

Infrared Receiver Module IRM-HQxxJ16/TR2 Series

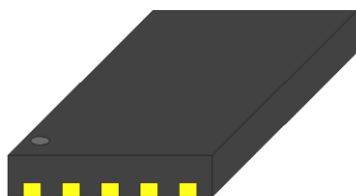
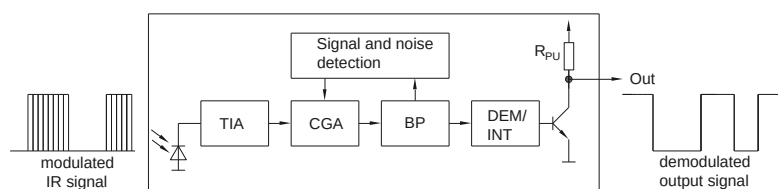


Fig.1 Block Diagram



Features

- Available for various carrier frequencies
- Low operating voltage and low power consumption
- High immunity against ambient light
- Long reception range
- High sensitivity
- Pb free and RoHS compliant
- Compliance with EU REACH
- Compliance Halogen Free (Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)

Descriptions

The IRM-HQxxJ16/TR2 device is a miniature SMD type infrared remote control system receiver that has been developed and designed by utilizing the most updated IC technology. The PIN diode and preamplifier are assembled on PCB, the epoxy package is designed as an IR filter. The demodulated output signal can directly be decoded by a microprocessor.

Applications

- Optical switch
- Light detecting portion of remote control
- AV instruments such as Audio, TV, VCR, CD, MD, etc
- Home appliances such as Air-conditioner, Fan, etc
- The other equipment's with wireless remote control
- CATV set top boxes
- Multi-media Equipment

Part number table

Model No.	Carrier Frequency f_c
IRM-HQ36J16/TR2	36 kHz
IRM-HQ38J16/TR2	38 kHz
IRM-HQ40J16/TR2	40 kHz

Absolute Maximum Ratings ($T_a=25^{\circ}\text{C}$) ^(note 1)

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{cc}	0 ~ 6	V
Output Current	I_{OUT}	0 ~ 5	mA
Operating Temperature	T_{opr}	-20 ~ +80	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-40 ~ +85	$^{\circ}\text{C}$
Soldering Temperature ^(note 2)	T_{sol}	260	$^{\circ}\text{C}$

Electro-Optical Characteristics ($T_a=25^{\circ}\text{C}$, $V_{cc} = 5\text{V}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Current consumption	I_{cc}	0.10	0.27	0.60	mA	No input signal
Supply voltage	V_{CC}	2.7	---	5.5	V	
Peak wavelength	λ_p	---	940	---	nm	
High level output voltage	V_{OH}	$V_{cc}-0.2$	V_{cc}	---	V	Output open
Low level output voltage	V_{OL}	---	---	0.4	V	$I_{OUT} < 2.5\text{mA}$
Internal pull up resistor	R_{PU}		45		k Ω	
Max Reception range	L_{0max}	---	40	---	m	See chapter test method, Output pulse width: 450us < T_L < 750us 450us < T_H < 750us
	L_{45max}	---	34	---		
Min reception distance	L_{0min}	---	---	0.1		
Half angle(horizontal)	ϕ_h	---	± 75	---	deg	
Half angle(vertical)	ϕ_v	---	± 75	---	deg	
Output low pulse	T_L	450	---	750	us	See chapter test method,
Output high pulse	T_H	450	---	750	us	

Note1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.

Note2: Soldering time ≤ 5 seconds

Test method

The specified electro-optical characteristics are valid under the following conditions.

