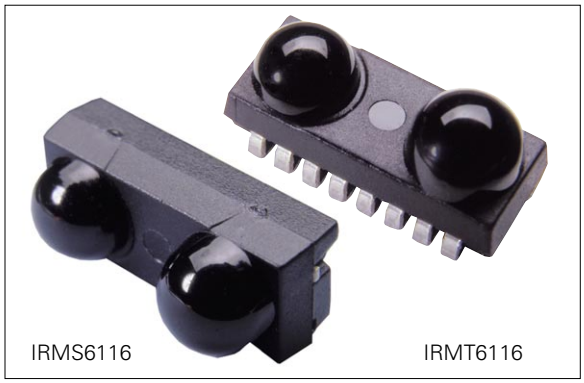
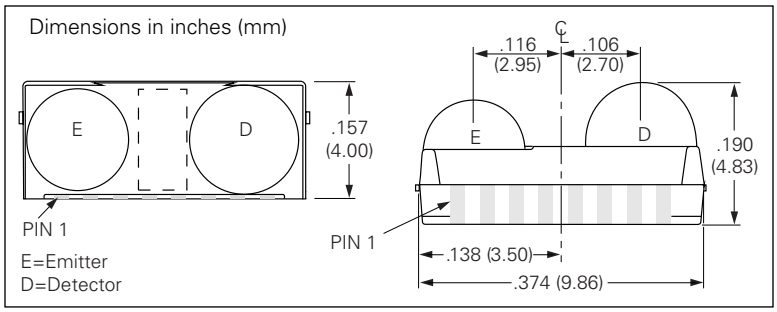
# SIDE VIEW IRMS6116
# TOP VIEW IRMT6116
## 115 Kb/s Infrared Data Transceiver




### FEATURES

- **Compliant with IrDA Specification**
- **Data Rates 9.6 Kb/s to 115 Kb/s, usable up to 576 Kb/s**
- **Wide Range of Supply Voltage 2.4 to 5.5 V**
- **Standby Current 90 µA Typical**
- **Excellent Power Supply Noise Rejection**
- **Tri-State Receiver Output and TxD Disable**
- **AC Coupled Transmit Input: Provides Integrated Protection for Eye Safety**
- **High DC Ambient Rejection**
- **Independent LED Supply, Anode Pin Can Take**
  - **up to 9.0 V DC when not Transmitting and**
  - **up to 4.0 V above $V_{CC}$ when Transmitting**
- **Receiver Latency Less than 100 µs**
- **Slimline Package: H 4.0 mm x D 4.8 mm x L 9.8 mm**

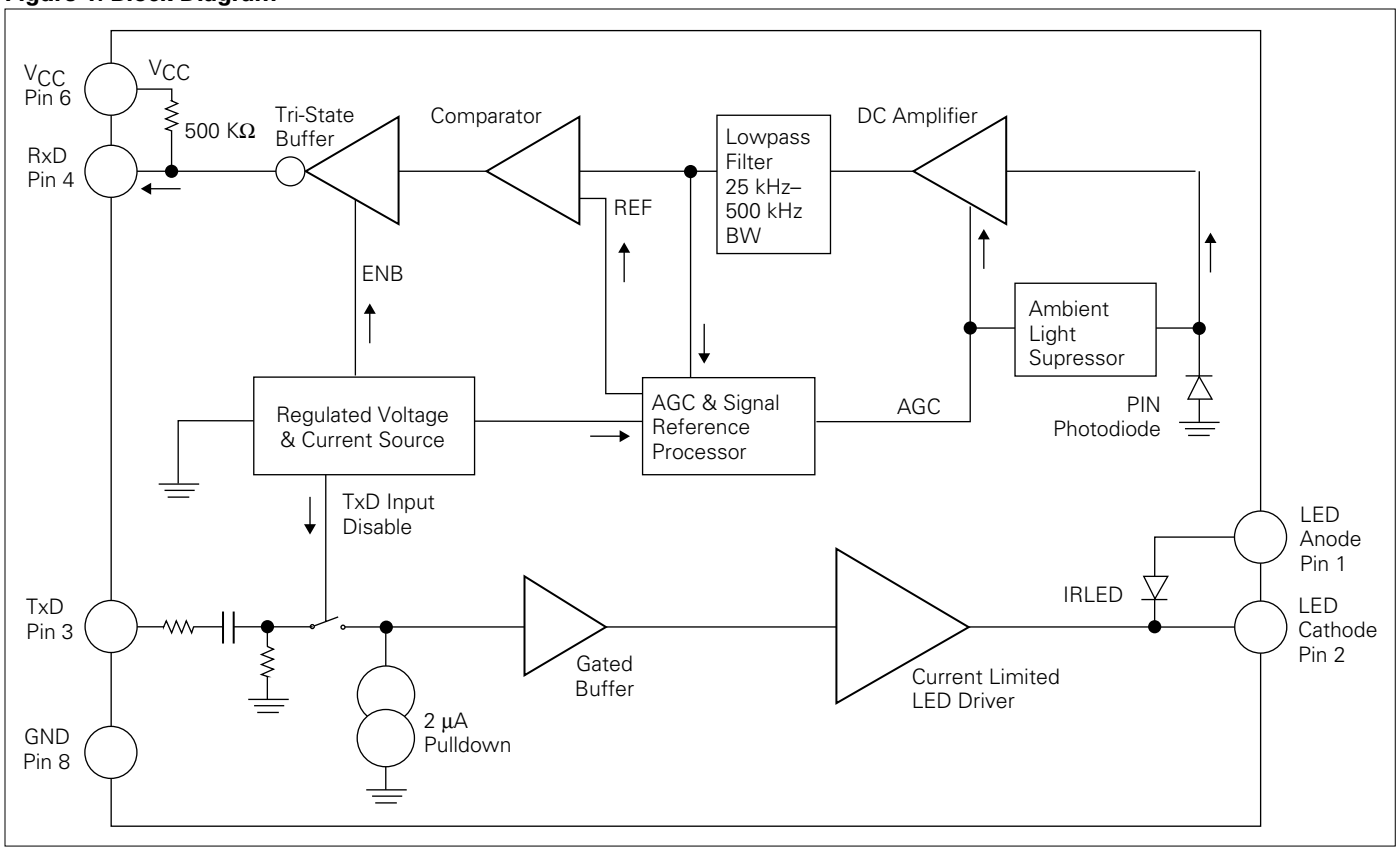
**Absolute Maximum Ratings, $T_A$=25°C (except where noted)**

