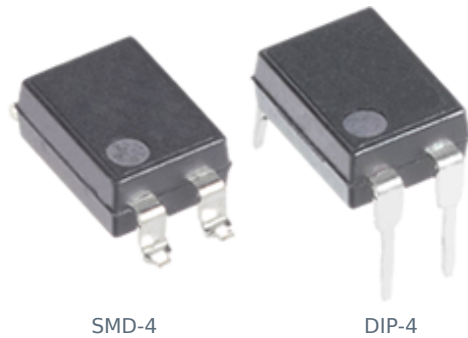
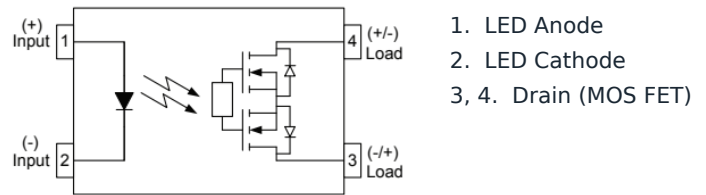
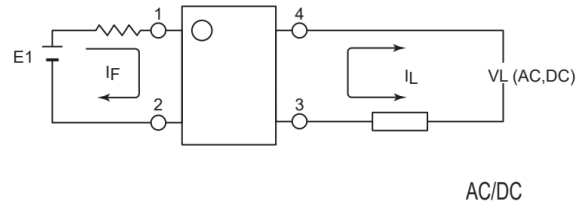


Parameter	Symbol	Rating	Units
Load Voltage	VL	60	V
Load Current	IL	0.6	A
On-Resistance	Ron	0.8	Ω
Output Capacitance	Cout	38	pF
I/O Breakdown Voltage	VISO	5000	Vrms

RoHS Pb-Free Halogen-Free UL E534710



PhotoRelays

Photorelays are the most reliable, technically advanced logic-to-power interface devices. Their basic function is to take a low current signal from a microprocessor to control the switching of both AC and DC loads, while providing an isolation barrier between logic and power. While this function is common to all relays, Photorelays provide distinct advantages over their mechanical counterparts including:

- Long life (No limit on mechanical and electrical lifetime)
- Bounce-free switching
- Higher speed and high frequency switching
- Higher sensitivity (less power consumption)
- Immunity to EMI or RFI
- No voltaic arc, bounce, and noise
- More resistant to vibration and impact
- AC or DC load switching
- Small package size

Function

PhotoRelays operate by taking a low level input current (<5mA) that energizes an input Infrared LED, which is optically-coupled to a Photo-diode array chip. This IC in turn generates a photo voltage that powers two MOSFETs typically connected in a source-to-source configuration, allowing for both AC and DC output loads. Photorelay basically move photons to accomplish their switching function, they incur no mechanical wear and tear, providing consistent reliable switching.

Applications

These advantages make Photorelays the ideal choice for:

- Telecom/Datacom switching
- Multiplexers
- Meter reading systems
- Data acquisition
- Medical equipment
- Battery monitoring
- I/O Sub-Systems
- Robotics
- Aerospace
- Home/Safety security systems
- Process Control
- Energy Management
- Reed Relay EMR Replacement
- Programmable Controllers

TYPES

Category	Output Rating		Package	Part No.	Packing Quantity
	Load Voltage	Load Current			
AC / DC	60V	600mA	DIP-4	OPT1212AEX	50pcs /tube
			SMD-4	OPT1212AEHX	1000pcs /reel

Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Value	Units	Note
Input	Continuous LED Current	IF	50	mA	
	Peak LED Current	IFP	1000	mA	f=100Hz, duty=1%
	LED Reverse Voltage	VR	5	V	
	Input Power Dissipation	Pin	75	mW	
Output	Load Voltage	VL	60	V(DC peak or AC)	
	Load Current	IL	0.6	A	
	Peak Load Current	IPeak	1.5	A	100ms (1 pulse)
	Output Power Dissipation	Pout	400	mW	
Total Power Dissipation		PT	440	mW	
I/O Breakdown Voltage		VI/O	5000	Vrms	RH=60%, 1min
Operating Temperature		Topr	-40 to 85	°C	
Storage Temperature		Tstg	-40 to 100	°C	
Pin Soldering Temperature		Tsol	260	°C	10 sec max.

