

EVALUATION KIT
AVAILABLE**MAXIM****+3.3V, 622Mbps SDH/SONET
Laser Driver with Current Monitors and APC****MAX3663****General Description**

The MAX3663 is a complete, +3.3V laser driver with automatic power-control (APC) circuitry for SDH/SONET applications up to 622Mbps. It accepts differential PECL inputs, provides bias and modulation currents, and operates over a -40°C to +85°C temperature range.

An APC feedback loop is incorporated to maintain a constant average optical power over temperature and lifetime. The wide modulation current range from 5mA to 75mA and bias current of 1mA to 80mA are easy to program, making this product ideal for use in various SDH/SONET applications. Two pins are provided to monitor the current levels in the laser: BIASMON with current proportional to laser bias current, and MODMON with current proportional to laser modulation.

The MAX3663 also provides enable control and a failure-monitor output to indicate when the APC loop is unable to maintain the average optical power. The MAX3663 is available in a compact 4mm x 4mm 24-pin thin QFN package.

Applications

622Mbps SDH/SONET Access Nodes
Laser Driver Transmitters
Section Regenerators
FTTH/FTTC Applications

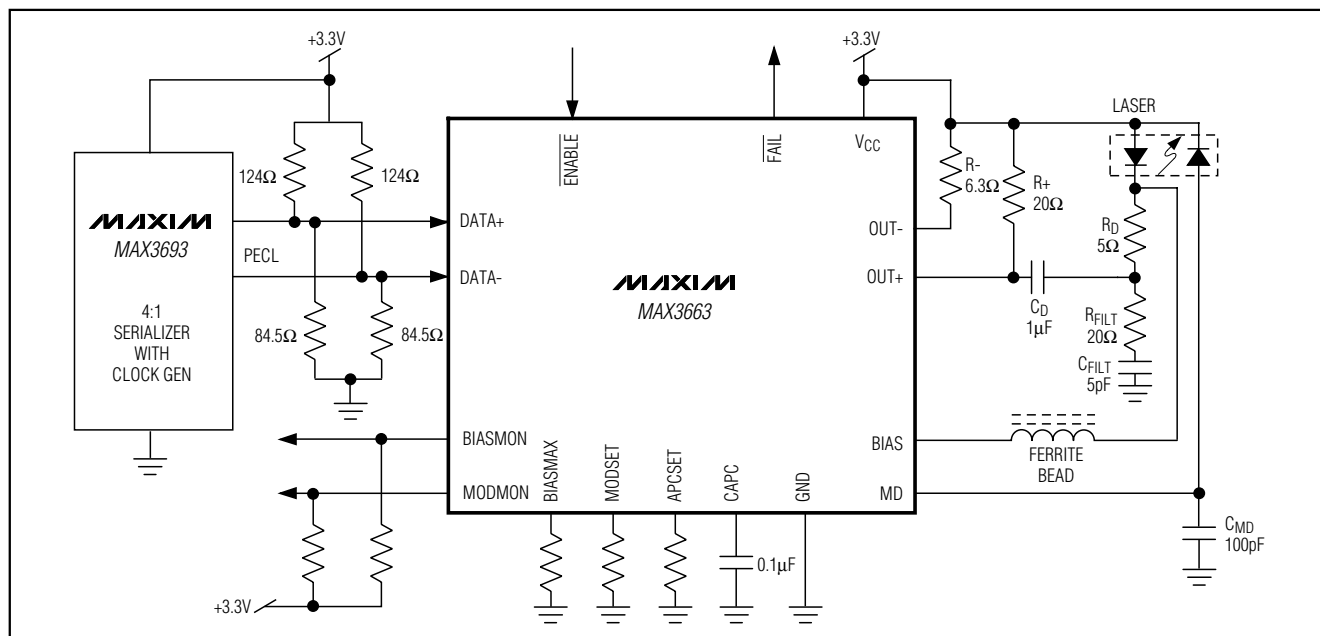
Features

- ◆ +3.3V or +5.0V Single-Supply Operation
- ◆ 40mA Supply Current at +3.3V
- ◆ Programmable Bias Current from 1mA to 80mA
- ◆ Programmable Modulation Current from 5mA to 75mA
- ◆ Bias Current and Modulation Current Monitors
- ◆ 200ps Rise/Fall Time
- ◆ Automatic Average Power Control with Failure Monitor
- ◆ Complies with ANSI, ITU, and Bellcore SONET/SDH Specifications
- ◆ Enable Control

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX3663ETG	-40°C to +85°C	24 Thin QFN (4mm x 4mm)

Pin Configuration appears at end of data sheet.

Typical Application Circuit**MAXIM**

Maxim Integrated Products 1

For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} -0.5V to +7.0V
 Current into BIAS -20mA to +150mA
 Current into OUT+, OUT- -20mA to +100mA
 Current into MD -5mA to +5mA
 Voltage at DATA+, DATA-, ENABLE,
 FAIL, BIASMON, MODMON -0.5V to ($V_{CC} + 0.5V$)
 Voltage at OUT+, OUT- +1.5V to ($V_{CC} + 1.5V$)
 Voltage at MODSET, APCSET, BIASMAX,
 CAPC -0.5V to +3.0V

