General Description

The MAX3658 is a transimpedance preamplifier for receivers operating up to 622Mbps. Low noise, high gain, and low power dissipation make it ideal for fiber access and small form-factor transceivers.

The MAX3658 features 45nA input-referred noise, 18kΩ transimpedance gain, 580MHz bandwidth, and 2mA p-p input overload. Operating from a +3.3V supply, the MAX3658 consumes only 66mW. An integrated filter resistor provides positive bias for the photodiode. These features, combined with a small die size, allow easy assembly into a TO-46 header with a photodiode. The MAX3658 also includes an average photocurrent monitor.

The MAX3658 has typical optical sensitivity of -33dBm (0.9A/W), which exceeds the class-B APON requirements. Typical optical overload is 1dBm. The MAX3658 is available in die form with both output polarities (MAX3658A and MAX3658B). The MAX3658A is also available in a 3mm x 3mm 8-pin TDFN package.

Features

- 45nARMS Noise, -33dBm Sensitivity
- 18.3kΩ Transimpedance Gain
- 580MHz Bandwidth
- 2mA p-p Input Overload, 1dBm Overload
- 66mW Power Dissipation
- 3.3V Operation
- Average Photocurrent Monitor

Ordering Information

<table>
<thead>
<tr>
<th>PART</th>
<th>TEMP RANGE</th>
<th>PIN-PACKAGE</th>
<th>PKG CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX3658AETA</td>
<td>-40°C to +85°C</td>
<td>8 TDFN (3mm x 3mm)</td>
<td>T833-3</td>
</tr>
<tr>
<td>MAX3658AETA+</td>
<td>-40°C to +85°C</td>
<td>8 TDFN (3mm x 3mm)</td>
<td>T833-3</td>
</tr>
<tr>
<td>MAX3658AE/D</td>
<td>—</td>
<td>Dice*</td>
<td>—</td>
</tr>
<tr>
<td>MAX3658BE/D</td>
<td>—</td>
<td>Dice*</td>
<td>—</td>
</tr>
</tbody>
</table>

*Denotes lead-free package.

Applications

- Optical Receivers (Up to 622Mbps Operation)
- Passive Optical Networks
- SFF/SFP Transceivers
- FTTx Transceivers

Pin Configuration appears at end of data sheet.
MAX3658

622Mbps, Low-Noise, High-Gain Transimpedance Preamplifier

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (VCC) ...................................................-0.5V to +4.2V
Current into IN ................................................................ 0.5mA
Voltage at OUT+, OUT- .................(VCC - 1.2V) to (VCC + 0.5V)
Voltage FILT, MON ... .......................................0.5V to (VCC + 0.5V)
Continuous Power Dissipation (TA = +85°C) .... 1951.2mW
8-Lead TDFN (derate 24.4mW/°C above +85°C) ...... 1951.2mW

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

(VCC = +2.97V to +3.63V, 150Ω load between OUT+ and OUT-, Tj = -40°C to +100°C. Typical values are at VCC = +3.3V and TA = +25°C, unless otherwise noted.)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current</td>
<td>Icc</td>
<td></td>
<td>20</td>
<td>26</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Input Bias Voltage</td>
<td>VIn</td>
<td>IIn = 1µA</td>
<td>0.83</td>
<td>1.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Transimpedance Linear Range</td>
<td>Z21</td>
<td></td>
<td>15.7</td>
<td>18.3</td>
<td>20.9</td>
<td>kΩ</td>
</tr>
<tr>
<td>Output Common-Mode Voltage</td>
<td>VOUT</td>
<td>AC-coupled output</td>
<td>VCC - 0.125</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Output Offset</td>
<td>VOUT</td>
<td>IIn = 1.3mA</td>
<td>±2</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Op-amp Impedance</td>
<td>ZOUT</td>
<td>Single ended</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>Ω</td>
</tr>
<tr>
<td>Maximum Output Voltage</td>
<td>VOUT(MAX)</td>
<td>IIn = 2µAP-P</td>
<td>150</td>
<td>240</td>
<td>400</td>
<td>mVp-p</td>
</tr>
<tr>
<td>Filter Resistor</td>
<td>Rfilt</td>
<td>IIn = 1.3mA</td>
<td>300</td>
<td>500</td>
<td>700</td>
<td>kΩ</td>
</tr>
<tr>
<td>Offset-Correction Disable Threshold</td>
<td>FILT</td>
<td>Voltage applied at FILT</td>
<td>0.4</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Resistance</td>
<td>FILT = 0V</td>
<td></td>
<td>400</td>
<td>Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal MON Current Gain</td>
<td>GMON</td>
<td></td>
<td>0.8</td>
<td>1</td>
<td>1.2</td>
<td>A/A</td>
</tr>
<tr>
<td>MON Output Voltage Range</td>
<td>VMON</td>
<td></td>
<td>0</td>
<td>2.2</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>MON Accuracy (Note 1)</td>
<td></td>
<td></td>
<td>1µA ≤ IIn &lt; 2µA</td>
<td>-2.5</td>
<td>+2.5</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2µA ≤ IIn &lt; 5µA</td>
<td>-2</td>
<td>+2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5µA ≤ IIn &lt; 1mA</td>
<td>-1.5</td>
<td>+1.5</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Accuracy is defined as 10log(I MON / I IN).

