SIDE VIEW IRMS6115
TOP VIEW IRMT6115
115 Kb/s Infrared Data Transceiver

IRMS6115 IRMT6115

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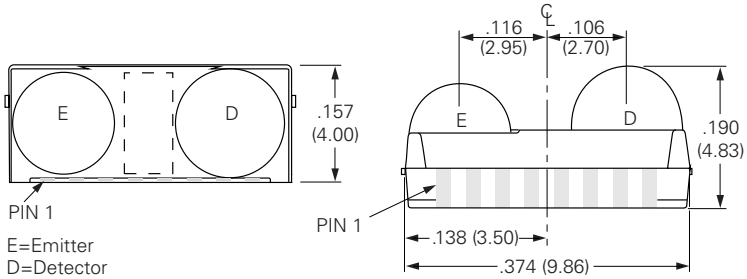

IRMS6115 IRMT6115

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**

DESCRIPTION

With state of the art submicron BiCMOS circuitry, coupled with Infineon optoelectronic expertise, the IRMS6115 and IRMT6115 outperforms its closest rival. The transmit input is AC coupled, limiting transmit pulse duration to 70 µs, preventing transmitter damage and continuous LED output.

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	SD
2	IR LEDC	6	V_{CC}
3	TxD	7	*Do not connect
4	RxD	8	GND

*Pin 7 internally grounded

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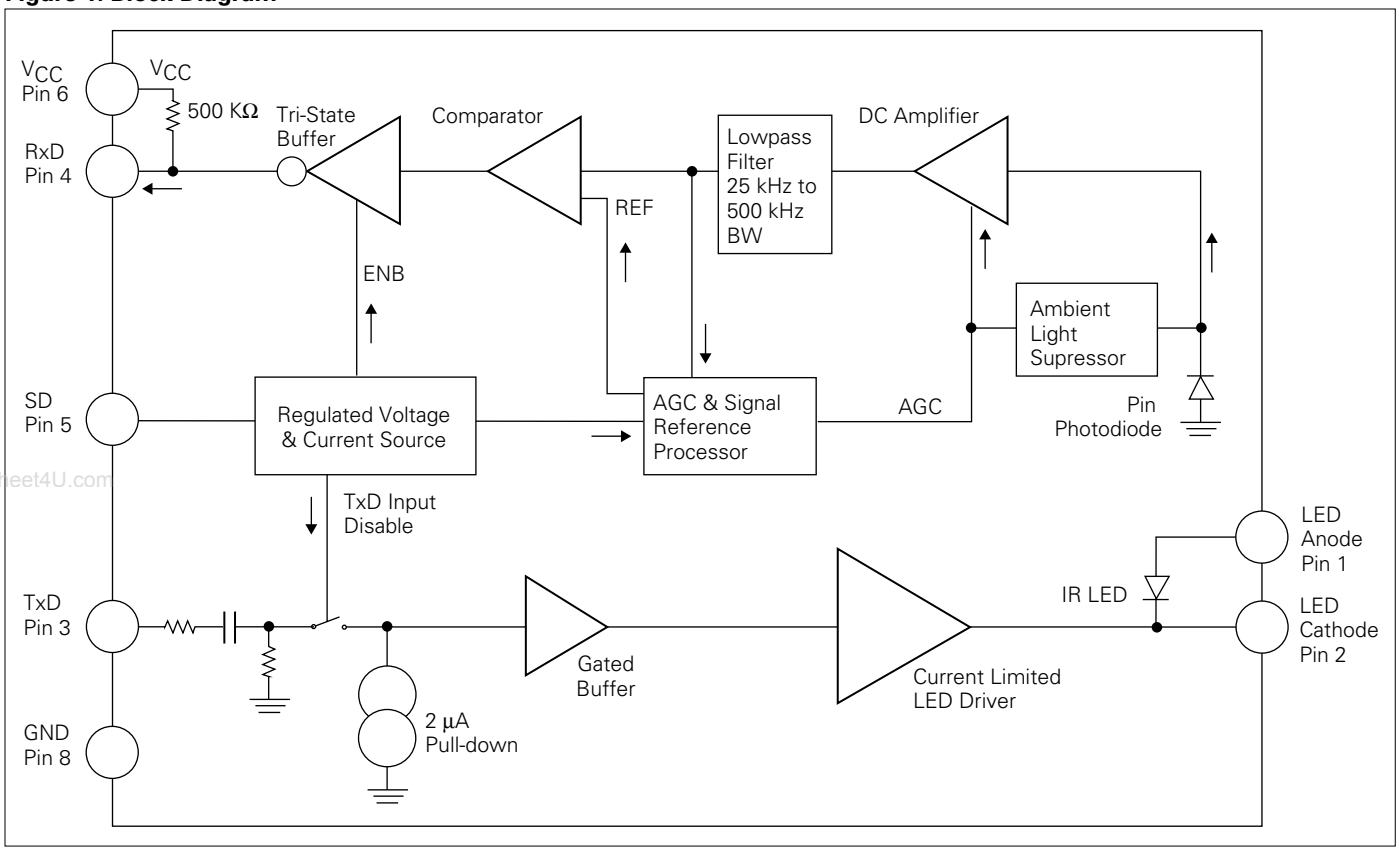
Figure 1. Block Diagram



