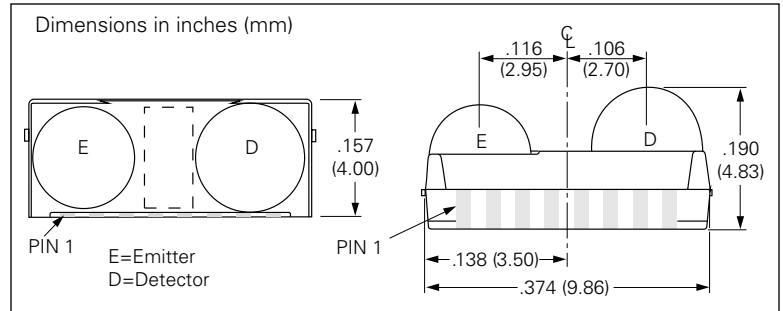


SIDE VIEW IRMS 6100

TOP VIEW IRMT6100

1.15 Mb/s IrDT Data Transceiver

Preliminary



DESCRIPTION

IRMS6100/IRMT6100 is an IrDA compliant 1.152 Mb/s infrared data transceiver. Its external Shut Down (SD) feature cuts current consumption to typically less than 0.01 μ A. The Shut Down (SD) mode disables the transmit input and tri-states the receiver output with a 500 k Ω pull up. The transmit input is AC coupled, limiting transmit pulse duration to 70 μ s, preventing transmitter damage and continuous LED output which also provides protection for eye safety.

Selectable LED transmit power (Pin 7) makes it easy for designers to use standard power mode (Pin 7=H) for 1 meter link or low power mode (Pin7=L) for 20 cm link.

Absolute Maximum Ratings, $T_A=25^\circ\text{C}$ (except where noted)

Supply Voltage Range, all states, V_{CC} -0.5 to +7.0 V
 LED Anode Voltage,
 $V_{CC}=0$ to 5.5 V, not transmitting, V_{LEDA} -0.5 to +9.0 V
 LED Anode Voltage,
 $V_{CC}=2.7$ to 5.5 V, transmitting, V_{LEDA} -0.5 to $V_{CC} + 4.0$ V
 Input Current,
 I_{CC} during transmit, $V_{CC}=5.0$ V, $TxD=V_{CC}$ (peak) 20 mA
 Output Rx/D Current 50 mA
 Storage Temperature,
 storage or reduced performance, T_S -40 to +100 $^\circ\text{C}$
 Ambient Temperature, operating, T_A -25 to 85 $^\circ\text{C}$
 Lead Solder Temperature, 230 $^\circ\text{C}$ <10 s
 IC Junction Temperature, T_J 125 $^\circ\text{C}$
 Average IR LED Current, LED Anode=3.3 V, I_{LED} 100 mA
 Repetitive Pulsed IR LED Current,
 <10 μ s, t_{on} <20%, LED Anode=3.3 V, $I_{LED(RP)}$ 600 mA
 Input Voltage: Tx/D, SD -0.5 to $V_{CC}+0.5$ V
 Rx/D Voltage -0.5 to $V_{CC} + 0.5$ V

