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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

Electrical Characteristics (T_A = 25°C unless otherwise specified)

Input Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Unit
V_F	LED Forward Voltage	I_{LED} = 10mA, $V_{COMP} = V_{FB}$ (Fig.1)	All			1.5	V
V_{REF}	Reference Voltage	I_{LED} = 10mA, $V_{COMP} = V_{FB}$	FOD2741A	2.482	2.495	2.508	V
			FOD2741B	2.470	2.495	2.520	V
			FOD2741C	2.450	2.500	2.550	V
$V_{REF\ (DEV)}$[4]	Deviation of V_{REF} Over Temperature	T_A					

Output Characteristics

Transfer Characteristics

Notes:

4. 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:

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

5. 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:

Electrical Characteristics (Continued) (T_A = 25°C unless otherwise specified)

Isolation Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{I-O}	Input-Output Insulation Leakage Current	RH = 45%, T_A = 25°C, t = 5s, V_{I-O} = 3000 VDC[6]			1.0	µA
V_{ISO}	Withstand Insulation Voltage	RH ≤ 50%, T_A = 25°C, t = 1 min.[6]	5000			Vrms
R_{I-O}	Resistance (Input to Output)	V_{I-O} = 500 VDC[6]		10^{12}		Ω

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BW	Bandwidth	(Fig. 7)		50		kHZ
$\|CMH\|$	Common Mode Transient Immunity at Output HIGH	I_{LED} = 0mA, $\|Vcm\|$ = 10 V_{PP}, R_L = 2.2kΩ[7] (Fig. 8)		1.0		kV/µs
$\|CML\|$	Common Mode Transient Immunity at Output LOW	(I_{LED} = 1mA, $\|Vcm\|$ = 10 V_{PP}, R_L = 2.2kΩ[7] (Fig. 8)		1.0		kV/µs

Notes:

6. 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.
7. Common mode transient immunity at output high is the maximum tolerable (positive) dVcm/dt on the leading edge of the common mode impulse signal, Vcm, to assure that the output will remain high. Common mode transient immunity at output low is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common pulse signal,Vcm, to assure that the output will remain low.

Test Circuits (Continued)

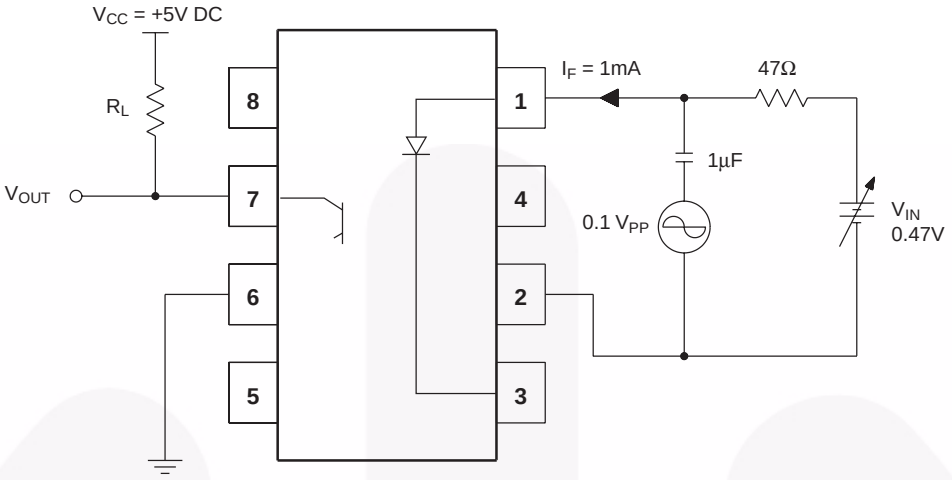


Figure 7. Frequency Response Test Circuit.