Voltage at BIAS +1.0V to ($V_{CC} + 0.5V$)
 Continuous Power Dissipation ($T_A = +85^\circ\text{C}$)
 24-Lead Thin QFN
 (derate 20.8mW/ $^\circ\text{C}$ above $+85^\circ\text{C}$) 1354mW
 Operating Junction Temperature Range -55°C to $+150^\circ\text{C}$
 Processing Temperature (Die) $+400^\circ\text{C}$
 Storage Temperature Range -65°C to $+165^\circ\text{C}$
 Lead Temperature (soldering, 10s) $+300^\circ\text{C}$

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

($V_{CC} = +3.14V$ to $+5.5V$, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, unless otherwise noted. Typical values are at $V_{CC} = +3.3V$, $T_A = +25^\circ\text{C}$.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Current		(Note 1)			40	60	mA
Bias Current Range	I_{BIAS}	$V_{BIAS} = V_{CC} - 1.6V$		1		80	mA
Bias Off Current		$\overline{ENABLE} = \text{high}$ (Note 2)				100	μA
Bias Current Stability		APC open loop	$I_{BIAS} = 80\text{mA}$		255		ppm/ $^\circ\text{C}$
			$I_{BIAS} = 1\text{mA}$		815		
Bias Current Absolute Accuracy		APC open loop, $3\text{mA} \leq I_{BIAS} \leq 80\text{mA}$		-15		+15	%
Differential Input Voltage	V_{ID}	Figure 1		200		1600	mV _{P-P}
Common-Mode Input Voltage	V_{ICM}	PECL compatible (Table 2)		$V_{CC} - 1.49$	$V_{CC} - 1.32$	$V_{CC} - V_{ID}/4$	V
DATA+, DATA- Input Current	I_{IN}			-1		+10	μA
Monitor Diode Current Stability		(Note 3)	$I_{MD} = 1\text{mA}$	-480	-50	+480	ppm/ $^\circ\text{C}$
			$I_{MD} = 18\mu\text{A}$ (Note 4)		35		
Monitor Diode Current Absolute Accuracy				-15		+15	%
DC Monitor Diode Current	I_{MD}			18		1000	μA
BIASMON to I_{BIAS} Gain	A_{BIAS}	$I_{BIAS}/I_{BIASMON}$			38		mA/mA
MODMON to I_{MOD} Gain	A_{MOD}	I_{MOD}/I_{MODMON}			29		mA/mA
Monitor Diode Input Voltage (MD Pin)	V_{MD}				0.8		V
TTL Input High Voltage	V_{IH}			2			V
TTL Input Low Voltage	V_{IL}					0.8	V
TTL Output High Voltage (FAIL)	V_{OH}	Sourcing $50\mu\text{A}$		2.4	$V_{CC} - 0.3$	V_{CC}	V
TTL Output Low Voltage (FAIL)	V_{OL}	Sinking $100\mu\text{A}$		0.1		0.44	V

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

MAX3663

AC ELECTRICAL CHARACTERISTICS

($V_{CC} = +3.14V$ to $+5.5V$, load as shown in Figure 2, $T_A = -40^{\circ}C$ to $+85^{\circ}C$, unless otherwise noted. Typical values are at $V_{CC} = +3.3V$, $T_A = +25^{\circ}C$.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Modulation Current Range	I_{MOD}	(Note 6)	5		75	mA
Modulation Off-Current		$\overline{ENABLE} = \text{high}$ (Note 2)			200	μA
Modulation Current Stability		$I_{MOD} = 75mA$	-620	-165	+620	ppm/ $^{\circ}C$
		$I_{MOD} = 5mA$ (Note 4)		205		
Modulation Current Absolute Accuracy			-15		+15	%
Output Rise/Fall Time	t_R, t_F	20% to 80%, $R_L = 10\Omega \parallel 20\Omega$ load		100	200	ps
				230	375	
Jitter Generation (Peak-to-Peak)		(Note 7)			100	ps
Pulse-Width Distortion (Peak-to-Peak)		(Notes 8, 9)		70	155	ps
				10	135	
Enable/Startup Delay		Open loop		250		ns
Maximum Consecutive Identical Digits at 622Mbps	CID		80			Bits

Note 1: Tested with $R_{MODSET} = 5.11k\Omega$ ($I_{MOD} \approx 38mA$), $R_{BIASMAX} = 4.56k\Omega$ ($I_{BIAS} \approx 52mA$), excluding I_{BIAS} and I_{MOD} .

Note 2: Both the bias and modulation currents are disabled if any of the current set pins are shorted to ground.

Note 3: Guaranteed by design and characterization. This assumes that the laser to monitor diode transfer function does not change with temperature.

Note 4: See the *Typical Operating Characteristics* for worst-case distributions.

Note 5: AC characteristics are guaranteed by design and characterization.

Note 6: Total I_{MOD} out of $OUT+$. See the *Design Procedure* section for information regarding current delivered to the laser.

Note 7: Input signal is a 622Mbps, $2^{13} - 1$ PRBS with eighty inserted 0s.

Note 8: Input signal is a 622Mbps, 11110000 pattern.

Note 9: $PWD = (\text{wider pulse} - \text{narrower pulse}) / 2$.