Note 2: Accuracy is defined as 10log(I MON / I IN).
# 622Mbps, Low-Noise, High-Gain Transimpedance Preamplifier

**AC ELECTRICAL CHARACTERISTICS**

(VCC = +2.97V to +3.63V, 150Ω load between OUT+ and OUT-, CIN = 0.5pF total, CFRIL = 400pF, CVCC2 = 1nF, TJ = -40°C to +100°C, TA = -40°C to +85°C. Typical values are at VCC = +3.3V and TA = +25°C, unless otherwise noted. AC characteristics are guaranteed by design and characterization.)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>BW</td>
<td>(Note 2)</td>
<td>435</td>
<td>580</td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td>Input-Referred Noise</td>
<td>( i_n )</td>
<td>BW = 467MHz</td>
<td>45</td>
<td>55</td>
<td></td>
<td>nARMS</td>
</tr>
<tr>
<td>Noise Density</td>
<td></td>
<td>BW = 467MHz</td>
<td>2.1</td>
<td></td>
<td></td>
<td>pA/√Hz</td>
</tr>
<tr>
<td>Low-Frequency Cutoff</td>
<td></td>
<td>IN = 1( \mu )A</td>
<td>30</td>
<td></td>
<td></td>
<td>kHz</td>
</tr>
<tr>
<td>Deterministic Jitter (Note 3)</td>
<td>DJ</td>
<td>( 2\mu A _P _P \leq i_n &lt; 10\mu A _P _P )</td>
<td>150</td>
<td></td>
<td>260</td>
<td>ps-P</td>
</tr>
<tr>
<td>Optical Overload</td>
<td>PIN(MAX)</td>
<td>1.0A/W photodiode at 622 Mbps</td>
<td>+1</td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>Optical Sensitivity</td>
<td>PIN(MIN)</td>
<td>0.9A/W photodiode at 155 Mbps</td>
<td>-7.2</td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
</tbody>
</table>

**Note 2:** -3dB bandwidth is measured relative to the gain at 10MHz.

**Note 3:** Measured using a pattern equivalent to 2\(^{23} - 1\) PRBS with 72 ClIDs at 622Mbps.

---

**Typical Operating Characteristics**

(VCC = +3.3V, CIN = 0.5pF, TA = +25°C, unless otherwise noted.)
Typical Operating Characteristics (continued)

(VCC = +3.3V, CIN = 0.5pF, TA = +25°C, unless otherwise noted.)

**FILTER VOLTAGE vs. DC INPUT CURRENT**

**DETERMINISTIC JITTER vs. INPUT CURRENT AMPLITUDE**

**SMALL-SIGNAL LOW-FREQUENCY CUTOFF vs. DC INPUT CURRENT**

**DIFFERENTIAL OUTPUT VOLTAGE vs. INPUT CURRENT**

**FREQUENCY RESPONSE**

**BANDWIDTH vs. INPUT CAPACITANCE**

**INPUT-REFERRED RMS NOISE vs. INPUT CAPACITANCE**

**INPUT-REFERRED RMS NOISE vs. DC INPUT CURRENT**

**OUTPUT EYE DIAGRAM (2μA ELECTRICAL INPUT)**
622Mbps, Low-Noise, High-Gain Transimpedance Preampifier

Typical Operating Characteristics (continued)

