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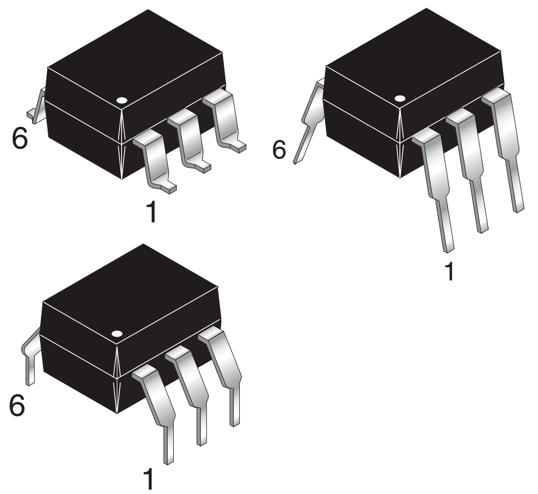
FAIRCHILD
SEMICONDUCTOR®

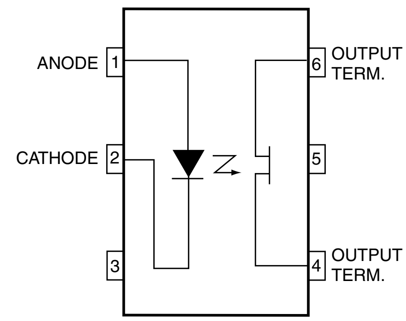
PHOTO FET OPTOCOUPLERS

H11F1 H11F2 H11F3

PACKAGE



SCHEMATIC



DESCRIPTION

The H11F series consists of a Gallium-Aluminum-Arsenide IRED emitting diode coupled to a symmetrical bilateral silicon photo-detector. The detector is electrically isolated from the input and performs like an ideal isolated FET designed for distortion-free control of low level AC and DC analog signals. The H11F series devices are mounted in dual in-line packages.

FEATURES

As a remote variable resistor
- ≤ 100Ω to ≥ 300 MΩ
- ≥ 99.9% linearity
- ≤ 15 pF shunt capacitance
- ≥ 100 GΩ I/O isolation resistance

As an analog switch
- Extremely low offset voltage
- 60 V_{pk-pk} signal capability
- No charge injection or latch-up
- t_{on}, t_{off} ≤ 15 µS
- UL recognized (File #E90700)
- VDE recognized (File #E94766)
  – Ordering option ‘300’ (e.g. H11F1.300)

APPLICATIONS

As a variable resistor –
- Isolated variable attenuator
- Automatic gain control
- Active filter fine tuning/band switching

As an analog switch –
- Isolated sample and hold circuit
- Multiplexed, optically isolated A/D conversion

Absolute Maximum Ratings (T_A = 25°C unless otherwise specified)				
Parameter	**Symbol**	**Device**	**Value**	**Units**
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-55 to +150	°C
Operating Temperature	T_{OPR}	All	-55 to +100	°C
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
EMITTER				
Continuous Forward Current	I_F	All	60	mA
Reverse Voltage	V_R	All	5	V
Forward Current - Peak (10 µs pulse, 1% duty cycle)	$I_{F(pk)}$	All	1	A
LED Power Dissipation 25°C Ambient	P_D	All	100	mW
Derate Linearly From 25°C			1.33	mW/°C
DETECTOR				
Detector Power Dissipation @ 25°C	P_D	All	300	mW
Derate linearly from 25°C			4.0	mW/°C
Breakdown Voltage (either polarity)	BV_{4-6}	H11F1, H11F2	±30	V
		H11F3	±15	V
Continuous Detector Current (either polarity)	I_{4-6}	All	±100	mA