1. Measurement environment must be a place without extreme reflections
2. Transmitter radiant intensity $IR=250\text{mA}$
3. External lighting contains LED lighting with a color temperature of 6000K and illumination at the IR receiver is less than 100lux ($E_v \leq 100\text{Lux}$)
4. Test signal as shown below in figure 2

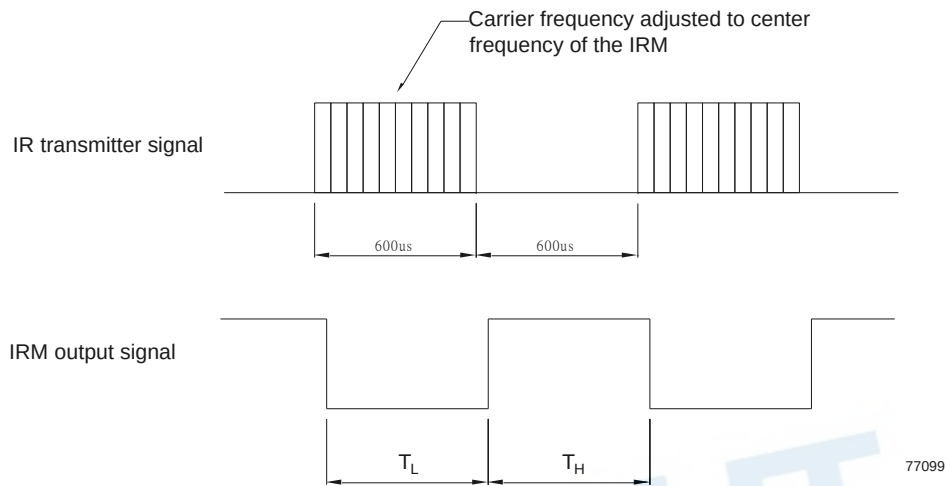


Fig.2 test signal and IRM output signal for reception distance and viewing angle test