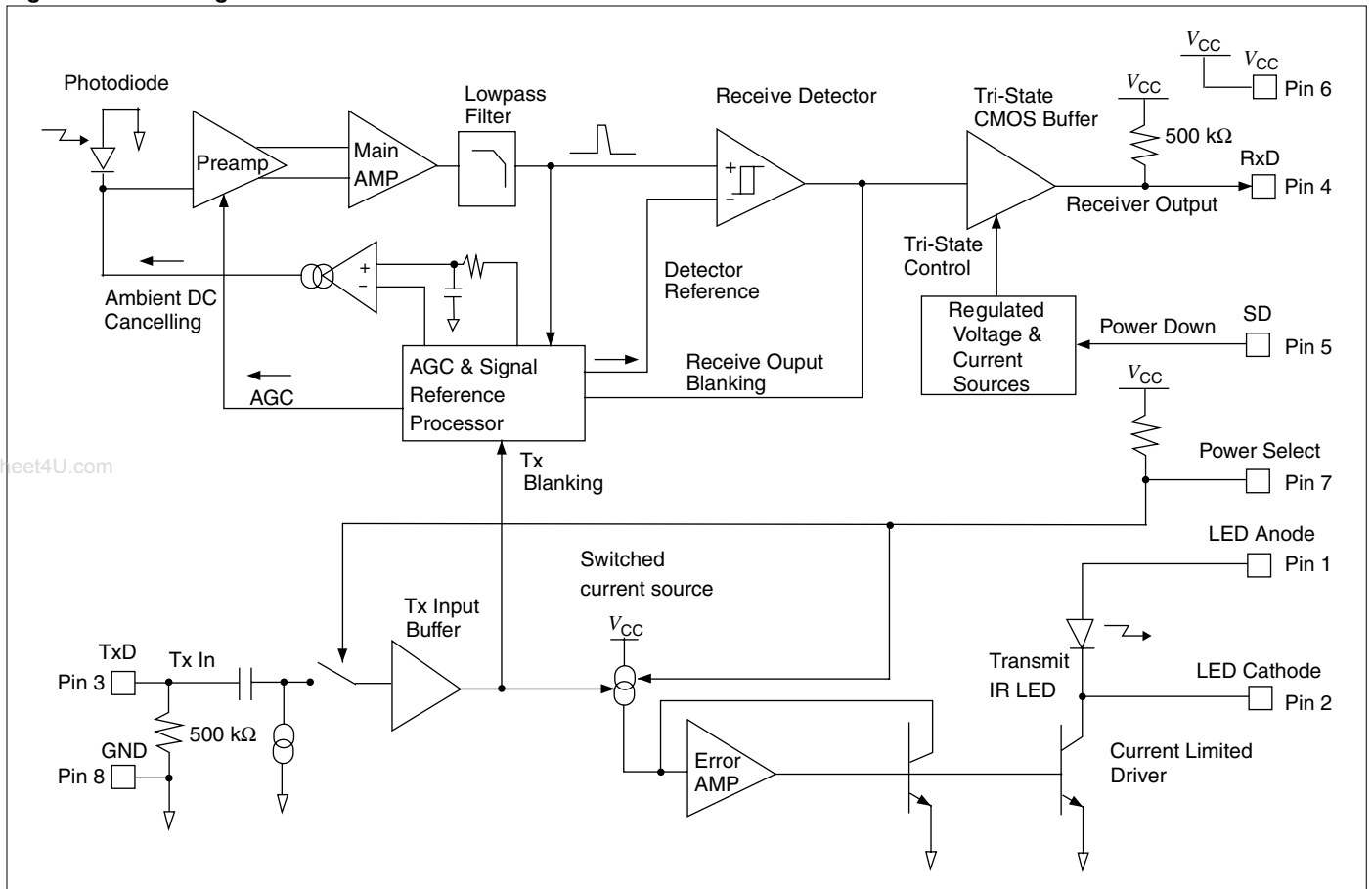
Table 1. Pin Functions

Pin no.	Function	Pin no.	Function
1	IR LEDA	5	SD
2	IR LEDC	6	V_{CC}
3	TxD	7	LED Power Select
4	RxD	8	GND

FEATURES

- Fully Compliant with IrDA Specification
- IrDA Data Rates 9.6 Kb/s to 1.152 Mb/s
- High Immunity to Fluorescent Light Noise
- Battery & Power Management Features:
 - Receive – 470 μ A Typical
 - Shutdown – 10 nA Typical
 - Programmable 500 mA/50 mA LED Transmitter for Standard 1.0 m or Low Power (30 cm) Operation
 - Independent LED Anode Supply – up to 9.0 V DC
 - Wide Voltage Range 2.7 V to 5.5 V Full Specification
 - High V_{CC} Noise Rejection >100 mV_{P-P}
- Shutdown Tri-States Receiver Output and Disables Tx/D allowing Bus Interfacing
- Integrated Protection for Eye Safety—AC Coupled Transmit Input
- High DC Ambient Rejection—Operates Outdoors
- Receiver Latency Less <100 μ s
- Slimline Package:
H 4.0 mm x D 4.8 mm x L 9.8 mm

Figure 1. Block Diagram



Theory of Operation

The IRMS6100/IRMT6100 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 10 mW/cm² at 5.0 V. This will typically allow operation in all but direct sunlight.

The receiver automatic gain control (AGC) circuit normalizes pulse width despite 120 dB signal range. The AGC also improves noise immunity while receiving a transmission by reducing gain so that noise less than 1/2 the peak signal height will not be detected.

Asserting shutdown powers down the transceiver, and for bus multiplexing, tri-states the receiver output and disables TxD input.

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 1.4 V will turn on IR LED transmitter. This pin has a 500 kΩ pulldown. 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 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 μW/cm ² (115 Kb/s) <1 μW/cm ² (1 Mb/s)	High	Off
		>4 μW/cm ² (115 Kb/s) >10 μW/cm ² (1 Mb/s)	Low	

The transmitter current limit is programmed to the high or low value by the state of Power Selection pin. If Power Select is low, low drive current limit is set. If the Power Select is high, high drive current limit is set.

