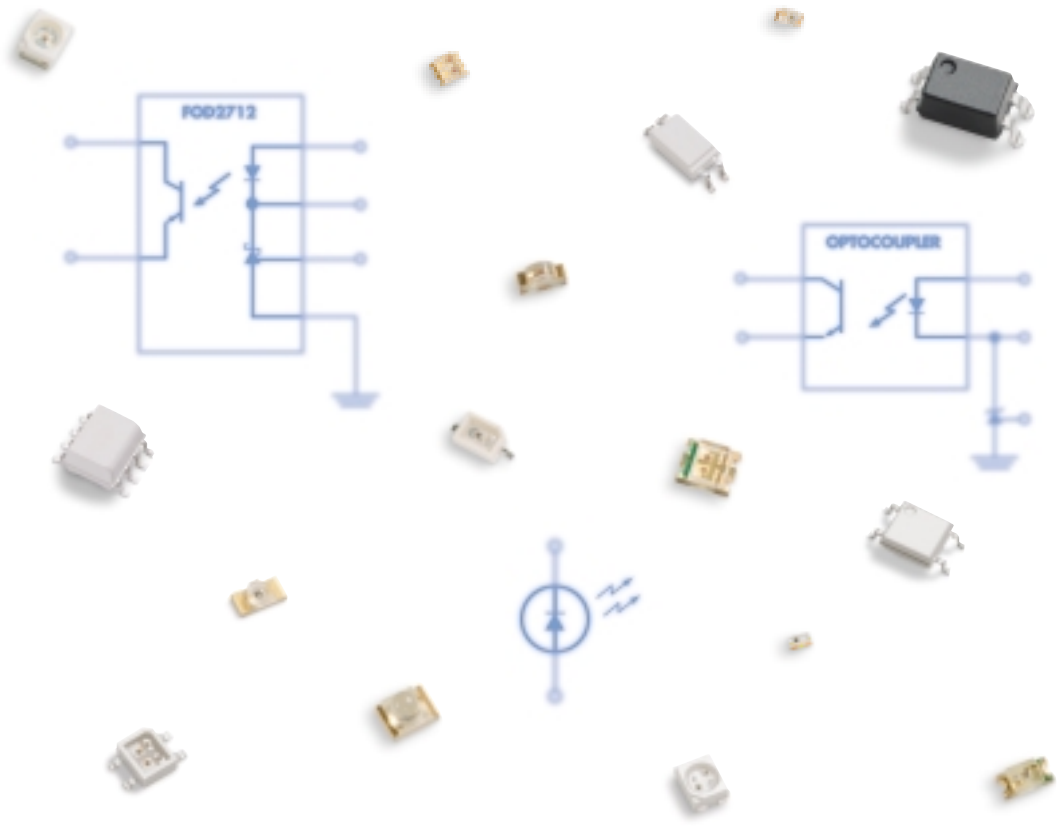
Optoelectronics Power Solutions



Power Conversion Circuits

- ac to dc Power Supplies
- ac to dc Battery Chargers
- dc to dc Converters

Optoelectronics Components

- Optocouplers
- Optically Isolated Error Amplifier
- Surface Mount LED Lamps

Power Conversion

Small optoelectronics components allow designers to save space in tightly packaged power supplies, battery chargers, and dc:dc converters for portable and compact products.

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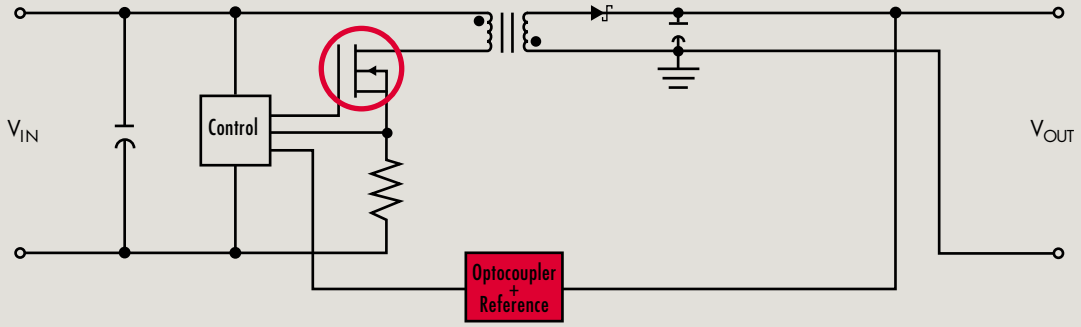
Across the board. Around the world.