Supply Voltage Range, all states, $V_{CC}$ ..... –0.5 to +7.0 V
LED Anode Voltage, $V_{LEDA}$
$V_{CC}$=0 to 5.5 V, not transmitting ..... –0.5 to +9.0 V
LED Anode Voltage, $V_{LEDA}$
$V_{CC}$=2.4 to 5.5 V, transmitting ..... –0.5 to $V_{CC}$ + 4.0 V
Input Current $I_{CC}$,
$V_{CC}$=5.0 V, TxD=$V_{CC}$, transmit ..... 20 mA
Output RxD Current ..... 50 mA
Storage Temperature, $T_S$ ..... –25 to +85°C
Operating Temperature, $T_O$ ..... –25 to 85°C
Lead Solder Temperature, Maximum 230°C ..... <10 s
IC Junction Temperature, $T_J$ ..... 125°C
Average IR LED Current, $I_{LED}$ ..... 100 mA
Repetitive Pulsed IR LED Current,
<10 µs, $t_{on}$ <20%, LED Anode=3.3 V, $I_{LED(RP)}$ ..... 600 mA
Input Voltage: TxD ..... –0.5 to $V_{CC}$ + 0.5 V
RxD Voltage ..... –0.5 to $V_{CC}$ + 0.5 V

**Table 1. Pin Functions**

| Pin no. | Function | Pin no. | Function |
|---|---|---|---|
| 1 | IR LEDA | 5 | NC |
| 2 | IR LEDC | 6 | $V_{CC}$ |
| 3 | TxD | 7 | NC |
| 4 | RxD | 8 | GND |

**Figure 1. Block Diagram**




### Theory of operation

The IRMS/T6116 Slimline—Infrared Data Transceiver consists of a detector photodiode, an IR LED transmitter, an IC containing ambient light suppressor, and Automatic Gain control circuitry (AGC).

The ambient light suppressor can cancel 4 mW/cm$^2$ (typical) at 2.4 V of DC ambient signal, and up to 1.5 mW/cm$^2$ (peak-to-peak) at 120 Hz AC ambient.

The AGC in the IC is to keep the system output constant by varying the gain to accommodate a wide range of input signals. It also provides noise immunity in the high noise ambient environment.

In receive mode, the receiver output (RxD) which normally stays high, will go low for duration of the receive pulses. It is a push-pull CMOS driver capable of driving a standard CMOS or TTL load. No external pull-up or pull-down resistor is required.

In transmit mode, by asserting the TxD pin above $^1/_2$ $V_{CC}$ will turn on IR LED transmitter. At the LED Anode (pin 1) connect this pin to $V_{CC}$ or unregulated power supply (not to exceed $V_{CC}$ + 4.0 V), through a resistor to set the proper LED current to reduce the thermal dissipation and to lower LED current.