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS							
Parameter	**Test Conditions**	**Symbol**	**Device**	**Min**	**Typ***	**Max**	**Unit**
EMITTER							
Input Forward Voltage	I_F = 16 mA	V_F	All		1.3	1.75	V
Reverse Leakage Current	V_R = 5 V	I_R	All			10	µA
Capacitance	V = 0 V, f = 1.0 MHz	C_J	All		50		pF
OUTPUT DETECTOR							
Breakdown Voltage Either Polarity	I_{4-6} = 10µA, I_F = 0	BV_{4-6}	H11F1, H11F2	30			V
			H11F3	15			
Off-State Dark Current	V_{4-6} = 15 V, I_F = 0	I_{4-6}	All			50	nA
	V_{4-6} = 15 V, I_F = 0, T_A = 100°C		All			50	µA
Off-State Resistance	V_{4-6} = 15 V, I_F = 0	R_{4-6}	All	300			MΩ
Capacitance	V_{4-6} = 15 V, I_F = 0, f = 1MHz	C_{4-6}	All			15	pF

ISOLATION CHARACTERISTICS						
Parameter	**Test Conditions**	**Symbol**	**Min**	**Typ***	**Max**	**Units**
Input-Output Isolation Voltage	f = 60Hz, t = 1 min.	V_{ISO}	5300			Vac (rms)
Isolation Resistance	V_{I-O} = 500 VDC	R_{ISO}	10^{11}			Ω
Isolation Capacitance	V_{I-O} = 0, f = 1.0 MHz	C_{ISO}			2	pF

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)							
DC Characteristics	**Test Conditions**	**Symbol**	**Device**	**Min**	**Typ***	**Max**	**Units**
On-State Resistance	I_F = 16 mA, I_{4-6} = 100 µA	R_{4-6}	H11F1			200	Ω
			H11F2			330	
			H11F3			470	
On-State Resistance	I_F = 16 mA, I_{6-4} = 100 µA	R_{6-4}	H11F1			200	Ω
			H11F2			330	
			H11F3			470	
Resistance, non-linearity and assymetry	I_F = 16mA, I_{4-6} = 25 µA RMS, f = 1kHz		All			0.1	%
AC Characteristics	**Test Conditions**	**Symbol**	**Device**	**Min**	**Typ***	**Max**	**Units**
Turn-On Time	R_L = 50Ω, I_F = 16mA, V_{4-6} = 5V	t_{on}	All			25	µS
Turn-Off Time	R_L = 50Ω, I_F = 16mA, V_{4-6} = 5V	t_{off}	All			25	µS