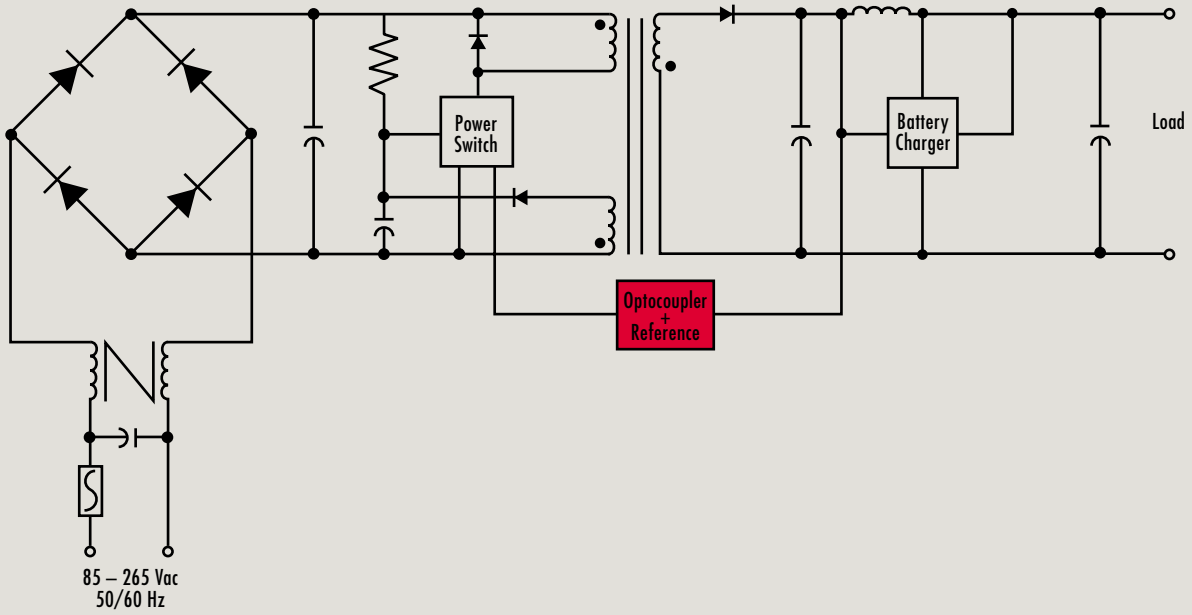
FAIRCHILD SEMICONDUCTOR®

Optoelectronics Power Solutions
Typical Power Conversion Schematics

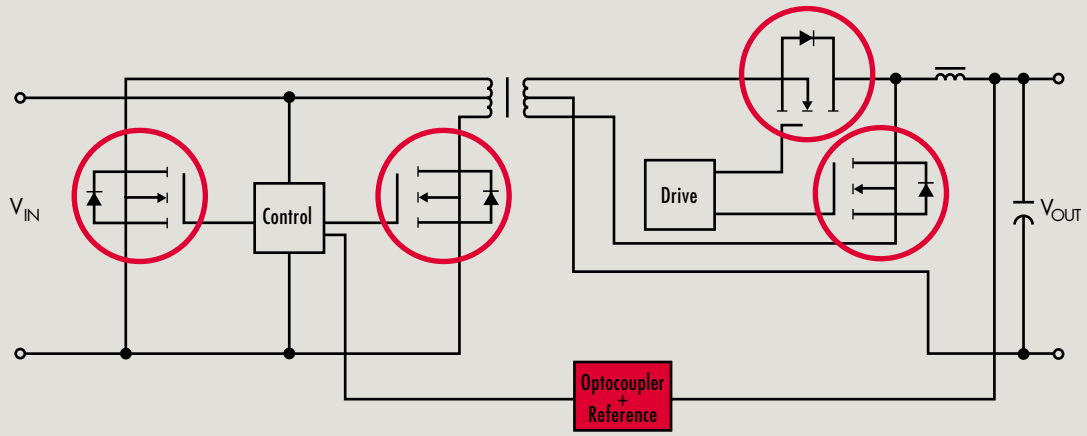
ac to dc Power Supply



ac to dc Battery Charger



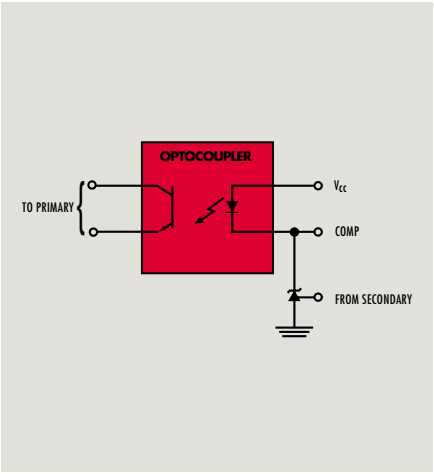
dc to dc Converter



Optoelectronics Power Solutions
Optical Isolation and Reference Options

A basic power conversion circuit uses a transformer to convert higher voltage ac or dc current to lower voltage dc current in order to operate microelectronics-based devices in automotive, computing, communications, consumer electronics, and industrial applications. Another common functional element found in power conversion circuits is an optocoupler and voltage reference combination that provides isolated feedback from the transformer's secondary side to a device in the primary side for control purposes. For this function, we offer the option of separate optocouplers that you can pair with reference devices or our unique FOD2712 Optically Isolated Error Amplifier that incorporates the error amplifier, reference voltage, and optocoupler function in a single, 8-pin small outline package.

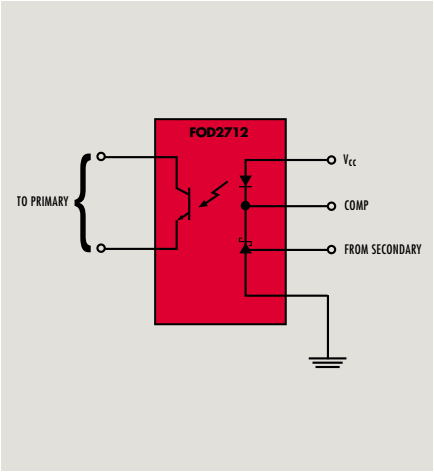
Separate Optocoupler and Reference Options



Fairchild offers a selection of optocouplers with narrow current transfer ratio (CTR) ranges in four small, surface mount package configurations: an 8-pin small outline package (SO-8), a 4-pin dual inline package (DIP), a full-pitch mini-flat package, and a half-pitch mini-flat package (see page 3 for more information).

