at a rate of $1.42 \text{ mW}/^\circ\text{C}$.
3. Derate linearly from 25°C at a rate of $2.42 \text{ mW}/^\circ\text{C}$.
4. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

ELECTRICAL CHARACTERISTICS ($V_{CC} = 12V$, $T_A = 25^\circ C$ Unless otherwise specified.)

INPUT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Min	Typ**	Max	Unit
LED forward voltage	($I_{LED} = 10 \text{ mA}$, $V_{COMP} = V_{FB}$)(Fig.1)	V_F			1.5	V
Reference voltage (-40 to +85°C)	($V_{COMP} = V_{FB}$, $I_{LED} = 10 \text{ mA}$ (Fig.1))	V_{REF}	1.221		1.259	V
(25°C)			1.228	1.240	1.252	
Deviation of V_{REF} over temperature - See Note 1	($T_A = -40 \text{ to } +85^\circ C$)	$V_{REF} \text{ (DEV)}$		4	12	mV
Ratio of Vref variation to the output of the error amplifier	($I_{LED} = 10 \text{ mA}$, $V_{COMP} = V_{REF}$ to 12 V) (Fig.2)	$\Delta V_{REF}/$ ΔV_{COMP}		-1.5	-2.7	mV/V
Feedback input current	($I_{LED} = 10 \text{ mA}$, $R1 = 10 \text{ k}\Omega$) (Fig.3)	I_{REF}		0.15	0.5	μA
Deviation of I_{REF} over temperature - See Note 1	($T_A = -40 \text{ to } +85^\circ C$)	$I_{REF} \text{ (DEV)}$		0.15	0.3	μA
Minimum drive current	($V_{COMP} = V_{FB}$) (Fig.1)	$I_{LED} \text{ (MIN)}$		55	80	μA
Off-state error amplifier current	($V_{LED} = 6 \text{ V}$, $V_{FB} = 0$) (Fig.4)	$I_{(OFF)}$		0.001	0.1	μA
Error amplifier output impedance - See Note 2	($V_{COMP} = V_{FB}$, $I_{LED} = 0.1 \text{ mA}$ to 15 mA, $f < 1 \text{ kHz}$)	$ Z_{OUT} $		0.25		Ohm

1. The deviation parameters $V_{REF(DEV)}$ and $I_{REF(DEV)}$ are defined as the differences between the maximum and minimum values obtained over the rated temperature range. The average full-range temperature coefficient of the reference input voltage, ΔV_{REF} is defined as:

$$|\Delta V_{REF}|(\text{ppm}/^\circ C) = \frac{\{V_{REF(DEV)}/V_{REF}(T_A = 25^\circ C)\} \times 10^6}{\Delta T_A}$$

where ΔT_A is the rated operating free-air temperature range of the device.

2. The dynamic impedance is defined as $|Z_{OUT}| = \Delta V_{COMP}/\Delta I_{LED}$. When the device is operating with two external resistors (see Figure 2), the total dynamic impedance of the circuit is given by:

$$|Z_{OUT, TOT}| = \frac{\Delta V}{\Delta I} \approx |Z_{OUT}| \times \left[1 + \frac{R1}{R2}\right]$$

OUTPUT CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Collector dark current	($V_{CE} = 10\text{ V}$) (Fig. 5)	I_{CEO}			50	nA
Collector-emitter voltage breakdown	($I_C = 1.0\text{ mA}$)	BV_{CEO}	70			V
Emitter-collector voltage breakdown	($I_E = 100\text{ }\mu\text{A}$)	BV_{ECO}	7			V

TRANSFER CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Current transfer ratio	($I_{LED} = 10\text{ mA}$, $V_{COMP} = V_{FB}$, $V_{CE} = 5\text{ V}$) (Fig. 6)	CTR	100		200	%
Collector-emitter saturation voltage	($I_{LED} = 10\text{ mA}$, $V_{COMP} = V_{FB}$, $I_C = 2.5\text{ mA}$) (Fig. 6)	$V_{CE(SAT)}$			0.4	V