*(V_{CC} = +3.3V, C_{IN} = 0.5pF, T_A = +25^\circC, unless otherwise noted.)*

### Pin Description

<table>
<thead>
<tr>
<th>PIN</th>
<th>NAME</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VCC</td>
<td>+3.3V Supply Voltage</td>
</tr>
<tr>
<td>2</td>
<td>IN</td>
<td>Signal Input. Connect to photodiode anode.</td>
</tr>
<tr>
<td>3</td>
<td>FILT</td>
<td>Optional Filter Connection. Use to bias the photodiode cathode. An internal on-chip resistive network is connected between this pin and VCC; an external decoupling capacitor connected to this pin forms a filter (see the Design Procedure section). Leave this pin open if a filter is not required.</td>
</tr>
<tr>
<td>4</td>
<td>MON</td>
<td>Optional Photocurrent Monitor. This is a current output. Connect a resistor between MON and ground to monitor the average photocurrent. Leave this pin open if a monitor is not required.</td>
</tr>
<tr>
<td>5, 8</td>
<td>GND</td>
<td>Circuit Ground</td>
</tr>
<tr>
<td>6</td>
<td>OUT+</td>
<td>Positive 75Ω Data Output. Increasing input current causes OUT+ to increase.</td>
</tr>
<tr>
<td>7</td>
<td>OUT-</td>
<td>Negative 75Ω Data Output. Increasing input current causes OUT- to decrease.</td>
</tr>
</tbody>
</table>
The MAX3658 transimpedance amplifier is designed for 622Mbps fiber optic applications. The MAX3658 is comprised of a transimpedance amplifier, a voltage amplifier, an output buffer, a DC cancellation circuit, and a photocurrent monitor.

**Transimpedance Amplifier**

The signal current at the input flows into the summing node of a high-gain amplifier. Shunt feedback through resistor Rf converts this current into a voltage. Schottky diodes clamp the output signal for large input currents (Figure 1).

**Voltage Amplifier**

The voltage amplifier provides additional gain and converts the transimpedance amplifier single-ended output into a differential signal.

---

**Detailed Description**

The MAX3658 transimpedance amplifier is designed for 622Mbps fiber optic applications. The MAX3658 is comprised of a transimpedance amplifier, a voltage amplifier, an output buffer, a DC cancellation circuit, and a photocurrent monitor.

**Transimpedance Amplifier**

The signal current at the input flows into the summing node of a high-gain amplifier. Shunt feedback through resistor Rf converts this current into a voltage. Schottky diodes clamp the output signal for large input currents (Figure 1).

**Voltage Amplifier**

The voltage amplifier provides additional gain and converts the transimpedance amplifier single-ended output into a differential signal.

---

**Figure 1. MAX3658 Limited Output**
Output Buffer

The output buffer is designed to drive a 150Ω differential load between OUT+ and OUT-. For optimum supply noise rejection, the MAX3658 should be terminated with a differential load. The MAX3658 single-ended outputs do not drive a DC-coupled grounded load. The outputs should be AC-coupled or terminated to VCC. If a single-ended output is required, both the used and the unused outputs should be terminated in a similar manner (see the Interface Schematics section).

DC Cancellation Circuit

The DC cancellation circuit uses low-frequency feedback to remove the DC component of the input signal (Figure 2). This feature centers the input signal within the transimpedance amplifier’s linear range, thereby reducing pulse-width distortion.

The DC cancellation circuit is internally compensated and does not require external capacitors. This circuit minimizes pulse-width distortion for data sequences that exhibit a 50% mark density. A mark density significantly different from 50% causes the MAX3658 to generate pulse-width distortion. Grounding the FILT pin disables the DC cancellation circuit. For normal operation, the DC cancellation circuit must be enabled.

The DC cancellation current is drawn from the input and creates noise. For low-level signals with little or no DC component, the added noise is insignificant. However, amplifier noise increases for signals with significant DC component (see the Typical Operating Characteristics).

Photocurrent Monitor

The MAX3658 includes an average photocurrent monitor. The current sourced from MON to ground is approximately equal to the DC current at IN.

Design Procedure

Select Photodiode

Noise performance and bandwidth are adversely affected by capacitance on the TIA input node. Select a low-capacitance photodiode to minimize the total input capacitance on this pin. The MAX3658 is optimized for 0.5pF of capacitance on the input. Assembling the MAX3658 in die form using chip and wire technology provides the lowest capacitance input and the best possible performance.

Select CFILT

Supply voltage noise at the cathode of the photodiode produces a current $i = CPD \frac{dv}{dt}$, which reduces the receiver sensitivity ($CPD$ is the photodiode capacitance). The filter resistor of the MAX3658 combined with an external capacitor, can be used to reduce the effect of supply noise on performance (see the Typical Operating Circuit). Current generated by supply noise voltage is divided between $C_{FILT}$ and $CPD$. To obtain a good optical sensitivity select $C_{FILT} = 400$ pF.