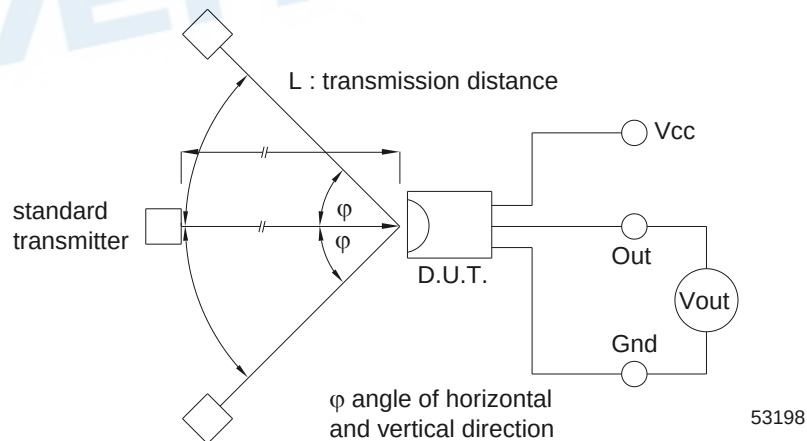


Fig.3 Measuring System

Typical Electro-Optical Characteristics Curves

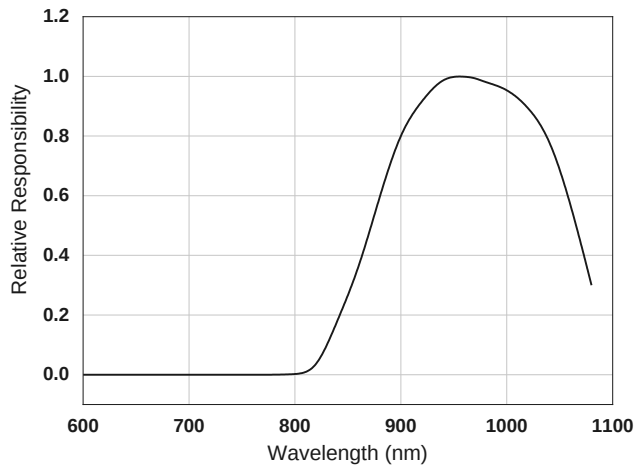


Fig. 4 Relative Responsibility vs. Wavelength

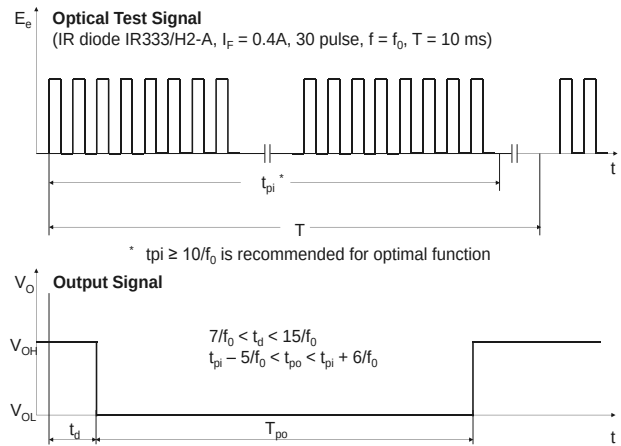


Fig. 5 IR Signal vs. Output Signal

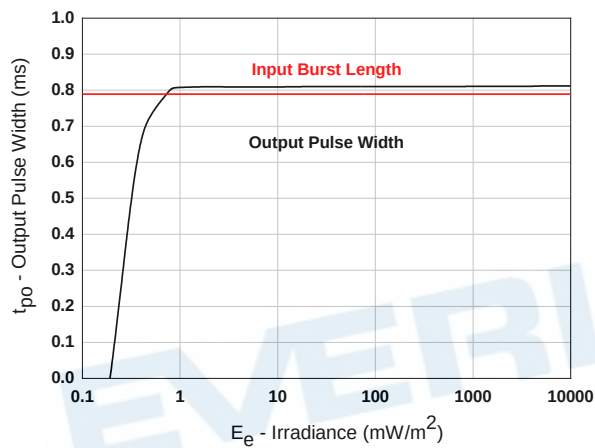


Fig. 6 Output Pulse Width and Sensitivity in Dark Ambient

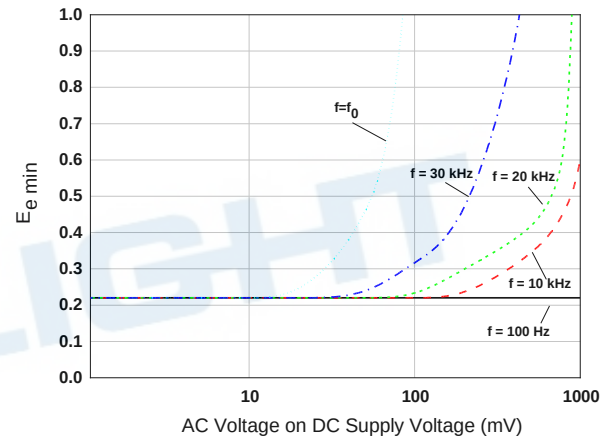


Fig. 7 $E_{e\text{ min.}}$ vs. Supply Voltage Disturbances

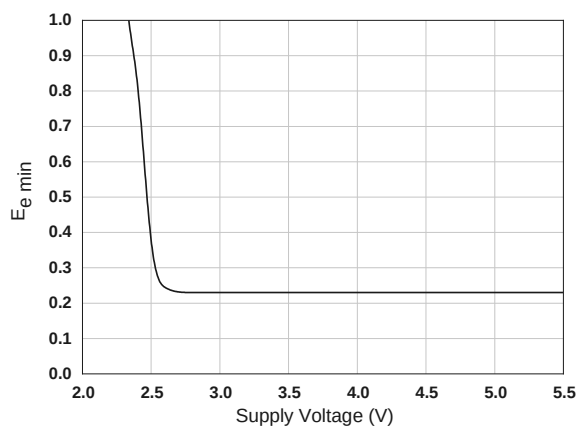


Fig. 8 $E_{e\text{ min.}}$ vs. Supply Voltage

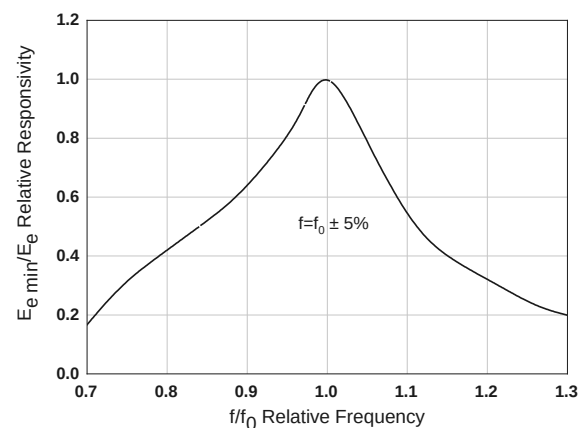


Fig. 9 Frequency Dependence of Responsibility

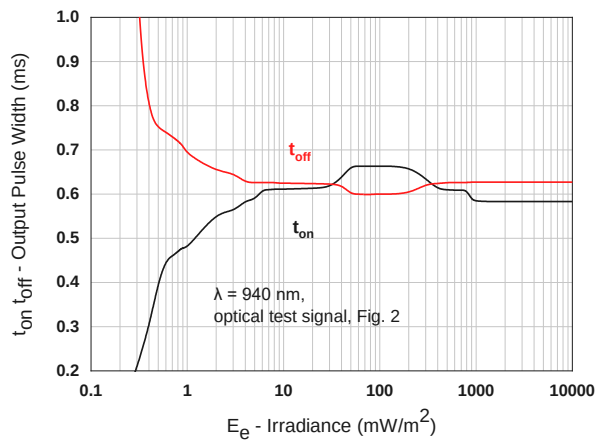


Fig. 10 Output Pulse Diagram

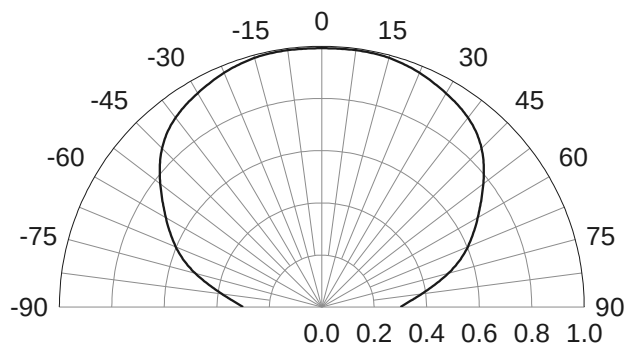


Fig. 11 Horizontal Directivity

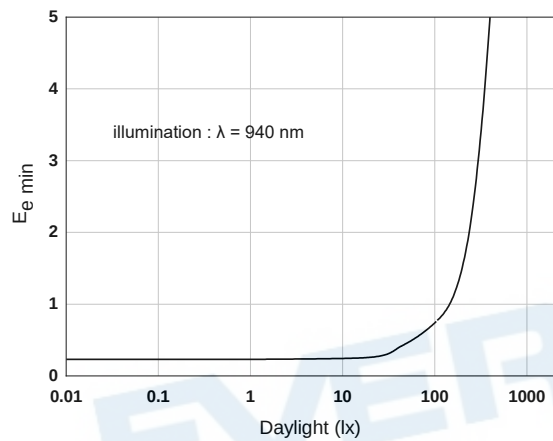


Fig. 12 Daylight vs. $E_{e \min}$

Application considerations

IRM IR receiver modules are high gain analog components to reach a long reception range. However, due to the high gain, they are also sensitive to noise from the power supply like Vcc ripple. Noise on the power supply can reduce the reception range of the IRM or cause output glitches and corrupted data. To protect the IRM receiver from power supply noise, a RC filter must be connected as close as possible to the Vcc and GND pins of the IRM. The circuit below in figure 13 shows the configuration of the RC filter and the required values. Ceramic or tantalum capacitor should be used, as standard electrolytic capacitors are only suitable for low frequencies and might not be able to filter noise in the frequency range of the IRM. The IRM receiver is most sensitive to noise which is at the carrier frequency or close to the carrier frequency. When using a switching mode power supply, the switching frequency must not be the same as the carrier frequency of the IRM. A gap of at least 20kHz between the switching frequency of the power supply and the IRM carrier frequency is recommended.

