



THE DATASHEET OF SFH615A-4X



SFH615A



DESCRIPTION

The SFH615A series of optically coupled isolators each consists of an infrared light emitting diode and an NPN silicon photo transistor in a space efficient Dual In Line Plastic Package.

FEATURES

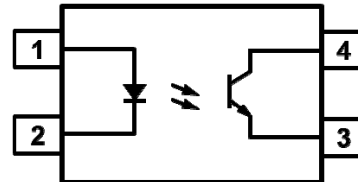
- AC Isolation Voltage 5300V_{RMS}
- Low Input Current I_F 1mA
- High Current Transfer Ratios
- Wide Operating Temperature Range -55°C to +110°C
- Lead Free and RoHS Compliant
- UL File E91231 Package Code "EE"
- VDE Approval Certificate No. 40028086

APPLICATIONS

- Computer Terminals
- Industrial System Controllers
- Measuring Instruments

ORDER INFORMATION

- Add X after PN for VDE Approval
- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel



- 1 Anode
- 2 Cathode
- 3 Emitter
- 4 Collector

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

Input

Forward Current	50mA
Reverse Voltage	6V
Power dissipation	70mW

Output

Collector to Emitter Voltage V _{CEO}	70V
Emitter to Collector Voltage V _{ECO}	6V
Collector Current	50mA
Power Dissipation	150mW

Total Package

Isolation Voltage	5300V _{RMS}
Total Power Dissipation	200mW
Operating Temperature	-55 to 110 °C
Storage Temperature	-55 to 125 °C
Lead Soldering Temperature (10s)	260°C

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SFH615A

ELECTRICAL CHARACTERISTICS (Ambient Temperature = 25°C unless otherwise specified)

INPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward Voltage	V_F	$I_F = 20\text{mA}$		1.2	1.4	V
Reverse Leakage	I_R	$V_R = 4\text{V}$			10	μA
Terminal Capacitance	C_t	$V = 0\text{V}, f = 1\text{KHz}$		30	250	pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector–Emitter Breakdown Voltage	BV_{CEO}	$I_C = 0.1\text{mA}, I_F = 0\text{mA}$	70			V
Emitter–Collector Breakdown Voltage	BV_{ECO}	$I_E = 10\mu\text{A}, I_F = 0\text{mA}$	6			V
Collector–Emitter Dark Current	I_{CEO}	$V_{CE} = 20\text{V}, I_F = 0\text{mA}$			100	nA

SFH615A

ELECTRICAL CHARACTERISTICS (Ambient Temperature = 25°C unless otherwise specified)

COUPLED

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit	
Current Transfer Ratio	CTR	$I_F = 10\text{mA}, V_{CE} = 5\text{V}$				%	
		SFH615A-1	40		80		
		SFH615A-2	63		125		
		SFH615A-3	100		200		
		SFH615A-4	160		320		
		$I_F = 1\text{mA}, V_{CE} = 5\text{V}$					
		SFH615A-1	13				
		SFH615A-2	22				
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F = 20\text{mA}, I_C = 1\text{mA}$		0.1	0.2	V	
Floating Capacitance	C_f	$V = 0\text{V}, f = 1\text{MHz}$		0.6	1	pF	
Cut-Off Frequency	f_c	$V_{CE} = 5\text{V}, I_C = 2\text{mA}, R_L = 100\Omega, -3\text{dB}$		80		kHz	



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ELECTRICAL CHARACTERISTICS (Ambient Temperature = 25°C unless otherwise specified)