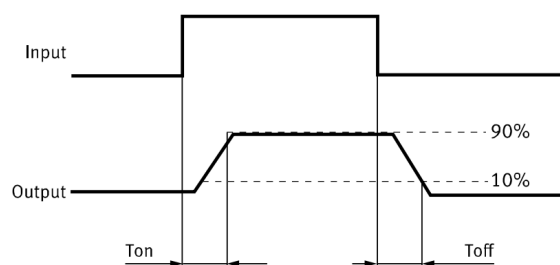
Electrical Characteristics (Ta = 25°C)

Item		Symbol	MIN.	TYP.	MAX.	Units	Conditions
Input *	LED Forward Voltage	VF	1.15	1.18	1.24	V	IF=10mA
	LED trigger current	IFT		0.8	3.0	mA	
	Input Current (ON)	IF(ON)		4.0	30.0	mA	
	Input Voltage (OFF)	VF(OFF)	0.7			V	

* The threshold for device switching is $IF \geq 3.0 \text{ mA (MAX.)}$; however, to ensure satisfactory performance of the device across the temperature range, taking into account both circuit loss and interference, it is recommended to operate when the working condition is: IF (input current) $\geq 5 \text{ mA}$ and $\leq 30 \text{ mA}$

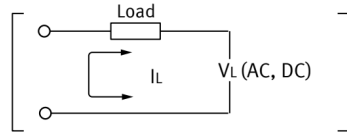
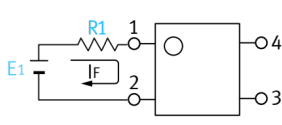
Item		Symbol	MIN.	TYP.	MAX.	Units	Conditions
Output	On-Resistance	Ron		0.80	1.6	Ω	IF=5mA, IL=100mA, within 1 sec.
	Off-State Leakage Current	ILeak		0.01	0.1	μA	VL=Rating
	Output Capacitance	Cout		38		pF	VL=0, f=1MHz
Transmission *	Turn-On Time	Ton		1.50	3.0	ms	IF=5mA, IL=100mA,
	Turn-Off Time	Toff		0.08	2.0	ms	
Coupled	I/O Isolation Resistance	RI/O	10^{10}			Ω	DC500V
	I/O Capacitance	CI/O		0.8	1.5	pF	f=1MHz

* Turn on / Turn off time



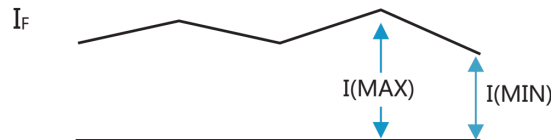
Using Methods

Examples of resistance value to control LED forward current ($I_F = 5\text{mA}$)



E1	R1 (Approx)
3.3V	300 Ω
5.0V	600 Ω

LED forward current must be more than 3mA, at $I_F(\text{MIN})$, and less than 30mA, at $I_F(\text{MAX})$.



Recommended Operating Conditions

Please obey the following conditions to ensure proper device operation and resetting. Input LED current (Recommended value):

Characteristic	Symbol	Min	Typ.	Max	Unit
Forward current	I_F	5.0	10	30	mA

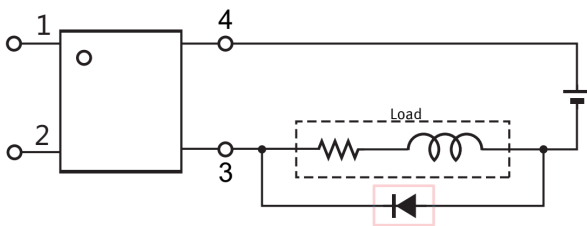
For usage with high reliability, Recommended Operation Conditions is a measure that takes into account the derating of Absolute Maximum Ratings and Electrical Characteristics. Each item on this list is an independent condition, so it is not simultaneously satisfy several conditions.