Figure 1. Resistance vs. Input Current

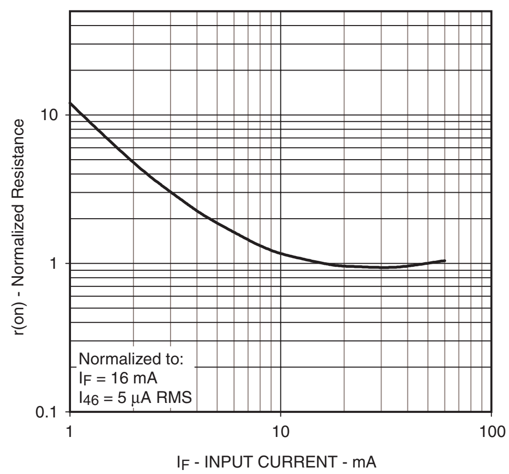


Figure 2. Output Characteristics

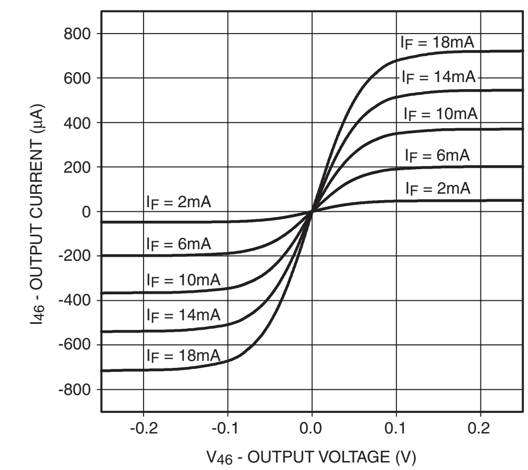


Figure 3. LED Forward Voltage vs. Forward Current

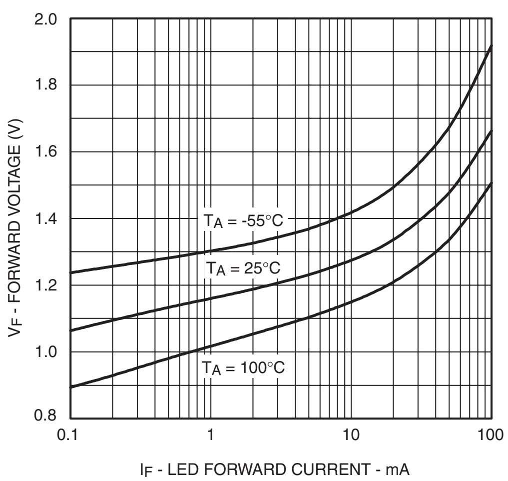


Figure 4. Off-state Current vs. Ambient Temperature

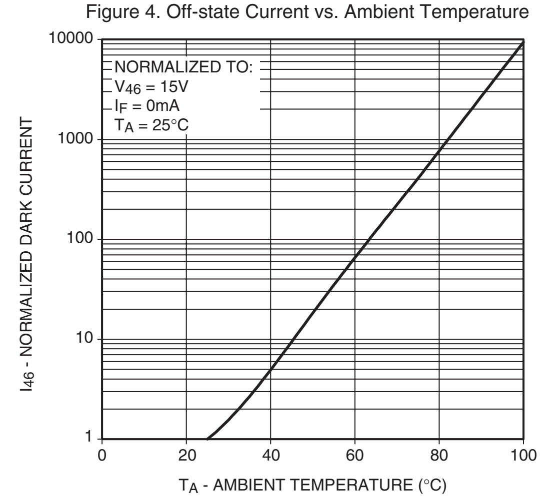


Figure 5. Resistance vs. Temperature

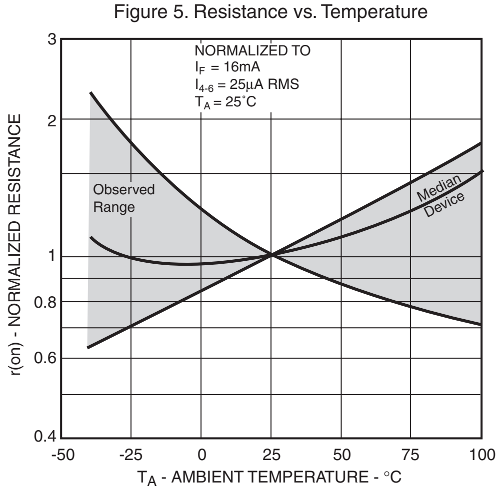


Figure 6. Region of Linear Resistance

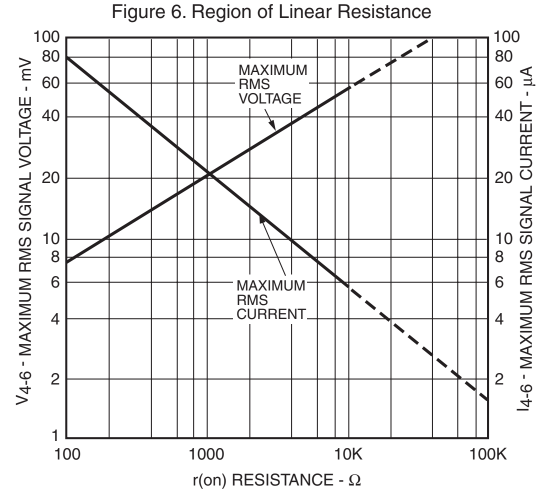
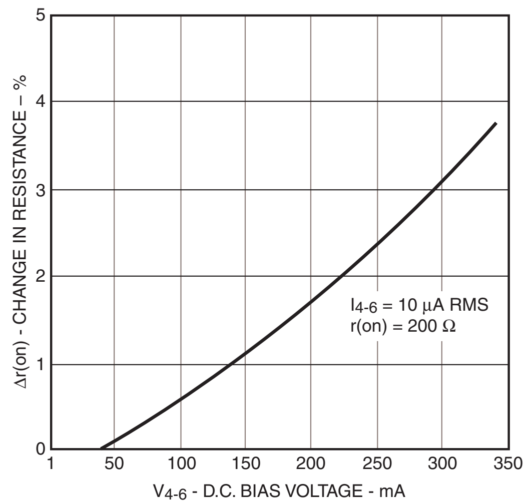


