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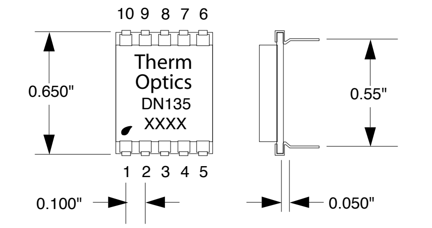
DATA SHEET

DN135



PIN #	FUNCTION
1	FACTORY CALIBRATION
2	I_{IN} CURRENT INPUT
3	GROUND
4	V_{REF} 1.25 VOLT REFERENCE
5	GROUND
6	+5 VOLTS
7	V_C CALIBRATION INPUT
8	-5 VOLTS
9	V_O VOLTAGE OUTPUT
10	FACTORY CALIBRATION

CURRENT TO VOLTAGE CONVERTER FOR PIGTAILED PHOTODIODE FIBER OPTIC POWER MONITORS

The DN135 is a current to voltage converter that is intended for use in fiber optic power monitors. The device converts current from a photodiode to voltage that is proportional to the incoming optical power in dBm. The DN135 functions equally well with InGaAs and Silicon photodiodes.

FEATURES

- 70dB DYNAMIC RANGE
- CONVERTS CURRENT LEVELS FROM 100pA to 2mA
- 0.500 VOLTS OUTPUT PER DECADE INCREASE IN OPTICAL POWER
- OPERATES FROM ± 5 VOLTS SUPPLIES

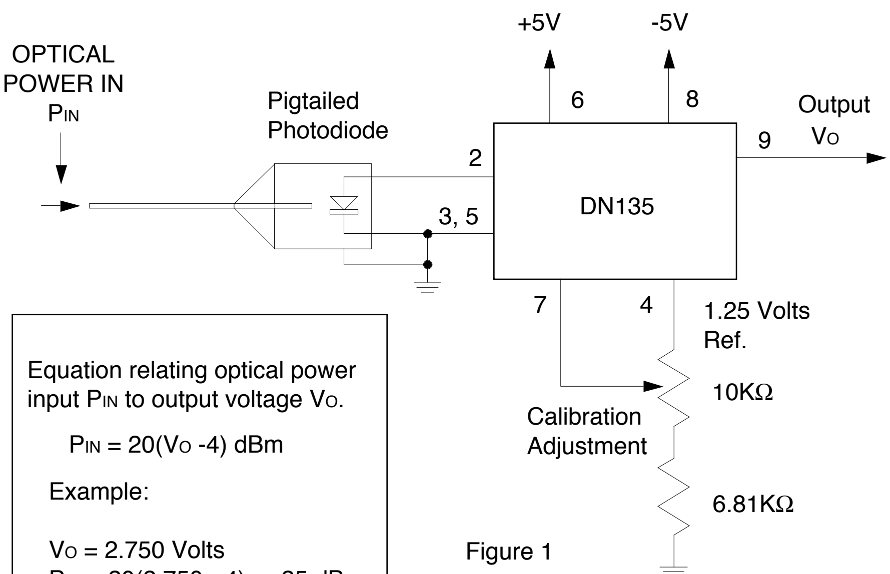


Figure 1

Equation relating optical power input P_{IN} to output voltage V_O.

$$P_{IN} = 20(V_O - 4) \text{ dBm}$$

Example:

V_O = 2.750 Volts

P_{IN} = 20(2.750 - 4) = -25 dBm

INPUT POWER		OUTPUT VOLTAGE
Watts	dBm	Volts
1 mW	0	4.000
100 µW	-10	3.500
10 µW	-20	3.000
1 µW	-30	2.500
100 nW	-40	2.000
10 nW	-50	1.500
1 nW	-60	1.000
100 pW	-70	0.500

INPUT CURRENT	OUTPUT VOLTAGE
Amperes	Volts
1 mA	4.000
100 µA	3.500
10 µA	3.000
1 µA	2.500
100 nA	2.000
10 nA	1.500
1 nA	1.000
100 pA	0.500

The pigtailed photodiode and DN135 assembly is calibrated by introducing an optical signal of known magnitude into the fiber and adjusting the calibration potentiometer so that the output voltage corresponds to the input power level.

Example:

One hundred microwatts of optical power @1550nm is introduced into a fiber that is terminated in an InGaAs photodiode.* Adjust the calibration control shown in Figure 1 until the output voltage indicates 3.500 Volts. The optical power monitor is now calibrated at 1550nm.

The calibration control can be driven from an external voltage source such as the output of a digital to analog converter. This would allow the power monitor to be automatically calibrated in a systems application.

*A typical InGaAs photodiode may have a responsivity of 0.9mA/mWatt of optical power at 1550nm. This would provide an output of current of 90µA with an input power of 100µW. The calibration control corrects for variations in the responsivity of various photo diodes.

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EQUATION RELATING THE OUTPUT VOLTAGE OF THE DN135 TO THE INPUT CURRENT.

