E2580 EML with Intergral Driver IC: Pin Definitions and Operation

Introduction

Agere Systems Inc.'s E2580 series Electroabsorption Modulated Isolated Laser Module (EM-ILM or EML) offers an integrated modulator and CW laser in a single semiconductor chip, and an integral driver IC in the same package.

This application note is intended to offer guidance on the pin functions and the voltage levels required by the driver IC. For general guidance in setup and operation of EML devices, refer to the *Electroabsorptive Modulated Laser (EML): Setup and Optimization* Technical Note (TN00-008OPTO). For additional information on the wavelength stability of 2.5 Gbits/s and 10 Gbits/s EML devices over temperature, refer to the technical note, *Use of EML Devices In DWDM Applications* (TN00-012OPTO).

Pin Definitions and Operation

As indicated in the block diagram below, the E2580 device has 13 pins on one side of the package that are dedicated to the required dc and control components, and a single, small-profile, Glibert GPO connector on the other side for the RF signal. Pins 6 to 11 interface to the integral driver IC, which in turn controls the modulator functions. Pins 1 and 2 connect the thermistor, pin 3 connects the CW laser section, pins 4 and 5 connect the monitor photodiode, and pins 12 and 13 connect the thermoelectric cooler.

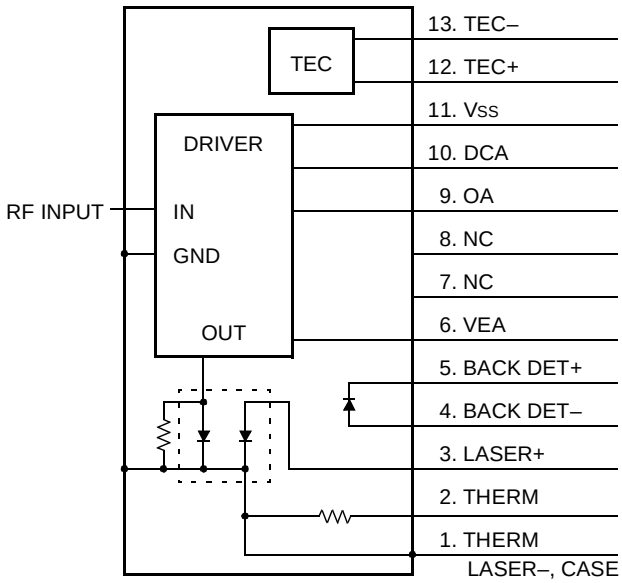

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Figure 1. Block Diagram of the E2580 10 Gbits/s EML Package with Driver IC and Output Amplitude/Cross Point Control Circuits

Pin Definitions and Operation (continued)