ELECTRICAL CHARACTERISTICS

Table 3. Basic Operating Parameters, $T_A=25^\circ\text{C}$ (except where noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supported IrDA Data Rate	—	9.6	—	1152	Kb/s	3/16 clock period or 1/4 clock >115 Kb/s
V_{CC} Voltage	V_{CC}	2.7	—	5.5	V	0 to 70°C V_{CC} to V_{SS}
Maximum LED Anode Voltage	V_{LEDA}	—	—	$V_{CC}+4$	V	$V_{CC}=1.5\text{ V to }5.5\text{ V}$
I_{CC} Shut Down Current (Note 1)	I_{CC1}	—	0.01	1.0	μA	$SD=V_{CC}$ $V_{CC}=2.7\text{ V to }5.5\text{ V}$
I_{CC} Standby Current	I_{CC2}	375	470	585	μA	$SD=0$ $V_{CC}=2.7\text{ V to }5.0\text{ V}$ no signal
I_{CC} Receiving Current	I_{CC3}	—	650	—	μA	$4.0\ \mu\text{W}/\text{cm}^2$ 576 Kb/s 15 pF load
I_{CC} Transmitting Current, Saturated Driver (Average)	I_{CC4}	—	3.0	4.5	mA	$V_{CC}=5.0$, LED $I=400\text{ mA}$

Table 4. I/O Parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
TxD, SD input capacitance	—	—	5.0	—	pF	$V_{CC}=2.7\text{ V to }5.5\text{ V}$
TxD Resistance	—	350	500	650	k Ω	$TxD=V_{CC}$ $V_{CC}=2.7\text{ V to }5.5\text{ V}$
TxD, SD Input Threshold (Note 1)	—	0.8	1.4	2.0	V	$V_{CC}=2.7\text{ V to }5.0\text{ V}$
SD to RxD Tri-State	—	—	35	100	ns	$V_{CC}=2.7\text{ V to }5.0\text{ V}$
SD to RxD Enable	—	—	90	200	ns	$V_{CC}=2.7\text{ V to }5.0\text{ V}$
RxD Output High	V_{IH}	4.3	4.6	—	V	$V_{CC}=5.0\text{ V}$ $I_{oh}=8.0\text{ mA}$
RxD Output High	V_{IH}	1.5	1.7	—	V	$V_{CC}=2.7\text{ V}$ $I_{oh}=2.0\text{ mA}$
RxD Output Low	V_{IL}	—	0.22	0.4	V	$V_{CC}=5.0\text{ V}$ $I_{ol}=8.0\text{ mA}$
RxD Output Low	V_{IL}	—	0.17	0.3	V	$V_{CC}=2.7\text{ V}$ $I_{ol}=2.0\text{ mA}$
RxD Short Circuit	—	—	40	—	mA	$V_{CC}=5.0\text{ V}$ $RxD=0$ $RxD=V_{CC}$
RxD Short Circuit	—	—	8.0	—	mA	$V_{CC}=2.7\text{ V}$ $RxD=0$ $RxD=V_{CC}$
RxD to V_{CC} Tri-State Impedance	—	350	500	650	k Ω	$SD=V_{CC}$ $V_{CC}=2.0\text{ V to }5.0\text{ V}$ between RxD to V_{CC}
RxD Rise/Fall Time	—	12	18	27	ns	$V_{CC}=5.0\text{ V}$ Load=15 pF
RxD Rise/Fall Time	—	20	30	40	ns	$V_{CC}=5.0\text{ V}$ Load=50 pF
RxD Rise/Fall Time	—	24	36	55	ns	$V_{CC}=2.7\text{ V}$ Load=15 pF
RxD Rise/Fall Time	—	42	63	94	ns	$V_{CC}=2.7\text{ V}$ Load=50 pF

Table 5. Receiver Parameters, $T_A=25^\circ\text{C}$ (except where noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Maximum Data Rate	—	—	1.15	—	Mb/s	200 ns $4.0\ \mu\text{W}/\text{cm}^2$ to $500\text{ mW}/\text{cm}^2$
Receive 1/2 Angle	—	15	—	—	degrees	IrDA <i>Physical Layer</i> specification
Minimum Signal Detect Irradiance	E_{IHmin}	—	5.0	10	$\mu\text{W}/\text{cm}^2$	Bit error Rate= 10^{-8} 217 ns pulse
Maximum Signal Detect Irradiance	E_{Emax}	500	1000	—	mW/cm^2	Bit error Rate= 10^{-8} 217 ns pulse
Maximum Signal Irradiance No detect	—	—	—	0.3	W/cm^2	< 0.1 pulse per second detect, 20 kHz to 200 kHz square wave <100 ns rise/fall
Maximum DC Ambient Irradiance 5.0 V	—	—	30	—	mW/cm^2	$V_{CC}=5.0\text{ V}$
Maximum DC Ambient Irradiance 2.7 V	—	—	10	—	mW/cm^2	$V_{CC}=2.7\text{ V}$
AGC Attack Time (Note 2)	—	—	300	1000	μs	$4.0\ \mu\text{W}/\text{cm}^2$ to $500\text{ mW}/\text{cm}^2$
AGC Settling (Note 3)	—	—	2.0	5.0	pulse	$4.0\ \mu\text{W}/\text{cm}^2$ to $500\text{ mW}/\text{cm}^2$ 217ns pulse

Table 5. Receiver Parameters (continued)

