

DEI 1030 Lighting Bus Mapping Circuit

Features

- Reduced part count
- True RMS Conversion
- Small foot print (8L-SOIC-NB)
- Wiring harness programmable
- Reduces multiple bus interfaces
- Stable over temperature
- DO 160C/D Category A3 Lightning Protection
- Works with 5VAC, 5VDC, 14VDC and 28VDC busses



General Description

The DEI1030 is designed to improve lighting bus tracking from unit to unit. Bus voltage is converted to a 0-5VDC signal level output that can be used to control analog drive of incandescent bulbs. It can provide the conditioned input to an ADC/microprocessor for pulse-width modulation, or to the control input of a DEI1090 LED Driver to emulate incandescent lamps using LED's. The need for different bus interface devices for each bus voltage is eliminated.

Bus voltage is selected via two open/ground discrete inputs permitting automatic unit adaptation to the system bus voltage. Lighting bus, common, and gain selection inputs are protected against lightning surges to DO-160C/D category A3 (waveforms 3, 4, and 5). See figures 5, 6, and 7.

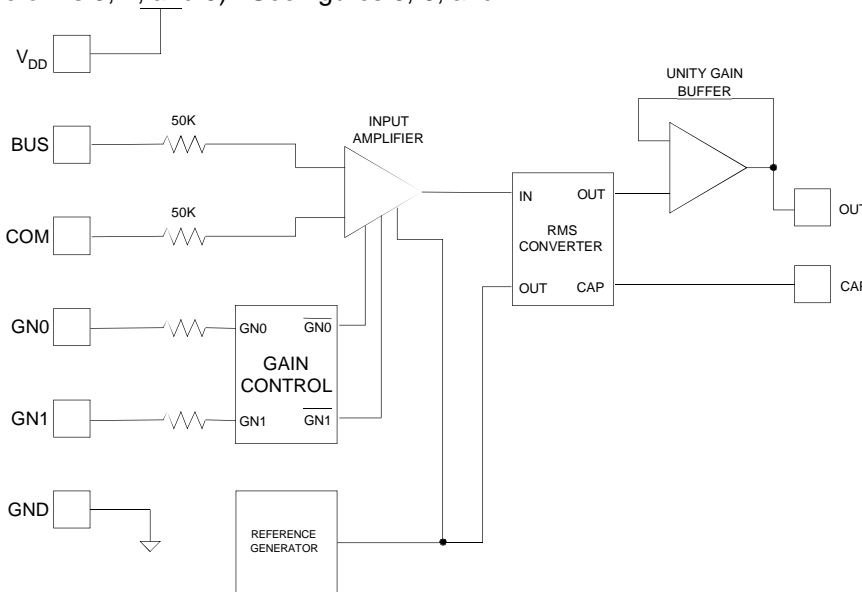


Figure 1: DEI1030 Block Diagram

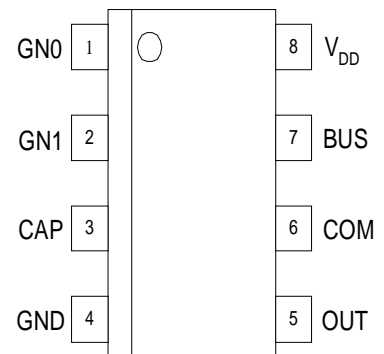


Figure 2: DEI1030 Pinout

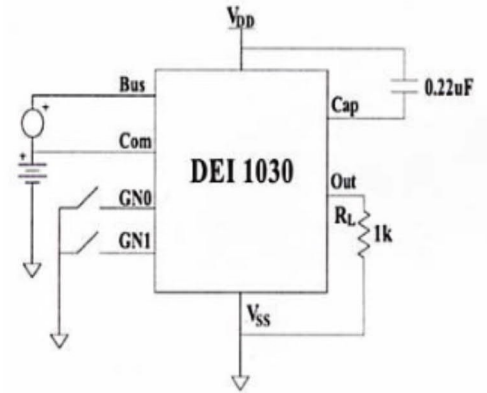
Table 1: Pin Definitions

PIN #	NAME	SYMBOL	DEFINITION
1	Gain Select 0	GN0	Lightning protected* gain select input
2	Gain Select 1	GN1	Lightning protected* gain select input
3	Capacitor	CAP	Capacitor connection to V _{DD} for 5VRMS to DC conversion.
4	Ground	GND	Circuit ground reference
5	Output	OUT	Circuit output to lamp driver.
6	Common	COM	Lightning protected* reference input from lighting bus.
7	Bus Input	BUS	Lightning protected* circuit input from lighting bus.
8	Supply Voltage	V _{DD}	Circuit input voltage.

*Protected from lightning surges to DO160C/D category A3. See figures 5, 6, and 7.