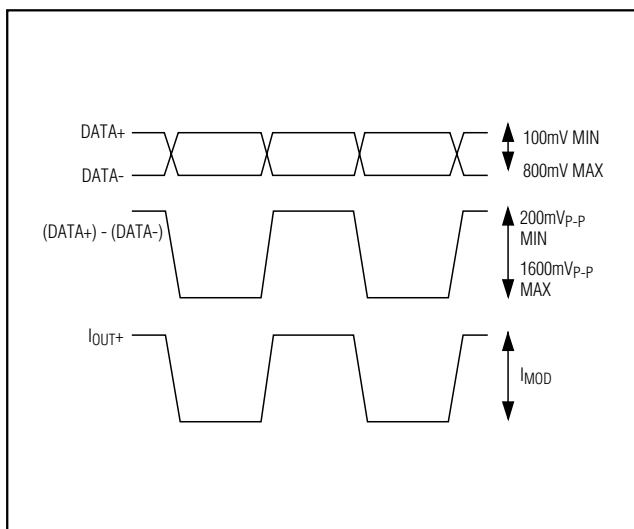


Figure 1. Required Input Signal and Output Polarity

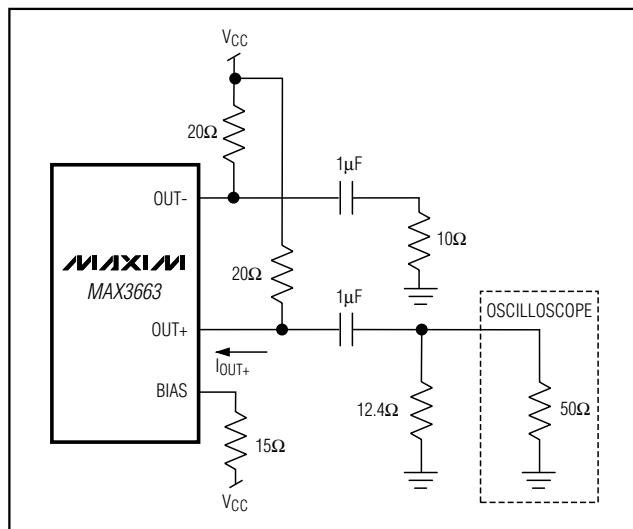


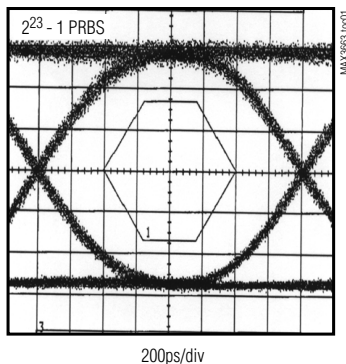
Figure 2. Output Termination for Characterization

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

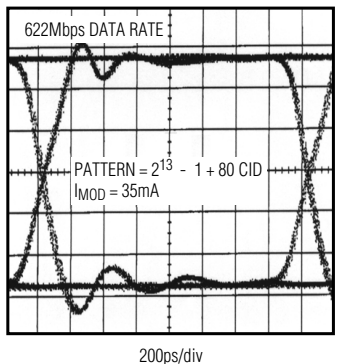
Typical Operating Characteristics

($V_{CC} = +3.3V$, $T_A = +25^\circ C$, unless otherwise noted.)

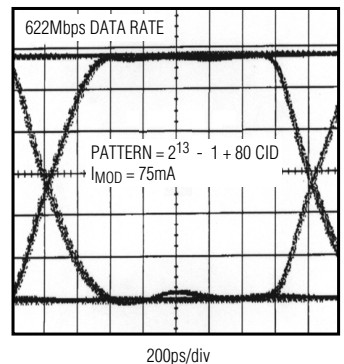
**EYE DIAGRAM
(622Mbps, 1300nm LASER
WITH 467MHz FILTER)**



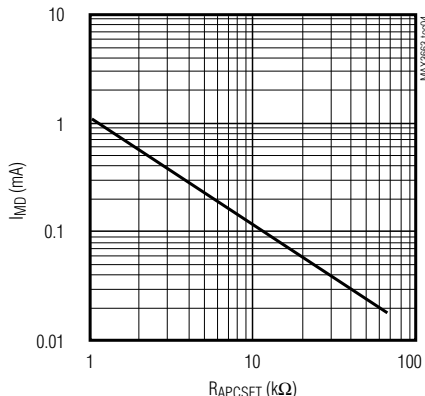
**ELECTRICAL EYE DIAGRAM
($I_{MOD} = 35mA$)**



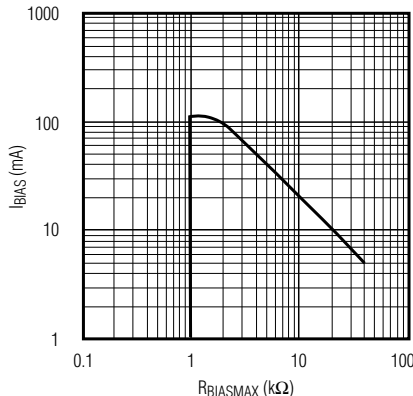
**ELECTRICAL EYE DIAGRAM
($I_{MOD} = 75mA$)**



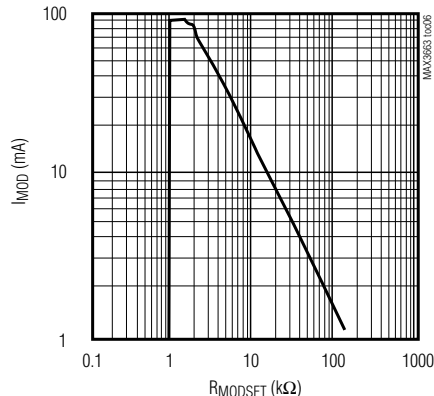
**MONITOR DIODE CURRENT
vs. APC SET RESISTOR**