Select the optocoupler that meets your package requirement and pair it with one of our programmable shunt regulators that provides a voltage reference for the isolated feedback circuit.

Optically Isolated Error Amplifier Option

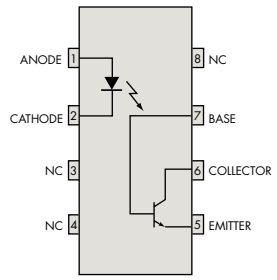


The FOD2712 Optically Isolated Error Amplifier combines the functional equivalent of our RC431A Precision Programmable Shunt Regulator and our MOC207 Optocoupler in a compact 8-pin small outline package (see page 4 for more information).

The FOD2712 is an ideal single component solution for providing an error amplifier, reference voltage, and optocoupler function for power conversion applications. This allows power designers to reduce the component count and save space in tightly packaged designs.

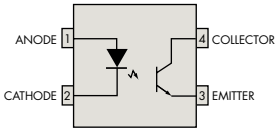
Optoelectronics Power Solutions
8-Pin and 4-Pin Package Optocouplers

8-Pin Phototransistor Output, GaAs Input Optocoupler Schematic and Electrical Characteristics



Package	Part Number	CTR @ 10 mA I_F (%) min	CTR @ 10 mA I_F (%) max	BV_{CEO} (V) min	BV_{ECO} (V) min	t_R/t_F (µs) typical	V_{ISO} AC [RMS]
Small Outline (SO-8)	MOC205	40	80	70	7	3/2.8	3.0 kV
Small Outline (SO-8)	MOC206	63	125	70	7	3/2.8	3.0 kV
Small Outline (SO-8)	MOC207	100	200	70	7	3/2.8	3.0 kV

4-Pin Phototransistor Output, GaAs Input Optocoupler Schematic and Electrical Characteristics