The DEI 1030 input stage is a differential to single-ended converter with variable gain. The GN0 and GN1 inputs control the gain of this circuit. Following the differential input stage is an RMS-to-DC converter, which provides a DC output voltage proportional to the RMS value of its input. The circuit is intended to interface various lighting systems to a 0 ~ 5 volt internal standard.

Three gain settings are provided. If both gain pins are grounded (GN0 = GN1 = 0), the circuit will output a DC voltage that is equal to the RMS value of the input. Because of the RMS conversion, either polarity of input DC voltage results in the same output. A true sine waveform will give a DC output that is equal to the RMS value of the input. A distorted sine, or any other waveform (at low enough frequency) will give a DC output voltage that is approximately equal to the RMS value of the input. Thus in this gain mode, either a zero-to-5 V DC or 400Hz sinusoidal input will result in a zero-to-5 V DC output.



A filter capacitor is used in the RMS-to-DC conversion. A value of at least 0.22 μ F is recommended. A larger value will reduce the ripple (at 2x the input frequency) at the output.

FUNCTION TABLE			
GN1	GN0	INPUT FORMAT	DC GAIN
0 (Gnd)	0 (Gnd)	5V	5V
0 (Gnd)	1 (Open)	14V	0.357
1 (Open)	0 (Gnd)	19V (not used)	0.263
1 (Open)	1 (Open)	28V	0.179

Table 2: ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNITS
Supply Voltage	V _{DD}	16.5	V
Input Voltage (Pins BUS, COM, GN0, GN1)	V _{in}	V _{SS} -10 to V _{DD} +40	V
Lightning Protection (BUS, COM, GN0, GN1; DO160C/D, Waveforms 3, 4* and 5*; Level 3)	V _{LTG}	\pm 600 \pm 300*	V
Output Current (Pin OUT)	I _{out}	50	mA
Peak Body Temperature -G Package		260	$^{\circ}$ C
Storage Temperature	T _{STG}	-65 to 125	$^{\circ}$ C
Note: The DEI1030 contains circuitry to protect inputs against damage due to high voltage static discharge. Normal precautions must be used in handling these devices.			

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
Supply Voltage	V_{DD}	10.8	12	13.2	V
Supply Current ($V_{DD} = 13.2V$, $V_{BUS} - V_{COM} = 0$)	I_{DD}			9	mA
Operating Temperature	T_O	-55		85	$^{\circ}C$

Unless noted, operating connections: $V_{DD} = 12V \pm 10\%$, $V_{COM} = 0V$, $T = -55^{\circ}C$ to $+85^{\circ}C$, GN0 = "low", GN1 = "low"						
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
OUTPUT CHARACTERISTICS						
DC Output voltage	V_{O1}	$V_{BUS} - V_{COM} = 0$ GN0 = GN1 = "low" $T = -55^{\circ}C$	0 0		50 60	mV
DC Output voltage	V_{O2}	$V_{BUS} - V_{COM} = 2.5 V DC$ GN0 = GN1 = "low" $T = -55^{\circ}C$	2.4 2.33		2.6 2.6	V
DC Output voltage	V_{O3}	$V_{BUS} - V_{COM} = 5.0 V DC$ GN0 = GN1 = "low" $T = -55^{\circ}C$	4.8 4.75		5.2 5.2	V
DC Output voltage	V_{O4}	$V_{BUS} - V_{COM} = 5.0V_{rms}$, 400Hz GN0 = GN1 = "low"	4.8		5.2	V
DC Output voltage	V_{O5}	$V_{BUS} - V_{COM} = 14.0 V DC$ GN0 = "high", GN1 = "low"	4.8		5.2	V
DC Output voltage	V_{O6}	$V_{BUS} - V_{COM} = 28.0 V DC$ GN0 = "high", GN1 = "high" $T = -55^{\circ}C$	4.8 4.75		5.2 5.2	V
INPUT CHARACTERISTICS						
Signal input resistance	R_I	Single-ended input resistance: BUS or COM (1)	30		80	$k\Omega$
Common-mode input range	V_{COM}	Voltage on COM pin for less than 1% change in output voltage (1)	-2		2	V
GAIN CONTROL INPUT CHARACTERISTICS						
Gain select low level voltage	V_{IL}	GN0, GN1 input voltage to guarantee "low" input			3.0	V
Gain select high level voltage	V_{IH}	GN0, GN1 input voltage to guarantee "high" input	3.5			V
Gain select low level resistance (GND)	R_{IL}	GN0, GN1 input resistor to ground to guarantee "low" input			100	Ω
Gain select high level resistance (OPEN)	R_{IH}	GN0, GN1 input resistor to ground to guarantee "high" input	100k			Ω
Gain select source current	I_G	Input voltage = 0			-100	μA

Notes:

1. Guaranteed by design and not production tested.

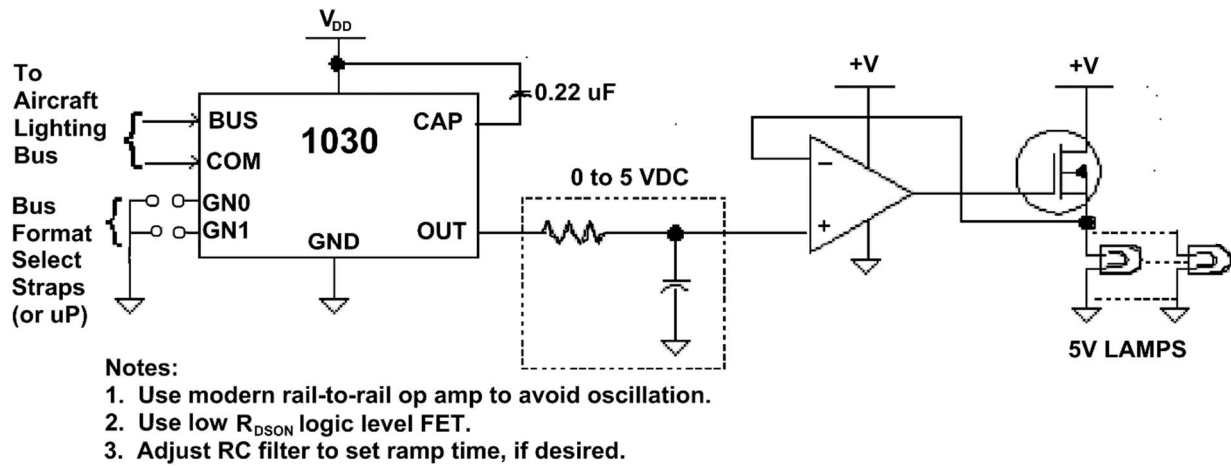


Figure 4. Typical Application

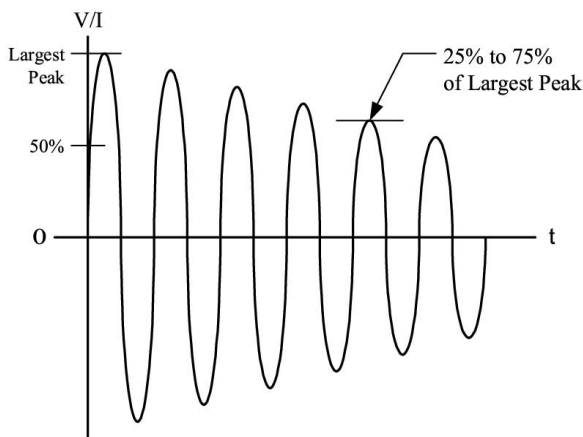


Figure 5: DO160C/D Voltage Waveform #3
 $V_{OC} = 600V$, $I_{SC} = 24A$, Frequency = $1.0MHz \pm 20\%$

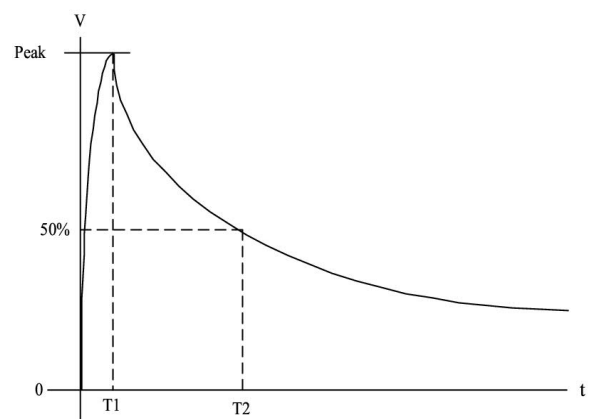


Figure 6: DO160C/D Voltage Waveform #4
 $V_{OC} = 300V$, $I_{SC} = 60A$

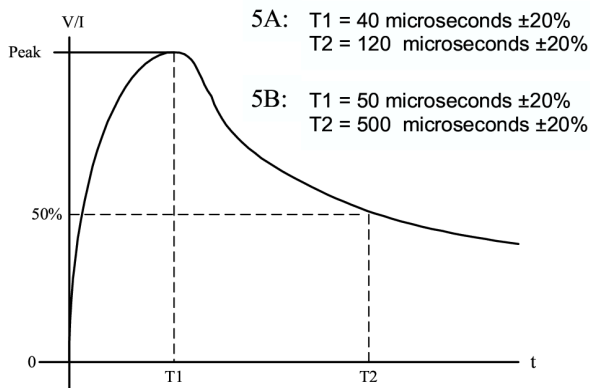


Figure 7: DO160C/D Voltage Waveform #5
 $V_{OC} = 300V$, $I_{SC} = 300A$

Notes:

1. V_{OC} = Peak Open Circuit Voltage available at the calibration point.
2. I_{SC} = Peak Short Circuit Current available at the calibration point.
3. Amplitude tolerances: +10%, -0%
4. The ratio of V_{OC} to I_{SC} is the generator source impedance to be used for generator calibration purposes.