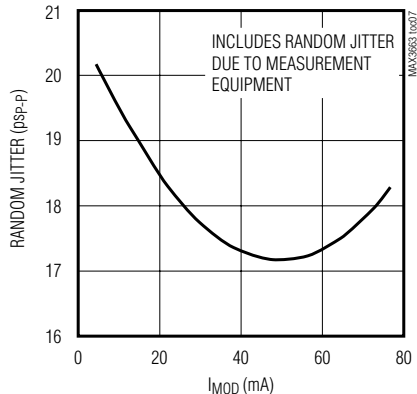
**BIAS CURRENT
vs. MAXIMUM BIAS SET RESISTOR**



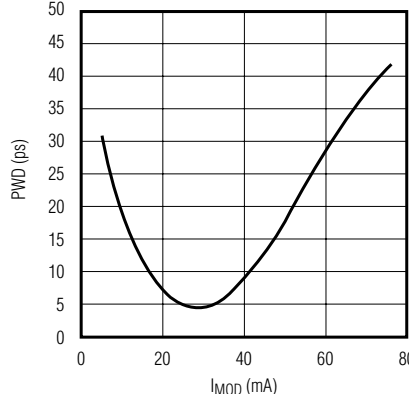
**MODULATION CURRENT
vs. MODULATION SET RESISTOR**



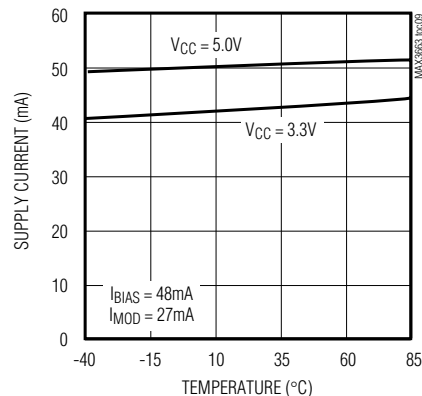
**RANDOM JITTER
vs. MODULATION CURRENT**



**PULSE-WIDTH DISTORTION
vs. MODULATION CURRENT**



**SUPPLY CURRENT
vs. TEMPERATURE**



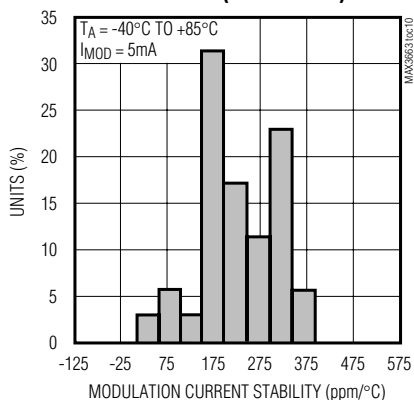
+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

Typical Operating Characteristics (continued)

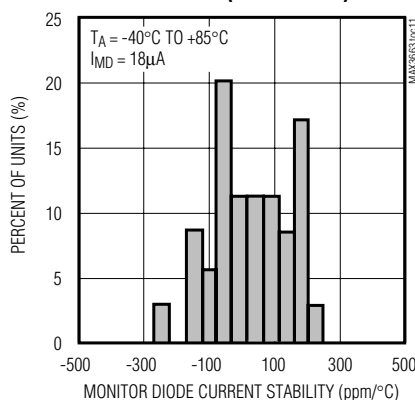
(VCC = +3.3V, T_A = +25°C, unless otherwise noted.)

