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# SFD2EB4105F



## Specifications and Applications Information

08/30/11

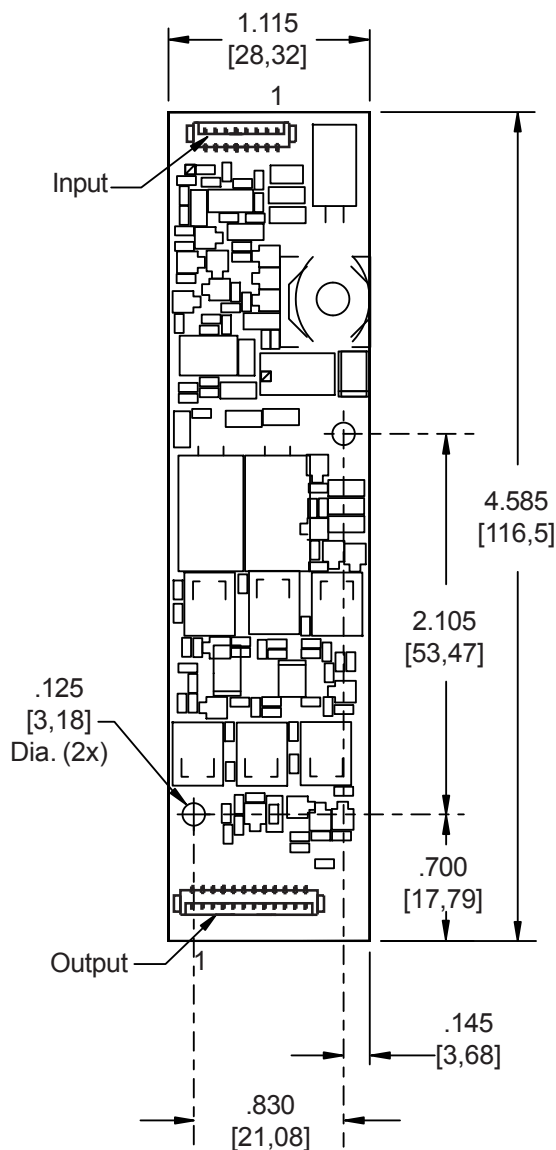
## Smart Force LED Driver

The ERG *Smart Force Series* of LED Drivers are specifically designed for applications which require wide dimming and LCD brightness stability over a wide input voltage range. The SFD2EB4105F is designed to provide backlight power for the Mitsubishi AA104SH12 and AA104XD12 displays.

Designed, manufactured and supported within the USA, the SFD2E features:

- ✓ 10 mm or less in height
- ✓ Wide input voltage range
- ✓ Constant LED current
- ✓ External dimming or on-board dimming
- ✓ High dimming ratio
- ✓ Soft start
- ✓ One year warranty

### Package Configuration



Mass: 18 grams typ.



### Connectors

Input Connector	Output Connector*
Molex 53261-0871	Molex 53261-1271
J1-1 Vin(+) J1-2 Vin(+) J1-3 Vin(+) J1-4 GND J1-5 GND J1-6 GND J1-7 Enable J1-8 Control	J2-1 Cathode 1    J2-7 Cathode 4 J2-2 Anode 1     J2-8 Anode 4 J2-3 Cathode 2   J2-9 (do not use) J2-4 Anode 2     J2-10 (do not use) J2-5 Cathode 3   J2-11 (do not use) J2-6 Anode 3     J2-12 (do not use)
	* Requires harness: ERG part number H15008152F recommended

**Absolute Maximum Ratings**

Rating	Symbol	Value	Units
Input Voltage Range	$V_{in}$	-0.3 to +20.0	Vdc
Storage Temperature	$T_{stg}$	-40 to +85	°C
Enable Input Voltage	$V_{Enable}$	0 to $V_{in}$	Vdc
Control Input Voltage	$V_{PWM}$	0 to +5.0	Vdc

**Operating Characteristics**

Unless otherwise noted  $V_{in} = 12.00$  Volts dc and  $T_a = 25^{\circ}\text{C}$ .