AGC Decay Rate (Note 5)	—	—	44	—	dB/ms	Following AGC settling at 500 mW/cm ²
Transmit Receiver Latency (Note 4)	t _L	—	50	100	μs	0 to 3.0 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 2.5 mW/cm ² DC ambient input
First Pulse Width at RxD (Note 8)	—	150	500	900	ns	217 ns 4.0 μW/cm ² to 500 mW/cm ² input
Subsequent Pulse Width at RxD (Note 8)	—	150	217	400	ns	217 ns 4.0 μW/cm ² to 500 mW/cm ² input
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}

Table 6. Transmitter Output

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Maximum Data Rate	—	—	1.1	—	Mb/s	TxD pulse width=125 ns
TxD Radiant Intensity, Tx Mode High	—	100	170	500	mW/Sr	V _{CC} =5.0 V LEDA=3.3 V Tx High 10% duty cycle
TxD Radiant Intensity, Tx Mode High	—	100	150	500	mW/Sr	V _{CC} =2.7 V LEDA=3.3 V Tx High 10% duty cycle
TxD Radiant Intensity, Tx Mode High	—	—	50	—	mW/Sr	LEDA=1.8 V 10% duty cycle
TxD Radiant Intensity, Tx Mode Low	—	—	18	—	mW/Sr	LEDA=3.3 V Tx Low 10% duty cycle
TxD Radiant Intensity, Tx Mode Low	—	—	16	—	mW/Sr	LEDA=2.7 V Tx Low 10% duty cycle
TxD 1/2 Angle	—	15	20	30	degrees	IrDA <i>Physical Layer</i> specification
TxD Peak Wavelength	—	850	870	900	nm	I _F =500 mA
I _{LED} Limit, Tx High	—	385	500	650	mA	TxD=V _{CC} LED anode=3.3 V V _{CC} =2.7 to 5.0 V
I _{LED} Limit, Tx Low	—	40	50	70	mA	TxD=V _{CC} LED anode=3.3 V V _{CC} =2.7 to 5.0 V
I _{LED} Limit Tempco	—	—	+0.47	—	%/°C	TxD=V _{CC} LED anode=3.3 V V _{CC} =2.7 to 5.0 V
LED Tempco	—	—	-0.5	—	%/°C	I _{LED} =500 mA
LED Cathode Saturation Drop	—	—	0.3	0.4	V	300 mA, V _{CC} =2.7
TxD V _{CC} dV/dt Rejection	—	—	5.0	—	V/μs	dV/dt for less than 20% change in TxD output

Note 1:

For Shut Down (SD) current to fall below 1.0 μA 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 1.0 V_{P-P} of 120 Hz ripple.

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.

Note 8:

“First Pulse Width” specifies the width of the first pulse received after AGC has decayed to maximum sensitivity. “Subsequent Pulse Width” defines the width of subsequent pulses received within 100 μs of first pulse.

Tx Power Mode Selection

The IRMS6100/IRMT6100 initializes in the standard Tx Power Mode upon power-up. To select Low Tx Power mode simply tie Power Select pin low (Gnd).

Table 7. External Component

Parameter	Values							Unit
V _{LED} power supply	2	2.7	3.0	3.5	4.0	4.5	5.0	V
Resistor (R ₀)	0	0	0	1.5	2.7	3.9	5.1	Ω