MAX3663

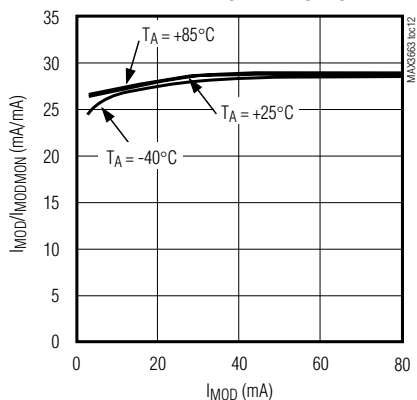
**DISTRIBUTION OF MODULATION CURRENT
STABILITY (WORST CASE)**



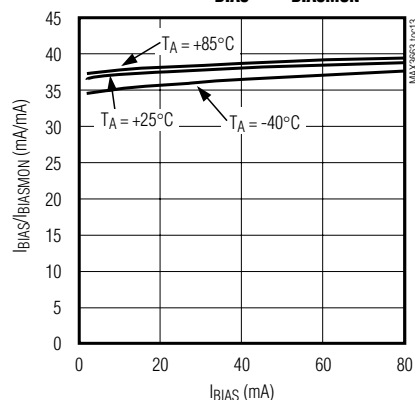
**DISTRIBUTION OF MONITOR DIODE CURRENT
STABILITY (WORST CASE)**



RATIO OF I_{MOD} vs. I_{MODMON}



RATIO OF I_{BIAS} vs. I_{BIASMON}



+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

Pin Description

PIN	NAME	FUNCTION
1, 13, 16, 19	VCC	Positive Supply Voltage
2	DATA+	Positive PECL Data Input
3	DATA-	Negative PECL Data Input
4, 8, 11, 17, 22	GND	Ground
5	BIASMON	Sink Current Source. Proportional to the laser bias current.
6	MODMON	Sink Current Source. Proportional to the laser modulation current.
7	$\overline{\text{ENABLE}}$	TTL/CMOS Enable Input. Low for normal operation, high to disable laser bias and modulation currents. Internally pulled low.
9	$\overline{\text{FAIL}}$	TTL Output. Indicates APC failure when low. Internally pulled high through a 6k Ω resistor.
10	N.C.	No Connection. Leave unconnected.
12	BIAS	Laser Bias Current Output. Isolate from laser with a ferrite bead.
14	OUT+	Positive Modulation Current Output. I _{MOD} flows into this pad when the input signal is high. Connect this pad to AC-coupling network.
15	OUT-	Negative Modulation Current Output. I _{MOD} flows into this pad when the input signal is low. Connect this pad to VCC through a 6.3 Ω resistor.
18	MD	Monitor Photodiode Connection. Connect this pad to the monitor photodiode anode. A capacitor to ground is required to filter high-speed AC monitor photocurrent.
20	CAPC	APC Compensation Capacitor. A 0.1 μ F capacitor connected from this pad to ground controls the dominant pole of the APC feedback loop.
21	APCSET	APC Set Resistor. A resistor connected from this pad to ground sets the desired average optical power. The resulting current is equal to the desired DC monitor diode current. Connect a 100k Ω resistor from this pad to ground if APC is not used.
23	MODSET	Modulation Set Resistor. A resistor from this pad to ground sets the laser modulation current.
24	BIASMAX	Maximum Bias Set Resistor. A resistor from this pad to ground sets the maximum laser bias current. The APC function can subtract from this maximum value but cannot add to it. This resistor controls the bias-current level when the APC loop is not used.
EP	Exposed Paddle	The exposed paddle must be soldered to ground.

MAX3663



At a 622Mbps data rate, any capacitive load at the cathode of a laser diode degrades the optical output performance. Since the BIAS output is directly connected to the laser cathode, minimize the parasitic capacitance associated with this pin by using an inductor to isolate the BIAS pin from the laser diode.

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

Automatic Power Control

To maintain constant average optical power, the MAX3663 incorporates an APC loop to compensate for the changes in laser threshold current over temperature and lifetime. A back-facet photodiode mounted in the laser package is used to convert the optical power into a photocurrent. The APC loop adjusts the laser bias current so the monitor current is matched to a reference current set by RAPCSET. The time constant of the APC loop is determined by an external capacitor (CAPC). To eliminate the pattern-dependent jitter associated with the APC loop-time constant and to guarantee loop stability, the recommended value for CAPC is 0.1μF.

When the APC loop is functioning, the maximum allowable bias current is set by an external resistor, RBIASMAX. An APC failure flag (FAIL) is set low when the bias current can no longer be adjusted to achieve the desired average optical power.

APC closed-loop operation requires the user to set three currents with external resistors connected between ground and BIASMAX, MODSET, and APCSET. Detailed guidelines for these resistor settings are described in the *Design Procedure* section.

Bias and Modulation Monitors

The MAX3663 includes pins to monitor the output levels of bias and modulation current. BIASMON and MODMON sink current proportional to laser bias current and modulation current, respectively. By monitoring the current through RMODMON and RBIASMON, it is possible to monitor the levels of bias and modulation current in the laser (Figure 3).

Open-Loop Operation

If necessary, the MAX3663 is fully operational without APC. In this case, the laser current is directly set by two external resistors connected from ground to BIASMAX and MODSET. Connect a 100kΩ resistor from APCSET to ground and leave MD open for open-loop operation.

Table 1. Optical Power Definition

PARAMETER	SYMBOL	RELATION
Average Power	PAVG	$P_{AVG} = (P_0 + P_1) / 2$
Extinction Ratio	r_e	$r_e = P_1 / P_0$
Optical Power High	P ₁	$P_1 = 2P_{AVG} \times r_e / (r_e + 1)$
Optical Power Low	P ₀	$P_0 = 2P_{AVG} / (r_e + 1)$
Optical Amplitude	PP-P	$PP-P = 2P_{AVG} (r_e - 1) / (r_e + 1)$
Laser Slope Efficiency	η	$\eta = PP-P / I_{MODL}$
Laser Modulation Current	I _{MOD}	$I_{MODL} = PP-P / \eta$

Enable Control

The MAX3663 incorporates a laser driver enable function. When ENABLE is high, both the bias and modulation currents are off. The typical laser enable time is 250ns.

APC Failure Monitor

The MAX3663 provides an APC failure monitor (TTL/CMOS) to indicate an APC loop tracking failure. FAIL is set low when the APC loop can no longer adjust the bias current to maintain the desired monitor current. This output is internally pulled up to VCC through a 6kΩ resistor.

Short-Circuit Protection

The MAX3663 provides short-circuit protection for the modulation, bias, and monitor current sources. If either BIASMAX, MODSET, or APCSET is shorted to ground, the bias and modulation outputs turn off.

Design Procedure

When designing a laser transmitter, the optical output is usually expressed in terms of average power and extinction ratio. Table 1 gives the relationships that are helpful in converting between the optical average power and the modulation current. These relationships are valid if the average duty cycle of the optical waveform is 50%.

Programming the Modulation Current

In addition to being a function of RMODSET, the modulation current delivered to the laser (IMODL) also depends on the values of the series damping resistor (RD), the shunt compensation resistance (RFILT), and the laser diode's resistance (see the *Typical Operating Circuit*).