SWITCHING

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
NON-SATURATED						
Turn-ON Time	t_{ON}	$V_{CC} = 5V,$ $I_F = 10mA,$ $R_L = 75\Omega$		3.0		μs
Rise Time	t_r			2.0		
Turn-OFF Time	t_{OFF}			2.3		
Fall Time	t_f			2.0		
Cut-off Frequency	f_{CO}				250	
SATURATED $V_{CC} = 5V, R_L = 1k\Omega, V_{CE(sat)} \leq 0.4V$						
Turn-ON Time	t_{ON}	$I_F = 20mA$ SFH615A-1 $I_F = 10mA$ SFH615A-2 $I_F = 10mA$ SFH615A-3 $I_F = 5mA$ SFH615A-4		3.0 4.2 4.2 6.0		μs
Rise Time	t_r	$I_F = 20mA$ SFH615A-1 $I_F = 10mA$ SFH615A-2 $I_F = 10mA$ SFH615A-3 $I_F = 5mA$ SFH615A-4		2.0 3.0 3.0 4.6		
Turn-OFF Time	t_{OFF}	$I_F = 20mA$ SFH615A-1 $I_F = 10mA$ SFH615A-2 $I_F = 10mA$ SFH615A-3 $I_F = 5mA$ SFH615A-4		18 23 23 25		
Fall Time	t_f	$I_F = 20mA$ SFH615A-1 $I_F = 10mA$ SFH615A-2 $I_F = 10mA$ SFH615A-3 $I_F = 5mA$ SFH615A-4		11 14 14 15		

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Input to Output Isolation Voltage	V_{ISO}	AC 1 minute, RH = 40% to 60% Note 1	5300			V_{RMS}
Input to Output Isolation Resistance	R_{ISO}	$V_{IO} = 500V,$ RH = 40% to 60% Note 1	5×10^{10}	1×10^{11}		Ω

Note 1 : Measure with input leads shorted together and output leads shorted together.