If the trace from the IRM output pin to the decoder IC on the PCB is long, the parasitic capacitance might be high causing slow rise times of the IRM output signal. In such case, an additional pull up resistor of 10kOhm or higher can be added at the IRM output to reduce the influence of parasitic trace capacitance.

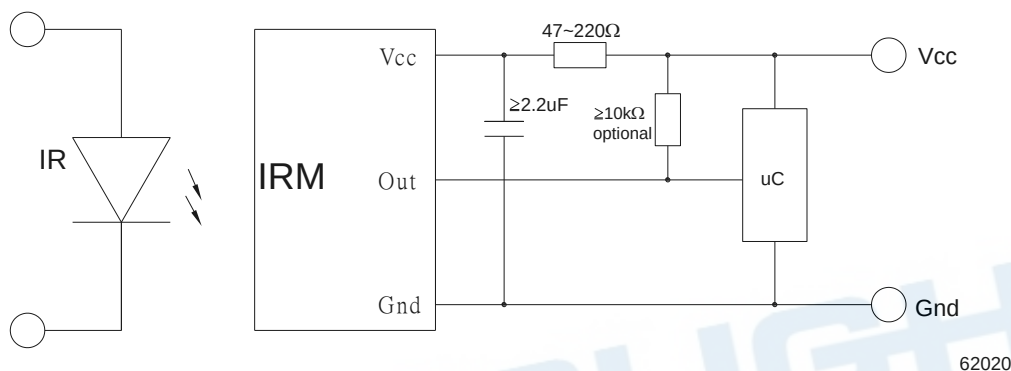


Fig.13: application circuit

Code compatibility

The IRM-HQxxJ16/TR2 receiver modules are mainly designed for remote control applications which require very high noise immunity. Hence the IR code compatibility is matched for the most common IR protocols. To guarantee a proper data signal reception, a few points need to be taken into consideration.

The compatibility needs to be checked according to the burst times, gap times.

The required limits for these items are shown in table 2 "acceptable IR signal timings".

Protocol	Suitable	Protocol	Suitable	Protocol	Suitable
NEC	Yes	Sony 12 Bit	Yes	RCA	Yes
Toshiba	Yes	Sony 15 Bit	Yes	TCL	Yes
RC5	Yes	Sony 20 Bit	Yes	RCMM	No
RC6	Yes	Continuous	Yes	XMP	No

Table 1: IR protocol compatibility

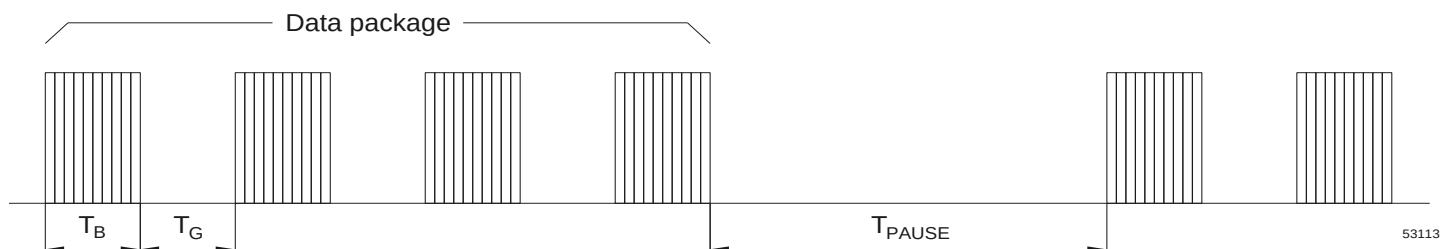


Fig.14: general IR data structure

	IRM-HQ36J16/TR2 IRM-HQ38J16/TR2 IRM-HQ40J16/TR2
Min. burst length T_B	300us
Min. gap length T_G	325us
Min. data pause time T_{PAUSE}	$T_{actual_Gap} \geq 0.8 \times T_{actual_Burst}$
Maximum number of continuous data	1700 Bit/sec