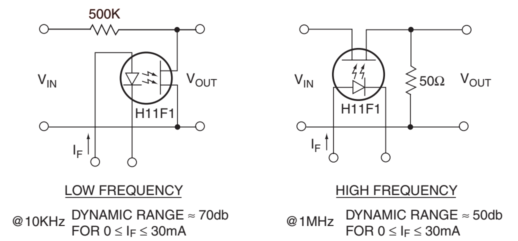
Figure 7. Resistive non-linearity vs. D.C. Bias



TYPICAL APPLICATIONS

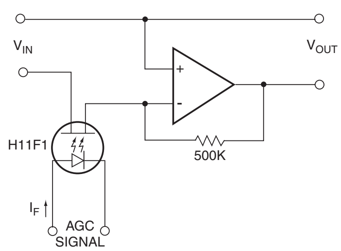
AS A VARIABLE RESISTOR

ISOLATED VARIABLE ATTENUATORS



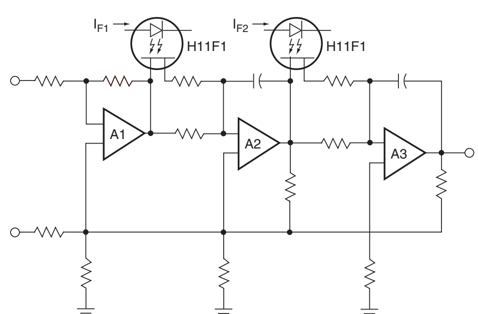
Distortion free attenuation of low level A.C. signals is accomplished by varying the IRED current, I_F Note the wide dynamic range and absence of coupling capacitors; D.C. level shifting or parasitic feedback to the controlling function.

AUTOMATIC GAIN CONTROL



This simple circuit provides over 70db of stable gain control for an AGC signal range of from 0 to 30mA. This basic circuit can be used to provide programmable fade and attack for electronic music.

ACTIVE FILTER FINE TUNING/BAND SWITCHING

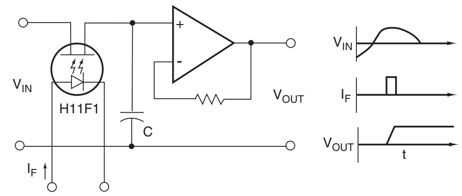


I_{F1} ADJUSTS f_1, I_{F2} ADJUSTS f_2

The linearity of resistance and the low offset voltage of the H11F allows the remote tuning or band-switching of active filters without switching glitches or distortion. This schematic illustrates the concept, with current to the H11F1 IRED's controlling the filter's transfer characteristic.

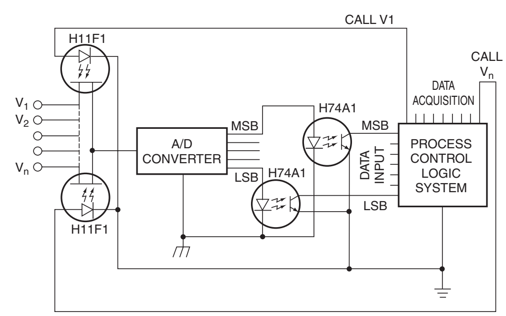
AS AN ANALOG SIGNAL SWITCH

ISOLATED SAMPLE AND HOLD CIRCUIT



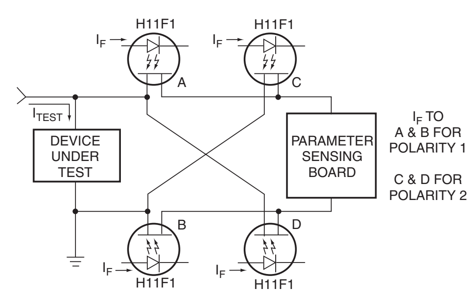
Accuracy and range are improved over conventional FET switches because the H11F has no charge injection from the control signal. The H11F also provides switching of either polarity input signal up to 30V magnitude.