The modulation current (assuming CFILT << CD) into the laser diode can be represented by the following:

$$I_{MODL} = I_{MOD} \left[\frac{20\Omega}{20\Omega + (R_D + r_{LASER})} \right]$$

Assuming RD = 5Ω and rLASER = 5Ω, this equation is simplified to:

$$I_{MODL} = I_{MOD}(0.67)$$

For RD = 5.0Ω and a laser resistance of approximately 5Ω, see the Modulation Current vs. Modulation Set Resistor graph in the *Typical Operating Characteristics* and select the value of RMODSET that corresponds to the required current at +25°C.

Programming the Bias Current

When using the MAX3663 in open-loop operation, the bias current is determined by the RBIASMAX resistor. To select this resistor, determine the required bias current at +25°C. See the Bias Current vs. Maximum Bias Set

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

Resistor graph in the *Typical Operating Characteristics* and select the value of $R_{BIASMAX}$ that corresponds to the required current at +25°C.

When using the MAX3663 in closed-loop operation, the $R_{BIASMAX}$ resistor sets the maximum bias current available to the laser diode over temperature and life. The APC loop can subtract from this maximum value but cannot add to it. See the Bias Current vs. Maximum Bias Set Resistor graph in the *Typical Operating Characteristics* and select the value of $R_{BIASMAX}$ that corresponds to the end-of-life bias current at +85°C.

Programming the APC Loop

When the MAX3663's APC feature is used, program the average optical power by adjusting the APCSET resistor. To select this resistor, determine the desired monitor current to be maintained over temperature and life. See the Monitor Diode Current vs. APC Set Resistor graph in the *Typical Operating Characteristics* and select the value of R_{APCSET} that corresponds to the required current.

Interfacing with the Laser Diode

To minimize optical output aberrations due to the laser parasitic inductance, an RC shunt network can be used (see the *Typical Operating Circuit*). If R_L represents the laser diode resistance, the recommended total resistance for $R_D + R_L$ is 10Ω. Starting values for coaxial lasers are $R_{FILT} = 20\Omega$ and $C_{FILT} = 5pF$. R_{FILT} and C_{FILT} should be experimentally adjusted to optimize the output waveform. A bypass capacitor should also be placed as close to the laser anode as possible for best performance.

Pattern-Dependent Jitter (PDJ)

When transmitting NRZ data with long strings of consecutive identical digits (CIDs), LF droop can contribute to PDJ. To minimize this PDJ, two external components must be properly chosen: capacitor C_{APC} , which dominates the APC loop time constant, and AC-coupling capacitor C_D .

To filter out noise effects and guarantee loop stability, the recommended value for C_{APC} is 0.1μF. This results

in an APC loop bandwidth of 20kHz. Consequently, the PDJ associated with an APC loop time constant can be ignored.

The time constant associated with the DC-blocking capacitor on I_{MOD} effects PDJ. It is important that this time constant produce minimum droop for long consecutive bit streams.

Referring to Figure 4, the droop resulting from long time periods without transitions can be represented by the following equation:

$$(100\% - \text{DROOP}) = e^{-\frac{t}{\tau}}$$

AC-coupling of I_{MOD} results in a discharge level for τ that is equal to P_{AVG} . An overall droop of 6% relative to PP-P equates to a 12% droop relative to P_{AVG} . To ensure a droop of less than 12% (6% relative to PP-P), this equation can be solved for τ as follows:

$$\tau = \frac{-t}{\ln(1 - 0.12)} = 7.8t$$

If t_1 equals 80 consecutive unit intervals without a transition, the time constant associated with the DC blocking capacitor needs to be longer than:

$$\tau_{AC} \geq R_{AC}C_D = 7.8 (80 \text{ bits}) (1.6\text{ns/bit}) = 1.0\mu\text{s}$$

R_{FILT} can be ignored for $C_{FILT} \ll C_D$; therefore, the estimated value of R_{AC} is:

$$R_{AC} = 20\Omega \parallel (R_D + r_{LASER})$$

Assuming $R_D = 5\Omega$, and $r_{LASER} = 5\Omega$:

$$R_{AC} = 6.7\Omega$$

with $C_D = 1\mu\text{F}$, $\tau_{AC} = 6.7\mu\text{s}$.

Input Termination Requirement

The MAX3663 data inputs are PECL compatible (Table 2). However, it is not necessary to drive the MAX3663 with a standard PECL signal. As long as the specified common-mode voltage and differential voltage swings are met, the MAX3663 will operate properly.

Table 2. PECL-Compatible Input Voltage Range

PECL-COMPATIBLE INPUTS (DATA+, DATA-)	SYMBOL	VICM = V _{CC} - 1.0		VICM = V _{CC} - 1.32V		VICM = V _{CC} - 1.4		UNITS
		MIN	MAX	MIN	MAX	MIN	MAX	
Input High Voltage	VH	V _{CC} - 0.95	V _{CC} - 0.60	V _{CC} - 1.27	V _{CC} - 0.92	V _{CC} - 1.35	V _{CC} - 1.00	V
Input Low Voltage	VL	V _{CC} - 1.40	V _{CC} - 1.05	V _{CC} - 1.72	V _{CC} - 1.37	V _{CC} - 1.80	V _{CC} - 1.45	V

