F71612

USB CIR Chip for Vista

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Release Date: December, 2007
Version: V0.22P

F71612 Datasheet Revision History

Version	Date	Page	Revision History
V0.10P	2007/05/20	-	Original Version.
V0.20P	2007/07/12	-	Release Version
V0.21P	2007/9/4	-	Update Application Circuit.
		-	Add pin description of TX pins.
		-	Modify description of STATE_SEL pin.
V0.22P	2007/12/17	1	Modify operating supply current

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1. General Description

The F71612 is a USB IR chip and compatible for Microsoft Windows Vista IR Receiver or Transceiver Emulation Device. It Supports 2 IR transceiver functions for blaster application and two IR receivers with long range frequency and wideband application.

In USB interface function, The F71612 communications with host by full-speed USB interface (12Mb/s). It supports 3 suits endpoint, one control endpoint(endpoint zero) is for bus enumeration, one output endpoint is for Microsoft Windows Vista IR Receiver or Transceiver Emulation Device command and one input endpoint is transmit IR information to host.

In I2C interface function, The F71612 builds 256 bytes SRAM to save flash/ROM information from I2C for USB bus enumerations. The I2C flash/ROM contains IdVendor/ IdProduct/ BcdDevice/ Manufacturer string / IProduct string / iSerialNumber string information.

In power function, the F71612 supports remote-wakeup function during USB interface, when PC system into S3 state. The F71612 decodes IR protocol is the same power key of remote control. The F71612 is asserted USB interface to wakeup PC system. Others also provide hardware pin PSOUT# for system wakeup, when PC system in to S5 state, the F71612 is asserted PSOUT# pin to wakeup PC system.

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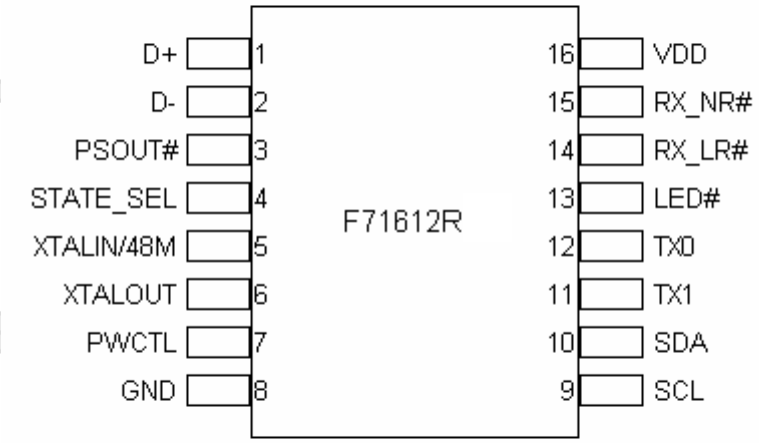
2. Feature List

- Support Microsoft Vista RC6 IR Receiver
- Support Microsoft Vista Learning Function
- Support Remote Wake-up Capability
- Hardware Base Implementation
- Provide Data Receiver LED
- Support 2 IR Transceiver Function for Blaster Application
- One IR Receiver with Long Range Frequency and Another with Wideband Application
- I2C Interface for Related ID Data Reading.
- USB Interface for System Connection.
- Power by 3Vcc and Packaged in 16-SSOP Green Package.

3. Key Specification

Supply Voltage	3.0V to 3.6V
Operating Supply Current	8 mA typ.
Standby Current	0.7 mA typ.

4. Pin Configuration



5. Pin Description

$I/O_{12t_1.5k}$	- TTL level bi-directional pin with 12 mA drive/sink capability and internal pull hign 1.5kΩ
I/O_{12t}	- TTL level bi-directional pin with 12 mA drive/sink capability.
OD_{12}	- Open-drain output pin with 12 mA sink capability
OD_{12_5v}	- Open-drain output pin with 12 mA sink capability and 5V tolerance
OD_{16_5v}	- Open-drain output pin with 16 mA sink capability and 5V tolerance.
O_{12}	- Output pin with 12 mA drive/sink capability.
IN_{ts}	- TTL level input pin with schmitt trigger.
IN_{ts_5v}	- TTL level input pin with schmitt trigger and 5V input tolerance.
IN_{t}	- TTL level input pin.

