Technical Data Sheet
4Mbit/s Infrared Transceiver

TM6101/TR2

Features

- Excellent Fluorescent noise immunity and very high EMI immunity
- Shutdown disables transmit input and tri-states receiver output with a 500K ohm pull-up
- Wide Operating Voltage Range from 2.4 to 5.0 Volts
- Small Surface Mount Package:
  - L9.8mm * W4.0mm * H4.65mm
- 2.4kbps to 4Mbps data rates IrDA compliant
- 600mA current limit transmitter:
  - 70us pulse width limiting
- Dual Bandwidth Control Pin (BC) Selects High speed (4Meg)/Low speed mode with either direct control or by TXD clocking with SD.
- Few External Components Required
- Pb-free

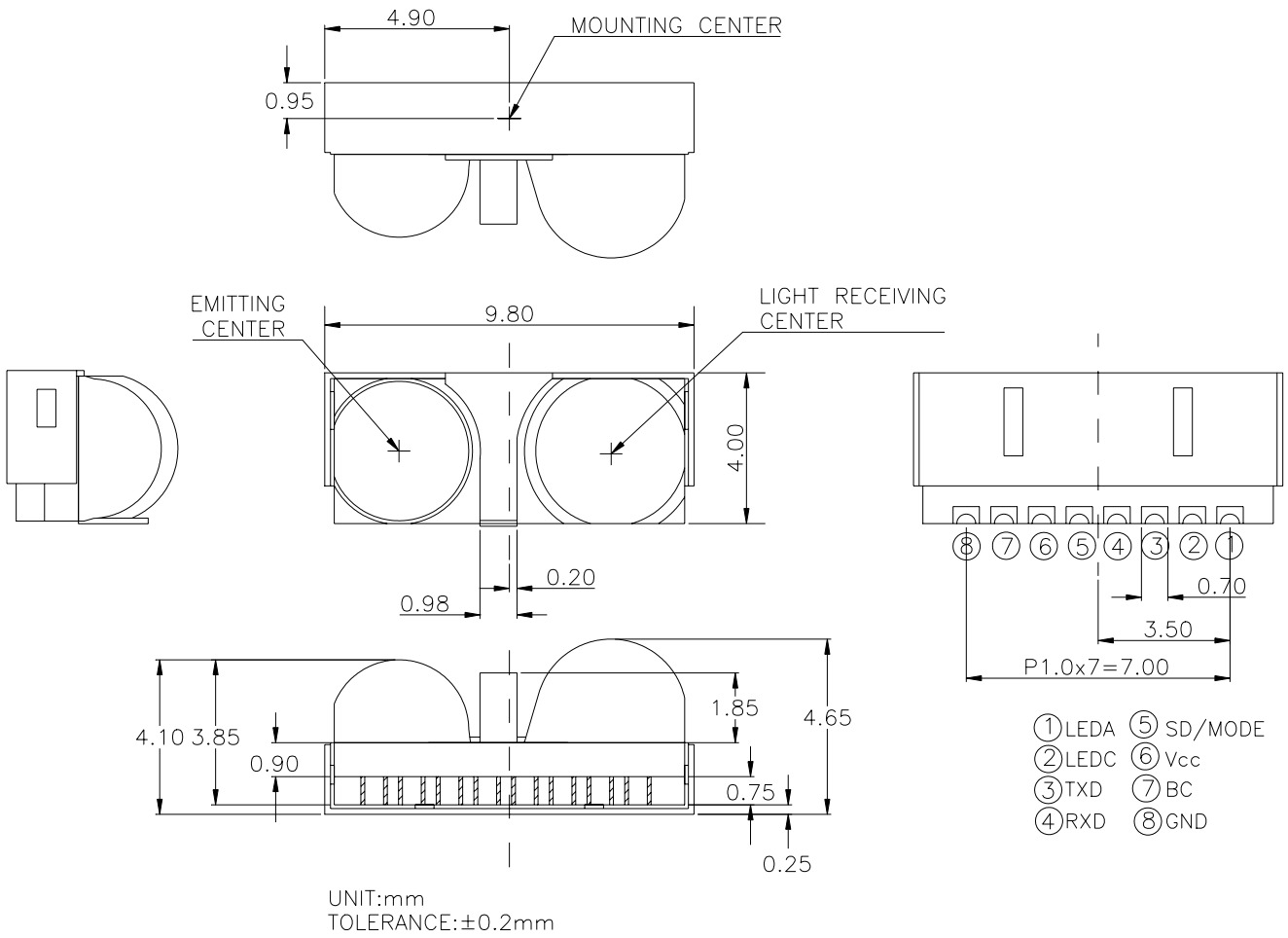
Descriptions

The TM6101/TR2 is a new generation of low cost, multi-mode IrDA module in small surface mount package. The operating voltage can range from 2.4 to 5.0 Volts and IrED supply voltage can reach Vcc+4 Volts. This module supports data rates speed up to 4Mbps and compliant to the IrDA 1.3. The transmitter input is AC coupled, limiting transmitter pulse duration to 70 usec, preventing transmitter damage and continuous IrED output.

Applications

- Notebook
- Digital Still and Video Cameras
- Cellular Phones, Pagers, Smart Phones
- PDA, Printers
- PCs

Package Dimensions



Device Selection Guide

Mode	Transmitter		Receiver		λp	Operating Voltage (Vcc)	Data Rate
	Distance	Angle 2θ1/2	Distance	Angle 2θ1/2			
TM6101/TR2	>1.0m	+/-15	>1.0m	+/-30	850~900 nm	2.4~5.0 Volts	2.4K~4M bps

Pin Descriptions

Pin	Symbol	Function	Description	I/O	Active
1	LEDA	LED Anode	IRED anode, to be external connected to Vcc through a current control resistor. Note: 1.		
2	LEDC	LED Cathode	IRED cathode, internally connected to driver transistor		
3	TXD	Transmitter Data Input	Logic High turn on the IrLED. Note: 2	I	High
4	RXD	Receiver Data Output	Note: 3	O	Low
5	SD/Mode	Shutdown	Must be driven either high or low. Do Not float the pin. Note: 4		High
6	Vcc	Supply Voltage	Supply Voltage from 2.4 to 5.0 Volts.		