Table 1. Pin Definitions and Operation

PIn Number	Symbol	Description
13	TEC(–)	**Thermoelectric Cooler (–).**
12	TEC(+)	**Thermoelectric Cooler (+).**
11	V_{SS}	**Voltage Supply to the IC.** The operating voltage range is –5.0 V to –5.5 V.
10	DCA	**Duty Cycle Adjust.** The input range is ~ –3.6 V to –3.8 V. At ~ –3.6 V, the pulse width is reduced to a minimum value of 70%. At ~ –3.8 V, the pulse width is a maximum at 130%. Typically, around –3.7 V, the pulse width is 100%, which corresponds to a normal duty cycle and 50% eye crossing for the electrical drive pattern. This will produce lower eye crossings in the optical pattern for an EML device because of the nonlinear extinction (light output vs. modulation voltage) characteristic. This input can be used to increase the crossings slightly for optimal performance.
9	OA	**Output Amplitude Adjust.** The input range is ~ –4.2 V to –4.8 V. Minimum drive amplitude to the modulator (~ 2 Vp-p) is achieved at –4.8 V. Maximum drive (~ 3 Vp-p) is attained at –4.2 V. This input can be used to adjust the extinction ratio in the optical output.
8	NC/DCM	**No Connect/Duty Cycle Monitor**. This pin is reserved for the duty cycle monitor function and may be available in future transponder versions. Currently, this functionality is not available on the driver ICs that are used in E2560. It will be NC, (no connect) on initial models.
7	NC/PCM	**No Connect/Peak Current Monitor.** This pin is reserved for the peak current monitor function. As with the duty cycle monitor, it is not yet available on the driver ICs used. It will be NC (no connect) on initial models
6	VEA	**Modulator Offset**. This pin controls the on-state bias voltage applied to the modulator. The input voltage ranges from –3.0 V to –5.0 V. At –5.0 V, there is no applied offset to the modulator, i.e., the on-state should be close to 0.0 V (excluding the effects of modulator photocurrent). At –3.0 V, the maximum offset is applied to the modulator, which would correspond to an on-state voltage of –1.0 V. The absolute minimum off-state is –3.4 V for the driver IC. Therefore, tuning the offset to more negative value at a fixed output amplitude will eventually result in clipping on the low end and a reduction in the drive amplitude. For example, if a package is set up for 2.5 Vp-p output amplitude, it may be tuned down for offset to –0.9 V maximum before amplitude clipping would normally occur. At –1.0 V offset, the maximum driver amplitude would be reduced to 2.4 Vp-p.
5	Back Det(+)	**Back Detector (+) (Cathode).**
4	Back Det(–)	**Back Detector (–) (Anode).**
3	Laser(+)	**Laser (+) (Anode).**
2	Therm	**Thermistor Connect.**
1	Therm/Laser(–)/Case	**Thermistor/Laser (–)/Case.**This pin offers a combined thermistor, laser CW section cathode (–) and case ground (for the RF signal). This is a modification on earlier models and has been introduced to offer optimum RF performance.
—	RF_{IN}	**RF Input.** The RF signal is applied to the Gilbert GPO connector. Via this connection, the driver IC requires an input voltage in the range 0.5 V to 1.0 V (peak to peak) for optimum performance. The RF path is optimized for a nominal input impedance of 50 Ω.

Pin Definitions and Operation (continued)