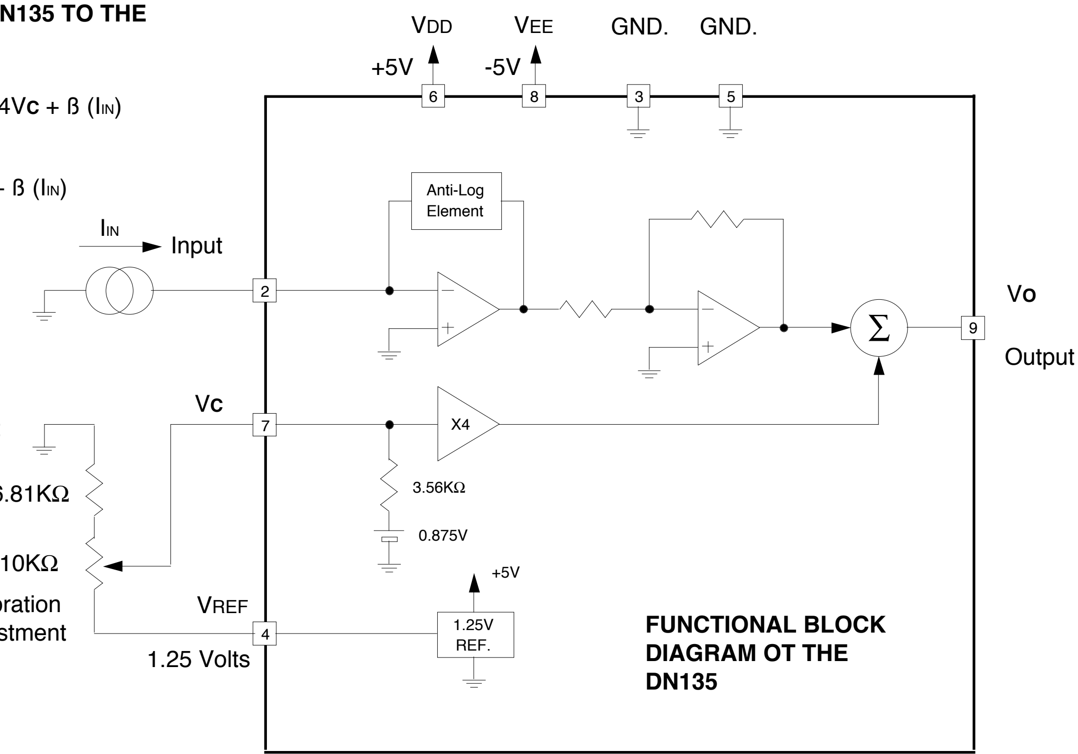
$$V_O = \frac{\text{Log}(I_{IN}) + 4}{2} + 4V_C + \beta(I_{IN})$$

or

$$V_O = \frac{\text{Log}(I_{IN})}{2} + 5.5 + \beta(I_{IN})$$

When V_C = 0.875 V
I_{IN} is in Amperes

β =0.010 ± .002 at 25°C. The effect of β on the output voltage is very small when the input current is less than 100µA.



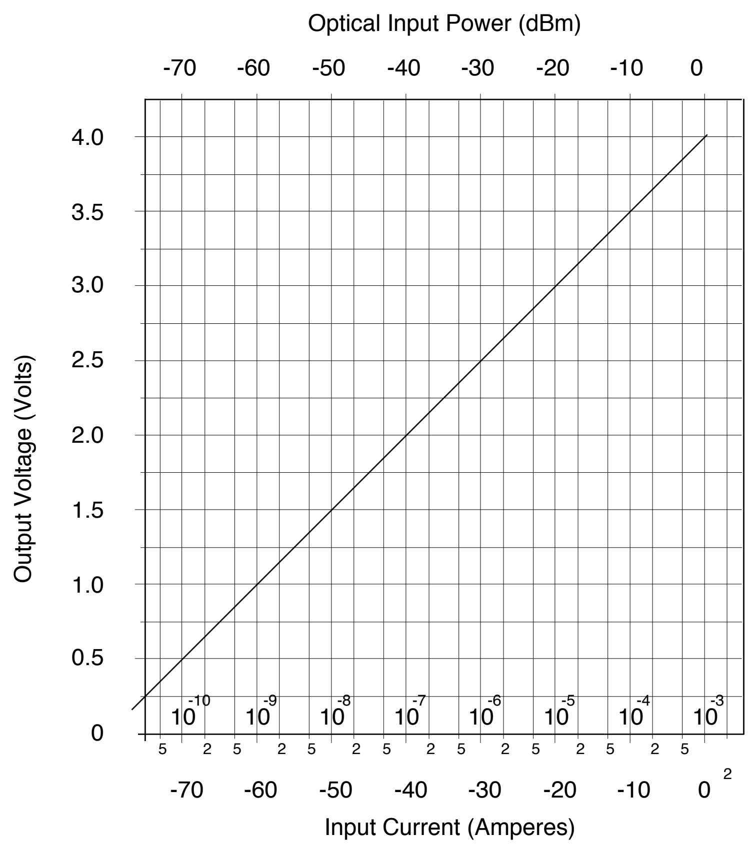
FUNCTIONAL BLOCK DIAGRAM OT THE DN135

OUTPUT VOLTAGE VS. INPUT CURRENT FOR THE DN135

Input Current	Output Voltage[1] T= 25°C	Output Voltage Tol.[1] T= 25°C	Output Voltage Tol.[1] T= -20°C to +75°C
Amperes	Volts	Volts	Volts
1 mA	4.000	+0.012	+0.024
100 µ A	3.500	±0.002	±0.010
10 µ A	3.000	±0.000	±0.010
1 µ A	2.500	±0.001	±0.010
100 nA	2.000	±0.002	±0.010
10 nA	1.500	±0.002	±0.010
1 nA	1.000	±0.002	±0.020
100 pA	0.500	±0.005	±0.150

1. This is the output voltage after the DN135 has been calibrated to produce an output voltage of 3.000 Volts with an input current of 10µA at an ambient temperature of 25°C.

OUTPUT VOLTAGE vs. INPUT CURRENT/OPTICAL POWER



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