7	BC	Bandwidth Control	Logic Level: High is FIR, Low is SIR/MIR. **If this pin is disconnected, the logic level is determined by internal flip-flop.** Note: 5		
8	GND	Ground	Connect to system ground		
-	Shield	EMI Shield	Connect to system ground via a low inductance trace. For best performance, don't connect to GND directly at the device.		

Note 1: This is a constant 600mA (current sink). The output can be allowed to saturate and output current can be limited by addition of resistor in series with the IrED. When using IrED anode supplies above 3.3V a series resistor should be used to reduce thermal IR drop across the transmitter driver.

Note 2: Asserting this pin turns on transmitter. Has 500Kohms pull down. This input is capacitive coupled to limit transmit pulse width to about 70usec and is gated by the shutdown function. The transmit pulse rise time must be faster than 1usec.

Note 3: Normally high, goes low for duration of receiver pulse. Output is a CMOS driver providing rail to rail operation. Note: Receiver output may go low if DC ambient exceeds maximum.

Note 4: Asserting this pin above 1.4V causes the device to shut down. The trailing edge of shutdown (enable) is used to clock the TXD input into the high speed/low speed mode control D flip flop. Current consumption in shut down mode is less than 1uA (if driven to more than Vdd-0.5V). Shutdown gates off the transmitter input and tri-states the receiver output to full sensitivity.

Note 5: The logic level of this pin determines the IrDA bandwidth; high is FIR, low is SIR/MIR. This pin has a 500K connection to the internal bandwidth control flip-flop set by clocking the TXD input with the trailing edge of SD. The state of this flip-flop will determine the level of BC if not connected to an external overdriving logic level. On power up the flip-flop is sets BC to the low state. During shutdown the 500K resistor is disconnected so no current flows through this pin.