Ordering Information

Table 5: Ordering Information			
DEI PART NUMBER	MARKING	PACKAGE	TEMP RANGE
DEI1030-G	DEI1030 E4	8L NB SOIC G	-55 / +85 °C

Package Information

Table 6: Package Characteristics	
PACKAGE TYPE	8 Lead SOIC Narrow Body, Green
REFERENCE	8L NB SOIC G
THERMAL RESISTANCE: θ_{JA} (4 layer PCB with Power Planes) θ_{JC}	135 °C/W 40 °C/W
JEDEC MOISTURE SENSITIVITY LEVEL (MSL)	MSL 1 / 260°C
LEAD FINISH MATERIAL / JEDEC Pb-free CODE	NiPdAu e4
Pb-Free DESIGNATION	RoHS Compliant
JEDEC REFERENCE	MS-012-AC

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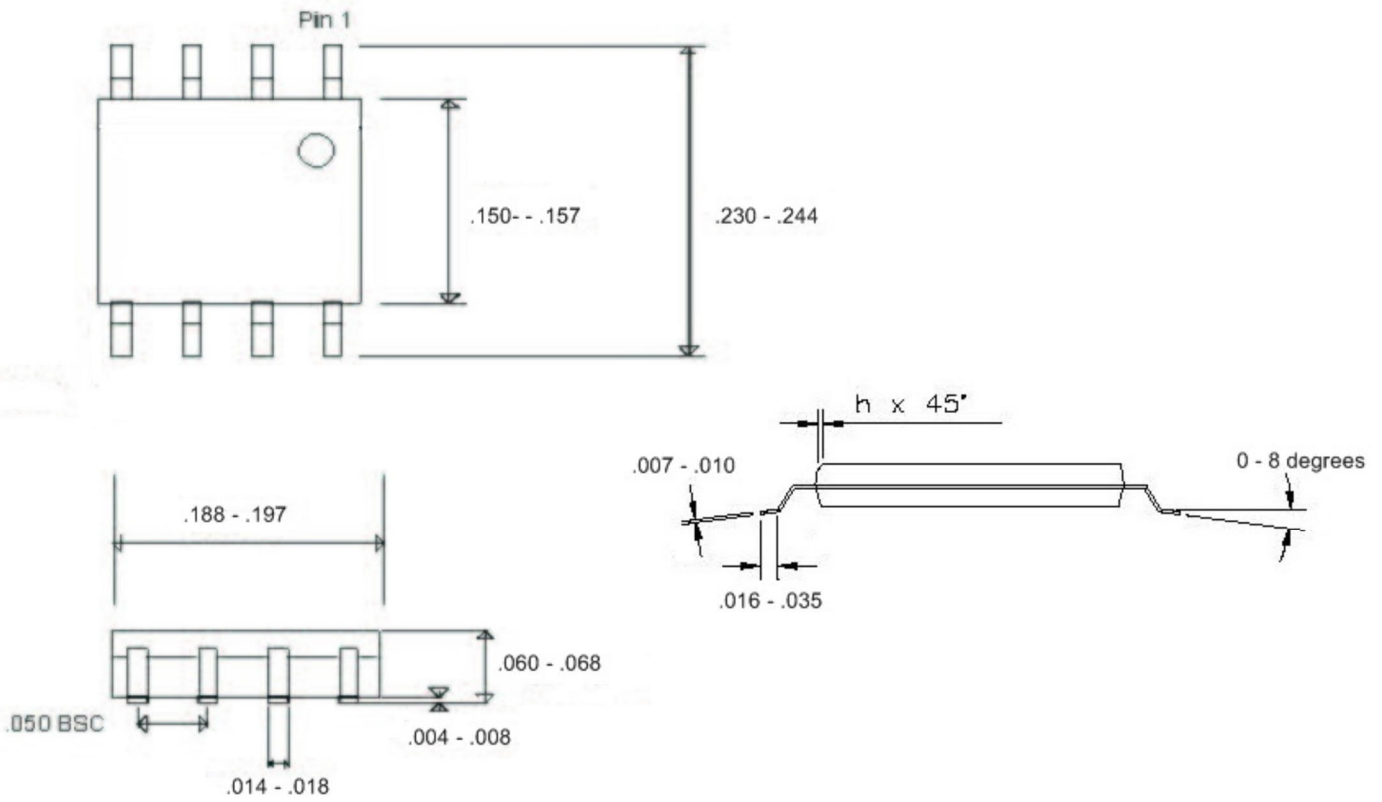


Figure 8: Mechanical Outline 8 Lead NB SOIC – G Package