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Theory of operation

The IRMS6115/IRMT6115 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 up to 4.0 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.

For normal operation of the transmit and receiver modes, the Shut Down (SD) pin should be held low. It is recommended that this pin be connected to GND if Shut Down (SD) mode is not used.

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 IRMS6115/IRMT6115 Truth Table

Inputs			**Outputs**	
SD	TxD	Detector	RxD	LED
High	X=don't care state	X=don't care state	500 kΩ pull-up	Off
Low	High		Undefined	On
	Low	0.4 mW/sr	High	Off
		40 mW/sr	Low	

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Electrical Characteristics

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

Parameter	Symbol	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°C 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} Shut Down Current **(Note 1)**	I_{CC1}	—	0.01	1.0	µA	SD=V_{CC}, V_{CC}=2.4 V to 5.5 V
I_{CC} Standby Current (Ave)	I_{CC1}	65	80	90	µA	no signal, V_{CC}=2.7 V to 3.3 V
I_{CC} Receiving Current (Ave)	I_{CC2}	—	100	200	µA	V_{CC}=2.7 V to 3.3 V
I_{CC} Transmitting Current (Ave)	I_{CC3}	—	2.0	2.5	mA	V_{CC}=2.7 V to 3.3 V, No LED resistor, VLED=3.0 V DC

Table 4. I/O Parameters

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Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
TxD, SD input capacitance	—	—	5.0	—	pF	V_{CC}=2.4 V to 5.5 V
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
TxD, SD Input Threshold **(Note 1)**	—	0.8	1.4	2.0	V	V_{CC}=2.4 V to 5.0 V
SD to RxD Tri-State	—	—	35	100	ns	V_{CC}=2.4 V to 5.0 V
SD to RxD Enable	—	—	90	200	ns	V_{CC}=2.4 V to 5.0 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	Symbol	Min.	Typ.	Max.	Unit	Conditions
Maximum Data Rate	—	9.6	115.2	576	Kb/s	4.0 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 7)**	—	—	7.5	—	mW/cm^2	V_{CC}=5.0 V
Maximum DC Ambient Irradiance, 2.4 V **(Note 7)**	—	—	4.0	—	mW/cm^2	V_{CC}=2.4 V
AGC Attack Time **(Note 2)**	—	—	1.0	2.0	µs	4 µW/cm^2 to 500 mW/cm^2
AGC Settling **(Note 3)**	—	—	5.0	10	pulse	4 µW/cm^2 to 500 mW/cm^2 at 115 Kb/s
Near-Far Receiver Latency **(Note 4)**	—	—	2.5	4.0	ms	0 to 5 mW/cm^2 ambient input
AGC Decay Rate **(Note 5)**	—	—	44	—	dB/ms	Following AGC settling at 500 mW/cm^2

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Table 5. Receiver Parameters (continued)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Transmit Receiver Latency **(Note 4)**	t_L	—	50	100	µs	0 to 3 mW/cm^2 DC ambient input
RxD Suppression Duration **(Note 8)**	—	—	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	—	1.0	1.63	3.0	µs	1.63 µs, 4 µW/cm^2 to 500 mW/cm^2 input.
Maximum Output Pulse Width at RxD, **(Note 7)**	—	—	57	100	µs	200 µs, 500 mW/cm^2, V_{CC}=5.0 V
Small Ripple Power Supply Rejection **(Note 6)**	—	50	100	—	mV/µs	100 mV_{P-P} triangle wave on V_{CC}
Large Ripple Power Supply Rejection **(Note 6)**	—	100	200	—	mV/ms	1.0 V_{P-P} triangle wave on V_{CC}