Package	Part Number	CTR @ ≤10 mA I_F (%) min	CTR @ ≤10 mA I_F (%) max	BV_{CEO} (V) min	BV_{ECO} (V) min	t_R/t_F (µs) typical	V_{ISO} AC [RMS]
Surface Mount DIP	H11A817A	80	160	35	6	18/18	5.3 kV
Surface Mount DIP	H11A817B	13	260	35	6	18/18	5.3 kV
Surface Mount DIP	H11A817C	200	400	35	6	18/18	5.3 kV
Surface Mount DIP	H11A817D	300	600	35	6	18/18	5.3 kV
Full-Pitch Mini-Flat	HMA121	50	600	80	7	3/3	3.75 kV
Full-Pitch Mini-Flat	HMA121A	100	300	80	7	3/3	3.75 kV
Full-Pitch Mini-Flat	HMA121B	50	150	80	7	3/3	3.75 kV
Full-Pitch Mini-Flat	HMA121C	100	200	80	7	3/3	3.75 kV
Full-Pitch Mini-Flat	HMA124	100	1200	80	7	3/3	3.75 kV
Full-Pitch Mini-Flat	HMA2701	50	300	40	7	3/3	3.75 kV
Half-Pitch Mini-Flat	HMHA281	50	600	80	7	3/3	2.5 kV
Half-Pitch Mini-Flat	HMHA2801	80	600	80	7	3/3	2.5 kV

8-Pin and 4-Pin Optocoupler Packages

8-Pin Small Outline Package (SO-8)

4-Pin Surface Mount DIP

Full-Pitch Mini-Flat Package

Half-Pitch Mini-Flat Package

Partial Cross-Reference*

Fairchild	Infineon	Liteon	NEC	Toshiba	Sharp	Vishay
H11A817A	SFH615AA	LTV-817A	PS2501-1H	TLP621	PC817A	TCET1107
H11A817B	SFH615AA	LTV-817B	PS2501-1W	TLP621	PC817B	TCET1108
H11A817C	SFH615AA	LTV-817C	PS2501-1L	TLP621	PC817C	TCET1109
H11A817D	SFH615AA	LTV-817D	PS2501-1K	TLP621	PC817D	
HMA121				TLP121	PC352	
HMA121A				TLP121GR	PC352	
HMA121B				TLP121Y	PC352	
HMA121C				TLP121GRL	PC352	
HMA124				TLP124	PC352	
HMA2701	SFH690ABT		PS2701			
HMHA281				TLP281	PC3H2	TCMT1100
HMHA2801			PS2801		PC3H2	TCMT4100
MOC205	IL205A					
MOC206	IL206A					
MOC207	IL207A					

***Contact the Fairchild sales office in your area for complete cross-reference information.**

Optoelectronics Power Solutions
FOD2712 Optically Isolated Error Amplifier

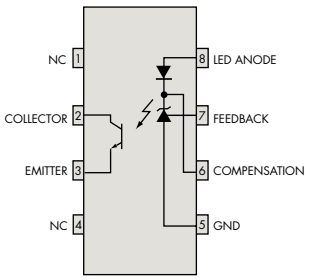
Schematic and Electrical Characteristics

The FOD2712 Optically Isolated Error Amplifier incorporates an error amplifier, a reference voltage, and an optocoupler in a single, 8-pin small outline package. This allows power designers to reduce the component count and save space in tightly packaged designs.

Pin Definitions

Number	Description of Function
1	Not connected
2	Phototransistor collector
3	Phototransistor emitter
4	Not connected
5	Ground
6	Error amplifier compensation (output of the error amplifier)*
7	Voltage feedback (inverted input to the error amplifier)*
8	Anode LED (input to the light emitting diode)