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P - Power.

Pin No	Pin Name	Type	PWR	Description
1	D+	$I/O_{12t_1.5k}$	VDD	D+. Different data bus conforming to USB standard. Internal pull high 1.5kΩ.
2	D-	I/O_{12t}	VDD	D-. Different data bus conforming to USB standard.
3	PSOUT#	OD_{12_5v}	VDD	Panel Switch Output. This pin is low active and pulse output. It is power on request output.
4	STATE_SEL	IN_{ts}	VDD	This pin is for wake up function. **For Portable Product** → Pull this pin to high for USB wake up. **For MB System Product** → Pull this pin to high and suggest connecting with one of S4/S5/PWROK/GPIO pin. MB System in S4/S5 state: Wake up signal will be asserted by PSOUT# pin in S4/S5 state. MB System in S3 state: Wake up signal will be asserted by USB interface in S3 state.
5	XTALIN/48M	IN_t	VDD	12MHz/48MHz clock input.
6	XTALOUT	O_{12}	VDD	12MHz/48MHz clock output.
7	PWCTL	OD_{12}	VDD	RX_LR learning power control pin. Suggest external pull high to 3.3V and the clock input source will be selected to 12MHz input.
8	GND	P	VDD	Ground pin.
9	SCL	OD_{12_5V}	VDD	I2C interface serial clock
10	SDA	OD_{12_5V}	VDD	I2C interface serial data
11	TX1	O_{12}	VDD	IR transmits port 1. Pull down 100k resister to ground → TX/RX functions selection. No resister connects to ground → RX function only.
12	TX0	O_{12}	VDD	IR transmits port 0. Pull down 100k resister to ground (TX/RX functions selection. No resister connects to ground (RX function only. (P.S One of TX pins pull down 100K resister to ground, chip feature will be selected to TX and RX functions, if not, chip will be selected to RX function only.)
13	LED#	OD16_5V	VDD	LED output pin.
14	RX_LR#	IN_{ts_5v}	VDD	IR receiver port1 (wide band for learning)
15	RX_NR#	IN_{ts_5v}	VDD	IR receiver port0 (long range)

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16	VDD	P	VDD	Power supply input 3.3V

6. Function Description

6.1 USB function

The F71612 communications with host by full-speed USB interface (12Mb/s). It supports 3 suits endpoint, one control endpoint(endpoint zero) is for bus enumeration, one output endpoint is for Microsoft Windows Vista IR Receiver or Transceiver Emulation Device command and one input endpoint is transmit IR information to host.

Endpoint zero is special significance in USB system. It is a control endpoint, and is required by every device. Only control endpoint accept special setup token that the host transfer command to device.

During enumeration, host requests GET_DESCRIPTOR to device and device return information (over in endpoint zero) as what device driver top load. The below table is about F71612 descriptor.

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offset	Field	size	Value
0	BLength	1	0x12
1	bDescriptor Type	1	0x01
2	BcdUSB	2	0x0200
4	bDeviceClass	1	0x00
5	bDeviceSubClass	1	0x00
6	bDeviceProtocol	1	0x00
7	bMaxPacketSize	1	0x10
8	IdVendor	2	0x1934
10	IdProduct	2	0x0602
12	BcdDevice	2	0x0000
14	Manufacturer	1	0x01
15	IProduct	1	0x02
16	iSerialNumber	1	0x03
17	bNumConfiguration	1	0x01

Table 6-1 Device Descriptor

offset	Field	size	Value
0	BLength	1	0x09
1	bDescriptor Type	1	0x02
2	wTotalLength	2	0x0020
4	bNumInterface	1	0x01
5	bConfigurationValue	1	0x01
6	iConfiguration	1	0x00
7	BmAttributes	1	0xa0
8	MaxPower	1	0x32

