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# SFD2CB3988F



## Specifications and Applications Information

05/13/10

Preliminary

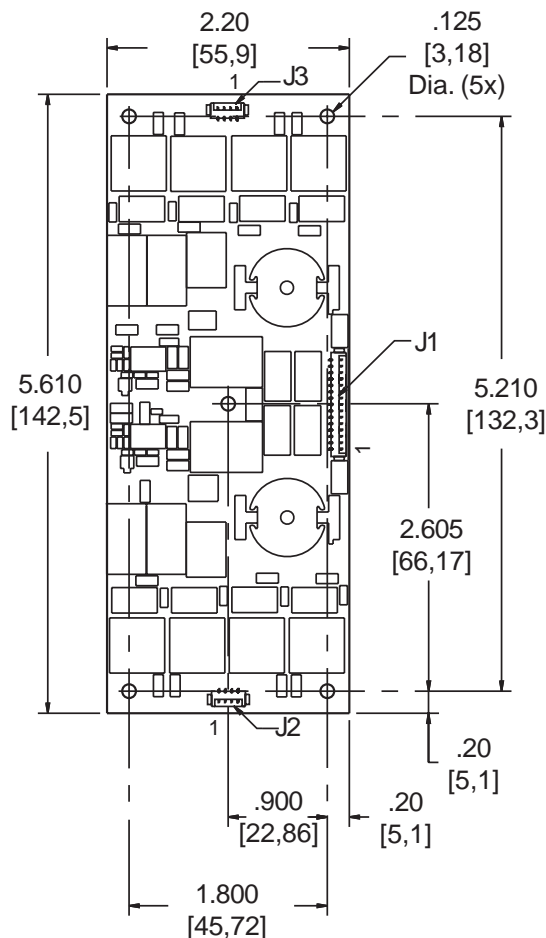
## Smart Force LED Driver

The ERG *Smart Force Series* of LED Drivers are specifically designed for applications which require high efficiency, wide dimming and LCD brightness stability over a wide input voltage range. The SFD2CB3988F is designed to provide backlight power for the NEC NL10276BC16-01.

Designed, manufactured and supported within the USA, the SFD2C features:

- ✓ Constant LED current
- ✓ High efficiency
- ✓ External or Internal dimming
- ✓ High dimming ratio
- ✓ Separate enable and dimming function
- ✓ Open/short circuit protection
- ✓ Soft start
- ✓ One year warranty

### Package Configuration



PCB components are shown for reference only. Actual product may differ from that shown.

Mass: 85 grams



Connectors	
Input Connector	Output Connector
Molex 53261-1571	Molex 53261-0471
J1-1,2,3 Vin(+)	J2-1 Cathode 1
J1-4,5,6 Vin(+)	J2-2 Anode 1
J1-7,8,9 GND	J2-3 Cathode 2
J1-10,11,12 GND	J2-4 Anode 2
J1-13 Enable	J3-1 Cathode 3
J1-14 PWM	J3-2 Anode 3
J1-15 Control	J3-3 Cathode 4
	J3-4 Anode 4

**Absolute Maximum Ratings**

Rating	Symbol	Value	Units
Input Voltage Range	$V_{in}$	-0.3 to +18	Vdc
Storage Temperature	$T_{stg}$	-40 to +85	°C
Control Voltage	$V_{Control}$	0 to 5.0	Vdc
Enable Input Voltage	$V_{Enable}$	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
Input Current (Note 2)	$I_{in}$	1.00	1.18	1.36	Adc
Operating Frequency (Note 3)	$F_o$	-	310	-	kHz
LED String Voltage	$V_{LED}$	20	-	32	Vdc
Efficiency (Note 2)	$\eta$	-	81	-	%
Output Current (per string)	$I_{out}$	107	113	119	mArms
<b>Enable Pin</b> (Note 4)					
Turn-on Threshold (Note 5)	$V_{thon}$	-	-	1.8	Vdc
Turn-off Threshold	$V_{thoff}$	1.3	-	-	Vdc
Enable Input Impedance (Note 7)	$R_{Enable}$	-	2.5	-	kOhms
<b>PWM Pin</b> (Note 4)					
Turn-on Threshold (Note 6)	$V_{thon}$	-	-	1.8	Vdc
Turn-off Threshold	$V_{thoff}$	1.3	-	-	Vdc
Enable Input Impedance (Note 7)	$R_{Enable}$	-	2.5	-	kOhms
<b>Control Pin</b> (Note 8)					
Full-on Threshold	$V_{fon}$	-	0.9	-	Vdc
Full-off Threshold	$V_{foff}$	-	4.2	-	Vdc