Characteristic	Symbol	Min	Typ	Max	Units
Input Voltage	$V_{in}$	+10.8	+12.0	+18.0	Vdc
Component Surface Temperature (Note 1)	$T_s$	-40	-	+80	°C
Peak Inrush Current (Note 2)	$I_{peak}$	-	0.9	-	Adc
Input Current	$I_{in}$	0.62	0.73	0.84	Adc
LED String Voltage	$V_{LED}$	22	-	39	Vdc
Efficiency (Note 3)	$\eta$	-	85	-	%
Output Current (per string)	$I_{out}$	66	70	74	mAdc
<b>Enable Pin</b> (Note 4)					
Turn-on Threshold	$V_{thon}$	-	-	2.0	Vdc
Turn-off Threshold	$V_{thoff}$	0.8	-	-	Vdc
Enable Input Impedance (Note 5)	$R_{Enable}$	-	10	-	kOhms
<b>Control Pin</b> (Notes 6,7)					
Full-on Threshold	$V_{thon}$	-	1.0	-	Vdc
Full-off Threshold	$V_{thoff}$	-	4.5	-	Vdc
Control Input Bias Current	$I_{Cbias}$	-	-	10	uA
Frequency	$F_{PWM}$	-	245	-	Hz

Specifications subject to change without notice.

- Note 1 Surface temperature must not exceed  $80^{\circ}\text{C}$ .  
 Note 2 Peak inrush occurs over a 1 to 3 ms time period during initial startup.  
 Note 3 Efficiency is calculated using a 26.5V LED string.  
 Note 4 Enable pin is internally pulled up above the turn-on threshold.  
 Note 5 Enable pin input impedance is 10k $\Omega$  to 12V.  
 Note 6 Control pin is internally pulled up above the turn-on threshold.  
 Note 7 Control pin input impedance is 485k $\Omega$ .



## Application Information

The ERG SFD2EB4105F has been designed to be configured in multiple ways:

### NO DIMMING

- OPERATION: The SFD2E can be configured to operate without dimming by floating the Control (J1-8) pin and Enable (J1-7) pin.
- Pins 1, 2 and 3 of connector J1 must be connected to +Vin, between 10.8 and 18 Vdc. Pins 4, 5 and 6 of connector J1 must be connected to GND.

### ONBOARD PWM DIMMING

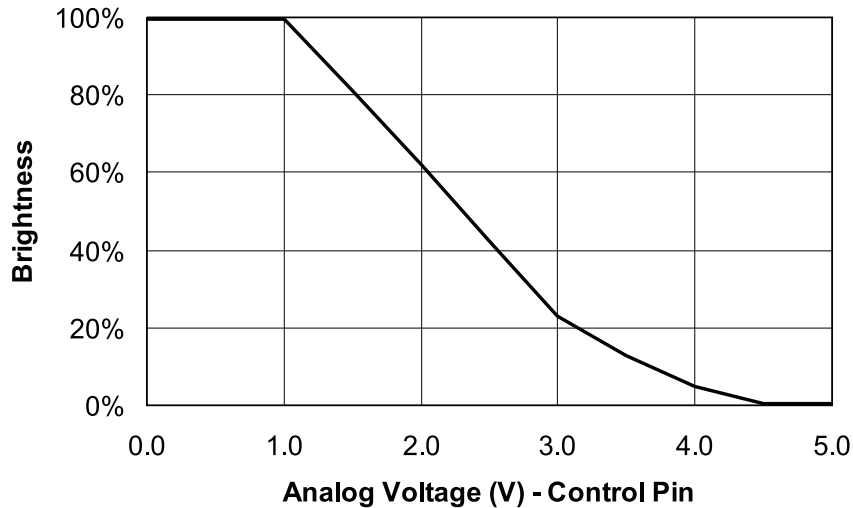
- OPERATION: Onboard PWM configuration as shown in Figure 1 allows the user to control display brightness by controlling the onboard PWM generator. The user is responsible to provide an analog control signal.
- DIMMING: Dimming is accomplished by applying an analog voltage to the Control Pin (J1-8). Display brightness is modulated by controlling the Control Pin voltage as shown in Graph 1.
- ENABLE/DISABLE: The driver may be enabled or disabled (turned on and off) by applying a DC voltage to the Enable Pin(J1-7). Enable Pin on and off levels are specified in the Operating Characteristics section of the data sheet. Enable pin is internally pulled up above the turn-on threshold.
- Pins 1, 2 and 3 of connector J1 must be connected to +Vin, between 10.8 and 18 Vdc. Pins 4, 5 and 6 of connector J1 must be connected to GND.