Table 6-2 Configuration Descriptor

offset	Field	size	Value
0	BLength	1	0x09
1	bDescriptor Type	1	0x04
2	wInterfaceNumber	1	0x00
3	bAlternateSetting	1	0x00
4	bNumEndpoints	1	0x02
5	bInterfaceClass	1	0xff
6	bInterfaceSubClass	1	0xff
7	bInterfaceProtocol	1	0xff
8	IInterface	1	0x00

Table 6-3 Interface Descriptor

offset	Field	size	Value
0	BLength	1	0x07
1	bDescriptor Type	1	0x05
2	bEndpointAddress	1	0x81
3	BmAttributes	1	0x02
4	wMaxPacketSize	2	0x0010
6	BInterval	1	0x00

Table 6-4 In Endpoint Descriptor

offset	Field	size	Value
0	BLength	1	0x07
1	bDescriptor Type	1	0x05
2	bEndpointAddress	1	0x01
3	BmAttributes	1	0x02
4	wMaxPacketSize	2	0x0010
6	BInterval	1	0x00

Table 6-5 Out Endpoint Descriptor

The string table 1 is about manufacturer information, its' contents is "FINTEK", the string table 2 is about Product information, its contents is "eHome Infrared Transceiver. The string table 3 is about serial number information, its contents is "88636562727801".

In power function, The F71612 supports remote-wakeup function for USB interface, when PC system into S3 state. The F71612 decodes IR protocol is the same power key of remote control. The F71612 is asserted USB interface to wakeup PC system.

The F71612 is compatible for Microsoft Windows Vista IR Receiver or Transceiver Emulation Device. The F71612 support Microsoft Compatible Device Descriptor and Extended Compact ID Descriptor are used to tell the host what type of device the emulation is. Vista Emulation Device driver transmits command over out endpoint1 and device return information over in endpoint1. About descriptor and command information, reference Microsoft Windows Vista IR Receiver or Transceiver

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Emulation Device spec.

6.2 IR function

The F71612 Supports 2 IR transceiver functions for blaster application and two IR receivers with long range frequency and wideband application. The wide-band receiver is necessary to support IR learning, which is necessary to support IR-blasting and set-top box control.

The long-range receiver is a receiver which has the following characteristics:

1. Works at a distance of 10 meters.
2. Demodulates the signal inside the receiver part
3. Has a BPF which works with carriers from 32-60 kHz.

The wide-band receiver is a receiver part which has the following characters:

1. Works at a distance of approximately 5 centimeters.
2. Does not demodulate the signal inside the receiver part
3. Works with carriers from 32-60 kHz. (Probably doesn't have a BPF, but still has the same (or wider) range.

About IR information, reference Microsoft Windows Vista IR Receiver or Transceiver Emulation Device spec.

6.3 Wakeup function

The F71612 Supports 2 kinds of wakeup system function, PSOUT and remote wakeup for USB interface. The F71612 detect idle state on USB bus for more than 3.0ms, it is into suspend state.

In Suspend state, the F71612 decodes IR protocol information is the same power key of remote controller. It asserted PSOUT and USB interface. Reference the below figure