Select Supply Filter

Sensitive optical receivers require wide-band powersupply decoupling. Power-supply bypassing should provide low impedance between VCC and ground for frequencies between 10kHz and 700MHz. Isolate the MAX3658 from noise sources with LC supply filters and shielding. Place a supply filter (Cvcc2) as close to the MAX3658 as possible.

Select RMON

If photocurrent monitoring is desired, connect a resistor between MON and ground to monitor the average photocurrent. Select $R_{MON}$ as large as possible:

$$R_{MON} = \frac{2.2V}{I_{MONMAX}}$$

where $I_{MONMAX}$ is the largest average input current observed. An ammeter can also monitor the current out of the MON pin.

Select Coupling Capacitors

A receiver built with the MAX3658 will have a bandpass frequency response. The low-frequency cutoff due to the coupling capacitors and load resistors is:

$$LFC_{TERM} = \frac{1}{2\pi \times R_{LOAD} \times C_{COUPLE}}$$
Select a value for \( C_{\text{COUPLE}} \) so the low-frequency cutoff due to the load resistors and coupling capacitors is much lower than the low-frequency cutoff of the MAX3658. The coupling capacitor should be 0.1\( \mu \)F or larger for SONET data. For lowest jitter, 1.0\( \mu \)F is recommended. Refer to application note HFAN-01.1: Choosing AC-Coupling Capacitors for a more detailed discussion on choosing AC-coupling capacitors.

**Select Output Filter**

Input sensitivity is improved by adding a filter between TIA and the quantizer/limiter amplifier, with 0.5pF input capacitance. Typical bandwidth of the MAX3658 is 580MHz; the highest expected bandwidth is 730MHz.

**Layout Considerations**

Figure 3 shows suggested layouts for 4- and 5-pin TO headers.

**Wire Bonding**

For high-current density and reliable operation, the MAX3658 uses gold metalization. For best results, use gold-wire ball-bonding techniques. Use caution when wedge bonding. Die-size is 52 mils x 29 mils, (1.32mm x 0.736mm) and die thickness is 15 mils (380\( \mu \)m). The bond-pad passivation opening is 75\( \mu \)m and bond-pad metal thickness is 5\( \mu \)m. Refer to Maxim application note HFAN-08.0.1: Understanding Bonding Coordinates and Physical Die Size for additional information on bond-pad coordinates.

---

**Applications Information**

**Optical Power Relations**

Many of the MAX3658 specifications relate to the input signal amplitude. When working with optical receivers, the input is sometimes expressed in terms of average optical power and extinction ratio. Figure 4 and Table 1 show relations that are helpful for converting optical power to input signal when designing with the MAX3658.

**Optical Sensitivity Calculation**

The input-referred RMS noise current \( (i_n) \) of the MAX3658 generally determines the receiver sensitivity. To obtain a system bit-error rate (BER) of 1E-10, the signal-to-noise ratio must always exceed 12.7. The input sensitivity, expressed in average power, can be estimated as:

\[
\text{SENSITIVITY} = 10 \log \left( \frac{12.7 \times i_n \times (r_e + 1)}{2 \times r_n \times (r_e - 1)} \right) \times 1000 \text{ dBm}
\]

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RELATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Power</td>
<td>( P_{\text{AVG}} )</td>
<td>( P_{\text{AVG}} = \frac{P_0 + P_1}{2} )</td>
</tr>
<tr>
<td>Extinction Ratio</td>
<td>( r_e )</td>
<td>( r_e = \frac{P_1}{P_0} )</td>
</tr>
<tr>
<td>Optical Power of a 1</td>
<td>( P_1 )</td>
<td>( P_1 = 2P_{\text{AVG}} \frac{r_e}{r_e + 1} )</td>
</tr>
<tr>
<td>Optical Power of a 0</td>
<td>( P_0 )</td>
<td>( P_0 = 2P_{\text{AVG}} \frac{r_e}{r_e + 1} )</td>
</tr>
<tr>
<td>Optical Modulation Amplitude</td>
<td>( P_{\text{IN}} )</td>
<td>( P_{\text{IN}} = P_1 - P_0 = 2P_{\text{AVG}} \frac{r_e - 1}{r_e + 1} )</td>
</tr>
</tbody>
</table>