### EXTERNAL PWM DIMMING

- OPERATION: External PWM configuration as shown in Figure 2 allows the user to control display brightness with an externally generated PWM signal. The user is responsible to provide the PWM signal.
- DIMMING: Dimming is accomplished by applying a PWM signal to the Enable Pin (J1-7). Enable on and off levels are specified in the Operating Characteristics section of the data sheet. Display brightness is modulated by controlling the PWM duty cycle as shown in Graph 2.
- Pins 1 through 3 of connector J1 must be connected to +Vin, between 10.8 and 18 Vdc. Pins 4 through 6 of connector J1 must be connected to GND.



## ONBOARD PWM DIMMING



Graph 1

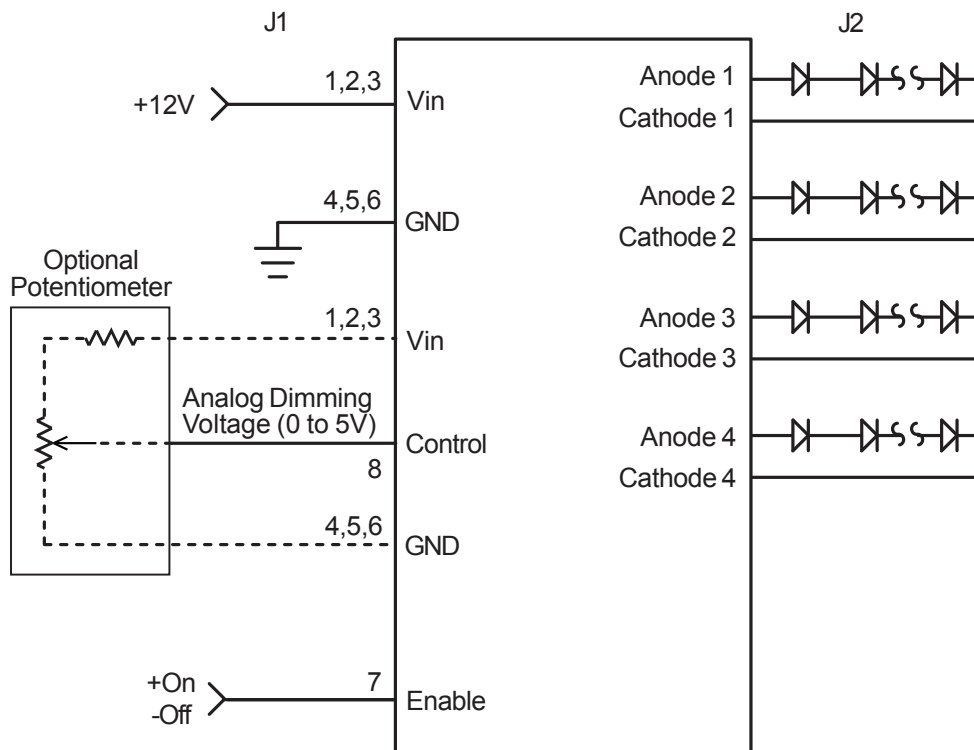
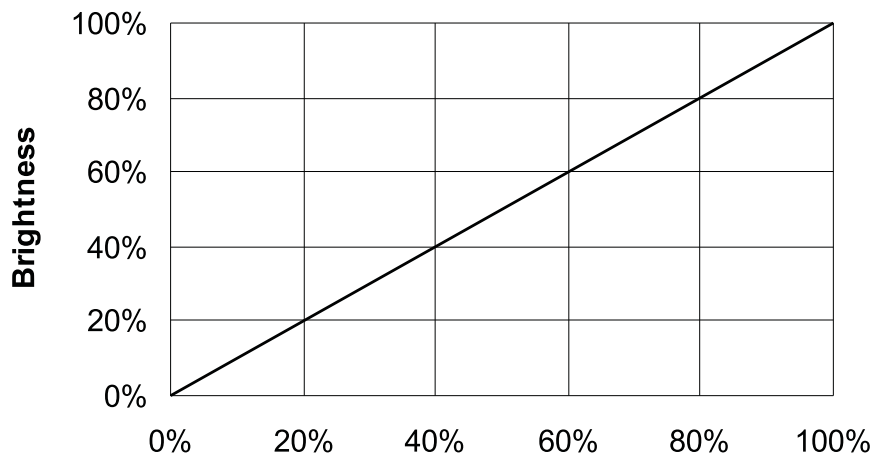