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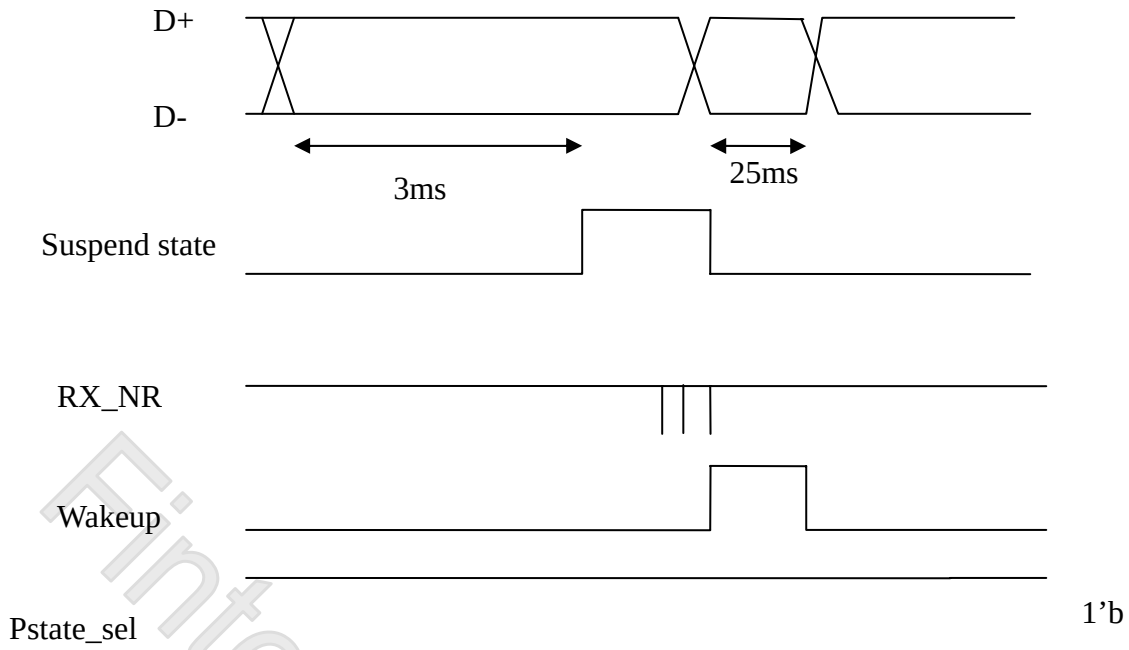


Figure 6-3-1 USB remote wakeup

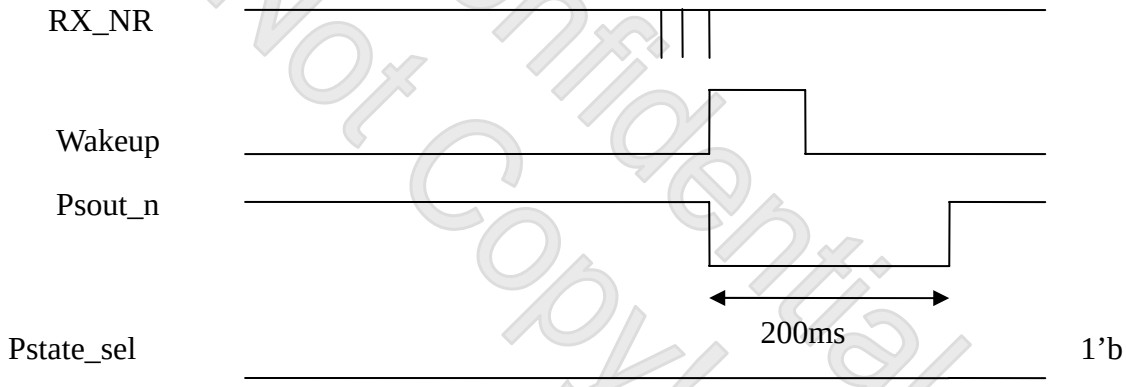


Figure 6-3-2 PSOUT wakeup

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6.4 I2C interface function

The F71612 Supports 1 suit I2C interface to get USB description information and builds 256 bytes RAM to save vendor USB description information. When power is ready, I2C function start to load USB description into 256 bytes RAM, and expect host requests GET_DESCRIPTOR to F71612

which returns vendor USB description, if i2c flash/ROM connect with F71612. The contents of I2C flash /ROM format is below table.

When F71612 does not finish loading 256 bytes information from I2C flash/ROM, F71612 disable PAD 1 internal pull high 1.5k, still finish loading, F71612 enable PAD 1 internal pull high 1.5k.