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Table 6. Transmitter Output

Parameter	Symbol	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	λ_{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:
For Shut Down (SD) current to fall below 1µA requires driving Shut Down (SD) to within 0.5 V of V_{CC} to ensure cutoff of the PMOS transistor of the input CMOS totem pole. In most applications this is not an issue if Shut Down (SD) is driven from a CMOS driver supplied from the same voltage supply

Note 2:
"AGC Attack Time" is the time required for internal AGC (Automatic Gain Control) attenuation to rise to within 10% of final value.

Note 3:
"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 4:
"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 Turnaround Time."

Note 5:
"AGC Decay Rate" is the rate at which the receiver gain increases following the cessation of signal input.

Note 6:
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 7:
If the low going RxD pulse width exceeds 100 µs, then the maximum DC ambient irradiance has been exceeded.

Note 8:
RxD is suppressed (forced high) while (TxD) transmit pulse is active and for the indicated period following the end of the TxD pulse.

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Figure 2. Timing Diagrams

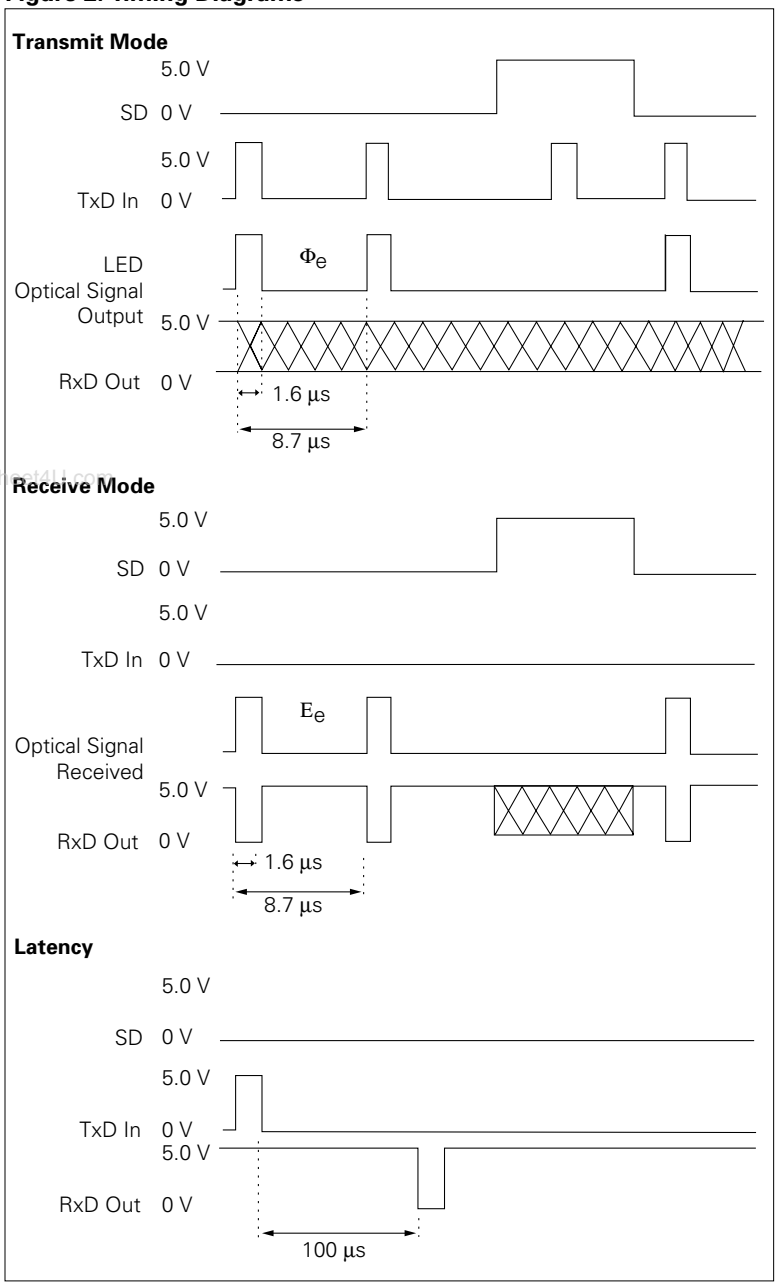

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Figure 3. Input Schematics

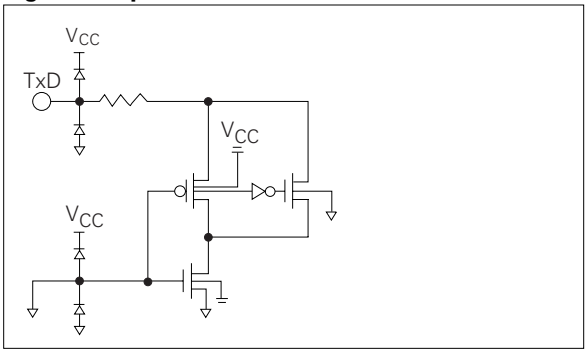

Figure 4. Output Schematics

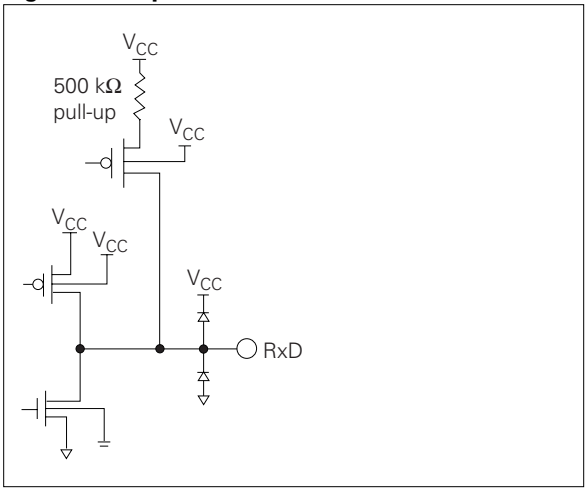

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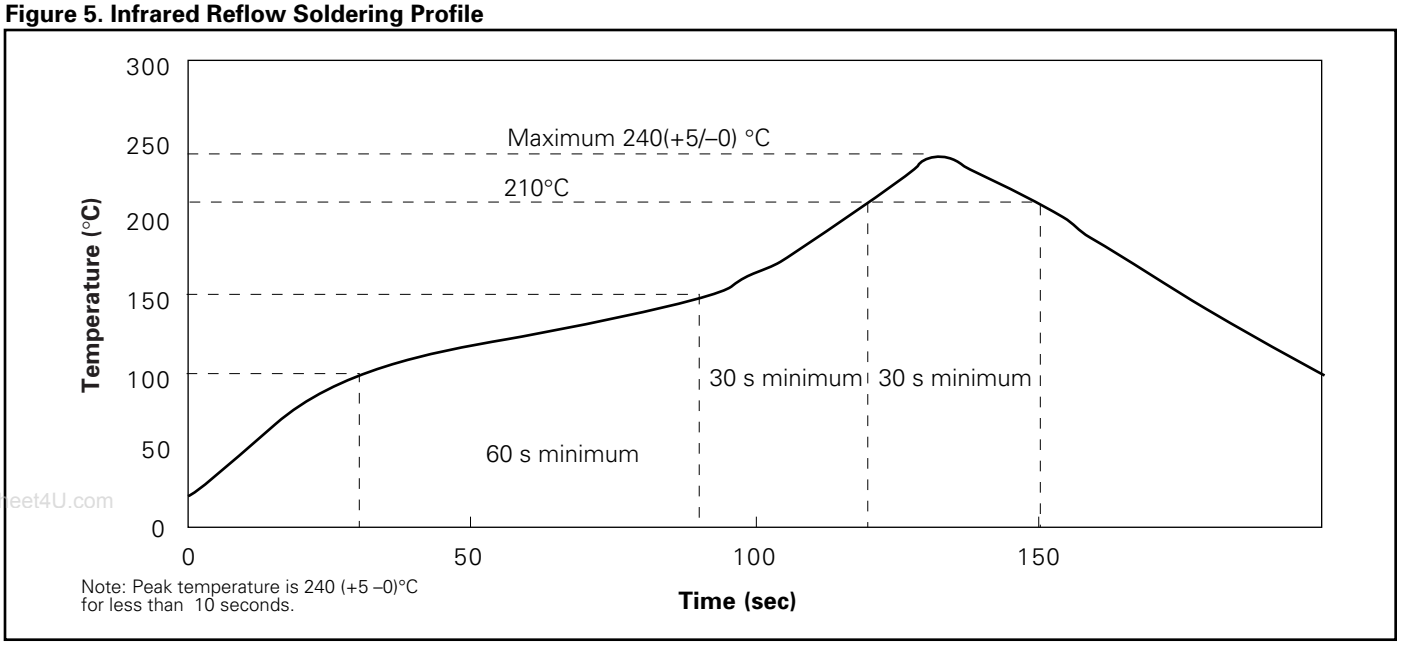
Figure 5. Infrared Reflow Soldering Profile