Characteristic	Symbol	Min	Typ.	Max	Unit
Load voltage (Peak AC)	V_L	—	—	60	V

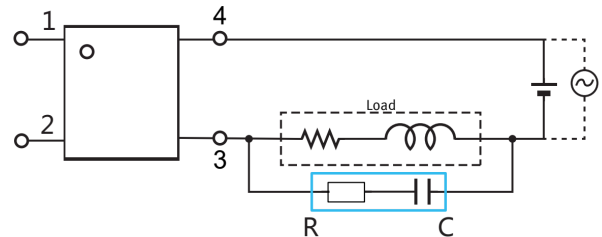
Protection Circuit

Output spike voltages: if an inductive load generates spike voltages which exceed the absolute maximum rating, the spike voltage shall be limited.

Clamp diode is connected in parallel with the load.
Absorb capacity with external diode.



CR Snubber is connected in parallel with the load.
Absorb capacity with buffer capacity.

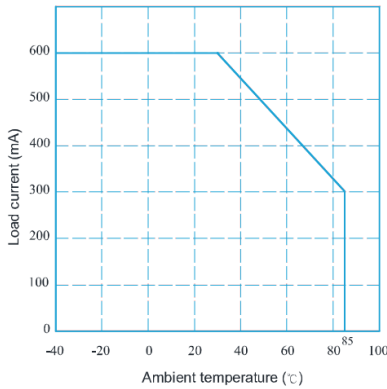


When adding diodes, buffer circuits (C-R), and other protections, they need to be installed near the MOS RELAY to be effective. Adding protection elements may result in a slow reset time, so adjust them according to the actual situation before use.

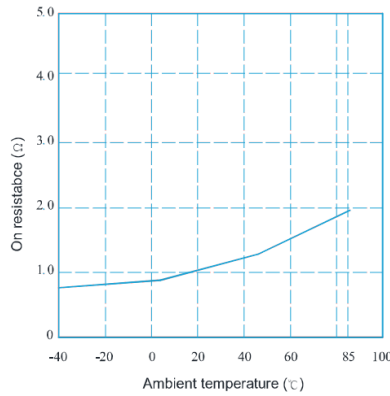
Note: When developing designs using this product, perform the expected performance of the equipment under the operating conditions recommended by the guidelines in this document. Continuous use under heavy loads (including, but not limited to, the application of high temperatures/current/voltage and significant changes in temperature, etc.) may result in deterioration of the reliability of this product.

Engineering Data (Typical Characteristics)