Specifications subject to change without notice.

- Note 1 Surface temperature must not exceed  $80^\circ\text{C}$ ; thermal management actions may be required.
- Note 2 Input Current and Efficiency are calculated with 25.5V LED strings.
- Note 3 Hysteretic current control frequency.
- Note 4 The input voltage to the driver must be within its operating characteristic before the driver is enabled, otherwise the driver may not start or may shut down unexpectedly.
- Note 5 Enable pin is internally pulled up above the Turn-on Threshold.
- Note 6 PWM pin is internally pulled up above turn on threshold.
- Note 7 Input Impedance is 2.5kohms to 2.5V.
- Note 8 Control pin is internally pulled down below Full-on Threshold.



## Onboard PWM

Unless otherwise noted  $V_{in} = 12.00$  Volts DC,  $T_a = 25$  °C and unit has been running for 5 minutes.

Characteristic	Symbol	Min	Typ	Max	Units
Frequency	$f_{pwm}$	-	160	-	Hz
Control Input Bias Current	$I_{cbias}$	-	-	10	$\mu A$

## Application Information

The ERG SFD2CB3988F has been designed to be configured in multiple ways:

### NO DIMMING

- OPERATION: The SFD driver can be configured to operate without dimming by grounding the Control Pin (J1-15), floating the Enable Pin (J1-13), and floating the PWM Pin (J1-14).
- Pins 1 through 6 of connector J1 must be connected to +Vin, between 10.8 and 18 Vdc. Pins 7 through 12 of connector J1 must be connected to GND.

### ONBOARD PWM DIMMING

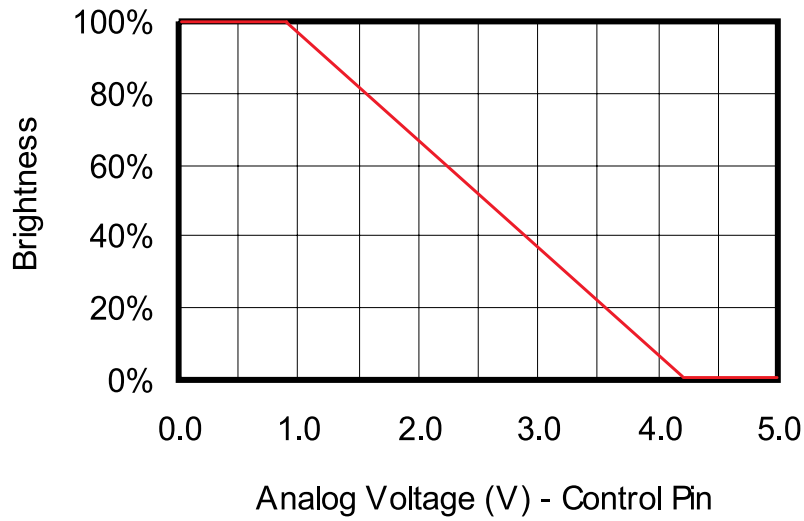
- OPERATION: Onboard PWM configuration as shown in Figure 1 allows the user to control display brightness by controlling the onboard PWM generator. The user is responsible to provide an analog control signal. A dimming ratio up to 100:1 is possible with this configuration.
- DIMMING: Dimming is accomplished by applying an analog voltage to the Control Pin (J1-15). 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 (J1-13). Enable Pin on and off levels are specified in the Operating Characteristics section of the data sheet. The driver can also be enabled by floating the Enable Pin.
- Pins 1 through 6 of connector J1 must be connected to +Vin, between 10.8 and 18 Vdc. Pins 7 through 12 of connector J1 must be connected to GND. Pin 14 may be left floating or pulled up.