SFH615A

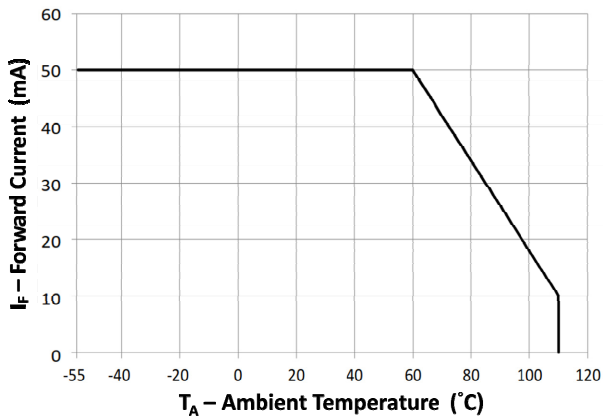


Fig 1 Forward Current vs Ambient Temperature

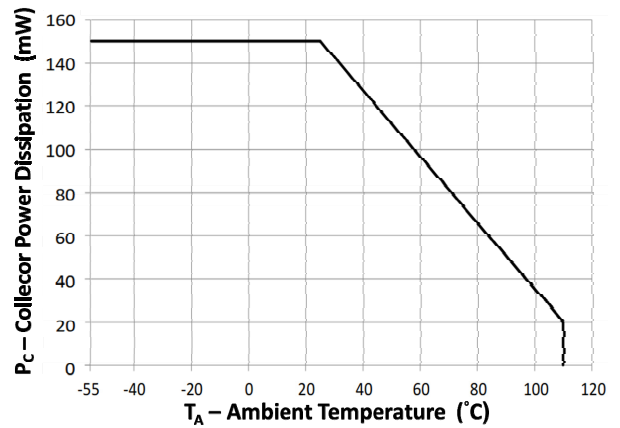


Fig 2 Collector Power Dissipation vs Ambient Temperature

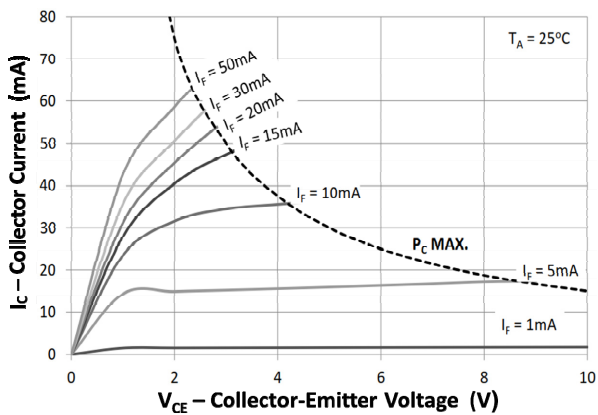


Fig 3 Collector Current vs Collector-Emitter Voltage

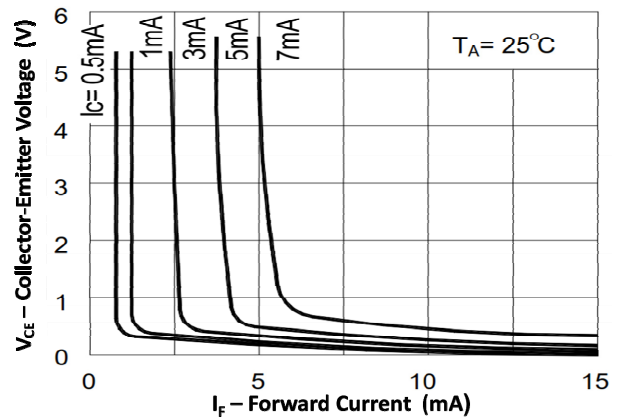


Fig 4 Collector-Emitter Voltage vs Forward Current

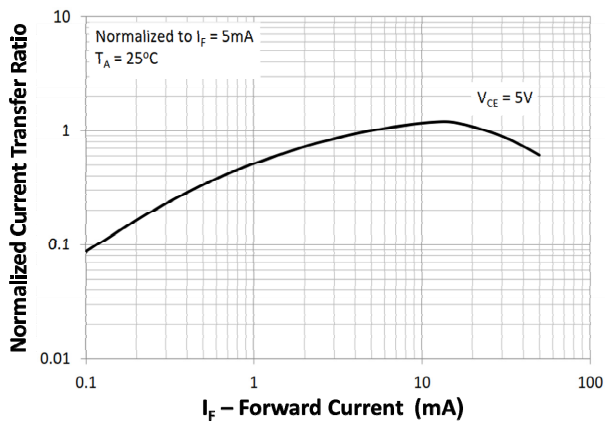


Fig 5 Normalized Current Transfer Ratio vs Forward Current

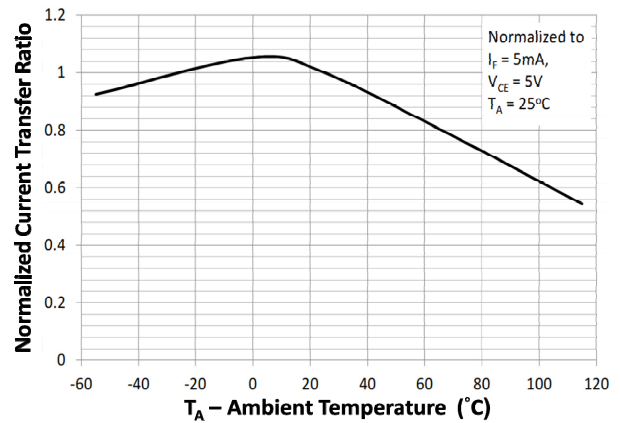


Fig 6 Normalized Current Transfer Ratio vs Ambient Temperature

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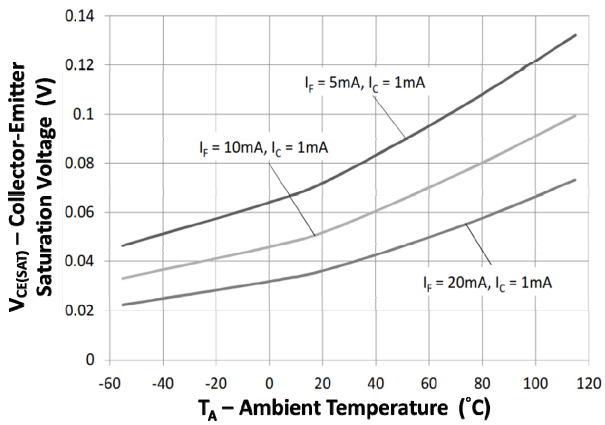