**Table 2. Slimline IRMS/T6116 Truth Table**

| **Inputs** | | **Outputs** | |
|---|---|---|---|
| TxD | Detector | RxD | LED |
| High | — | Undefined | On |
| Low | 0.4 mW/Sr | High | Off |
| | 40 mW/Sr | Low | |

## Electrical Characteristics

**Table 3. Basic Operating Parameters,** $T_A$=25°C (except where noted)

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Supported Data Rate | — | 9.6 K | — | 115 K | Kb/s | 1.63 µs or 3/16 clock period |
| Power Supply Voltage | $V_{CC}$ | 2.4 | — | 5.5 | V | –25 to 85° C, $V_{CC}$ to $V_{SS}$ |
| Maximum LED Anode Voltage | $V_{LEDA}$ | — | — | $V_{CC}$ + 4 | V | $V_{CC}$=2.4 V to 5.5 V |
| $I_{CC}$ Standby Current | $I_{CC}$ | 65 | 90 | 133 | µA | no signal, $V_{CC}$=2.4 V to 5.0 V |
| $I_{CC}$ Receiving Current | $I_{CC}$ | — | 117 | — | µA | 10 µW, 57.6 Kb/s, 15 pF load |
| $I_{CC}$ Transmitting Current | $I_{CC}$ | — | 12 | 18 | mA | $V_{CC}$=5.0 V, No LED resistor, 3.0 V |

**Table 4. I/O Parameters**

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| TxD High Loading | — | 1.0 | 2.0 | 3.0 | µA | TxD=$V_{CC}$, $V_{CC}$ =2.4 V to 5.5 V |
| TxD Low Loading | — | — | — | 0.01 | µA | TxD=0, $V_{CC}$ =2.4 V to 5.5 V |
| RxD Output High | $V_{IH}$ | 4.3 | 4.6 | — | V | $V_{CC}$=5.0 V, $I_{OH}$=8 mA |
| RxD Output High | $V_{IH}$ | 1.9 | 2.1 | — | V | $V_{CC}$=2.4 V, $I_{OH}$=3 mA |
| RxD Output Low | $V_{IL}$ | — | 0.22 | 0.4 | V | $V_{CC}$=5.0 V,$I_{OL}$ =8 mA |
| RxD Ouput Low | $V_{IL}$ | — | 0.17 | 0.3 | V | $V_{CC}$=2.4 V, $I_{OL}$=3.0 mA |
| RxD Short Circuit | — | — | 48 | — | mA | $V_{CC}$=5.0 V, RxD=0, RxD=$V_{CC}$ |
| RxD Short Circuit | — | — | 10 | — | mA | $V_{CC}$=2.4 V, RxD=0, RxD=$V_{CC}$ |
| RxD to $V_{CC}$ Tri-State Impedance | — | 350 | 500 | 650 | kΩ | $V_{CC}$=2.4 V to 5.0 V, between RxD to $V_{CC}$ |
| RxD Rise Time | $t_r$ | 12 | 18 | 27 | ns | $V_{CC}$=5.0 V, Load=15 pF |
| RxD Fall Time | $t_f$ | 20 | 30 | 40 | ns | $V_{CC}$=5.0 V, Load=50 pF |
| RxD Rise Time | $t_r$ | 17 | 25 | 40 | ns | $V_{CC}$=2.4 V, Load=15 pF |
| RxD Fall Time | $t_f$ | 30 | 45 | 70 | ns | $V_{CC}$=2.4 V, Load=50 pF |

**Table 5. Receiver Parameters,** $T_A$=25°C (except where noted)

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Maximum Data Rate | — | 9.6 | 115.2 | 576 | Kb/s | 10 µW/cm$^2$ to 500 mW/cm$^2$ |
| Receive 1/2 Angle | — | 15 | — | — | degree | IrDA *Physical Layer* specification |
| Minimum Signal Detect Irradiance | $E_{IHmin}$ | — | 2.0 | 4.0 | µW/cm$^2$ | Bit error rate=$10^{-8}$, 1.63 µs pulse |
| Maximum Signal Detect Irradiance | $E_{Emax}$ | 500 | 1000 | — | mW/cm$^2$ | Bit error rate=$10^{-8}$, 1.63 µs pulse |
| Maximum Signal Irradiance No detect | — | — | — | 0.3 | µW/cm$^2$ | <0.1 pulse per second detect, 1.63 µs |
| Maximum DC Ambient Irradiance, 5.0 V **(Note 6)** | — | — | 7.5 | — | mW/cm$^2$ | $V_{CC}$=5.0 V |
| Maximum DC Ambient Irradiance, 2.4 V **(Note 6)** | — | — | 4.0 | — | mW/cm$^2$ | $V_{CC}$=2.4 V |
| AGC Attack Time **(Note 1)** | — | — | 1.0 | 2.0 | µs | 4 µW/cm$^2$ to 500 mW/cm$^2$ |
| AGC Settling **(Note 2)** | — | — | 5.0 | 10 | pulse | 4 µW/cm$^2$ to 500 mW/cm$^2$ at 115 Kb/s |
| Near-Far Receiver Latency **(Note 3)** | — | — | 2.5 | 4.0 | ms | 0 to 5 mW/cm$^2$ ambient input |
| AGC Decay Rate **(Note 4)** | — | — | 44 | — | dB/ms | Following AGC settling at 500 mW/cm$^2$ |
| Transmit Receiver Latency **(Note 3)** | $t_L$ | — | 50 | 100 | µs | 0 to 3 mW/cm$^2$ DC ambient input |
| RxD Suppression Duration **(Note 7)** | — | — | 50 | 100 | µs | Following end of TxD pulse |
| Powerup Receiver Latency | — | — | 50 | 100 | µs | 0 to 3 mW/cm$^2$ DC ambient input |
| Output Pulse Width at RxD | — | 1.41 | 1.63 | 3.0 | µs | 1.63 µs, 4 µW/cm$^2$ to 500 mW/cm$^2$ input |