TRANSCEIVER I/O Truth Table

The LED and RXD outputs are controlled by the combination of the TXD and SD pins and light falling on the receiver.As shown in the table below,the transmitteris non-inverting ;the LED is on when the TXD pin is high and off when TXD is low.The receiver is inverting;the RXD pin is low during IrDA signal pulses and high when the receiver does not see any light.When shutdown(SD pin high),the LED is off (the state of the TXD pin does not matter),and the RXD pin is pulled high with a weak internal pullup.

SD	TXD	LED	Receiver	RXD
Low	High	On	Don't care	Not Valid
	Low	Off	IrDA Signal	Low
			No Signal	High
High	Don't care	Off	Don't care	High

Absolute Maximum Ratings (Ta=25℃)

Reference point Pin GND unless otherwise noted.

Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	All States	Vcc	-0.5		7	V
IrED Supply Voltage	SD=0, TXD=Vcc	V_{LEDA}	-0.5		Vcc+4	V
	Vcc=0~7V, TXD=0	V_{LEDA}	-0.5		9	V
Receiver Data Output	All States	RXD	-0.5		Vcc+0.5	V
Transmitter Data Input	All States	TXD	-0.5		Vcc+0.5	V
Shut Down	All States	SD	-0.5		Vcc+0.5	V
Operating Temperature Range		Tamb	-25		+85	℃
Storage Temperature Range		Tstg	-40		+85	℃
Soldering Temperature	See Recommended Solder Profile			-	245	℃
Average IrED Current		I_{IrED} (DC)			100	mA
Repetitive Pulsed IrED Current	t<50μs, t_{on}<20%	I_{IrED} (RP)			600	mA

Electrical Characteristics

Tamb=25℃, Vcc=2.4V to 5.0V unless otherwise noted.

Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Transceiver						
Supply Voltage	Receive Mode Transmit Mode, R=3.9Ω	Vcc	2.4		5.0	V
Supply Current Pin Vcc (Receive Mode)	Vcc=5.0V, SD=0, HSM*1: 4Mbps	Icc1 (Rx)		2.3		mA
	Vcc=2.4V, SD=0, HSM*1: 4Mbps	Icc2 (Rx)		1.75		mA
	Vcc=2.4V, SD=0, LSM*2: No input	Icc3 (Rx)		1.4		mA
Supply Current Pin Vcc (avg) (Transmit Mode)	I_{IrED}=600mA (at IrED Anode Pin) Vcc=5V	Icc (Tx)		12		mA
Shut Down Current Pin SD	SD=Vcc=2.4 to 5.0V	I_{SD}		0.01	1	uA
Transmit Receiver Latency		T_{TRL}		50	100	uA
Transceiver Power On Setting Time		T_{PON}		100	150	us

*1 HSM: High Speed Mode

*2 LSM: Low Speed Mode

I/O Parameters

Tamb=25℃,Vcc=2.4V to 5.0V unless otherwise noted.