MULTIPLEXED, OPTICALLY-ISOLATED A/D CONVERSION



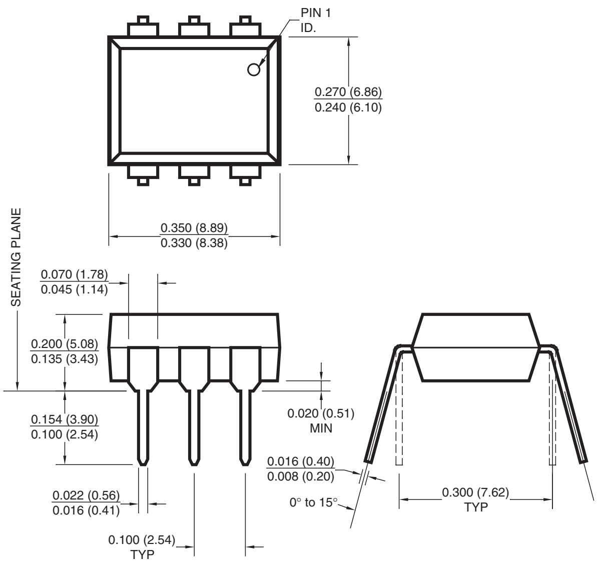
The optical isolation, linearity and low offset voltage of the H11F allows the remote multiplexing of low level analog signals from such transducers as thermocouplers, Hall effect devices, strain gauges, etc. to a single A/D converter.

TEST EQUIPMENT - KELVIN CONTACT POLARITY

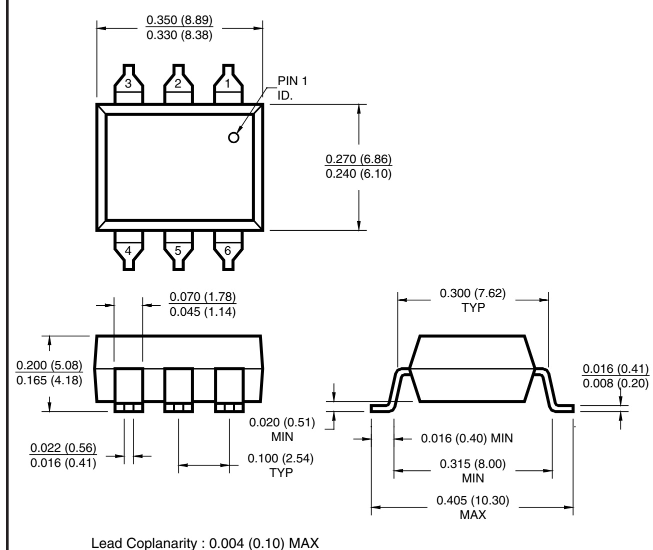


In many test equipment designs the auto polarity function uses reed relay contacts to switch the Kelvin Contact polarity. These reeds are normally one of the highest maintenance cost items due to sticking contacts and mechanical problems. The totally solid-State H11F eliminates these troubles while providing faster switching.

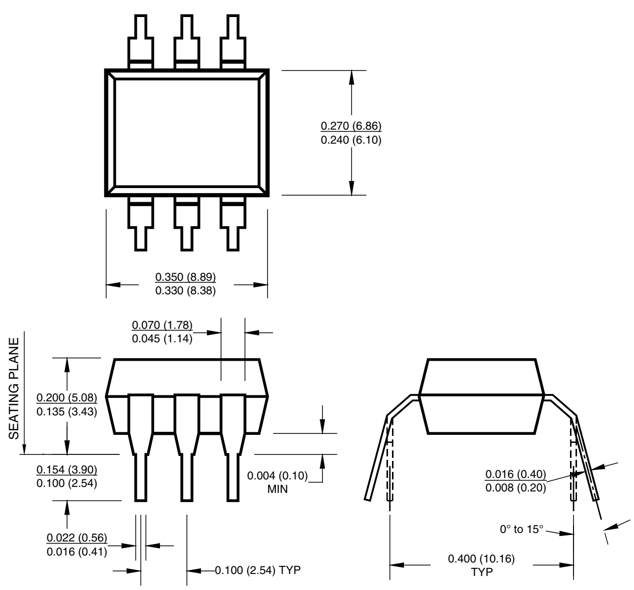
Package Dimensions (Through Hole)