### 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. A dimming ratio up to 10,000:1 is possible with this configuration.
- DIMMING: Dimming is accomplished by applying a PWM signal to the PWM Pin (J1-14). PWM 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.
- ENABLE/DISABLE: The driver may be enabled or disabled (turned on and off) by applying a DC voltage to the Enable Pin (J1-13). Enable Pin on and off levels are specified in the Operating Characteristics section of the data sheet.
- Pins 1 through 6 of connector J1 must be connected to +Vin, between 10.8 and 18 Vdc. Pins 7 through 12 of connector J1 must be connected to GND. Pin 15 must be held below the Full-on Threshold or connected directly to ground.



## ONBOARD PWM DIMMING



Graph 1

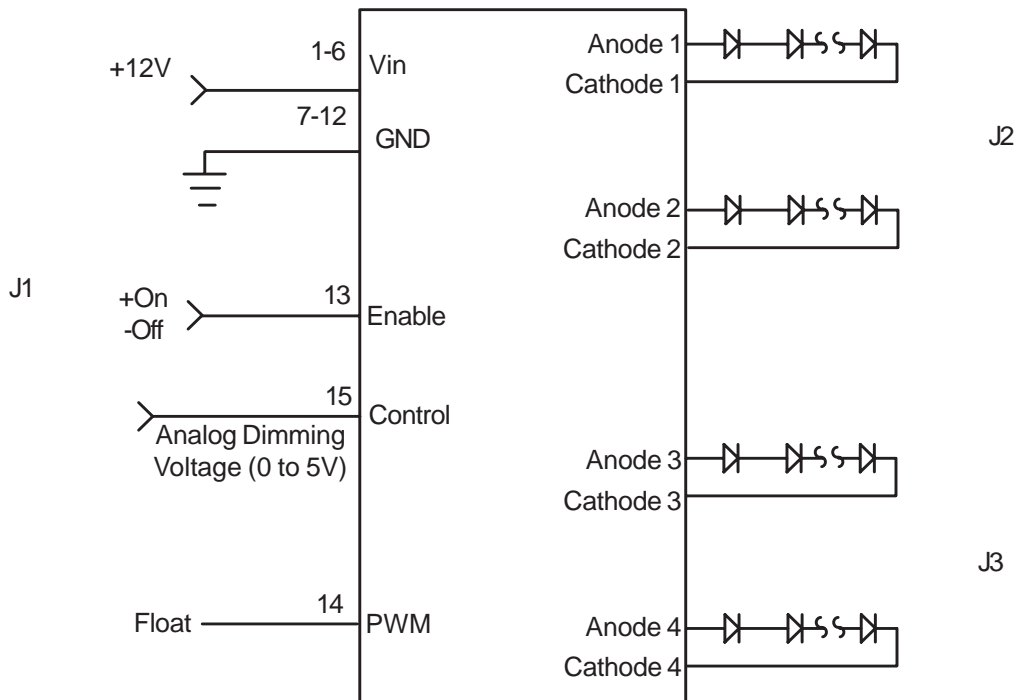
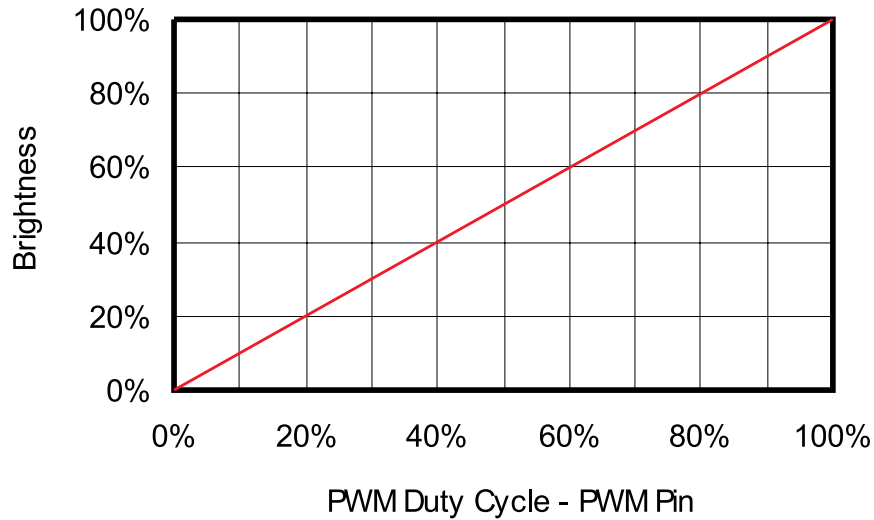