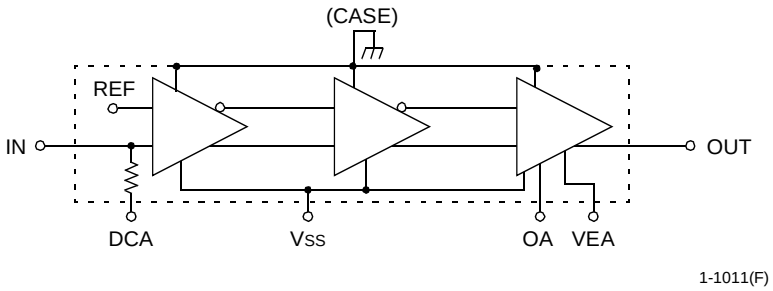


Figure 2. Driver IC Block Diagram

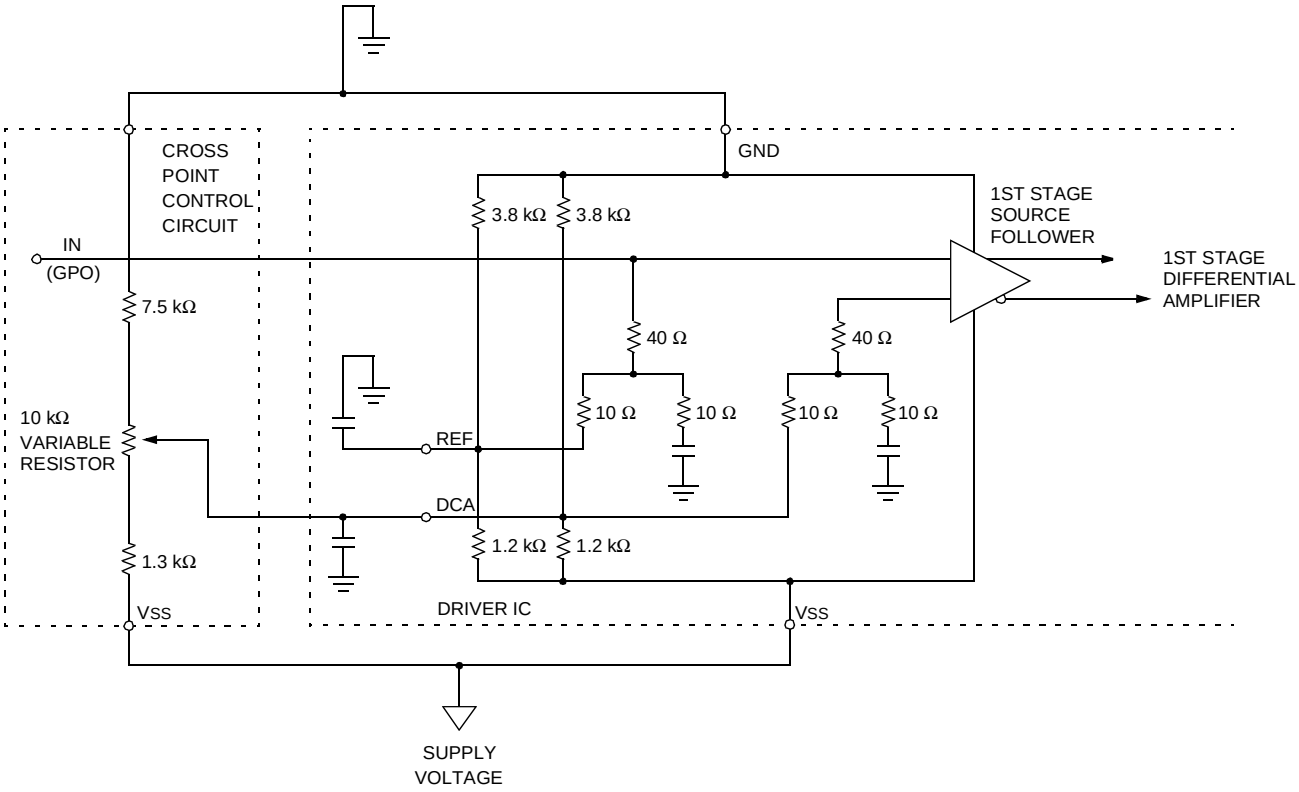


Figure 3. Cross Point Control Circuit Example

Pin Definitions and Operation (continued)