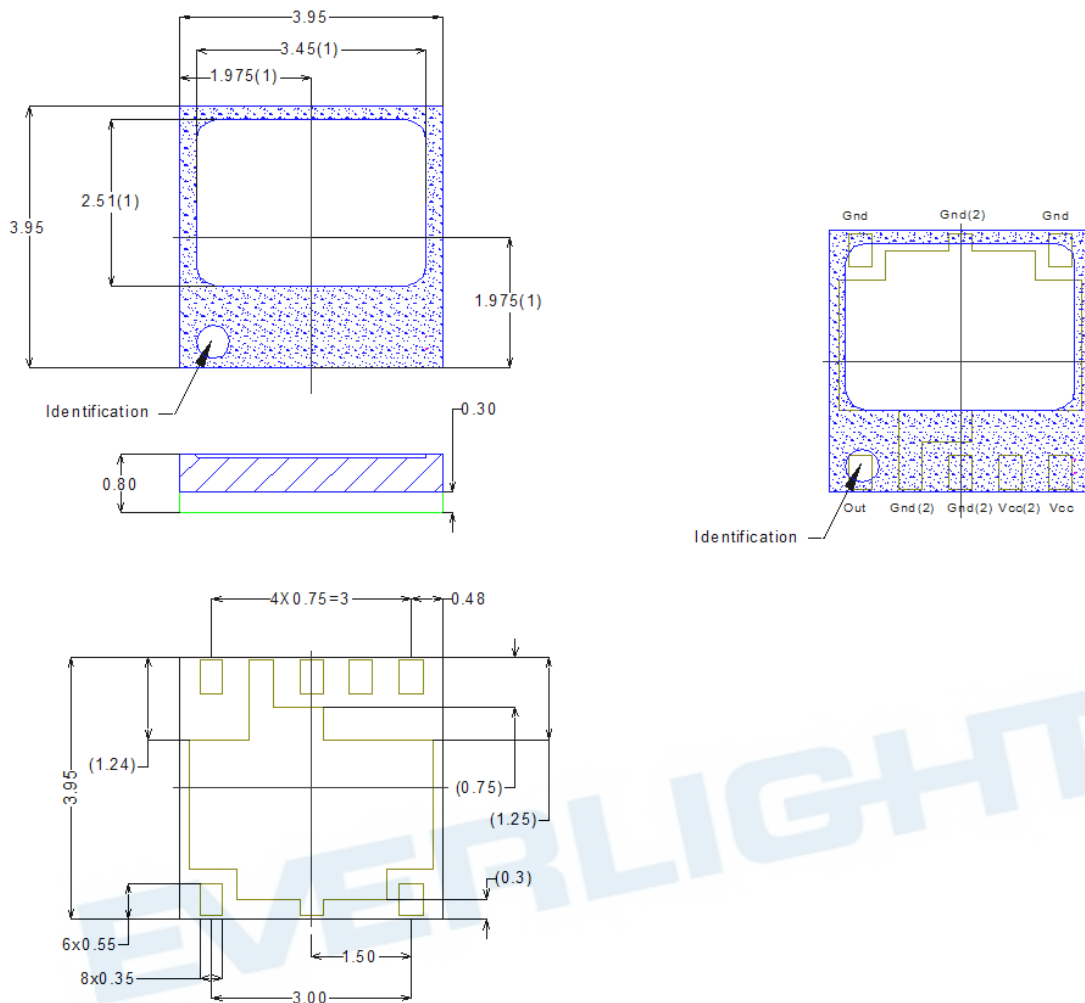
Table 2: acceptable IR timings

Operation under noisy environment

The IRM-HQxxJ16/TR2 receiver modules are designed for high light noise immunity, especially for noise from fluorescent and energy saving lamps and noise from TFT TVs with CCFL backlight. The receiver is able to suppress most optical noise, but the presence of any kind of optical noise will cause shorter reception range because the AGC will reduce the gain to suppress the noise.