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Parameters	Test Conditions	Min.	Typ.	Max.	Unit
TXD, SD input capacitance	Vcc=2.4 to 5.0V	-	1	-	pF
TXD pull down	TXD=Vcc, Vcc=5V	-	500	-	KΩ
TXD Min. Setup	Vcc=2.4 to 5V, Referenced to SD Negative clocking edge	-	27	40	ns
TXD Min. Hold Time for Mode Change	Vcc=2.4 to 5V, Referenced to SD Negative clocking edge	10	-	-	ns
TXD input Threshold	Vcc=5V, 125ns input pulse	1	1.4	1.8	V
TXD input Threshold	Vcc=2.4V, 125ns input pulse	0.7	1.0	1.3	V
SD transmit enable setup	Vcc=2.4 to 5V	20	-	-	ns
SD to TXD input disable& RXD tri-state	Vcc=2.4 to 5V	50	-	-	ns
SD pull up	SD=0, Vcc=5V	-	500	-	KΩ
SD input Threshold	Vcc=5V	1.6	1.9	2.2	V
SD input Threshold	Vcc=2.4V	0.8	1.1	1.4	V
RXD Output High	Vcc=5V, Ioh=20mA	-	2.6	-	V
RXD Output High	Vcc=2.4V, Ioh=3mA	1.9	-	3	V
RXD Output Low	Vcc=5V, Iol=20mA	-	0.85	-	V
RXD Output Low	Vcc=2.4V, Iol=3mA	-	0.23	-	V
RXD Short Circuit	Vcc=5V, RXD=0, RXD=Vcc	-	48	-	mA
RXD Short Circuit	Vcc=2.4V, RXD=0, RXD=Vcc	-	10	-	mA
RXD to Vcc Tri-state	SD=Vcc, Vcc=5V, Measured between RXD to Vcc	-	500	-	KΩ
RXD Rise/Fall Time	Vcc=5V, Load=15pF	10	-	40	ns
RXD Rise/Fall Time	Vcc=2.4V, Load=15pF	10	-	40	ns

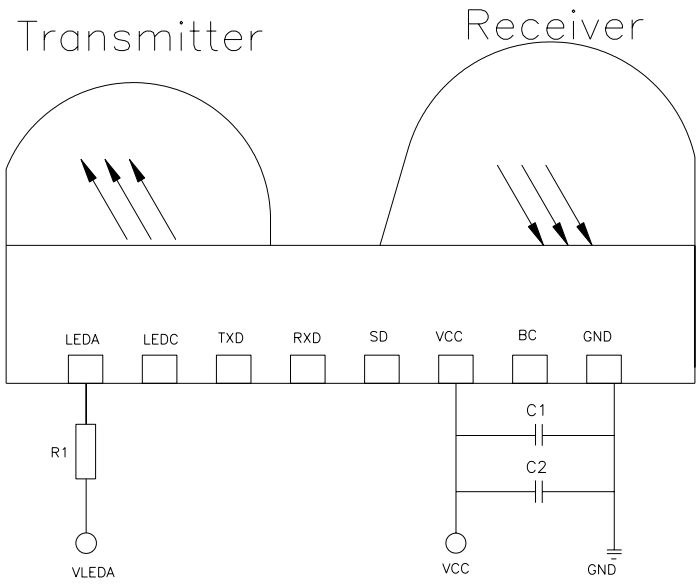
Opto-electronic Characteristics

Tamb=25℃,Vcc=2.4V to 5.0V unless otherwise noted.

Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

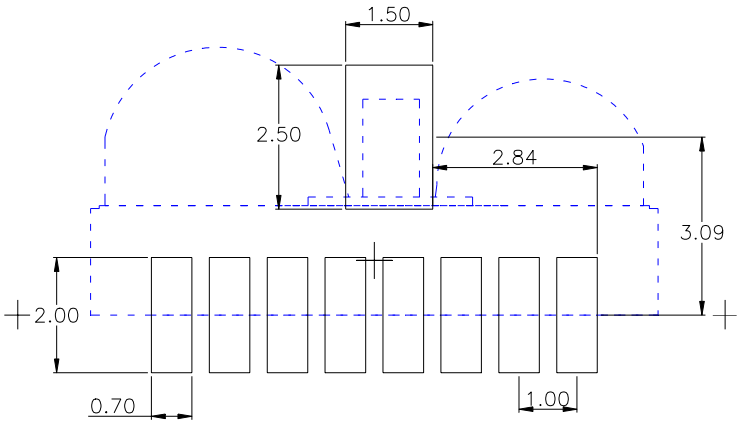
Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Receiver						
Date rate		-	2.4K	-	4M	bps
Logic High Input Irradiance	Bit error rate=10^{-8}	E_{IHmin}(FIR)	10	-	-	uW/cm^2
		E_{IHmin}(MIR)	10	-	-	uW/cm^2
		E_{IHmin}(SIR)	4.0	-	-	uW/cm^2
Logic High Input Irradiance	In band irradiance maximum	E_{IHmax}	-	-	500	mW/cm^2
Minimum Detection Threshold	4.0Mbps	E_{Emin}	-	4.0	-	uW/cm^2
Logic Low Input Irradiance	Ambient interference pulsed	E_{IL}	-	-	0.4	uW/cm^2
Power up Latency	0 to 10mW/cm^2 ambient input	-	-	50	150	us
Transmit Latency (turn around)	0 to 10mW/cm^2 ambient input	-	-	30	100	us
Power supply Rejection < 5MHz	<0.1 pulse per second spurious output	-	-	50	-	mVpp
Power supply Rejection > 5MHz	<0.1 pulse per second spurious output	-	-	25	-	mVpp
Output Pulse Width at RXD (4Mbps)	125ns, 40uW/cm^2 input, load=15pF, measured at 1.4V	-	90	120	140	ns
Output Pulse Width at RXD (1.152Mbps)	217ns, 40uW/cm^2 input, load=15pF, measured at 1.4V	-	110	220	270	ns
Output Pulse Width at RXD (115.2Kbps)	1.63us, 40uW/cm^2 input, load=15pF, measured at 1.4V	-	1.4	1.59	2.5	us
Output Pulse Width at RXD (9.6Kbps)	19.5us, 40uW/cm^2 input, load=15pF, measured at 1.4V	-	1.4	10.5	22	us
Transmitter						
Transmit Delay	125ns pulse, Vcc=5.0V	-	-	15	-	ns
Pulse Width Limit	TXD pulse>100us, 5.0V pulse	-	50	70	100	us
IrED Operating Current limit	TXD=Vcc, V_{LEDA}=Vcc=5.0V, Averaged over 125ns pulse	I_{IrED}	510	520	650	mA
	TXD=Vcc, V_{LEDA}=Vcc=3.0V, Averaged over 125ns pulse	I_{IrED}	310	360	550	mA
Logic LOW Transmitter Input Voltage		V_{IL}	0	-	0.8	V
Logic HIGH Transmitter Input Voltage		V_{IH}	2.0	-	Vcc+ 0.5	V
Output Radiant Intensity	Vcc=2.7V, no resistor	Ie	100	170	400	mW/sr
Peak Wavelength of Emission	I_F=20mA DC	λ p	850	870	900	nm
Half-Width of Emission Spectrum	I_F=20mA DC	Δλ	-	40	-	nm

Application Circuit



Component	Recommended Value
C1	0.1uF,Ceramic Capacitor.It must be placed closelydevices within 7mm between Vcc and GND.
C2	10uF, Ceramic Capacitor.
R1	5V supply voltage,R1=7.2Ω 3.3V supply voltage,R1=3.6Ω