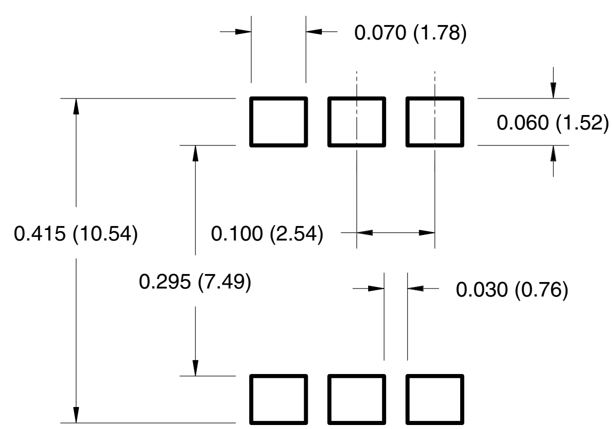
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform

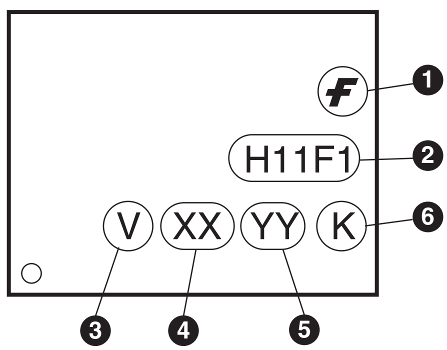


NOTE
All dimensions are in inches (millimeters)

ORDERING INFORMATION

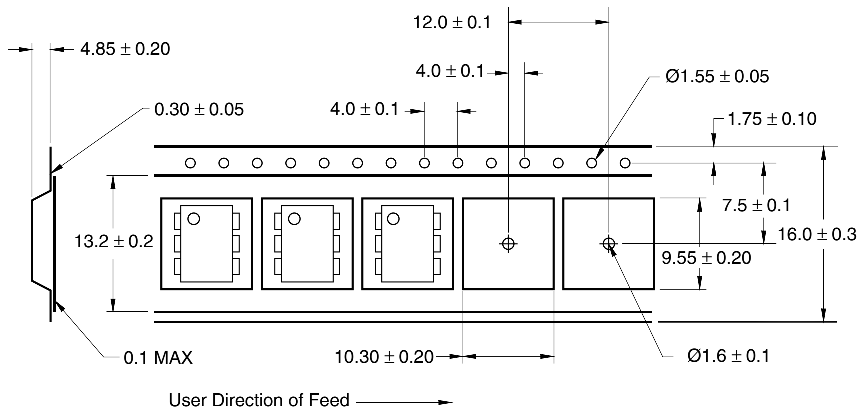
Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and Reel
W	.W	0.4" Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape and Reel

MARKING INFORMATION



Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digit year code, e.g., ‘03’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Carrier Tape Specifications

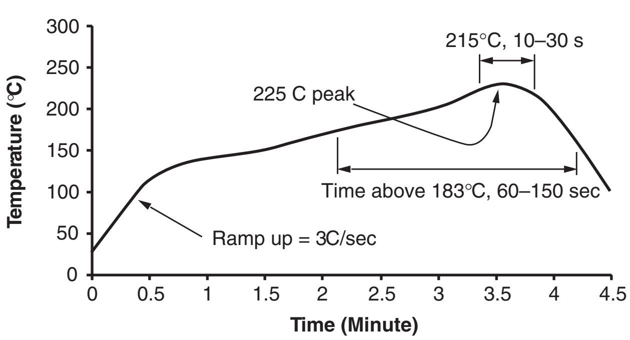


NOTE

All dimensions are in inches (millimeters)

Tape and reel quantity is 1,000 units per reel

Reflow Profile (Black Package, No Suffix)



- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60–150 seconds
- One time soldering reflow is recommended

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