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Interface Diagrams

Figure 6. Super I/O (PC87108AVJE) to IRMS6115/IRMT6115

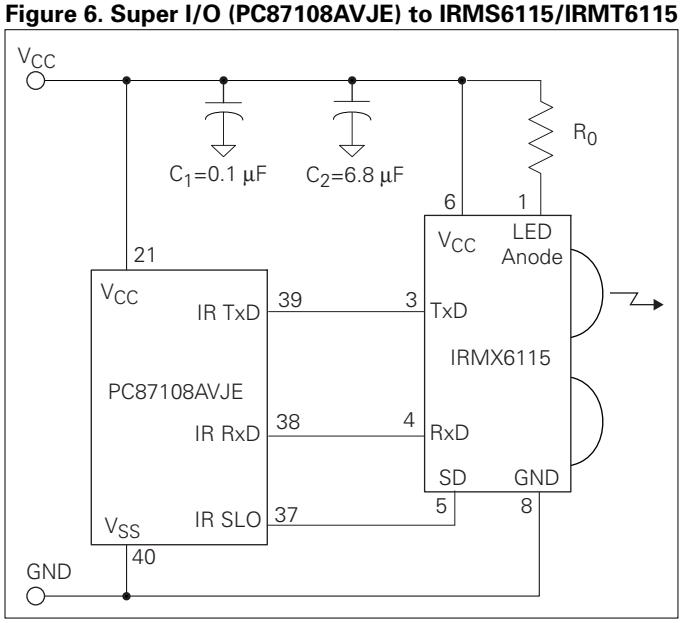

Figure 7. With independent V_{LED} supply

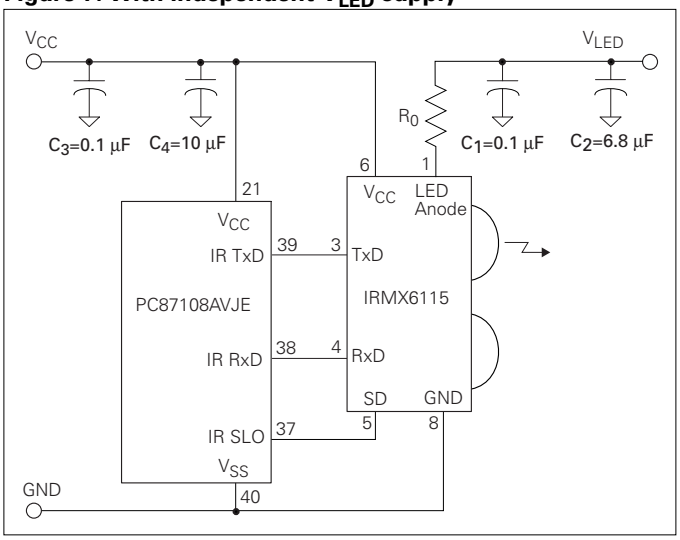

Table 7. Recommended External Component

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

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Ordering Information

Part Number	Description	PCB Mounting Orientation
IRMS6115	Integrated Transceiver —Side View	Packaged in Component Carrier Reel (1000/reel) for Side View Mounting on PCB
IRMT6115	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)

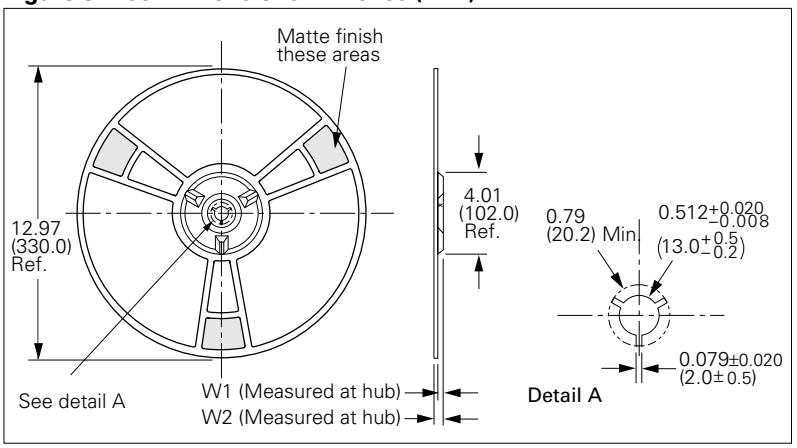

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Figure 8. Tape Dimensions in Inches (mm)