0x0	Security code	0x55
0x1	Security code	0xaa
0x2	IdVendor length	0x02
0x3	IdVendor low byte	IdVendor low byte
0x4	IdVendor low byte	IdVendor high byte
0x5	IdProduct length	0x02
0x6	IdProduct low byte	IdProduct low byte
0x7	IdProduct high byte	IdProduct high byte
0x8	BcdDevice length	0x02
0x9	BcdDevice low byte	BcdDevice low byte
0xa	BcdDevice high byte	BcdDevice high byte
0xb	Manufacturer string length	Define by vendor content
0xb+ Manufacturer string length	Manufacturer string content	Define by vendor content
0xb+ Manufacturer string length + 1	IProduct string length	Define by vendor content
0xb+ Manufacturer string length + IProduct string length +1	IProduct string content	Define by vendor content
0xb+ Manufacturer string length + IProduct string length +2	ISerialNumber string length	Define by vendor content
0xb+ Manufacturer string length + IProduct string length +2	IProduct string length	Define by vendor content

Table 6-4-1 I2C flash/ROM USB description format

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7. Electron Characteristic

Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Power Supply Voltage	-0.5 to 5	V
Input Voltage	-0.5 to VDD+0.5	V
Operating Temperature	0 to +70	° C
Storage Temperature	-55 to 150	° C

Electrical characteristics table

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

DC Characteristics

(Ta = 0° C to 70° C, VDD = 3.3V ± 10% , VSS = 0V) (Note)

PARAMETER	RATING	
Operating Voltage	3.0 to 3.6	VDD

Operating Voltage table

PARAMETER	SYM.	MIN	TYP	MAX.	UNIT	CONDITIONS
I/O_{12t} - TTL level bi-directional pin with 12 mA source-sink capability(3.3V)						
Input Low Voltage	VIL			0.8	V	
Input High Voltage	VIH	2.0			V	
Output Low Current	IOL		12		mA	0.4V
Output High Current	IOH		12		mA	2.4V
Input High Leakage	ILIH	-1		1	μA	
Input Low Leakage	ILIL	-1		1	μA	
OD_{12_5v} – Open-drain output pin with12mA source-sink capability(3.3V), 5V tolerance						
Output Low Current	IOL		12		mA	0.4V
OD_{16_5v} – Open-drain output pin with16mA source-sink capability(3.3V), 5V tolerance						
Output Low Current	IOL		16		mA	0.4V
O_{12} – Output pin with12mA source-sink capability(3.3V)						
Output Low Current	IOL		12		mA	0.4V
Output HIGH Current	IOH		12		mA	2.0V
IN_{ts} – TTL level input pin and schmitt trigger						
Input Low Threshold Voltage	Vt-			0.8	V	
Input High Threshold Voltage	Vt+	2.0			V	
Hysteresis			0.5		V	
Input High Leakage	ILIH			+1	μA	
Input Low Leakage	ILIL	-1			μA	
IN_t – TTL level input pin						
Input Low Threshold Voltage	Vt-			0.8	V	
Input Hign Threshold Voltage	Vt+	2.0			V	

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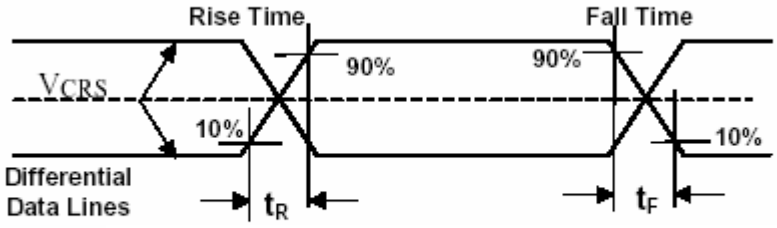
Input High Leakage	ILIH			+1	μA	
Input Low Leakage	ILIL	-1			μA	
IN_{ts_5v} – TTL level input pin and schmitt trigger, 5 tolerance						
Input Low Threshold Voltage	Vt-			0.8	V	
Input Hign Threshold Voltage	Vt+	2.0			V	
Hysteresis			0.5		V	
Input High Leakage	ILIH			+1	μA	
Input Low Leakage	ILIL	-1			μA	

PAD DC table

USB Interface

Parameter	Symbol	Min.	Max.	Units
Rise Time	T_{FR}	4	20	ns
Fall Time	T_{FF}	4	20	ns
Differential Rise and Fall Time Matching	T_{FRFM}	90	111.11	%
Driver Output Resistance	Z_{DRV}	28	44	Ω