Fig 7 Collector-Emitter Saturation Voltage vs Ambient Temperature

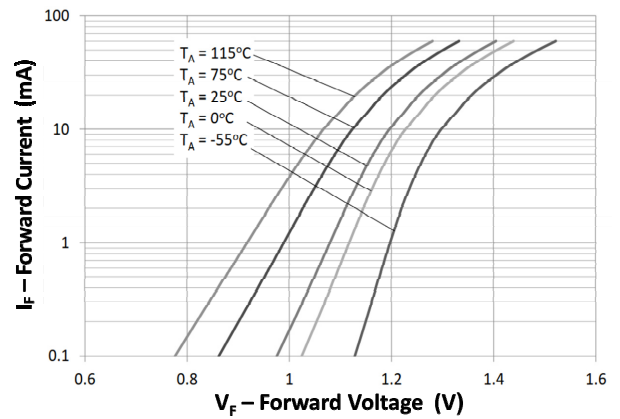


Fig 8 Forward Current vs Forward Voltage

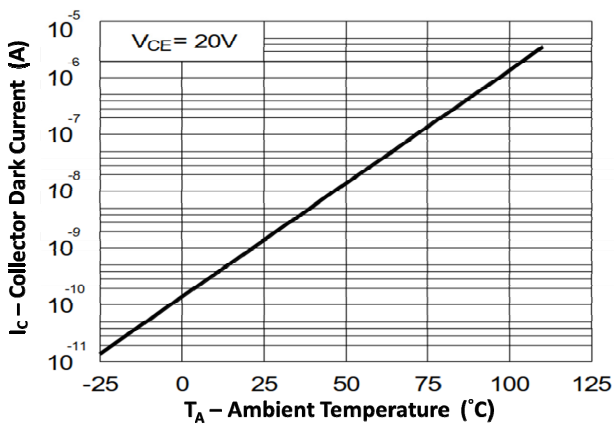


Fig 9 Collector Dark Current vs Ambient Temperature

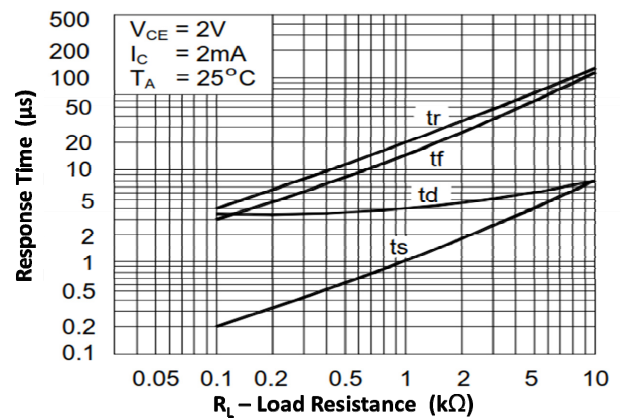


Fig 10 Response Time vs Load Resistance

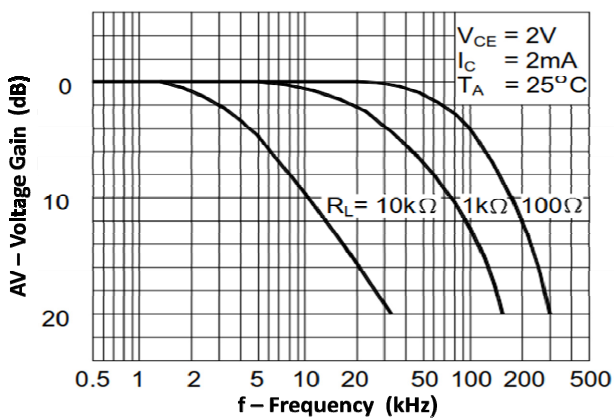
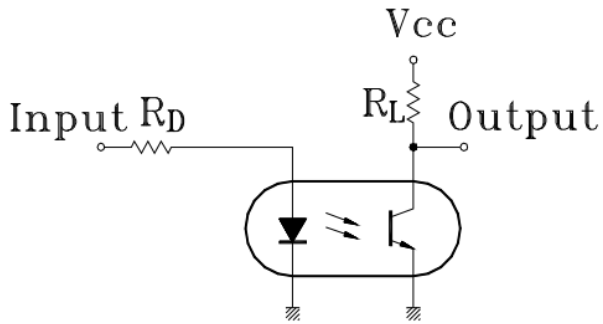
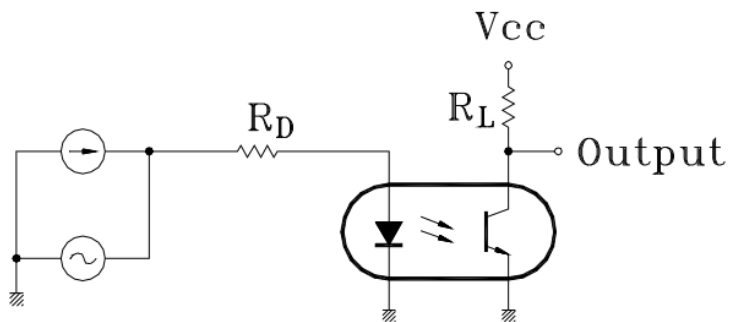
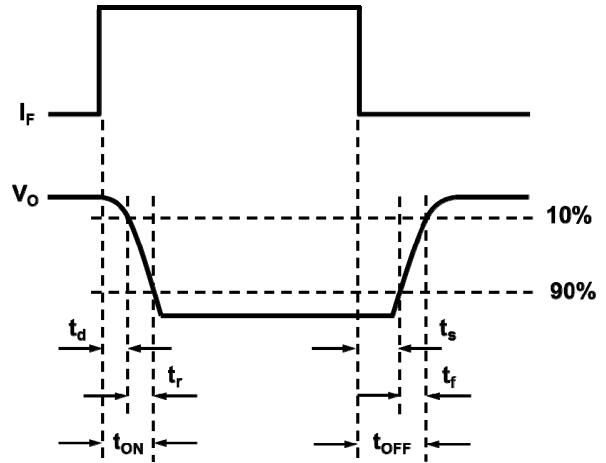


Fig 11 Frequency Response

SFH615A



Response Time Test Circuit and Waveform



Frequency Response Test Circuit

SFH615A

ORDER INFORMATION

SFH615A (UL Approval)			
After PN	PN	Description	Packing quantity
None	SFH615A-1, SFH615A-2, SFH615A-3, SFH615A-4	Standard DIP4	100 pcs per tube