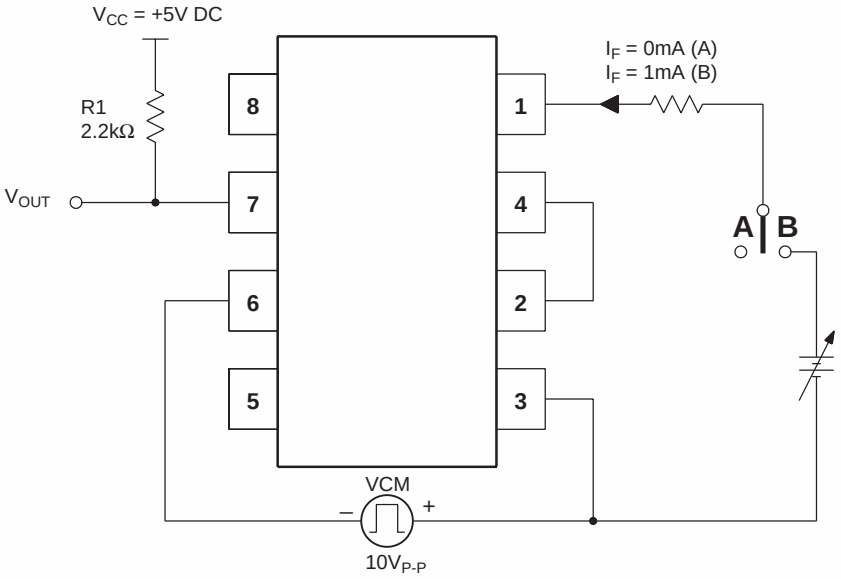


Figure 8. CMH and CML Test CircuitA)

Typical Performance Curves

Fig. 10 – Reference Voltage vs. Ambient Temperature

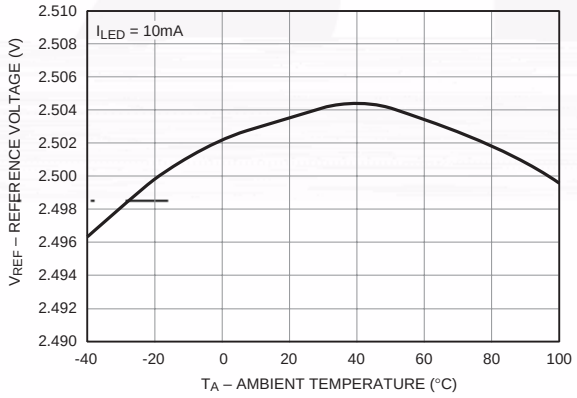
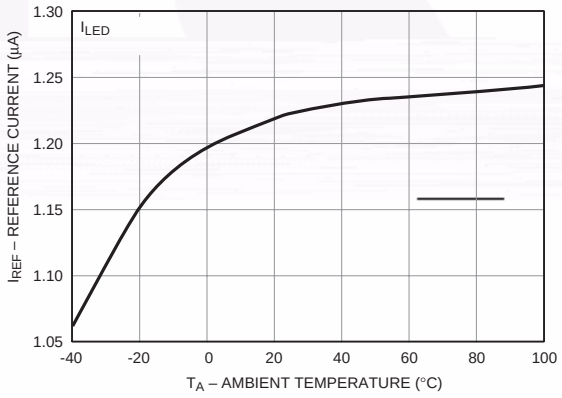


Fig. 11 – Reference Current vs Ambient Temperature



Typical Performance Curves (Continued)

Fig. 15 – Collector Current vs. Ambient Temperature

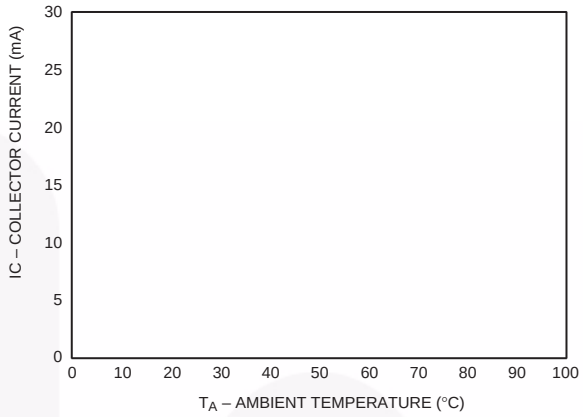
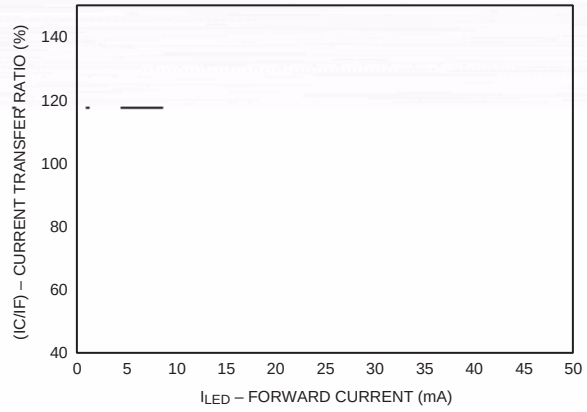
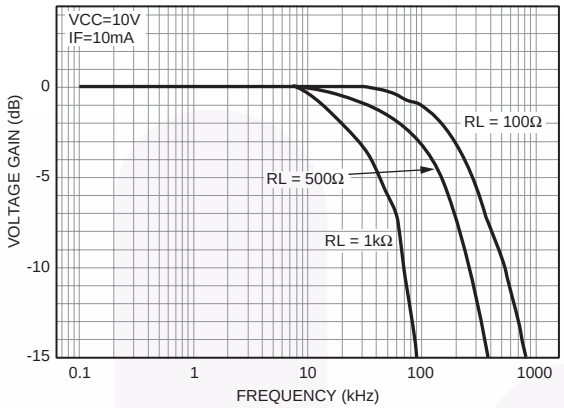