ISOLATION CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Input-output insulation leakage current	($RH = 45\%$, $T_A = 25^\circ\text{C}$, $t = 5\text{ s}$, $V_{I-O} = 3000\text{ VDC}$) (note. 1)	I_{I-O}			1.0	μA
Withstand insulation voltage	($RH \leq 50\%$, $T_A = 25^\circ\text{C}$, $t = 1\text{ min}$) (notes. 1)	V_{ISO}	2500			Vrms
Resistance (input to output)	$V_{I-O} = 500\text{ VDC}$ (note. 1)	R_{I-O}		10^{12}		Ohm

SWITCHING CHARACTERISTICS ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Bandwidth	(Fig. 7)	B_W		10		kHz
Common mode transient immunity at output high	($I_{LED} = 0\text{ mA}$, $ V_{cm} = 10\text{ V}_{PP}$, $RL = 2.2\text{ k}\Omega$) (Fig. 8) (note. 2)	$ CMH $		1.0		kV/ μs
Common mode transient immunity at output low	($I_{LED} = 10\text{ mA}$, $ V_{cm} = 10\text{ V}_{PP}$, $RL = 2.2\text{ k}\Omega$) (Fig. 8) (note. 2)	$ CML $		1.0		kV/ μs

Notes

- Device is considered as a two terminal device: Pins 1, 2, 3 and 4 are shorted together and Pins 5, 6, 7 and 8 are shorted together.
- Common mode transient immunity at output high is the maximum tolerable (positive) dV_{cm}/dt on the leading edge of the common mode impulse signal, V_{cm} , to assure that the output will remain high. Common mode transient immunity at output low is the maximum tolerable (negative) dV_{cm}/dt on the trailing edge of the common pulse signal, V_{cm} , to assure that the output will remain low.