Recommended SMD Pad Layout

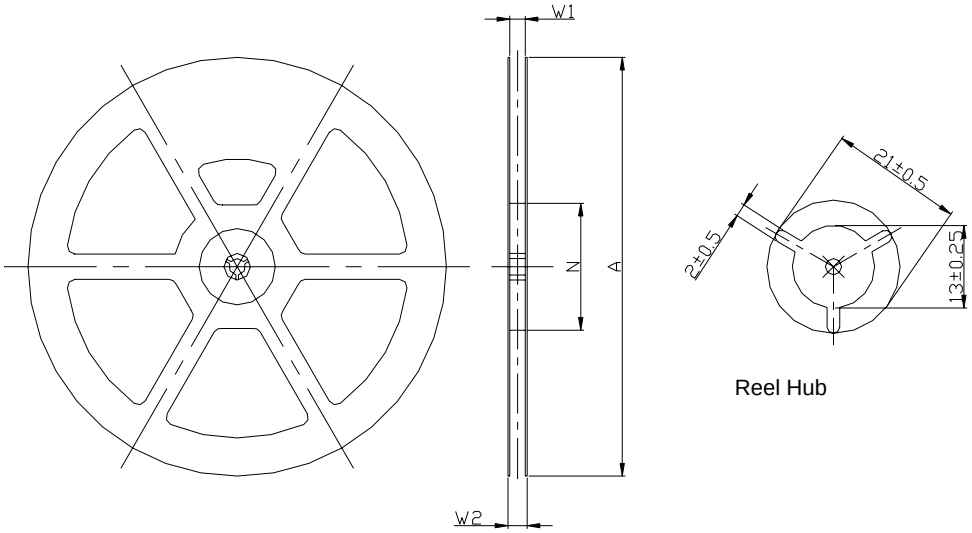


8x SOLDER PAD

Unit: mm

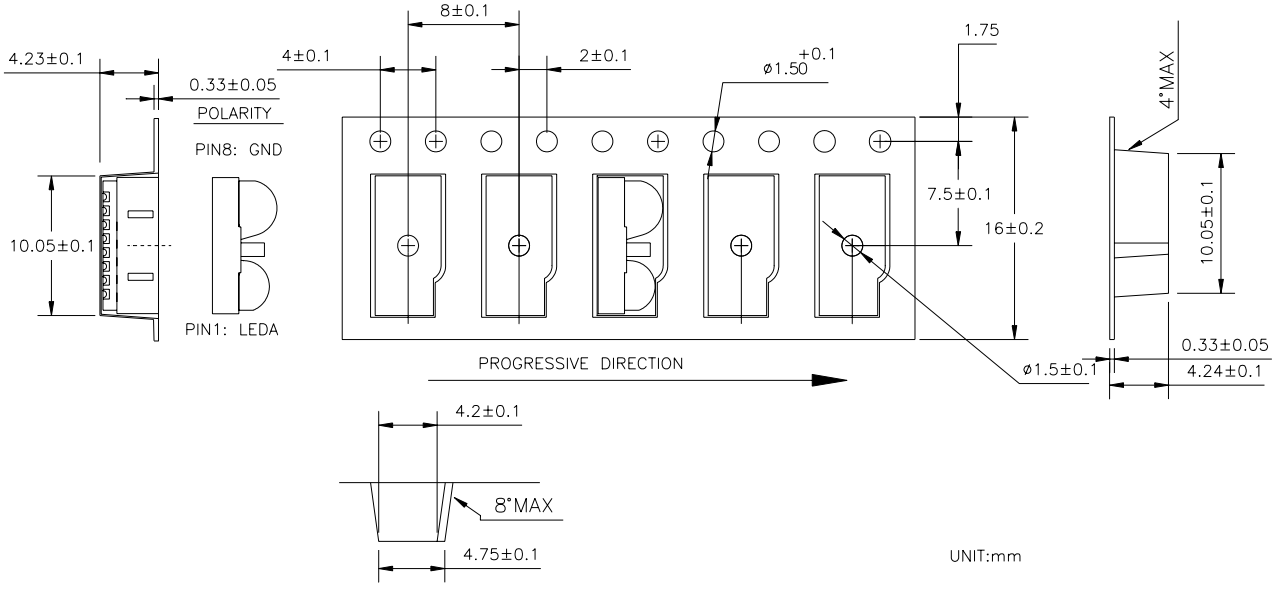
Taping and Packing Information

Shape of Reel and Dimensions

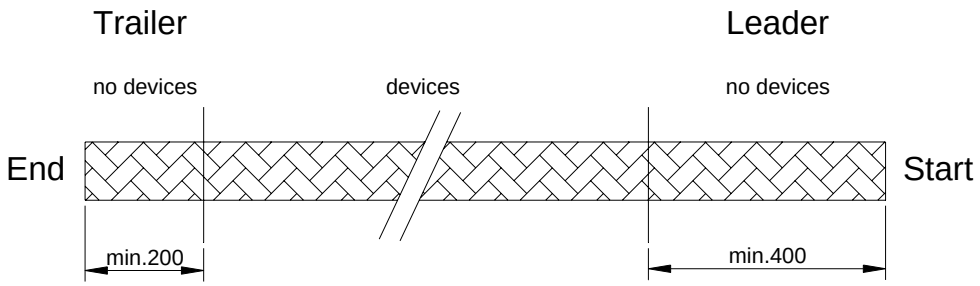


Version	Tape Width	A	N	W1	W2max
C	16	330±1	100±1.5	18±2	21.7

Tape Dimensions



Leader and Trailer



Quantity

TM6101/TR2 1000 pcs. per reel

Cover Tape Peel Strength

According to IEC 286

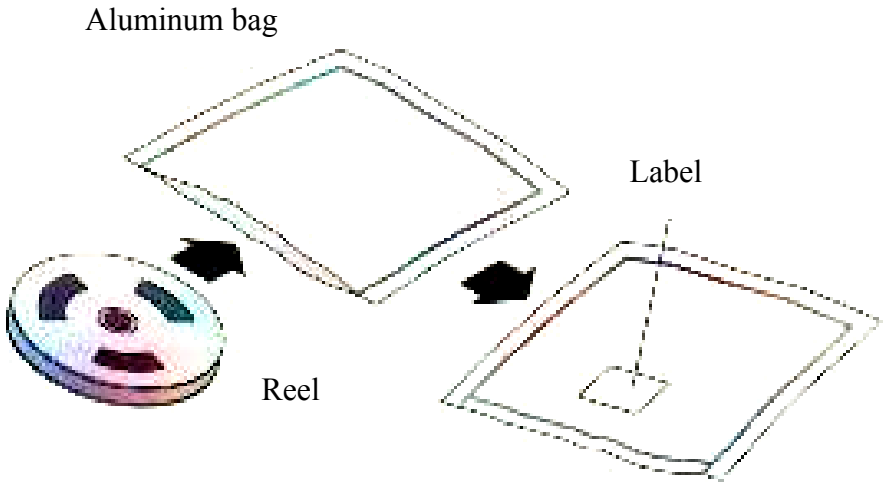
0.1 to 1.3N

300±10%mm/min

165°-180°peel angle

Damp Proof Packing.

The reel is packed in a damp proof aluminum bag to protect the devices from absorbing moisture during transportation and storage.



Recommended Method of Storage

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10℃ to 30℃