**Table 5. Receiver Parameters** (continued)

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Maximum Output Pulse Width at RxD, **(Note 6)** | — | — | 57 | 100 | µs | 200 µs, 500 mW/cm$^2$, $V_{CC}$ =5.0 V |
| Small Ripple Power Supply Rejection **(Note 5)** | — | 50 | 100 | — | mV/ms | 100 $mV_{P-P}$ triangle wave on $V_{CC}$ |
| Large Ripple Power Supply Rejection **(Note 5)** | — | 100 | 200 | — | mV/ms | 1.0 $V_{P-P}$ triangle wave on $V_{CC}$ |

**Table 6. Transmitter Output**

| Parameter | Sym. | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Maximum Data Rate | — | 9.6 | 115.2 | 576 | Kb/s | TxD pulse width=434 ns |
| TxD Radiant Intensity | — | 40 | 150 | 500 | mW/Sr | $I_{LED}$=350 mA, (6.8 Ω LED resistor, 5.0 $V_{LED}$ supply) |
| TxD Radiant Intensity | — | — | 70 | 500 | mW/Sr | LEDA=2.4 V, no current limiting LED resistor |
| TxD $^1/_2$ Angle | — | 15 | 20 | 30 | degree | IrDA *Physical Layer* specification |
| TxD Peak Wavelength | $\lambda_{peak}$ | 850 | 870 | 900 | nm | $I_F$=20 mA |
| $I_{LED}$ Pulse Width | — | 1.55 | 1.60 | 1.65 | µs | TxD=1.63 µs, $V_{CC}$=5.0 V |
| Optical Rise and Fall Time | $t_r$, $t_f$ | 10 | — | 600 | ns | $V_{LED}$=2.7 V |
| Pulse Width Limit | — | 35 | 70 | 140 | µs | TxD pulse>200 µs, 5.0 V pulse, $V_{CC}$=5.0 V |
| $I_{LED}$ Limit | — | 350 | 400 | 600 | mA | TxD=$V_{CC}$, LED anode=3.3 V, $V_{CC}$=5.0 V |
| $I_{LED}$ Limit Temperature Coefficient | — | — | +0.47 | — | %/°C | TxD=$V_{CC}$, LED anode=3.3 V, $V_{CC}$=5.0 V |
| LED Temperature Coefficient | — | — | –0.5 | — | %/°C | $I_{LED}$=300 mA |
| LED Cathode Saturation Drop | — | — | 0.3 | 0.4 | V | 300 mA, $V_{CC}$=2.4 V |
| TxD $V_{CC}$ dV/dt Rejection | — | — | 5.0 | — | V/µs | dV/dt for less than 10% change in TxD output |

Note 1:
"AGC Attack Time" is the time required for internal AGC (Automatic Gain Control) attenuation to rise to within 10% of final value.

Note 2:
"AGC Settling" is the number of pulses within 100 µs required for the output pulse width to settle to 90% of its final value.

Note 3:
"Near-Far Receiver Latency" is the time required for the AGC and ambient correction circuits to return to maximum sensitivity (Far) following reception of a maximum (Near) signal or a change in ambient. "Transmit Receiver Latency" is commonly called "Receiver Latency" or "Transmitter Turn-around Time."

Note 4:
"AGC Decay Rate" is the rate at which the receiver gain increases following the cessation of signal input.

Note 5:
The receiver $V_{CC}$ power supply rejection is significantly better for small ripple of less than 100 $mV_{P-P}$ than for larger values. For ripple of more than 100 $mV_{P-P}$, internal circuits can maintain operating headroom provided that the slew rate is significantly slower. Typically, these specifications allow operation without an external filter from either switching supplies with less than 50 $mV_{P-P}$ ripple or unregulated supplies with less than 1 $V_{P-P}$ of 120 Hz ripple.

Note 6:
If the low going RxD pulse width exceeds 100 µs, then the maximum DC ambient irradiance has been exceeded.

Note 7:
RxD is suppressed (forced high) while (TxD) transmit pulse is active and for the indicated period following the end of the TxD pulse.