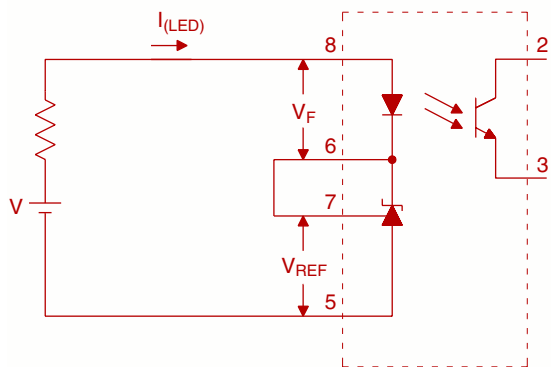


FIG. 1. V_{REF} , V_F , I_{LED} (min) TEST CIRCUIT

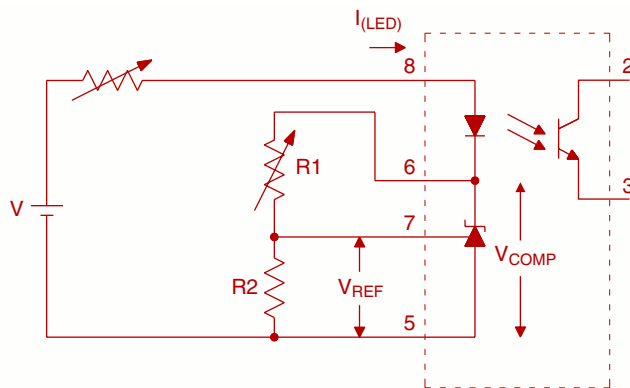


FIG. 2. $\Delta V_{REF}/\Delta V_{COMP}$ TEST CIRCUIT

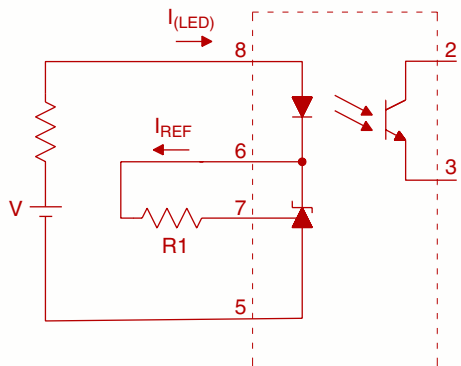


FIG. 3. I_{REF} TEST CIRCUIT

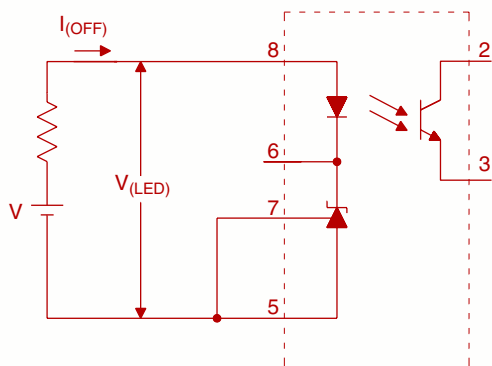


FIG. 4. $I_{(OFF)}$ TEST CIRCUIT

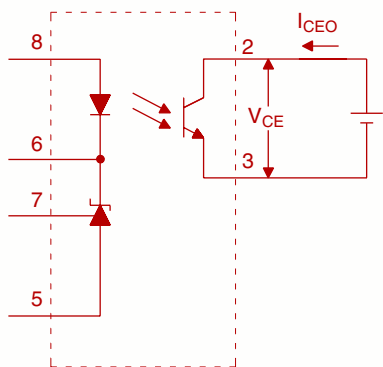


FIG. 5. I_{CEO} TEST CIRCUIT

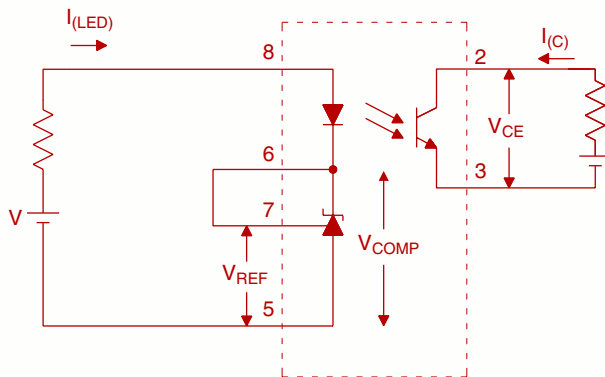


FIG. 6. CTR , $V_{CE(sat)}$ TEST CIRCUIT

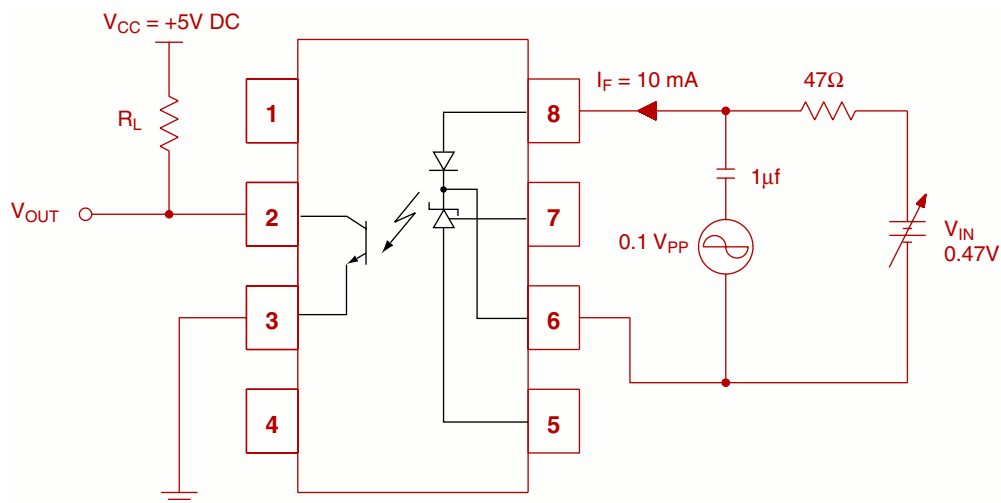


Fig. 7 Frequency Response Test Circuit

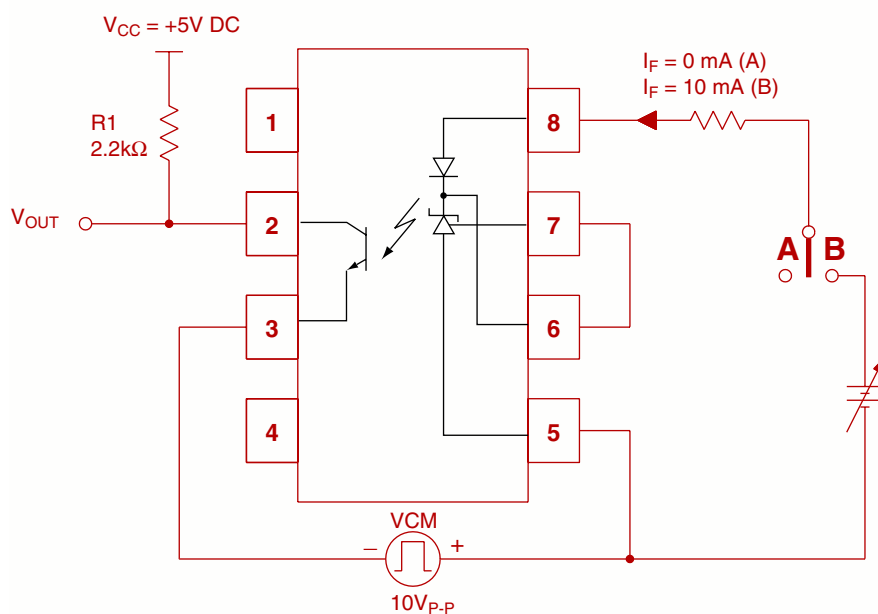