- Storage humidity ≦60%RH max.

After more than 72hours under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 hours at 40℃+5℃/-0℃ and 5% RH (dry air/nitrogen) or

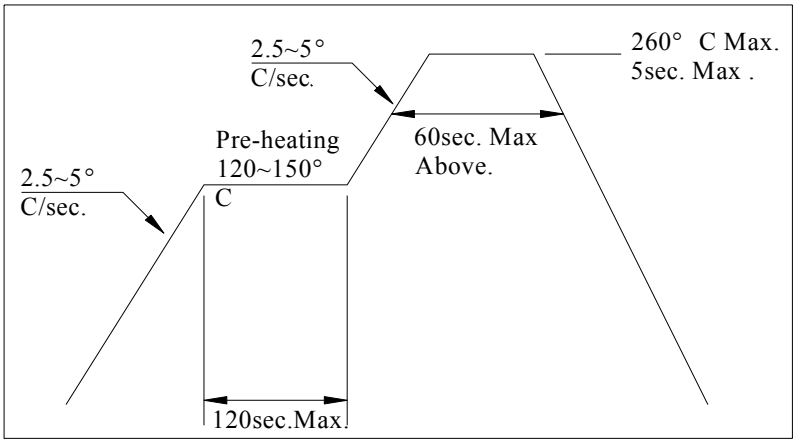
96 hours at 60℃+5℃ and <5% RH for all device containers or

24 hours at 125℃+5℃ not suitable for reel or tubes.

ESD Precaution

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the Anti-static bag. Electro-Static Sensitive Devices warning labels are on the packing.

Recommended Solder Profile



Notice:

(1) Reflow soldering should not be done more than two times.

(2) When soldering, do not put stress on the IrDA devices during heating.

(3) After soldering, do not warp the circuit board.

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