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

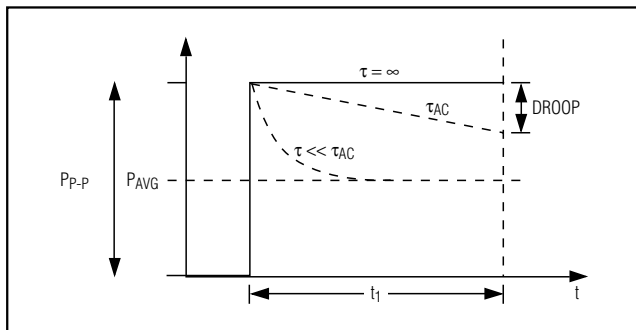


Figure 4. DROOP

Calculate Power Consumption

The total power dissipation of the MAX3663 can be estimated by the following:

$$P = V_{CC} \times I_{CC} + (V_{CC} - V_f) \times I_{BIAS} + I_{MOD} (V_{CC} - 20\Omega \times I_{MOD} / 2)$$

where I_{BIAS} is the maximum bias current set by $R_{BIASMAX}$, I_{MOD} is the modulation current, and V_f is the typical laser forward voltage.

Applications Information

The following is an example of how to set up the MAX3663.

Select Laser

A communication-grade laser should be selected for 622Mbps applications. Assume the laser output average power is $P_{AVG} = 0\text{dBm}$, the minimum extinction ratio is $r_e = 6.6$ (8.2dB), the operating temperature is -40°C to $+85^\circ\text{C}$, and the laser diode has the following characteristics:

Wavelength:	$\lambda = 1.3\mu\text{m}$
Threshold Current:	$I_{TH} = 22\text{mA}$ at $+25^\circ\text{C}$
Threshold Temperature Coefficient:	$\beta_{TH} = 1.3\%/^\circ\text{C}$
Laser to Monitor Transfer:	$\rho_{MON} = 0.2\text{A/W}$
Laser Slope Efficiency:	$\eta = 0.05\text{mW/mA}$ at $+25^\circ\text{C}$

Determine R_{APCSET}

The desired monitor diode current is estimated by $I_{MD} = P_{AVG} \times \rho_{MON} = 200\mu\text{A}$. The Monitor Diode Current vs. APC Set Resistor graph in the *Typical Operating Characteristics* shows that R_{APCSET} should be $6\text{k}\Omega$.

Determine R_{MODSET}

To achieve a minimum extinction ratio (r_e) of 6.6dB over temperature and lifetime, calculate the required extinction ratio at $+25^\circ\text{C}$. Assuming $r_e = 20$, the peak-to-peak optical power $P_{P-P} = 1.81\text{mW}$, according to Table 1. The required modulation current is $1.81(\text{mW}) / 0.05(\text{mW/mA}) = 36.2\text{mA}$. The Modulation Current vs. Modulation Set Resistor graph (see *Typical Operating Characteristics*) shows that R_{MODSET} should be $5\text{k}\Omega$.

Determine $R_{BIASMAX}$

Calculate the maximum threshold current ($I_{TH(MAX)}$) at $T_A = +85^\circ\text{C}$ and end of life. Assuming $I_{TH(MAX)} = 50\text{mA}$, the maximum bias current should be:

$$I_{BIAS} = I_{TH(MAX)} + I_{MOD} / 2$$

In this example, $I_{BIAS} = 68.1\text{mA}$. The Bias Current vs. Maximum Bias Set Resistor graph in the *Typical Operating Characteristics* shows that $R_{BIASMAX}$ should be $3\text{k}\Omega$.

Determine $R_{BIASMON}$

To avoid saturating the current mirror of $BIASMON$, the voltage at this pin should not drop below $(V_{CC} - 1.6\text{V})$. The resulting condition is:

$$R_{BIASMON} \leq 1.6V \left(\frac{A_{BIAS}}{I_{BIASMAX}} \right)$$

where $I_{BIASMAX}$ is the maximum current expected for the application.

Determine R_{MODMON}

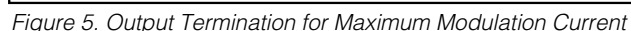
To avoid saturating the current mirror of $MODMON$, the voltage at this pin should not drop below $(V_{CC} - 1\text{V})$. The resulting condition is:

$$R_{MODMON} \leq 1V \left(\frac{A_{MOD}}{I_{MOD}} \right)$$

Modulation Currents Exceeding 50mA

To drive modulation currents greater than 50mA at 3.3V, external pullup inductors (Figure 5) should be used to DC-bias the modulation output at V_{CC} . Such a configuration isolates the laser forward voltage from the output circuitry and allows the output at $OUT+$ to swing above and below the supply voltage V_{CC} .

MAX 3663



Wire Bonding Die

Layout Considerations

Laser Safety and IEC 825

Using the MAX3663 laser driver alone does not ensure that a transmitter design is compliant with IEC 825. The entire transmitter circuit and component selections must be considered. Customers must determine the level of fault tolerance required by their application, recognizing that Maxim products are not designed or authorized for use as components in systems intended for surgical implant into the body, for applications intended to support or sustain life, or for any other application where the failure of a Maxim product could create a situation where personal injury or death may occur.