*A compensation network must be attached between pins 6 and 7



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

Characteristic	Parameter	Test Conditions	Symbol	Min	Typical	Max	Unit
INPUT	LED forward voltage	I_{LED} = 10 mA, V_{COMP} = V_{FB}	V_F			1.5	V
	Reference voltage (–40 to +85°C)	I_{LED} = 10 mA, V_{COMP} = V_{FB}	V_{REF}	1.221		1.259	V
	Reference voltage (25°C)	I_{LED} = 10 mA, V_{COMP} = V_{FB}	V_{REF}	1.228	1.240	1.252	V
	Deviation of V_{REF} over temperature[1]	T_A = –40 to +85°C	$V_{REF\ (DEV)}$		4	12	mV
	Ratio of V_{REF} variation to the output of the error amplifier	I_{LED} = 10 mA, V_{COMP} = V_{REF} to 12 V	$\Delta V_{REF}/\Delta V_{COMP}$		–1.5	–2.7	mV/V
	Feedback input current	I_{LED} = 10 mA, R = 10 kΩ	I_{REF}		0.15	0.5	µA
	Deviation of I_{REF} over temperature[1]	T_A = –40 to +85°C	$I_{REF\ (DEV)}$		0.15	0.3	µA
	Minimum drive current	V_{COMP} = V_{FB}	$I_{LED\ (MIN)}$		55	80	µA
	Off-state error amplifier current	V_{LED} = 13.2 V, V_{FB} = 0	I_{OFF}		0.001	0.1	µA
	Error amplifier output impedance[2]	I_{LED} = 0.1 to 15 mA, V_{COMP} = V_{FB}, f <1 kHz	$\lvert Z_{OUT}\rvert$		0.25		Ω
OUTPUT	Collector dark current	V_{CE} = 10 V	I_{CEO}			50	nA
	Emitter-collector voltage breakdown	I_E = 100 µA	BV_{ECO}	7			V
TRANSFER	Current transfer ratio	I_{LED} = 10 mA, V_{COMP} = V_{FB}, V_{CE} = 5 V	CTR	100		200	%
	Collector-emitter saturation voltage	I_{LED} = 10 mA, V_{COMP} = V_{FB}, I_C = 2.5 mA	$V_{CE\ (SAT)}$			0.4	V
ISOLATION	Input-output insulation leakage current[3]	RH = 45%, T_A = 25°C, t = 5 s, V_{I-O} = 3000 Vdc	I_{I-O}			1.0	µA
	Withstand insulation voltage[3 & 4]	RH ≤ 50%, T_A = 25°C, t = 1 min	V_{ISO}	2500			Vrms
	Resistance (input to output)[3]	V_{I-O} = 500 Vdc	R_{I-O}		10^{12}		Ω
SWITCHING	Bandwidth		B_W		10		kHz
	Common mode transient immunity at output high[5]	I_{LED} = 0 mA, $\lvert V_{CM}\rvert$ =10 V_{PP}, RL = 2.2 kΩ	$\lvert CMH\rvert$		1.0		kV/µs
	Common mode transient immunity at output low[5]	I_{LED} = 0 mA, $\lvert V_{CM}\rvert$ =10 V_{PP}, RL = 2.2 kΩ	$\lvert CML\rvert$		1.0		kV/µs

[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} where ΔT_A is the rated operating free-air temperature range of the device, is defined as:

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

[2] The dynamic impedance is defined as $|Z_{OUT}| = \Delta V_{KA}/I_K$. When the device is operating with two external resistors (see test circuit figure 2 on the FOD2712 data sheet), the total dynamic impedance of the circuit is given by:

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

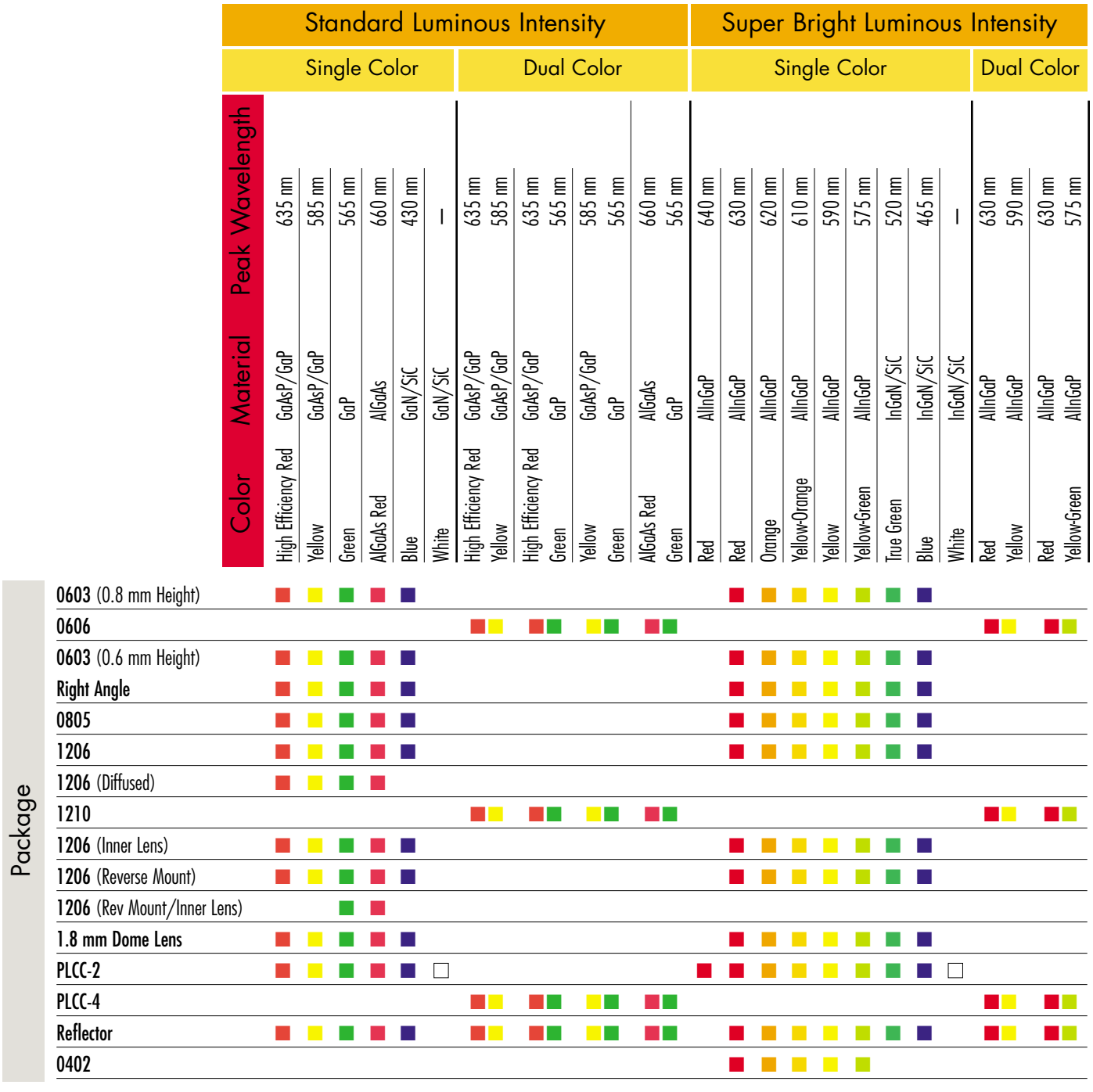
[3] The device is considered as a two terminal device: pins 1, 2, 3, and 4 are shorted together and pins 5, 6, 7, and 8 are shorted together.

[4] 2500 VAC RMS for 1 minute duration is equivalent to 3000 VAC RMS for 1 second duration.

[5] 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 mode impulse signal, Vcm, to assure that the output will remain low.

Optoelectronics Power Solutions
Surface Mount LED Lamps Color Selection Guide

Power supplies, battery chargers, and dc:dc power converters use LED lamps for status indication. We offer an extensive line of small, low-current, surface mount LED lamps in standard and super bright luminous intensity, with single and dual color combinations that are ideal for use in portable and compact products. For more information, including data sheets, go to www.fairchildsemi.com/smledlamps.



Optoelectronics Power Solutions
Surface Mount LED Lamps Package Selection Guide
















Package	Single or Dual Color	Luminous Intensity
0603 (0.8 mm)	Single	Standard
		Super Bright
0603 (0.6 mm)	Single	Standard
		Super Bright
0606	Dual	Standard
		Super Bright
Right Angle	Single	Standard
		Super Bright
0805	Single	Standard
		Super Bright
1206	Single	Standard
		Super Bright
1210	Dual	Standard
		Super Bright
1206 Inner Lens	Single	Standard
		Super Bright
1206 Reverse Mount	Single	Standard
		Super Bright
1206 Reverse Mount with Lens	Single	Standard
1.8 mm Dome Lens	Single	Standard
		Super Bright
PLCC-2	Single	Standard
		Super Bright
PLCC-4	Dual	Standard
		Super Bright
Reflector	Single	Standard
		Super Bright
Reflector	Dual	Standard
		Super Bright
0402	Single	Super Bright