USB AC

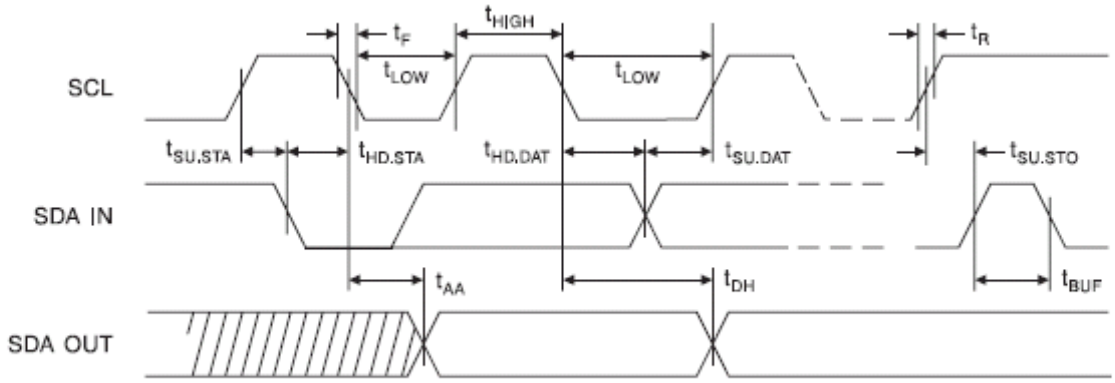


USB timing

Jitter Source	Full-speed			
	Next Transition		Paired Transition	
	Each (ns)	Total (ns)	Each (ns)	Total (ns)
Source Driver Jitter Source Frequency Tolerance (worst-case)	2.0 0.21/bit	2.0 1.5	1.0 0.21/bit	1.0 3.0
Source Jitter Total Hub Jitter	 3.0	3.5 15.0	 1.0	4.0 5.0
Jitter Specification Destination Frequency Tolerance	 0.21/bit	18.5 1.5	 0.21/bit	9.0 3.0
Receiver Jitter Budget		20.0		12.0

USB Jitter

I2C Interface



Symbol	Parameter	Min	Max	Units
t_{SCL}	Clock Frequency, SCL		400	kHz
t_{LOW}	Clock Pulse Width Low	1.2		us
t_{HIGH}	Clock Pulse Width High	0.6		us
t_I	Noise Suppression Time		50	ns
t_{AA}	Clock Low to Data Out Valid	0.1	0.9	us
t_{BUF}	Time the bus must be free before a new transmission can start	1.2		us
$t_{HD.STA}$	Start Hold Time	0.6		us
$t_{SU.STA}$	Start Set-up Time	0.6		us
$t_{HD.DAT}$	Data In Hold Time	0		us
$t_{SU.DAT}$	Data In Set-up Time	100		ns
t_R	Inputs Rise Time		300	ns
t_F	Inputs Fall Time		300	ns
$t_{SU.STO}$	Stop Set-up Time	0.6		us
t_{DH}	Data Out Hold Time	50		ns
t_{WR} Endurance	Write Cycle Time 5.0V, 25'C, Page Mode	 1M	5	ms Write Cycles

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Spec. for Reliability

Test Item	Description	Y/N	Test Item	Description	Y/N
ESD	VHBM > 2KV, VMM > 200V VHBM > 8KV for USB PAD	Y	**TH(B)**	1000Hrs, 85% RH, 85℃	N
Latch-UP	I_{tr} => 50~ 100mA	Y	**PCT**	168 Hrs, 100% RH , 121℃	N
HTSL	1000 Hrs @ 150 ℃	N	**TCT**	-65℃ ~ 150℃, 200 Cycles	N
HTOL	168/500 Hrs Bias @ 125 ℃	N	**TST**	-65℃ ~ 150℃, 100 Cycles	N
HAST	96Hrs , 85% RH , 131℃	N			