Figure 2. Input Schematics

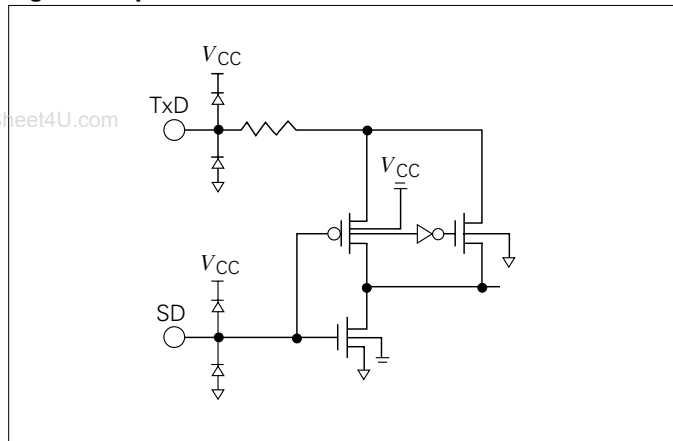
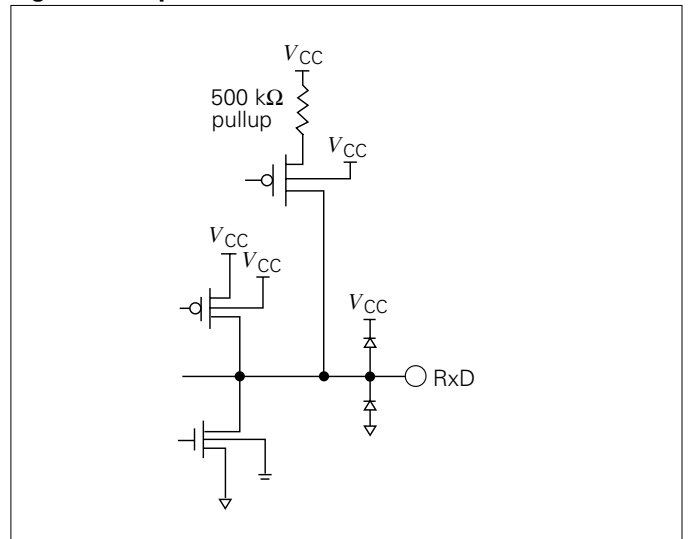
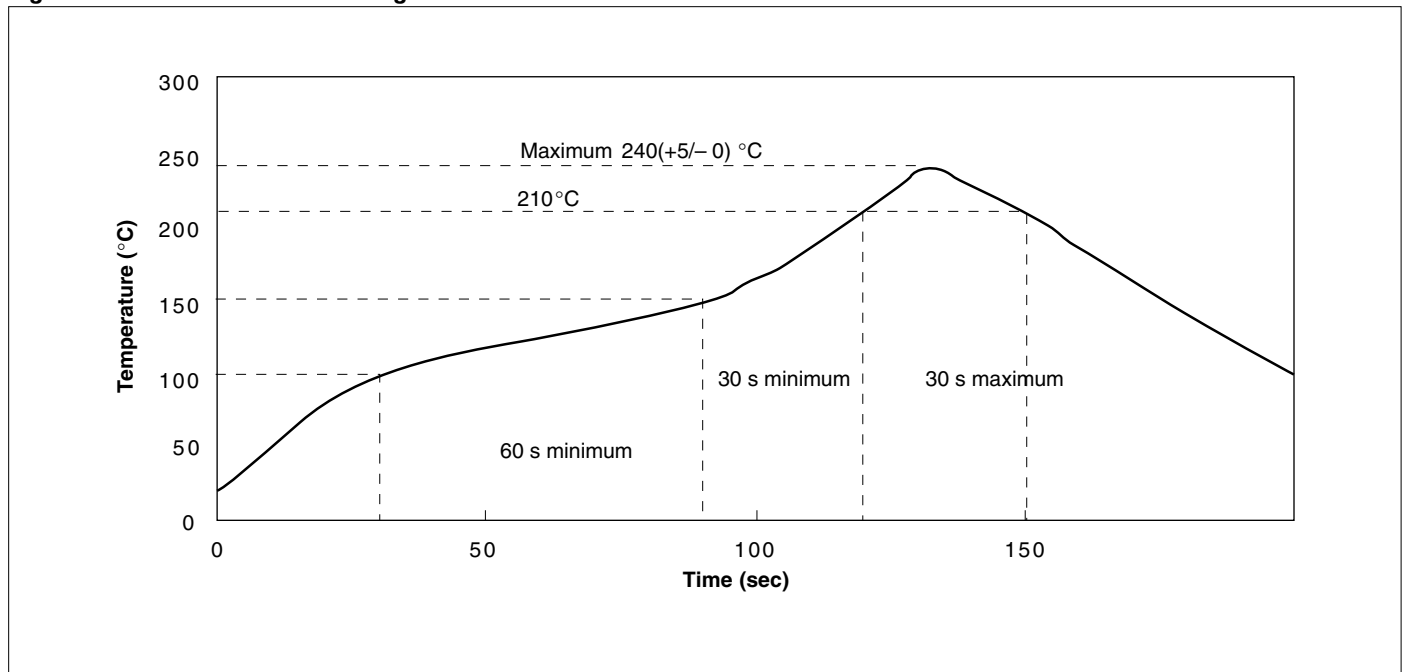


Figure 3. Output Schematics



A current limiting resistor should be used between the LED anode and V_{CC} (see Table 7 for recommended values).