TOP VIEW

Pin Configuration (Top View):

- Top Pins (Left to Right): 24 BIASMAX, 23 MODSET, 22 GND, 21 APCSET, 20 CAPC, 19 VCC
- Right Pins (Top to Bottom): 18 MD, 17 GND, 16 VCC, 15 OUT-, 14 OUT+, 13 VCC
- Bottom Pins (Right to Left): 12 BIAS, 11 GND, 10 N.C., 9 FAIL, 8 GND, 7 ENABLE
- Left Pins (Bottom to Top): 6 MODMON, 5 BIASMON, 4 GND, 3 DATA-, 2 DATA+, 1 VCC

MAXIM
MAX3663

THIN QFN

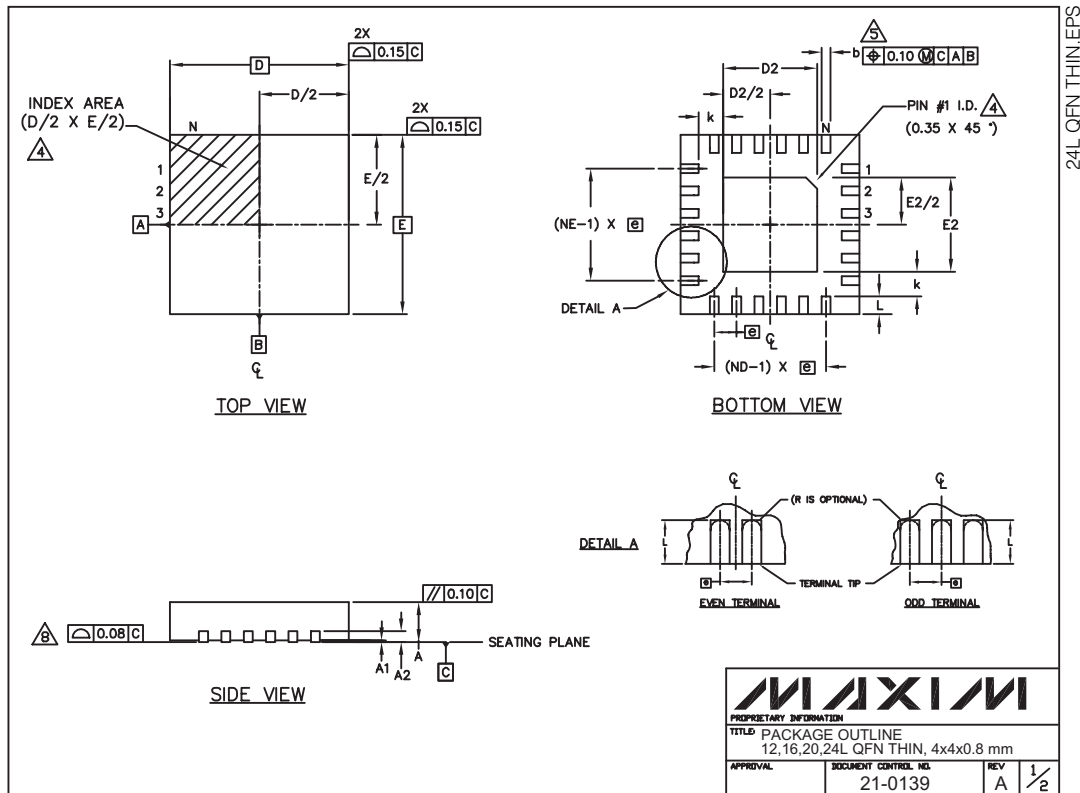
TRANSISTOR COUNT: 1525

SUBSTRATE CONNECTED TO GND

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to www.maxim-ic.com/packages.)



24L QFN THIN EPS

+3.3V, 622Mbps SDH/SONET Laser Driver with Current Monitors and APC

Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to www.maxim-ic.com/packages.)

MAX3663

COMMON DIMENSIONS												
PKG	12L 4x4			16L 4x4			20L 4x4			24L 4x4		
REF.	MIN.	NDM.	MAX.	MIN.	NDM.	MAX.	MIN.	NDM.	MAX.	MIN.	NDM.	MAX.
A	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80
A1	0.0	0.02	0.05	0.0	0.02	0.05	0.0	0.02	0.05	0.0	0.02	0.05
A2	0.20 REF			0.20 REF			0.20 REF			0.20 REF		
b	0.25	0.30	0.35	0.25	0.30	0.35	0.20	0.25	0.30	0.18	0.23	0.30
D	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10
E	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10	3.90	4.00	4.10
e	0.80 BSC.			0.65 BSC.			0.50 BSC.			0.50 BSC.		
k	0.25	—	—	0.25	—	—	0.25	—	—	0.25	—	—
L	0.45	0.55	0.65	0.45	0.55	0.65	0.45	0.55	0.65	0.30	0.40	0.50
N	12			16			20			24		
ND	3			4			5			6		
NE	3			4			5			6		
JeDEC	VGGB			VGGC			WGGD-1			WGGD-2		

EXPOSED PAD VARIATIONS						
PKG. CODES	D2			E2		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
T1244-2	1.95	2.10	2.25	1.95	2.10	2.25
T1644-2	1.95	2.10	2.25	1.95	2.10	2.25
T2044-1	1.95	2.10	2.25	1.95	2.10	2.25
T2444-1	2.45	2.60	2.63	2.45	2.60	2.63

NOTES:

- DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
- N IS THE TOTAL NUMBER OF TERMINALS.
- THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEDEC 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.
- DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.
- ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.
- DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.
- COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.
- DRAWING CONFORMS TO JEDEC MO220.

MAXIM	
PROPRIETARY INFORMATION	
TITLE PACKAGE OUTLINE	
12,16,20,24L QFN THIN, 4x4x0.8 mm	
APPROVAL	DOCUMENT CONTROL NO.
	21-0139
REV	2/2

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