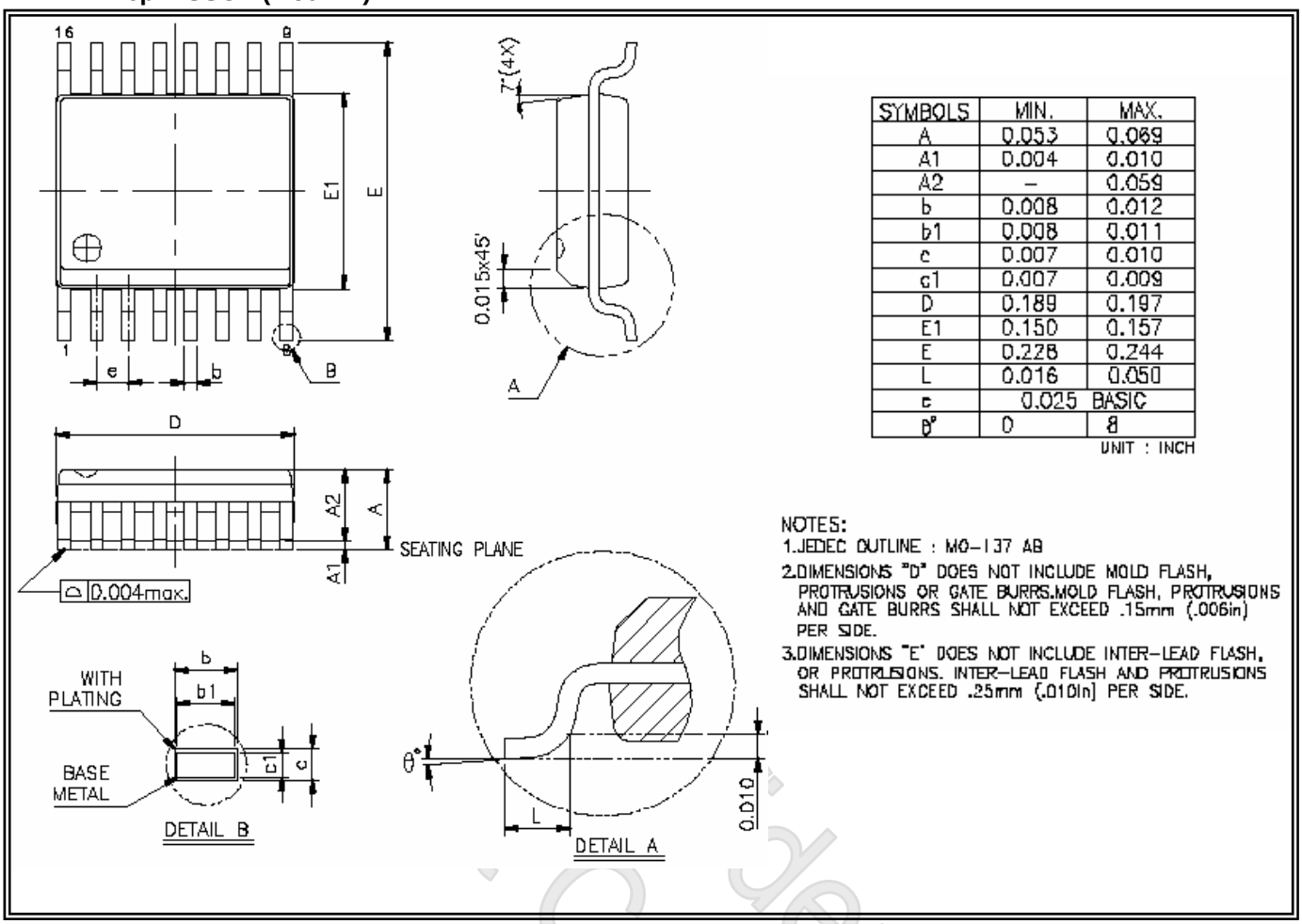
8. Ordering Information

Part Number	Package Type	Production Flow
F71612R	16-SSOP Green Package	Commercial, 0°C to +70°C

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9. Package Dimensions

16pin-SSOP (150 mil)



SYMBOLS	MIN.	MAX.
A	0.053	0.069
A1	0.004	0.010
A2	–	0.059
b	0.008	0.012
b1	0.008	0.011
c	0.007	0.010
c1	0.007	0.009
D	0.189	0.197
E1	0.150	0.157
E	0.228	0.244
L	0.016	0.050
e	0.025 BASIC	
θ°	0	8

UNIT : INCH

NOTES:
1. JEDEC OUTLINE : MO-137 AB
2. DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .15mm (.006in) PER SIDE.
3. DIMENSIONS "E" DOES NOT INCLUDE INTER-LEAD FLASH, OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .25mm (.010in) PER SIDE.