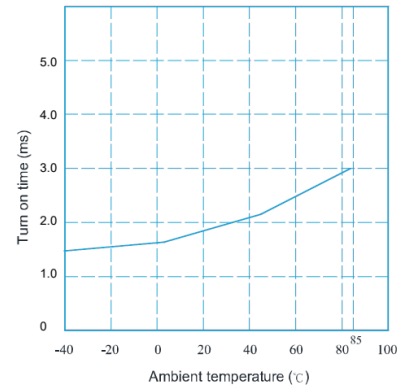
Load current Vs.
Ambient temperature



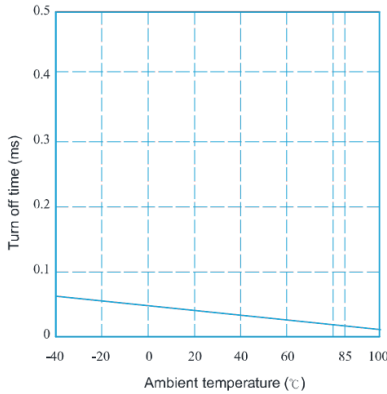
On resistance Vs.
Ambient temperature



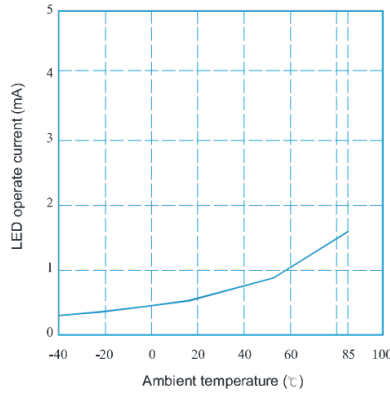
Turn on time Vs.
Ambient temperature



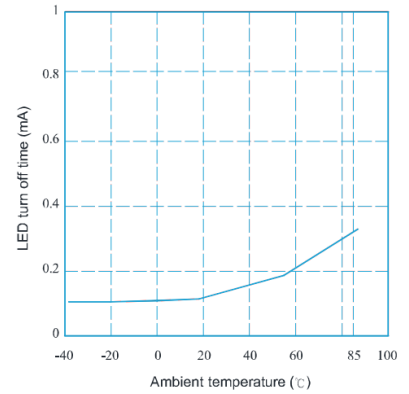
Turn off time Vs.
Ambient temperature



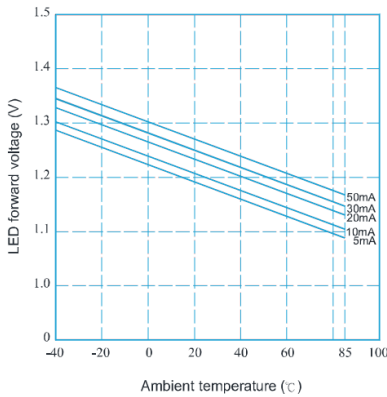
LED operate current Vs.
Ambient temperature



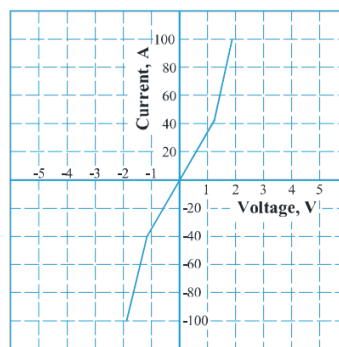
LED turn off current Vs.
Ambient temperature



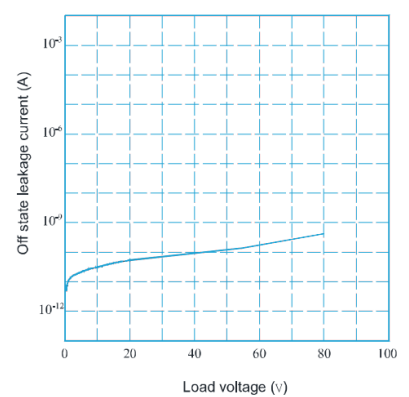
LED forward voltage Vs.
Ambient temperature



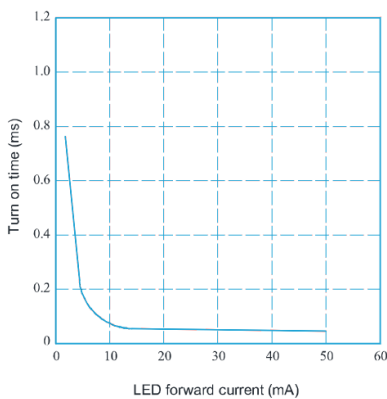
Voltage Vs. current characteristics
of output at MOS portion



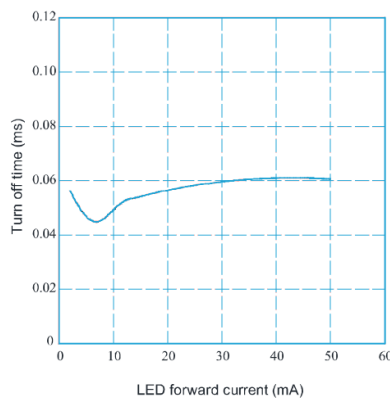
Off state leakage current Vs.
Load voltage characteristics