Figure 1



## EXTERNAL PWM DIMMING



Graph 2

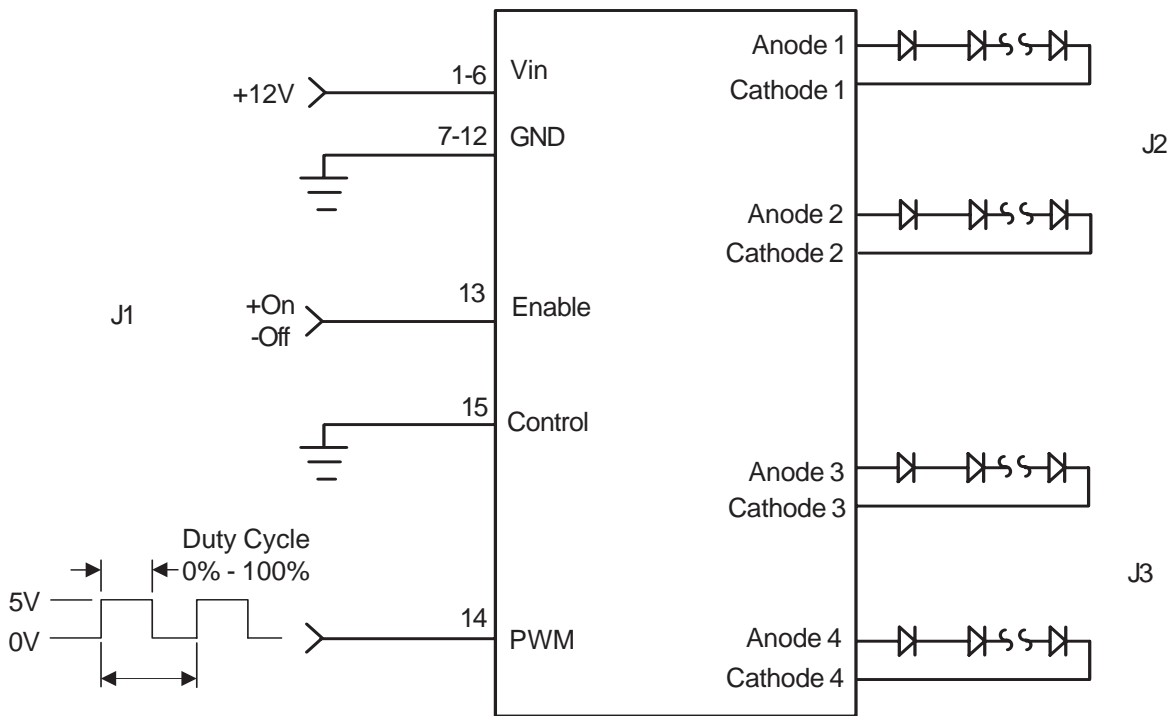


Figure 2



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