*Assuming a 50% average mark density.
where \( \rho \) is the photodiode responsivity in A/W and \( i_n \) is the RMS noise current in amps. For example, with photodiode responsivity of 0.9A/W, an extinction ratio of 10 and 45nA input-referred noise, the sensitivity of the MAX3658 is:

\[
\text{SENSITIVITY} = 10 \log \left( \frac{4 \mu A \times (r + 1)}{2 \times \rho \times (r - 1)} \times 1000 \right) \text{dBm}
\]

\[
= -34 \text{dBm}
\]

Actual results may vary depending on supply noise, output filter, limiting amplifier sensitivity, and other factors (refer to application note HFAN-03.0.0: Accurately Estimating Optical Receiver Sensitivity).

Maxim obtains -33dBm typ sensitivity combined with the MAX3748.

**Input Optical Overload**

Overload is the largest input that the MAX3658 accepts while meeting the pulse-width distortion specification. Optical overload can be estimated in terms of average power with the following equation:

\[
\text{OVERLOAD} = 10 \log \left( \frac{2 \times i_n}{2 \times \rho} \times 1000 \right) \text{dBm}
\]

For example, if photodiode responsivity is 1.0A/W, the input overload is 0dBm.

**Optical Linear Range**

The MAX3658 has high gain, which limits the output for large input signals. The MAX3658 operates in a linear range for inputs not exceeding:

\[
\text{LINEAR RANGE} = 10 \log \left( \frac{4 \mu A \times (1)}{2 \times \rho \times (1)} \times 1000 \right) \text{dBm}
\]

For example, with photodiode responsivity of 0.9A/W and an extinction ratio of 10, the linear range is:

\[
\text{LINEARRANGE} = 10 \log \left( \frac{4 \mu A \times 11}{2 \times 0.9 \times 9} \times 1000 \right) \text{dBm}
\]

\[
= -25 \text{dBm}
\]

**Interface Schematics**

**Equivalent Output Interface**

The MAX3658 has a differential output structure with 75Ω termination (150Ω differential). Figure 5 is a simplified diagram of the output interface. Common test equipment is designed with a 50Ω single-ended termination (100Ω differential). Figures 6a and 6b show alternate interface schemes for the MAX3658.

![Figure 5. Equivalent Output Interface](image-url)
622Mbps, Low-Noise, High-Gain Transimpedance Preamplifier

Figure 6a. 50Ω AC-Coupled Interface

Figure 6b. 50Ω DC-Coupled Single-Ended Output Interface
**622Mbps, Low-Noise, High-Gain Transimpedance Preamplifier**

**Pad Coordinates**

Table 2 gives center pad coordinates for the MAX3658 bond pads. Refer to application note HFAN-08.01: *Understanding Bonding Coordinates and Physical Die Size* for more information on bond-pad coordinates.

Table 2. Bond-Pad Information

<table>
<thead>
<tr>
<th>PAD</th>
<th>NAME</th>
<th>MAX3658A</th>
<th>MAX3658B</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP1</td>
<td>MON</td>
<td>MON</td>
<td></td>
<td>16.6</td>
<td>818.6</td>
</tr>
<tr>
<td>BP2</td>
<td>GND</td>
<td>GND</td>
<td></td>
<td>18.0</td>
<td>543.4</td>
</tr>
<tr>
<td>BP3</td>
<td>N.C.</td>
<td>N.C.</td>
<td></td>
<td>18.0</td>
<td>425.8</td>
</tr>
<tr>
<td>BP4</td>
<td>OUT+</td>
<td>OUT-</td>
<td></td>
<td>16.6</td>
<td>39.4</td>
</tr>
<tr>
<td>BP5</td>
<td>OUT-</td>
<td>OUT+</td>
<td></td>
<td>445.0</td>
<td>39.4</td>
</tr>
<tr>
<td>BP6</td>
<td>N.C.</td>
<td>N.C.</td>
<td></td>
<td>456.2</td>
<td>155.6</td>
</tr>
<tr>
<td>BP7</td>
<td>GND</td>
<td>GND</td>
<td></td>
<td>455.0</td>
<td>565.8</td>
</tr>
<tr>
<td>BP8</td>
<td>VCC</td>
<td>VCC</td>
<td></td>
<td>455.0</td>
<td>818.6</td>
</tr>
<tr>
<td>BP9</td>
<td>IN</td>
<td>IN</td>
<td></td>
<td>254.6</td>
<td>818.6</td>
</tr>
<tr>
<td>BP10</td>
<td>FILT</td>
<td>FILT</td>
<td></td>
<td>135.6</td>
<td>818.6</td>
</tr>
</tbody>
</table>