The presence of noise can also affect the output pulse jitter. In such case, the output pulse jitter shown in the electro-optical specification above, might not be valid anymore and bigger pulse jitter can occur. This behavior needs to be considered when tuning the timing limits of the decoder. It is recommended to use the output pulse variation shown in the electro-optical specifications above as a base to set the timing limits of the decoder. However, due to different protocols and environmental conditions, other timing limits might result in better performance and decoding security. This needs to be verified for the specific application by testing under different noise conditions.

Package Dimenstions

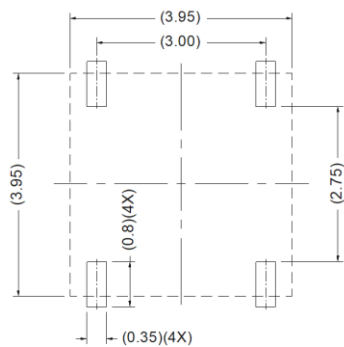


Notes:

1. Pins connected internally. It is not necessary to connect externally
2. Tolerances unless mentioned $\pm 0.5\text{mm}$. Unit: mm

Recommend soldering patterns

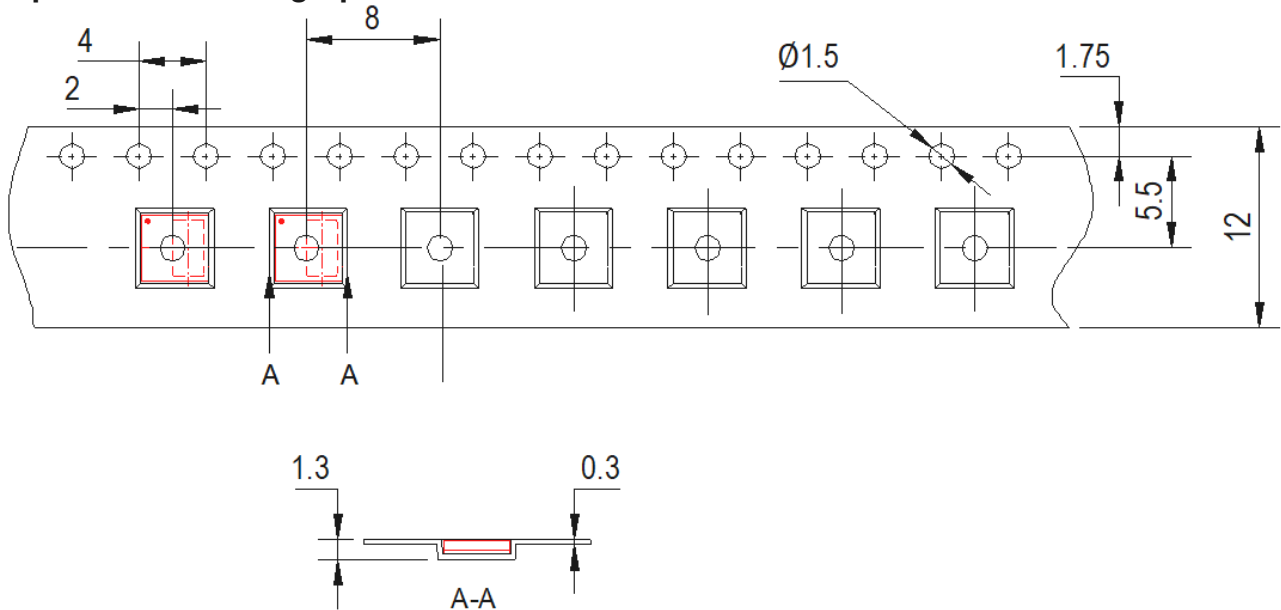
The following soldering patterns are recommended for reflow-soldering



Notice: Suggested pad dimension is just for reference only.