Figure 4. Infrared Reflow Soldering Profile



INTERFACE DIAGRAM

Figure 5. Super I/O (PC87108AVJE) to IRMS6100/IRMT6100

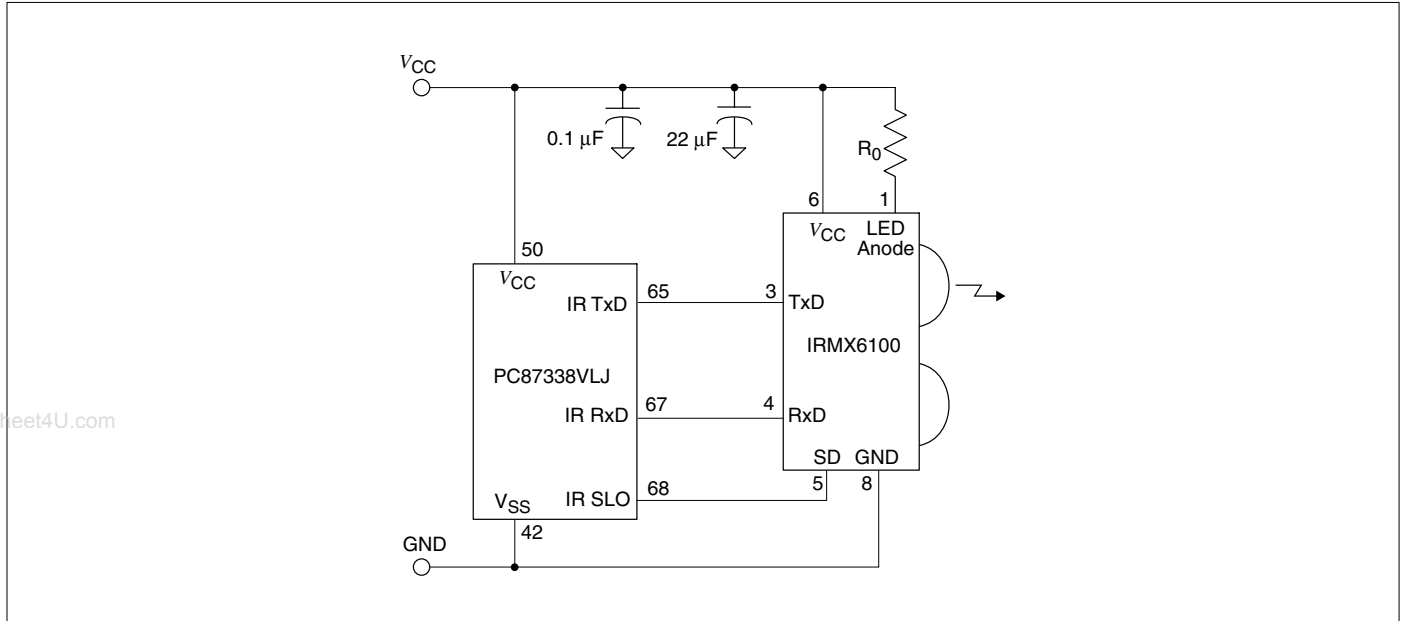
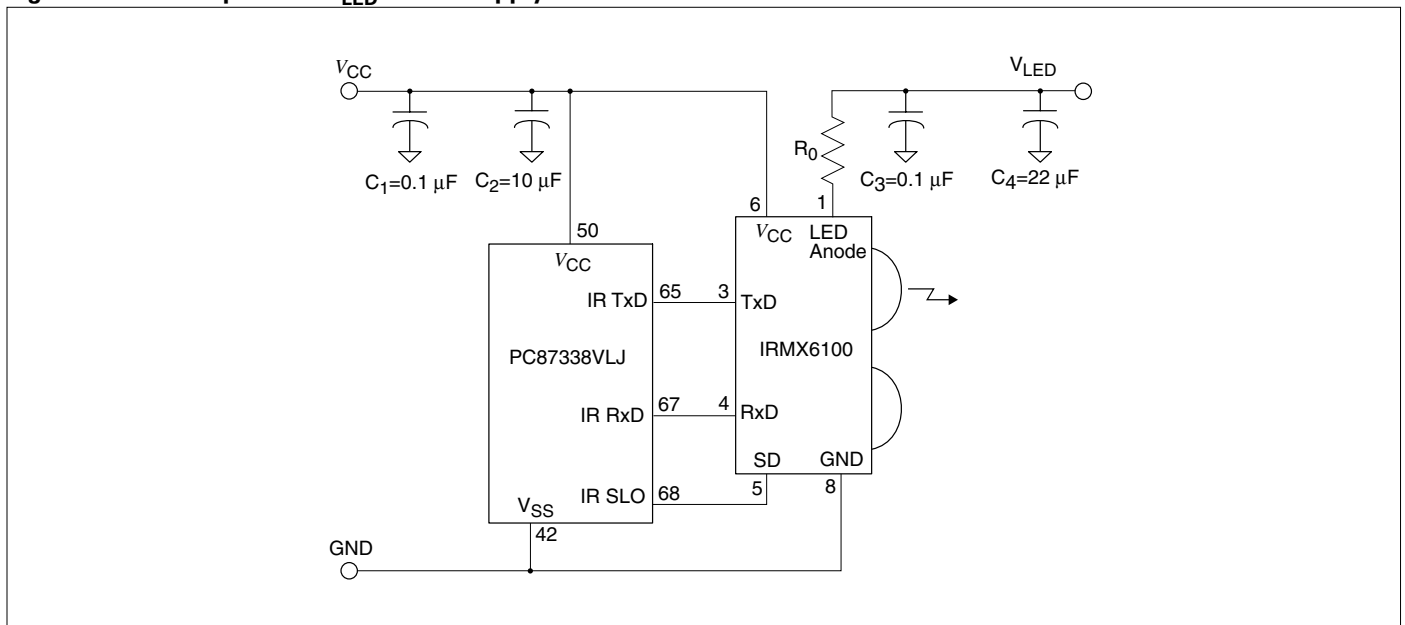