G	SFH615A-1G, SFH615A-2G, SFH615A-3G, SFH615A-4G	10mm Lead Spacing	100 pcs per tube
SM	SFH615A-1SM, SFH615A-2SM, SFH615A-3SM, SFH615A-4SM	Surface Mount	100 pcs per tube
SMT&R	SFH615A-1SMT&R, SFH615A-2SMT&R, SFH615A-3SMT&R, SFH615A-4SMT&R	Surface Mount Tape & Reel	2000 pcs per reel

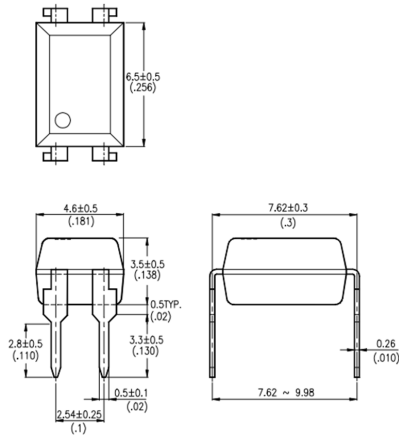
SFH615A (UL and VDE Approvals)			
After PN	PN	Description	Packing quantity
None	SFH615A-1X, SFH615A-2X, SFH615A-3X, SFH615A-4X	Standard DIP8	100 pcs per tube
G	SFH615A-1XG, SFH615A-2XG, SFH615A-3XG, SFH615A-4XG	10mm Lead Spacing	100 pcs per tube
SM	SFH615A-1XSM, SFH615A-2XSM, SFH615A-3XSM, SFH615A-4XSM	Surface Mount	100 pcs per tube
SMT&R	SFH615A-1XSMT&R, SFH615A-2XSMT&R, SFH615A-3XSMT&R, SFH615A-4XSMT&R	Surface Mount Tape & Reel	2000 pcs per reel