Figure 1



## EXTERNAL PWM DIMMING



**PWM Duty Cycle - Enable Pin <sup>(1)</sup>**

(1) Nonlinear relationship from 0 to 2% duty cycle.

Graph 2

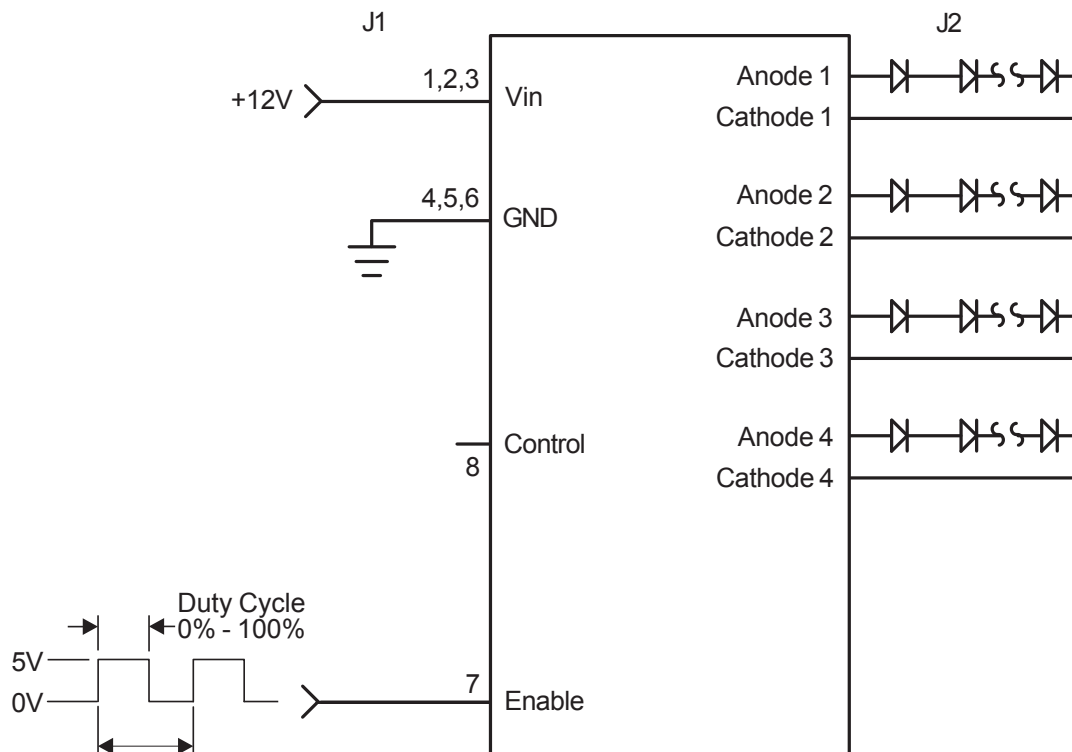


Figure 2



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