Figure 6. With Independent V_{LED} Power Supply



ORDERING INFORMATION

Part Number	Description	PCB Mounting Orientation
IRMS6100	Integrated Transceiver —Side View	Packaged in Component Carrier Reel (1000/reel) for Side View Mounting on PCB
IRMT6100	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 8. Reel Dimensions in Inches (mm)

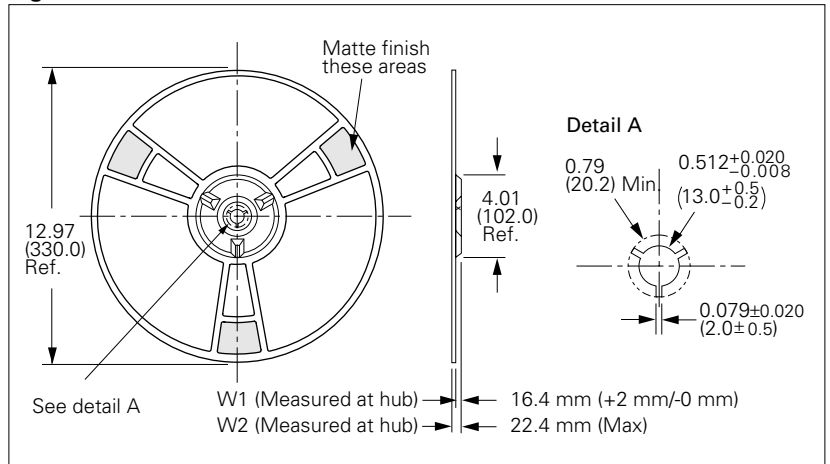


Figure 7. Tape dimensions in Inches (mm)