Fig. 16 – Current Transfer Ratio vs. LED Current



Typical Performance Curves (Continued)

Fig. 20 – Voltage Gain vs. Frequency



The FOD2741

The FOD2741 is an optically isolated error amplifier. It incorporates three of the most common elements necessary to make an isolated power supply, a reference voltage, an error amplifier, and an optocoupler. It is functionally equivalent to the popular KA431 shunt voltage regulator plus the CNY17F-X optocoupler.

Powering the Secondary Side

The LED pin in the FOD2741 powers the secondary side, and in particular provides the current to run the LED. The actual structure of the FOD2741 dictates the minimum voltage that can be applied to the LED pin: The error amplifier output has a minimum of the reference voltage, and the LED is in series with that. Minimum voltage applied to the LED pin is thus 2.5V + 1.5V = 4.0V. This voltage can be generated either directly from the output of the converter, or else from a slaved secondary winding. The secondary winding will not affect regulation, as the input to the FB pin may still be taken from the output winding.

The LED pin needs to be fed through a current limiting resistor. The value of the resistor sets the amount of current through the LED, and thus must be carefully selected in conjunction with the selection of the primary side resistor.

Feedback

Output voltage of a converter is determined by selecting a resistor divider from the regulated output to the FB pin. The FOD2741 attempts to regulate its FB pin to the reference
voltage, 2.5V. The ratio of the two resistors should thus be:

$$\frac{R_{TOP}}{R_{BOTTOM}} = \frac{V_{OUT}}{V_{REF}} - 1$$

The absolute value of the top resistor is set by the input offset current of 5.2µA. To achieve 0.5% accuracy, the resistance of R_{TOP} should be:

$$\frac{V_{OUT} - 2.5}{R_{TOP}} > 1040\mu A$$

Compensation

The compensation pin of the FOD2741 provides the opportunity for the designer to design the frequency response of the converter. A compensation network may be placed between the COMP pin and the FB pin. In typical low-bandwidth systems, a 0.1µF capacitor may be used. For converters with more stringent requirements, a network should be designed based on measurements of the system's loop. An excellent reference for this process may be found in "Practical Design of Power Supplies" by Ron Lenk, IEEE Press, 1998.

Secondary Ground

The GND pin should be connected to the secondary ground of the converter.

No Connect Pins

The NC pins have no internal connection. They should not have any connection to the secondary side, as this may compromise the isolation structure.

Photo-Transistor

The Photo-transistor is the output of the FOD2741. In a normal configuration the collector will be attached to a pull-up resistor and the emitter grounded. There is no base connection necessary.

The value of the pull-up resistor, and the current limiting resistor feeding the LED, must be carefully selected to account for voltage range accepted by the PWM IC, and for the variation in current transfer ratio (CTR) of the opto-isolator itself.

Example: The voltage feeding the LED pins is +12V, the voltage feeding the collector pull-up is +10V, and the PWM IC is the Fairchild KA1H0680, which has a 5V reference. If we select a 10kΩ resistor for the LED, the maximum current the LED can see is:

(12V–4V) / 10kΩ = 800µA.

The CTR of the opto-isolator is a minimum of 100%, so the minimum collector current of the photo-transistor when the diode is full on is also 800µA. The collector resistor must thus be such that:

$$\frac{10V - 5V}{R_{COLLECTOR}} < 800\mu A \text{ or } R_{COLLECTOR} > 6.25k\Omega;$$

select 12kΩ to allow some margin.

Ordering Information

Option	Example Part Number	Description
No Option	FOD2741A	Standard Through Hole
S	FOD2741AS	Surface Mount Lead Bend
SD	FOD2741ASD	Surface Mount; Tape and Reel
T	FOD2741AT	0.4" Lead Spacing

Marking Information

Carrier Tape Specifications

Symbol	Description	Dimension in mm
W	Tape Width	16.0 ± 0.3
t	Tape Thickness	

Reflow Profile

NOTES:
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