Please modify the pad dimension based on individual need.

Tape & Reel Packing Specifications



Packing Quantity

1800 pcs / Reel

Recommended method of storage

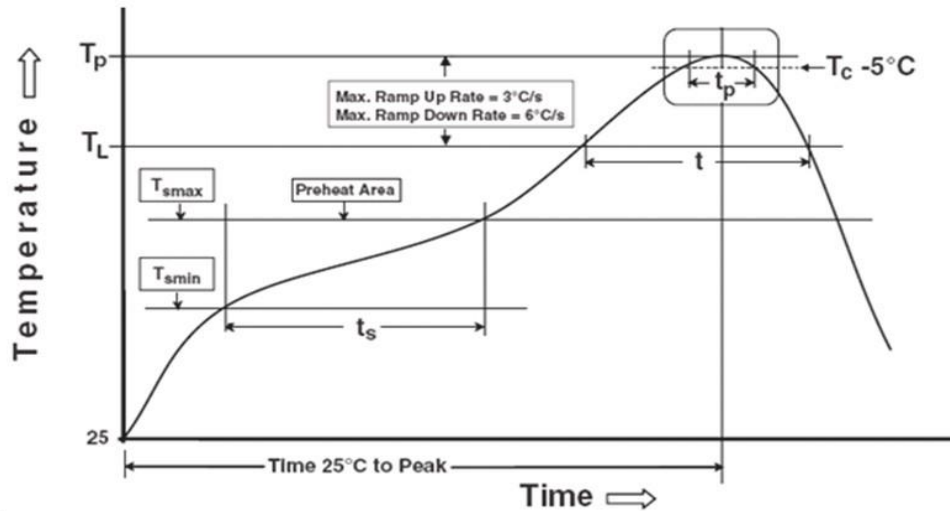
The following are general recommendations for moisture sensitive level (MDTE) 4 storage and use:

1. Do not open moisture proof bag before devices are ready to use.
2. Shelf life in sealed bag from the bag seal date: 12 months at 10°C~30°C and < 90% RH.
3. After opening the package, the devices must be stored at 10°C~30°C and ≤ 60%RH, and used within 72 hours (floor life).
4. If the moisture absorbent material (desiccant material) has faded or unopened bag has exceeded the shelf life or devices (out of bag) have exceeded the floor life, baking treatment is required.
If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure or recommend the following conditions: 96 hours at 60°C ± 5°C and < 5 % RH.

ESD Precaution

Proper storage and handing 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.

Solder Reflow Temperature Profile



Note:

Reference: IPC/JEDEC J-STD-020D

Preheat

Temperature min (T_{smin})	150 °C
Temperature max (T_{smax})	200°C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max

Other

Liquidus Temperature (T_L)	217 °C
Time above Liquidus Temperature (t_L)	60-100 sec
Peak Temperature (T_p)	260°C
Time within 5 °C of Actual Peak Temperature: $T_p - 5^\circ\text{C}$	30 s
Ramp- Down Rate from Peak Temperature	6°C /second max.
Time 25°C to peak temperature	8 minutes max.
Reflow times	2 times

Note:

1. Suggest that reflow soldering should not be done more than two times.
2. When soldering, do not put stress on the IRM device during heating.
3. After soldering, do not warp the circuit board.

DISCLAIMER

1. EVERLIGHT reserves the right(s) on the adjustment of product material mix for the specification.
2. The product meets EVERLIGHT published specification for a period of twelve (12) months from date of shipment.
3. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
4. When using this product, please observe the absolute maximum ratings and the instructions for using outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from the use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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