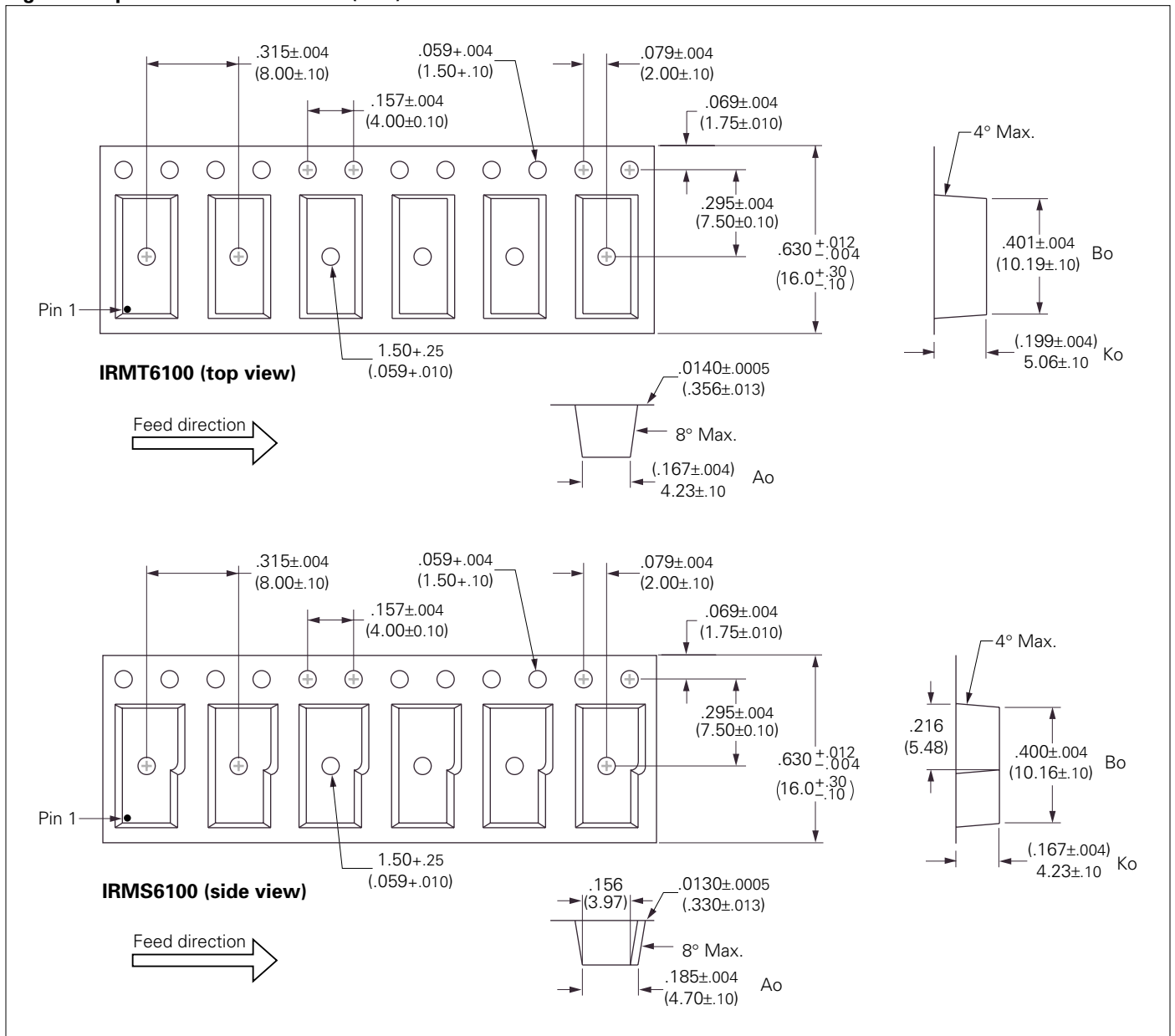
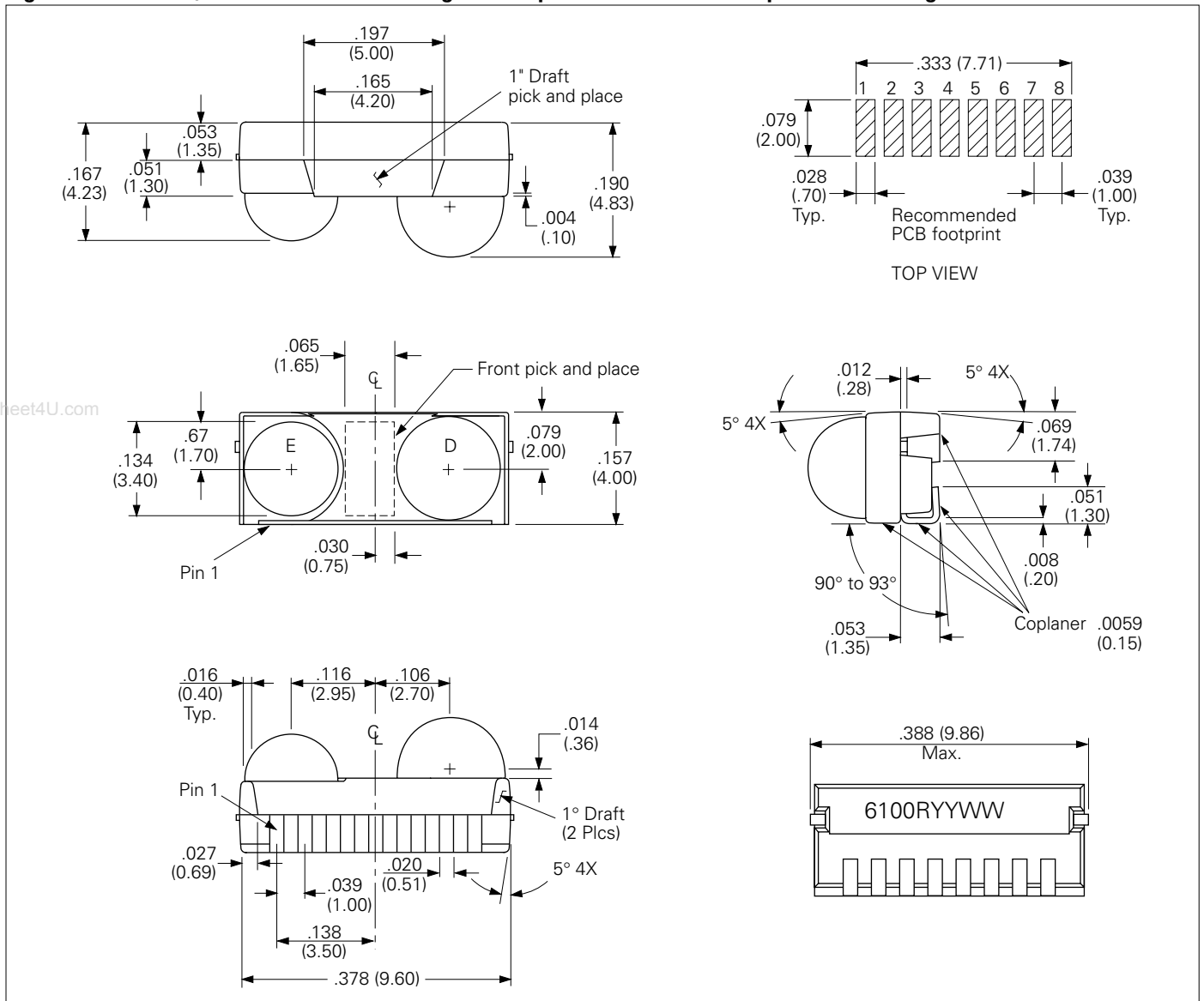


Figure 9. IRMS6100/IRMT6100 Detail Drawings With Optional Side View or Top View Mounting



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