SFH615A

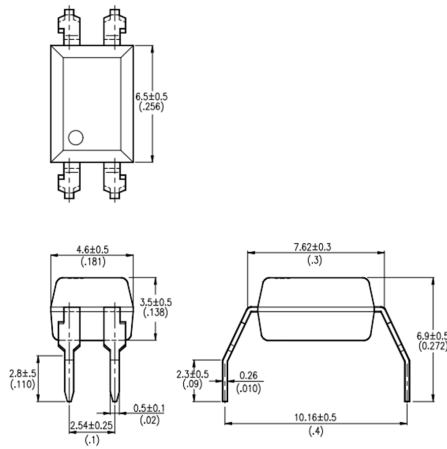
PACKAGE DIMENSIONS in mm (inch)

DIP

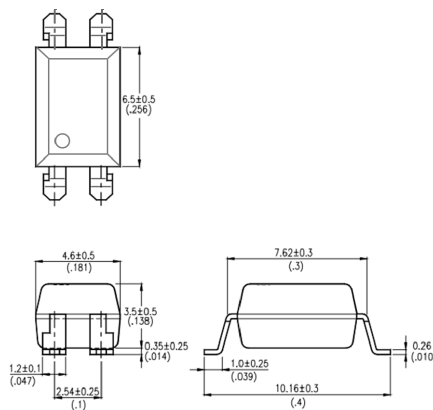
SFH615



SFH615G

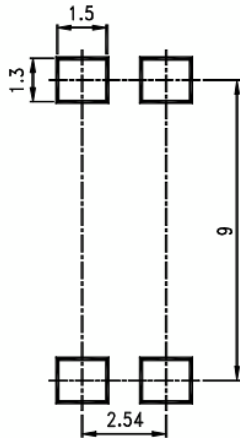


SFH615SM

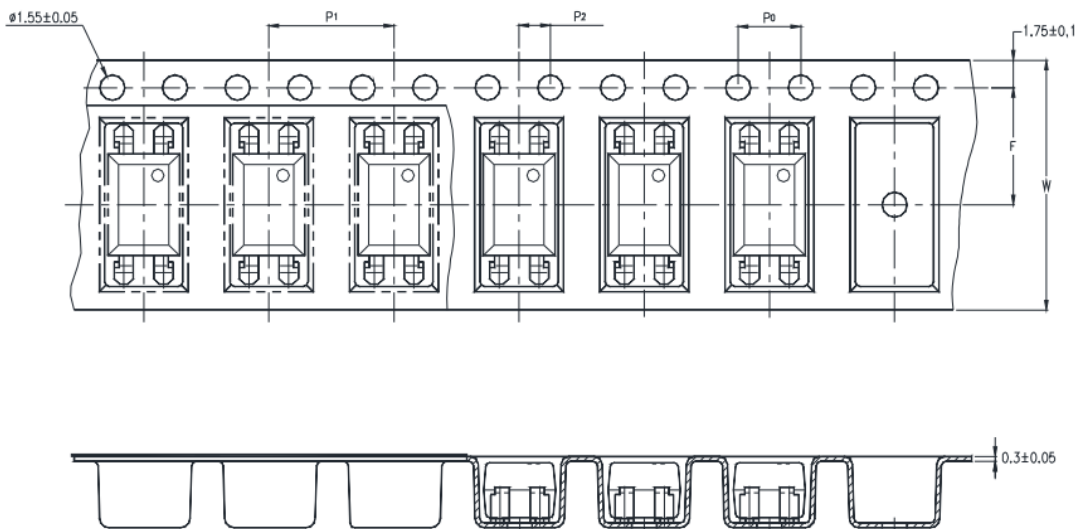


SFH615A

RECOMMENDED PAD LAYOUT FOR SMD (mm)