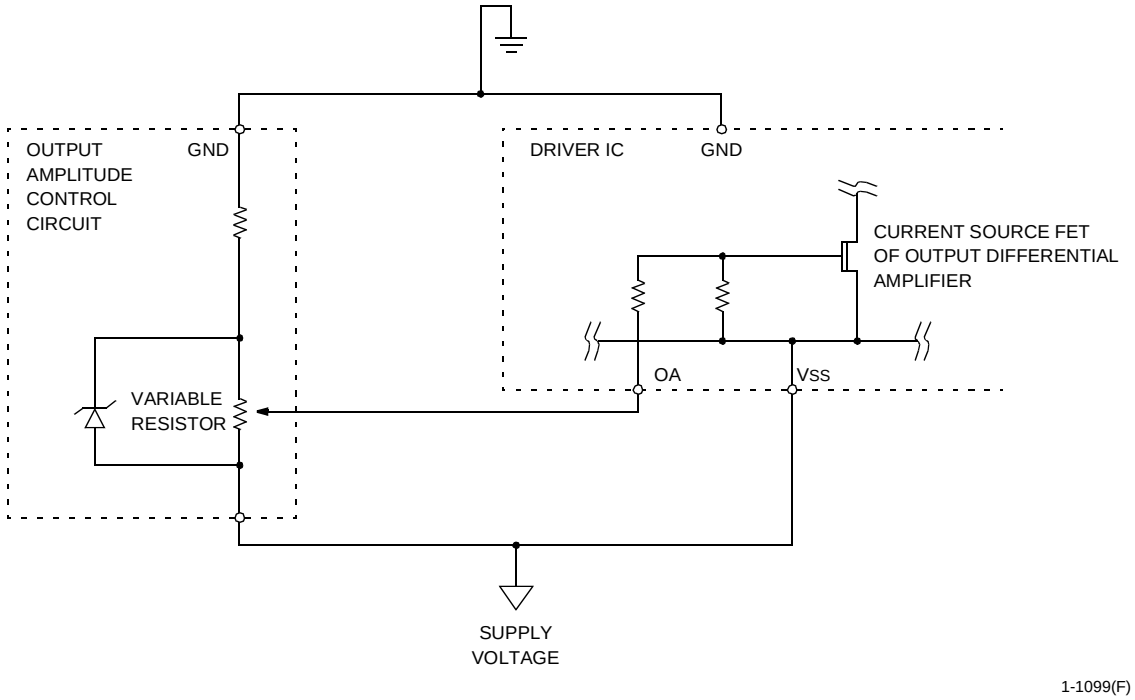


Figure 4. Output Amplitude Control Circuit Example (10 Gbits/s EA Driver IC)

Recommended Start-Point Conditions

With the appropriate control circuits in place, as described above, the following starting point (i.e., prior to any tuning) values are suggested for the dc bias parameters in the IC.

Table 2. Recommended Start-point Conditions for dc Bias Parameters in the IC*

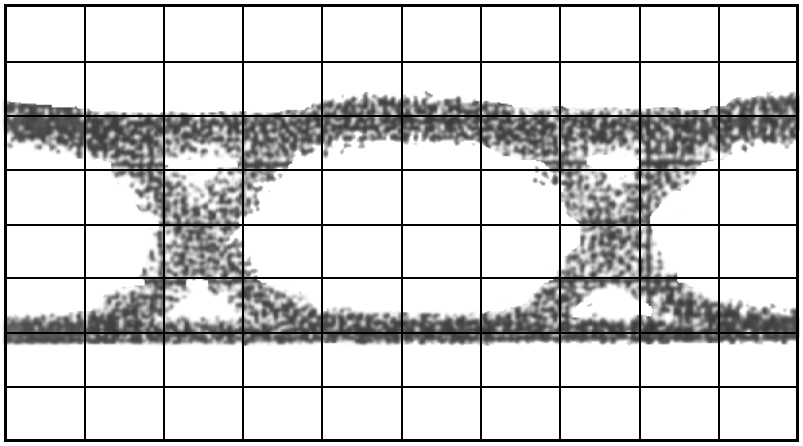
Parameter	Symbol	Value
Duty Cycle Adjust	DCA	–3.7 ± 0.1 V
Modulation Offset	VEA	–3.5 ± 0.3 V
Output Amplitude	OA	–4.6 ± 0.2 V

* The information offered here is recommended as a time-saving condition and further adjustment may be necessary to achieve the desired performance, as described in Table 1.

Summary

In conjunction with the technical note describing general setup and optimization of the EML device, the user should now be in a position to design the interface to the E2580 package, and, subsequently, to optimize its performance to meet the individual system requirements.

Appendix



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RISE TIME = 37 ps, FALL TIME = 40 ps.

Figure 5. E2580xx Eye Pattern (Example)

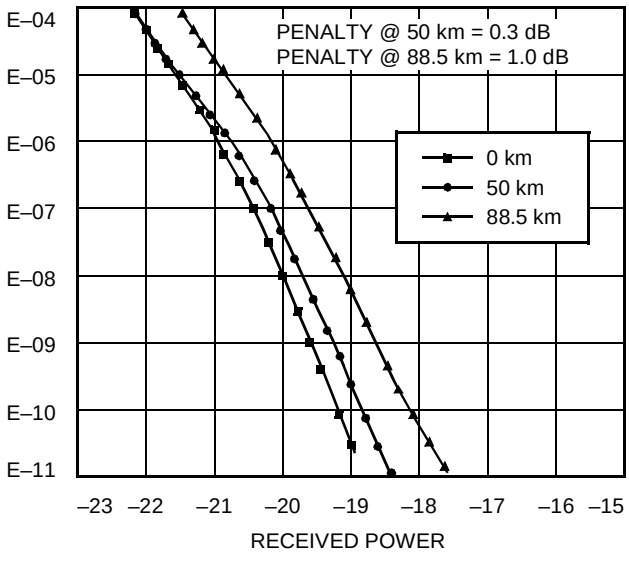

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Figure 6. E2581xx BER Performance (Example)

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