**Figure 2. Timing Diagrams**

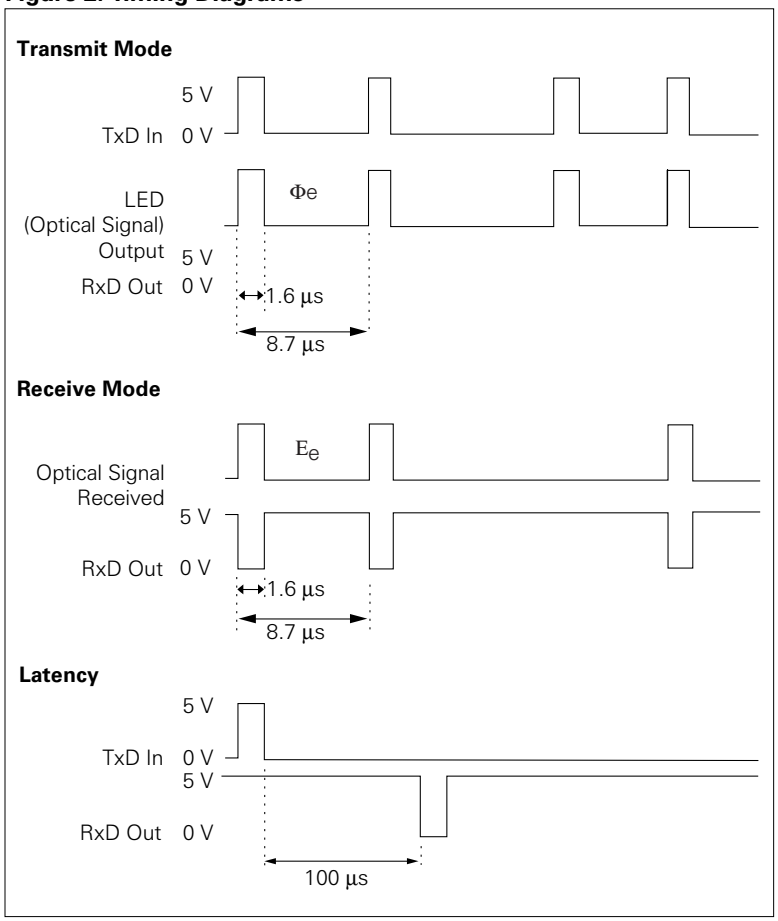



**Figure 3. Input Schematics**

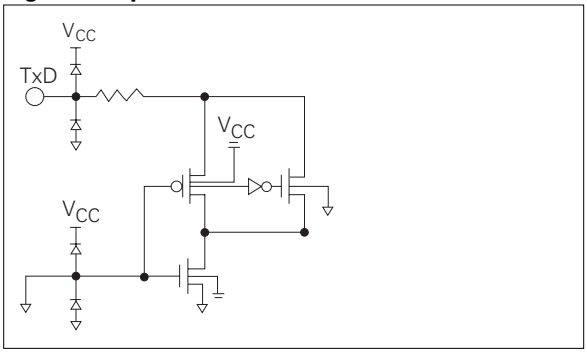



**Figure 4. Output Schematics**

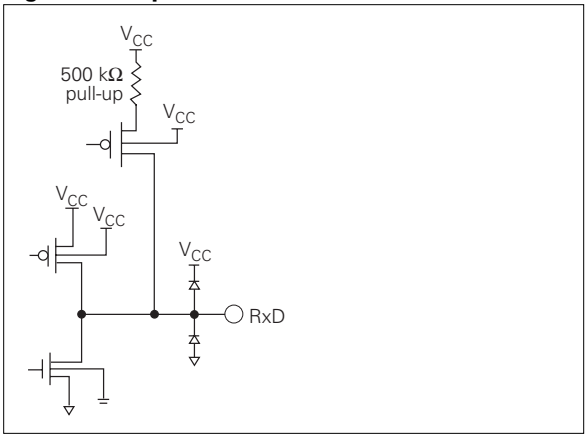
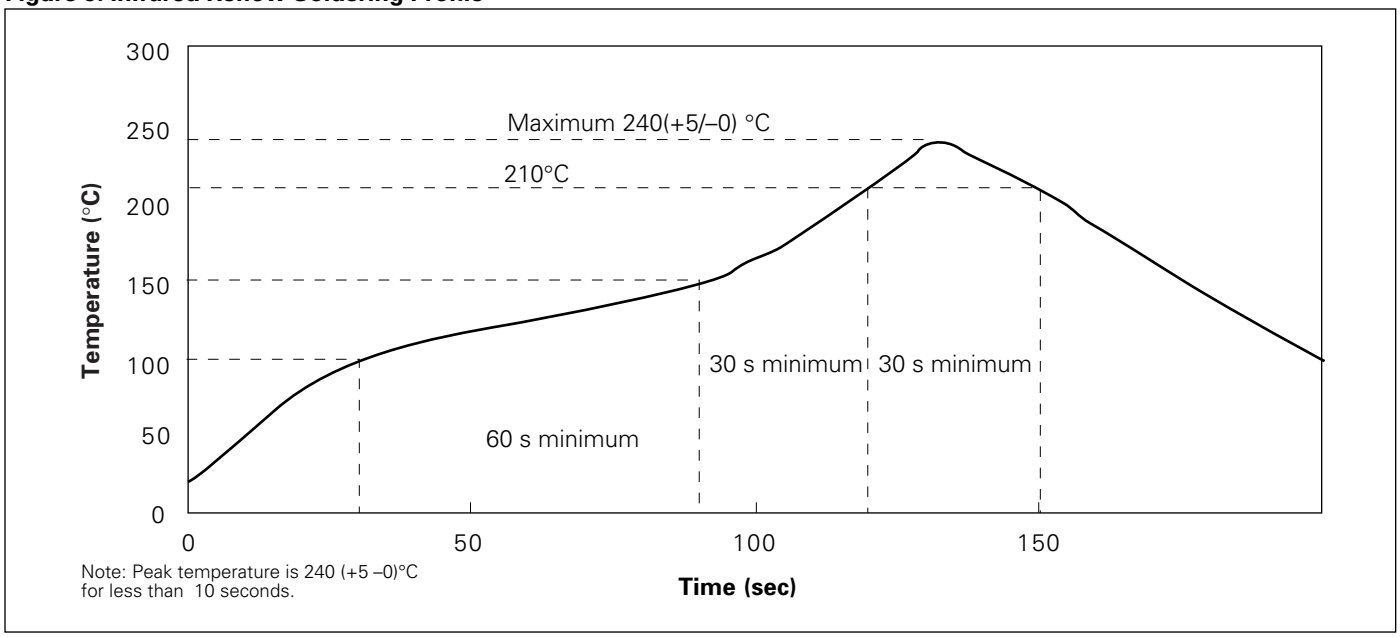