**Pin Configuration**

**Chip Information**

TRANSISTOR COUNT: 833
PROCESS: GST-4

*THE EXPOSED PAD MUST BE CONNECTED TO CIRCUIT BOARD GROUND FOR PROPER THERMAL AND ELECTRICAL PERFORMANCE.*

**AGP = DEVICE TOPMARK.**

---

Figure 7. FILT Interface

Figure 8. MON Interface
622Mbps, Low-Noise, High-Gain Transimpedance Preamplifier

Chip Topographies

Topography for MAX3658A
622Mbps, Low-Noise, High-Gain Transimpedance Preamplifier

Chip Topographies (continued)

Topography for MAX3658B
## 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](http://www.maxim-ic.com/packages).)

### COMMON DIMENSIONS

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.70</td>
<td>0.80</td>
</tr>
<tr>
<td>D</td>
<td>2.90</td>
<td>3.10</td>
</tr>
<tr>
<td>E</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>A1</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>L</td>
<td>0.20</td>
<td>0.40</td>
</tr>
<tr>
<td>k</td>
<td>0.25</td>
<td>REF.</td>
</tr>
<tr>
<td>A2</td>
<td>0.20</td>
<td>REF.</td>
</tr>
</tbody>
</table>

### PACKAGE VARIATIONS

<table>
<thead>
<tr>
<th>PROG. CODE</th>
<th>N</th>
<th>D2</th>
<th>D3</th>
<th>k</th>
<th>JEDEC SPEC</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>T633-1</td>
<td>6</td>
<td>1.50±0.10</td>
<td>2.30±0.10</td>
<td>0.95 BSC</td>
<td>MO229 / WEEA</td>
<td>0.40±0.05</td>
</tr>
<tr>
<td>T833-1</td>
<td>8</td>
<td>1.50±0.10</td>
<td>2.30±0.10</td>
<td>0.65 BSC</td>
<td>MO229 / WEEA</td>
<td>0.30±0.05</td>
</tr>
<tr>
<td>T833-2</td>
<td>8</td>
<td>1.50±0.10</td>
<td>2.30±0.10</td>
<td>0.65 BSC</td>
<td>MO229 / WEEC</td>
<td>0.30±0.05</td>
</tr>
<tr>
<td>T633-3</td>
<td>10</td>
<td>1.50±0.10</td>
<td>2.30±0.10</td>
<td>0.50 BSC</td>
<td>MO229 / WEEA</td>
<td>0.25±0.05</td>
</tr>
<tr>
<td>T833-3</td>
<td>10</td>
<td>1.50±0.10</td>
<td>2.30±0.10</td>
<td>0.50 BSC</td>
<td>MO229 / WEEC</td>
<td>0.25±0.05</td>
</tr>
<tr>
<td>T1433-1</td>
<td>14</td>
<td>1.70±0.10</td>
<td>3.00±0.10</td>
<td>0.40 BSC</td>
<td>MO229 / WEEA</td>
<td>0.20±0.05</td>
</tr>
<tr>
<td>T1433-2</td>
<td>14</td>
<td>1.70±0.10</td>
<td>3.00±0.10</td>
<td>0.40 BSC</td>
<td>MO229 / WEEC</td>
<td>0.20±0.05</td>
</tr>
</tbody>
</table>

**NOTES:**

1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY SHALL NOT EXCEED 0.08 mm.
3. WARPAGE SHALL NOT EXCEED 0.15 mm.
4. PACKAGE LENGTH/PACKAGE WIDTH ARE CONSIDERED AS SPECIAL CHARACTERISTICS.
5. DRAWING CONFORMS TO JEDEC MO229, EXCEPT DIMENSIONS "D2" AND "D3," AND T1433-1 & T1433-2.
6. "N" IS THE TOTAL NUMBER OF LEADS.
7. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.
8. WARNING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
622Mbps, Low-Noise, High-Gain
Transimpedance Preamplifier

Revision History

Rev 0; 10/03: Initial data sheet release.
Rev 1; 5/04: Added line to EC table regarding Optical Overload at 155MHz (page 3).
Rev 2; 11/05: Changed TO layout in Figure 3 (page 8).
Rev 3; 2/07: Added lead-free package to Ordering Information table (page 1).