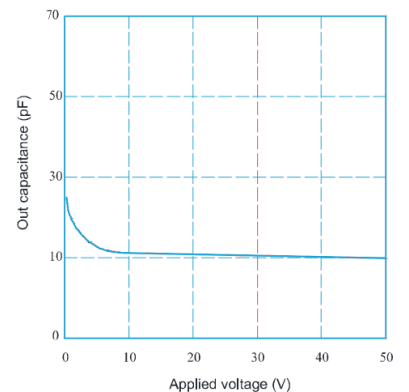
LED forward current Vs.
turn on time characteristics



LED forward current Vs.
turn off time characteristics

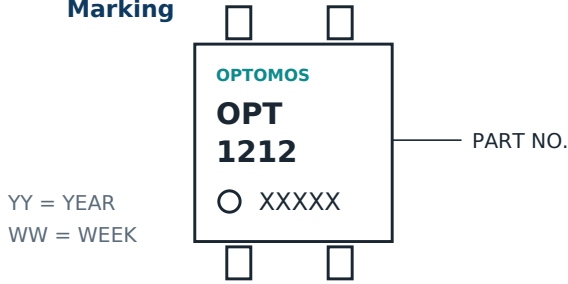


Applied voltage Vs.
output capacitance characteristics

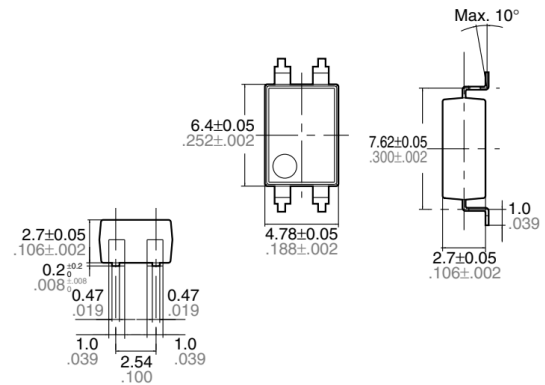


Dimensions and SMD-4 Package

Marking



Surface mount terminal type



Terminal thickness: $t = 0.2$

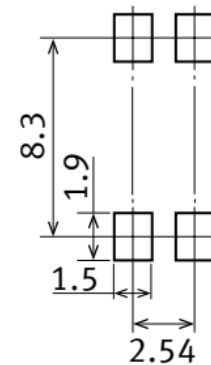
Unit : mm Terminal thickness : $t = 0.2$ Tolerance : ± 0.1

Label



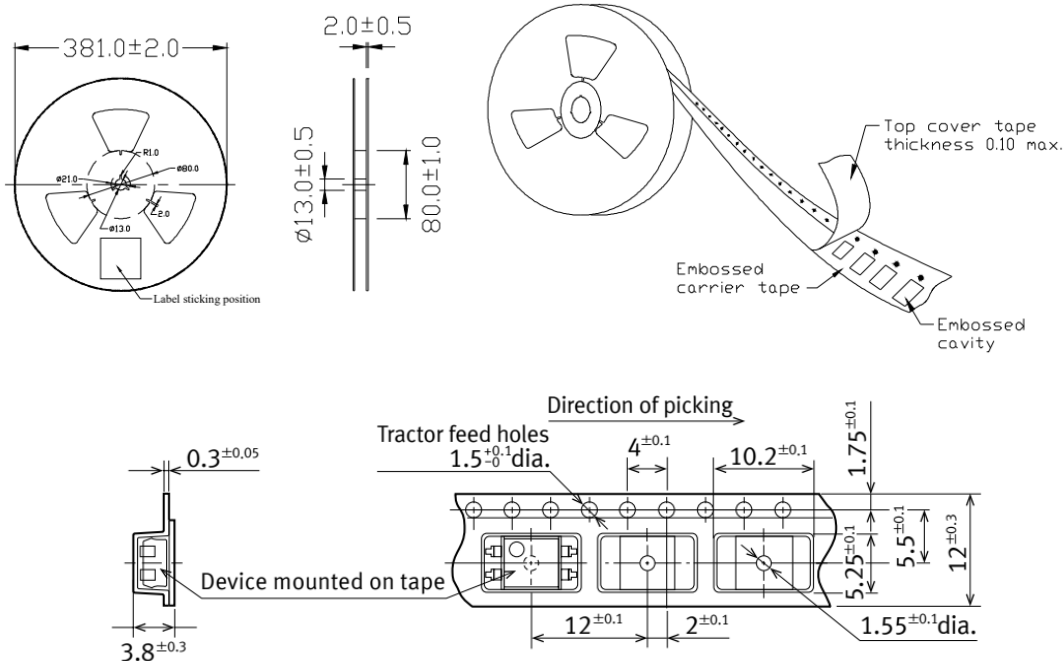
Recommended mounting pad (Top view)