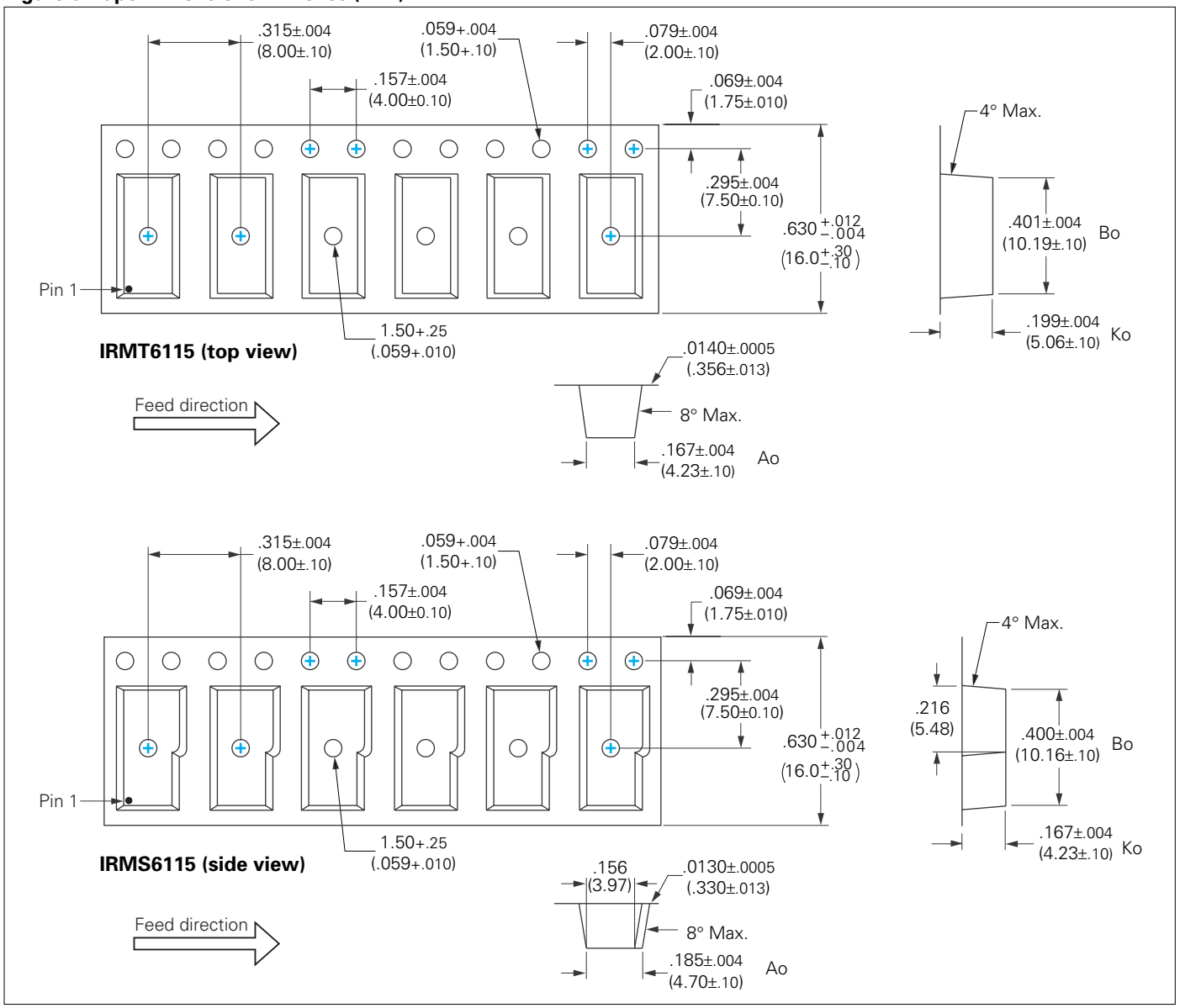

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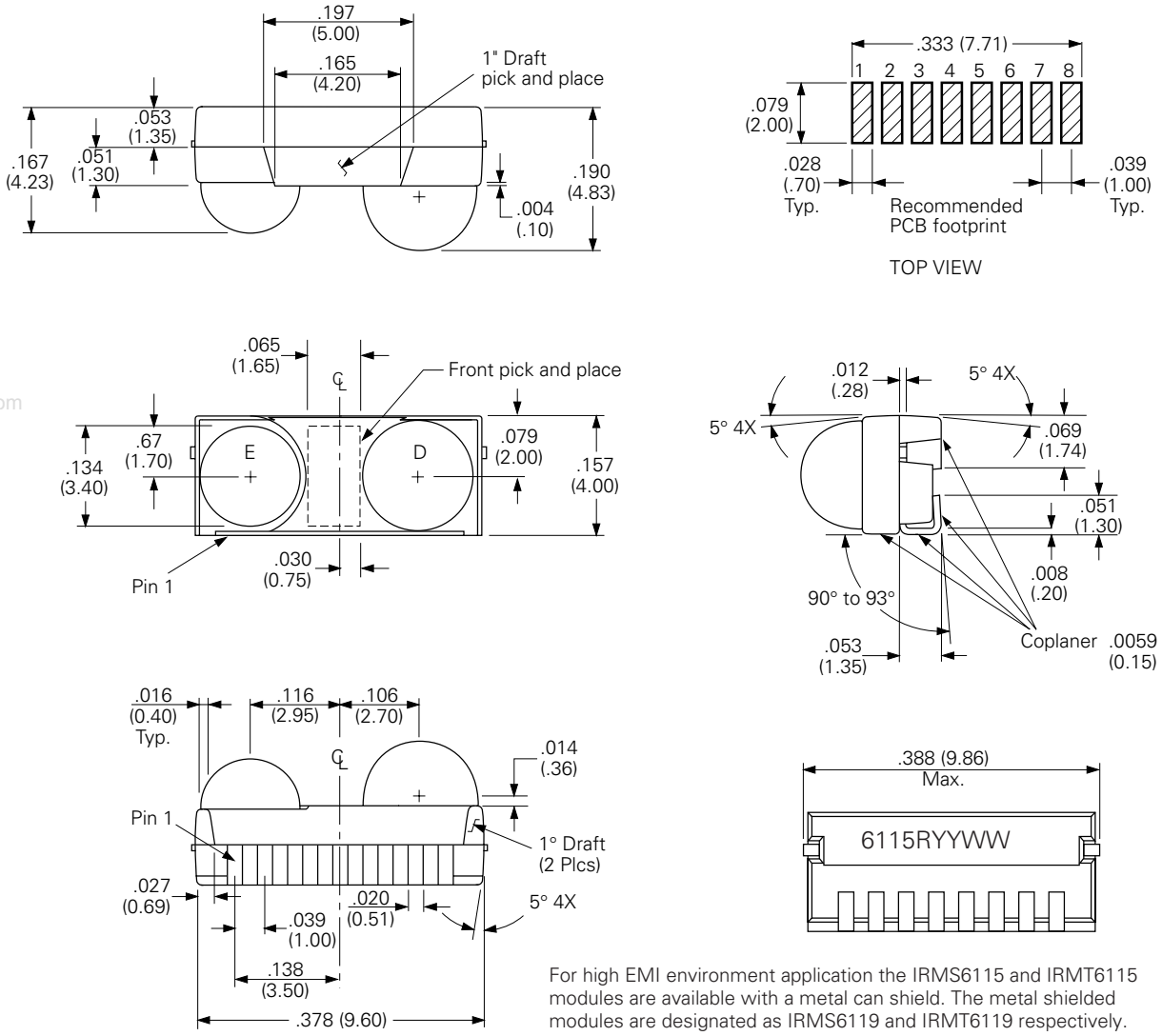
Figure 10. IRMS6115/IRMT6115 Detail Drawings With Optional Side View or Top View Mounting

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



For high EMI environment application the IRMS6115 and IRMT6115 modules are available with a metal can shield. The metal shielded modules are designated as IRMS6119 and IRMT6119 respectively.

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IRMS6115/IRMT6115

115 Kb/s Data Transceiver

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