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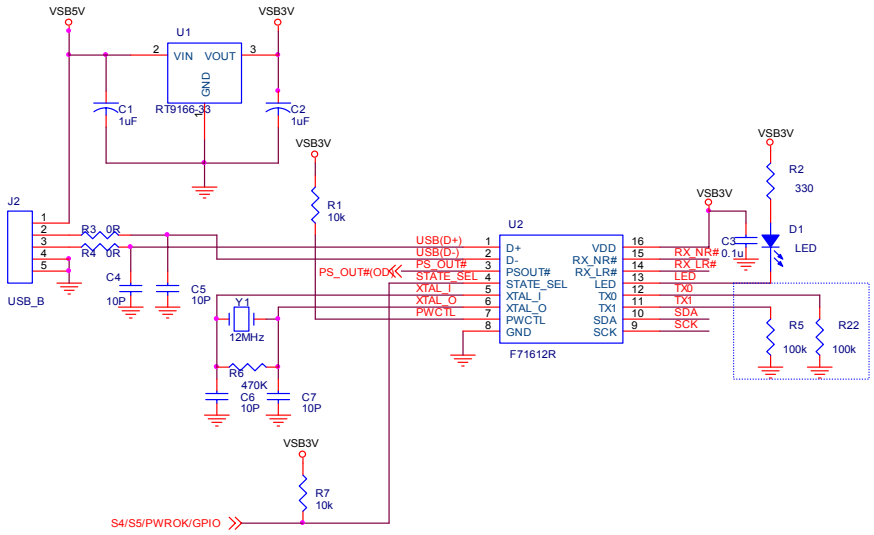
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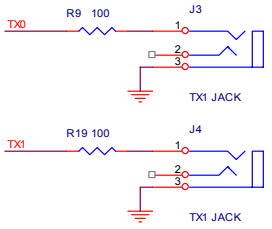
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10. Application Circuit

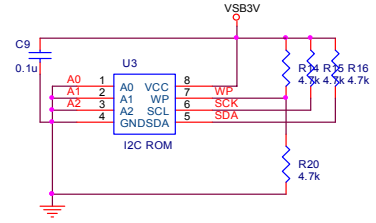


pull down resister 100k to choose the F71612R function

Tx and rx : TX [0] or TX[1] connect pull down resister 100k As power on.
Rx only : Tx [0] and tx[1] do not connect pull down resister 100k As power on

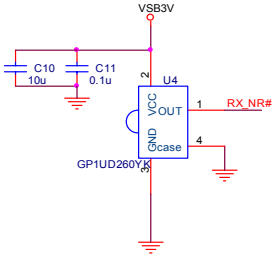


2 ports TX

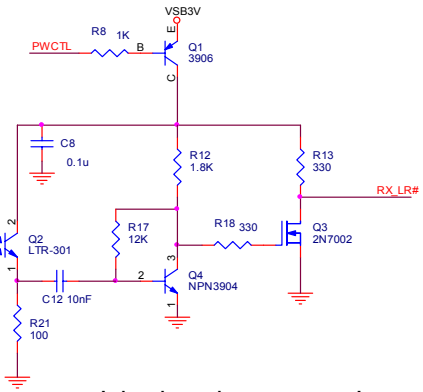


1. I2C Address = A0H
2. choose WP pull high resister to enable write protect
   choose WP pull low resister to disbale write protect

I2C EEPROM



Long Rang IR Receiver



Wide band IR Receiver

Title	FINTEK F71612R application circuit	
Size B	Document Number <Doc>	Rev 1.0
Date: Thursday, September 06, 2007	Sheet 1 of 1	