(TOP VIEW)



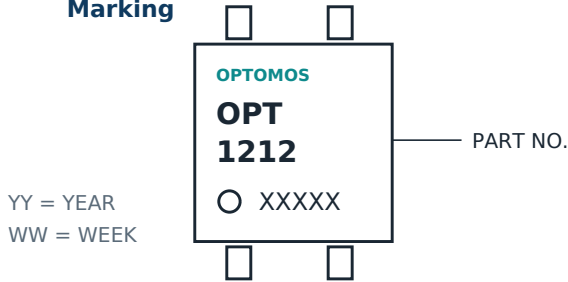
Tolerance: ± 0.1

Tape dimensions (tape reel)

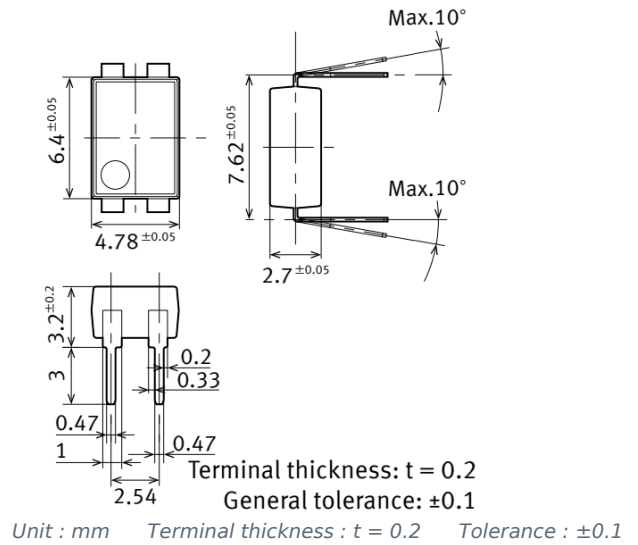


Dimensions and DIP-4 Package

Marking



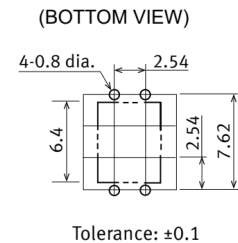
Surface mount terminal type



Label



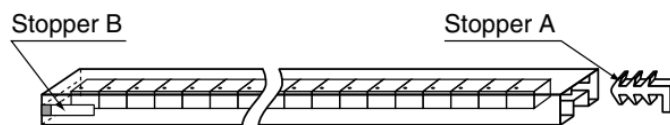
PC board pattern (Bottom view)



Tube dimensions

DIP type

Devices are packaged in a tube so that pin No. 1 is on the stopper B side. Observe correct orientation when mounting them on PC boards.