Fig. 8 CMH and CML Test Circuit



OPTICALLY ISOLATED ERROR AMPLIFIER

EMI D T

FOD2712

ORDERING INFORMATION

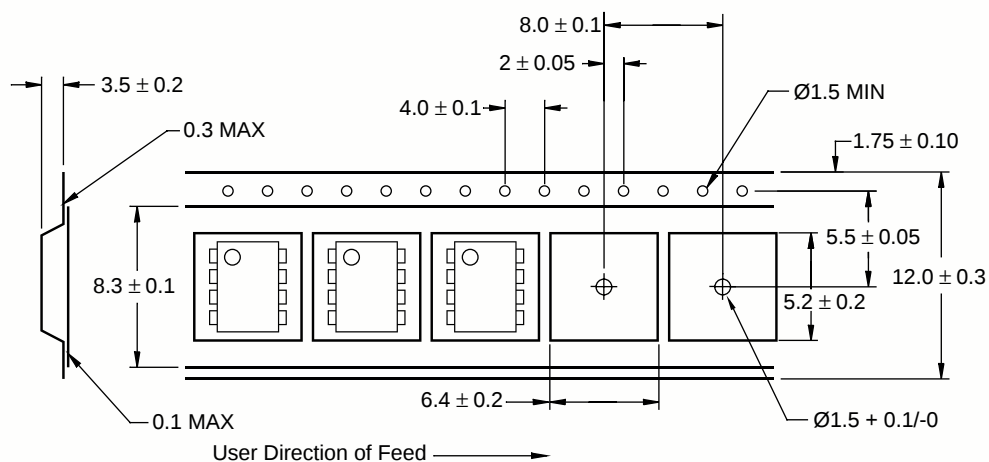
Example: FOD2712 X Y

X	Y
Packaging Option	
R1: Tape and Reel (500 per reel)	V:VDE tested
R2: Tape and Reel (2,500 per reel)	

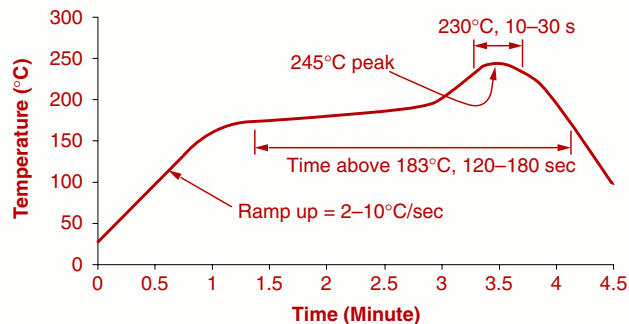
MARKING INFORMATION



Carrier Tape Specifications



Reflow Profile



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended

DISCLAIMER

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2. A critical component in 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.