**Figure 5. Infrared Reflow Soldering Profile**




**Interface Diagrams**

**Figure 6. Super I/O (PC87108AVJE) to IRMS/T6116**

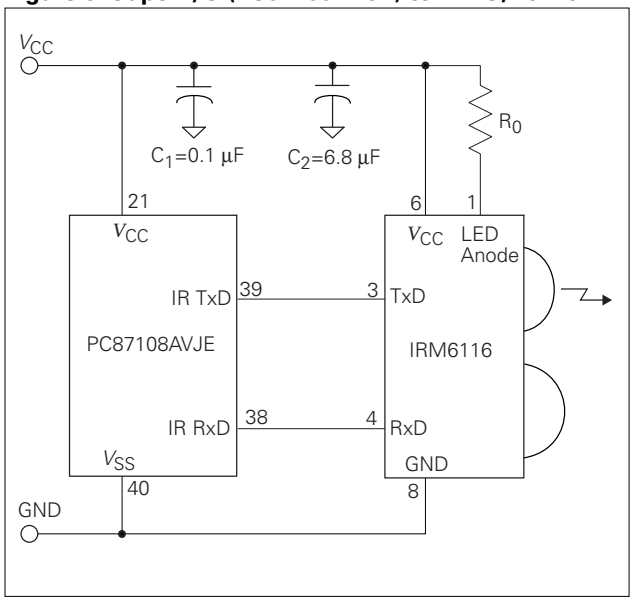



**Figure 7. With independent $V_{LED}$ supply**

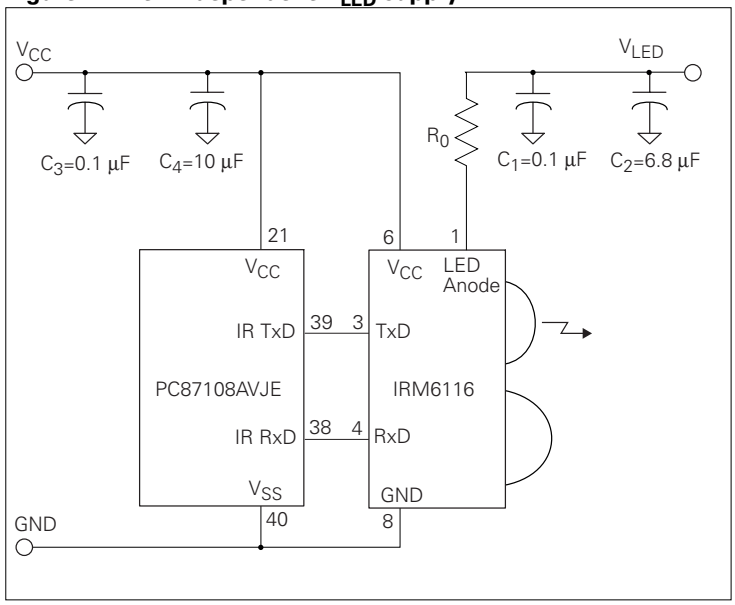



**Table 7. Recommended External Component**

| Parameter | Values | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|
| $V_{LED}$ power supply | 2.4 | 2.7 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | V |
| Resistor | 0 | 0 | 0 | 1.5 | 3.9 | 5.1 | 6.8 | Ω |