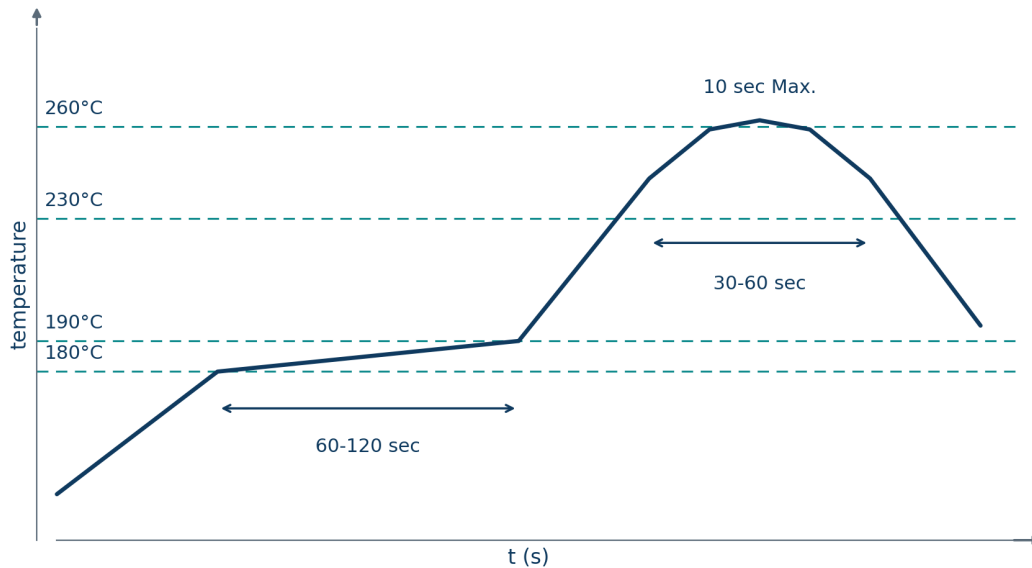


Recommended Soldering Conditions

(a) Infrared reflow soldering :

- Peak reflow soldering : 260°C or below (package surface temperature)
- Time of peak reflow temperature : 10 sec
- Time of temperature higher than 230°C : 30-60 sec
- Time to preheat temperature from 180~190°C : 60-120 sec
- Time(s) of reflow : Two
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



(b) Wave soldering :

- Temperature : 260°C or below (molten solder temperature)
- Time : 10 seconds or less
- Preheating conditions : 120°C or below (package surface temperature)
- Time(s) of reflow : One
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(c) Cautions :

- Fluxes : Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.
- Avoid shorting between portion of frame and leads.

■ Manufacturing Information

■ Moisture Sensitivity

All plastic encapsulated semiconductor packages are susceptible to moisture ingress. OPTOMOS classifies its plastic encapsulated devices for moisture sensitivity according to the latest revision of the joint industry standard, IPC/JEDEC J-STD-020, in force at the time of product evaluation. We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below. Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a Moisture Sensitivity Level (MSL) classification as shown below, and should be handled according to the requirements of the latest revision of the joint industry standard IPC/JEDEC J-STD-033.

Moisture Sensitivity Level (MSL) Classification MSL 3

■ ESD Sensitivity

This product is ESD Sensitive, and should be handled according to the industry standard JESD-625.

■ Board Wash

OPTOMOS recommends the use of no-clean flux formulations. Board washing to reduce or remove flux residue following the solder reflow process is acceptable provided proper precautions are taken to prevent damage to the device. These precautions include but are not limited to: using a low pressure wash and providing a follow up bake cycle sufficient to remove any moisture trapped within the device due to the washing process. Due to the variability of the wash parameters used to clean the board, determination of the bake temperature and duration necessary to remove the moisture trapped within the package is the responsibility of the user (assembler). Cleaning or drying methods that employ ultrasonic energy may damage the device and should not be used. Additionally, the device must not be exposed to halide flux or solvents.

Post high-temperature welding, direct cleaning with dry ice is prohibited.

■ RESTRICTIONS ON PRODUCT USE

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Revision History

Revision	Subjects (major changes since last revision)	Date
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Disclaimer

1. Operating conditions may differ from simulation assumptions in several aspects like level of DC-link voltage, applied gate-voltage and gate-resistor, case and junction temperatures as well as the power circuit stray-inductance. Therefore, deviations of parameters and assumptions used for the simulation and the real application may exist.
2. For these reasons we cannot take any responsibility or liability for the exactness or validity of the form's results. The form cannot replace a detailed reflection of the customers application with all of its operating conditions.
3. Accurate results depend on huge data, so with the measured data is increasing, we should be updated in real time and send it to the corresponding engineer so that he can know it in real time.