## Ordering Information

| Part Number | Description | PCB Mounting Orientation |
|---|---|---|
| IRMS6116 | Integrated Transceiver —Side View | Packaged in Component Carrier Reel (1000/reel) for Side View Mounting on PCB |
| IRMT6116 | Integrated Transceiver —Top View | Packaged in Component Carrier Reel (1000/reel) for Top View Mounting on PCB |
| Tape Leader and Trailer is 400 mm minimum. | | |

**Figure 9. Reel Dimensions in Inches (mm)**

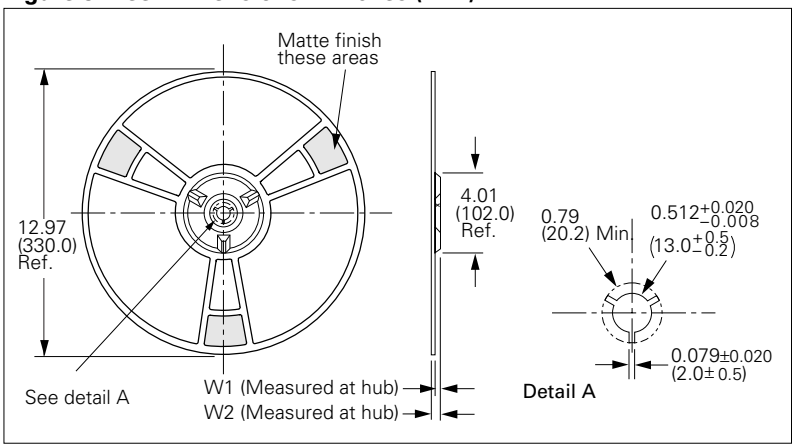



**Figure 8. Tape Dimensions in Inches (mm)**

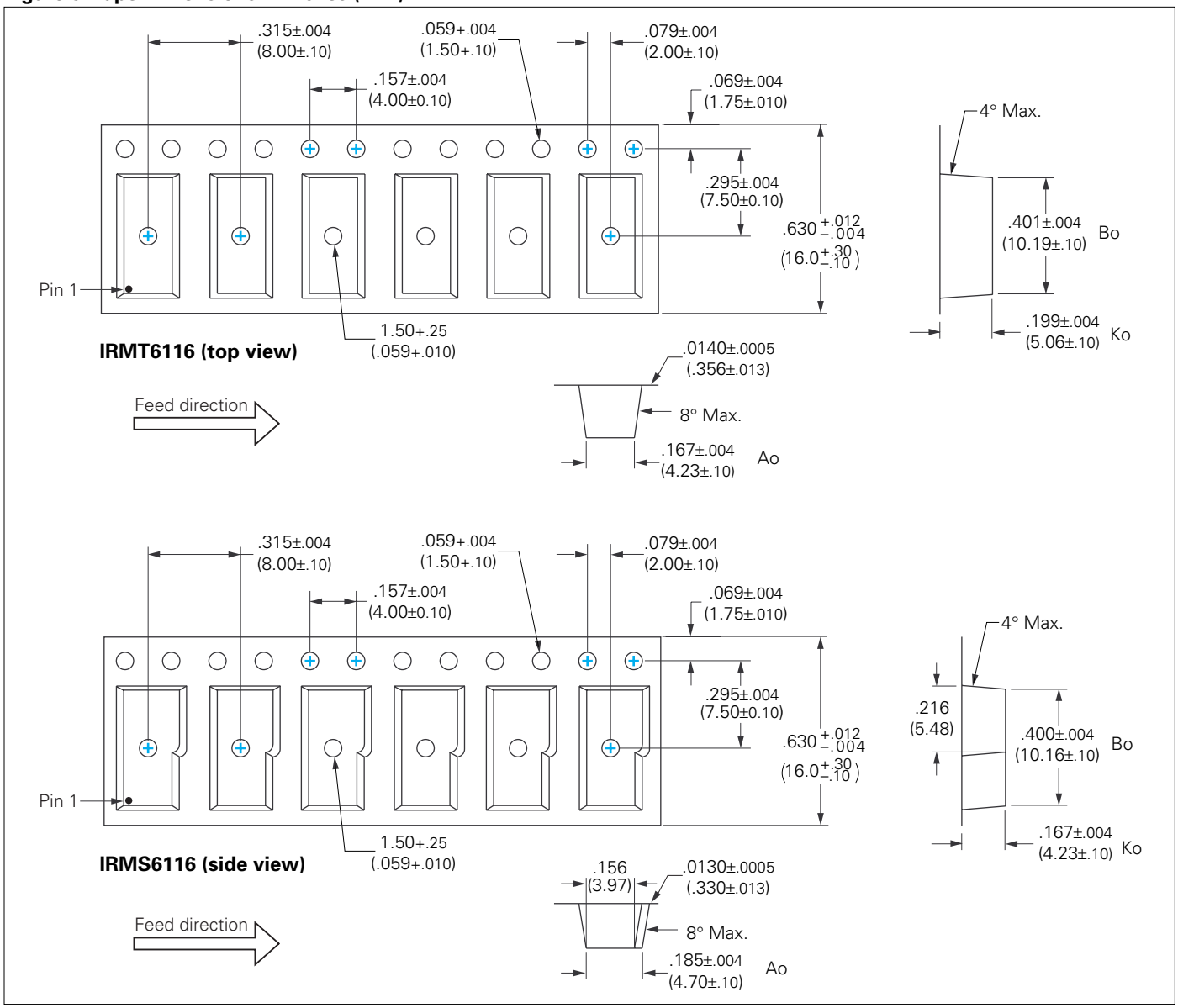
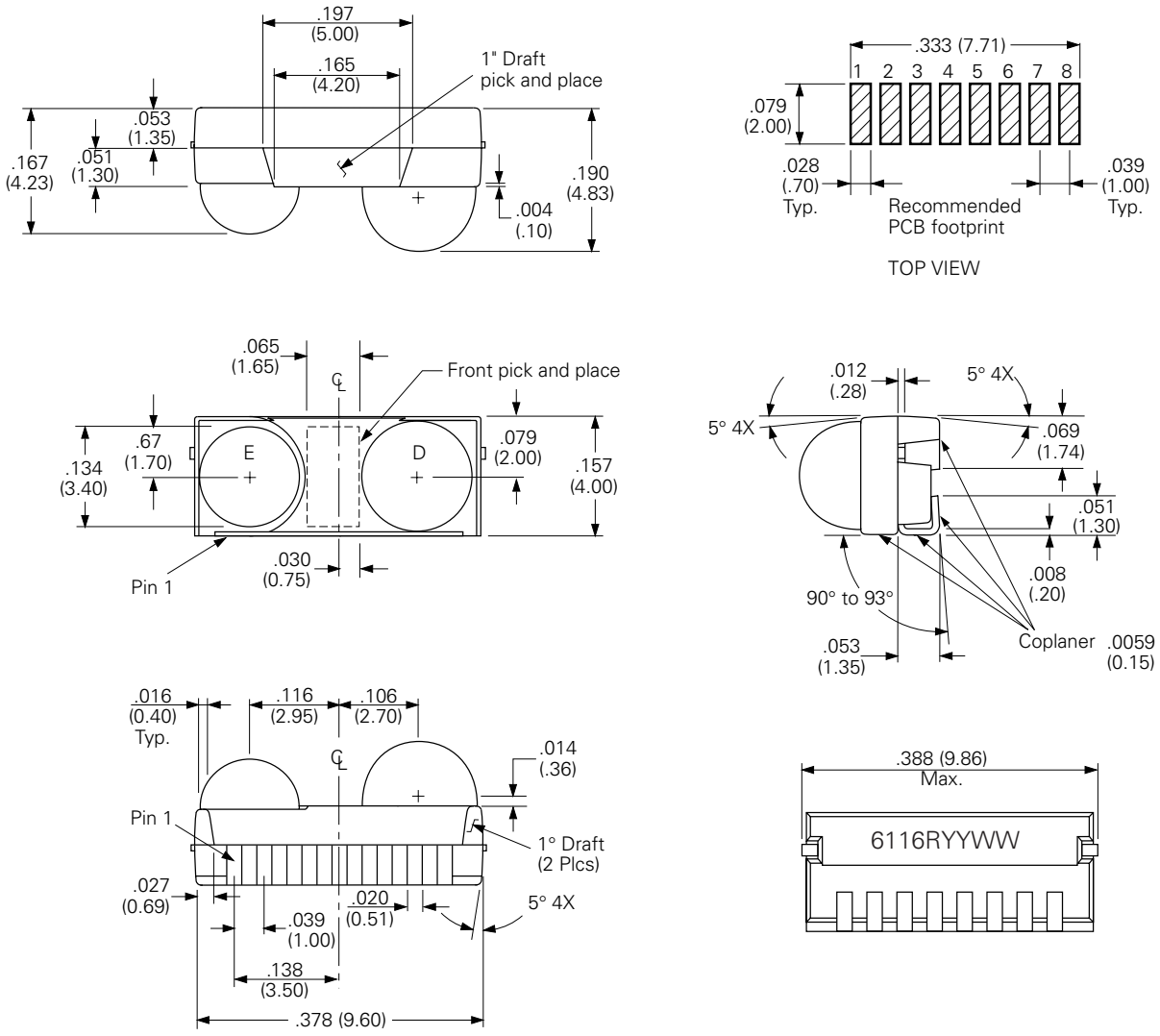


**Figure 10. IRMS/T6116 Detail Drawings With Optional Side View or Top View Mounting**

Dimensions in inches (mm)—All dimensions have tolerances of ±0.004" (±0.1 mm)



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