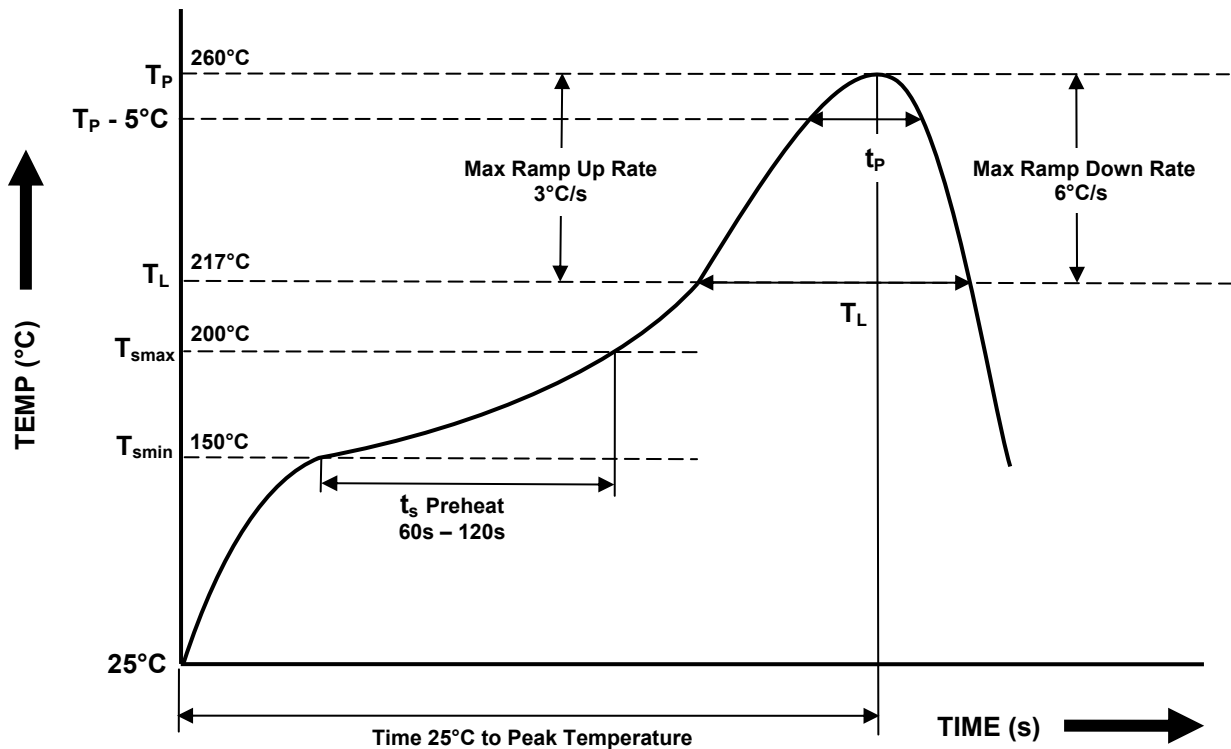
TAPE AND REEL PACKAGING



Description	Symbol	Dimension mm (inch)
Tape Width	W	16 ± 0.3 (0.63)
Pitch of Sprocket Holes	P ₀	4 ± 0.1 (0.15)
Distance of Compartment to Sprocket Holes	F	7.5 ± 0.1 (0.295)
	P ₂	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P ₁	8 ± 0.1 (0.472)

SFH615A

IR REFLOW SOLDERING TEMPERATURE PROFILE FOR SMD
One Time Reflow Soldering is Recommended.
Do not immerse device body in solder paste.



Profile Details	Conditions
Preheat - Min Temperature (T_{SMIN}) - Max Temperature (T_{SMAX}) - Time T_{SMIN} to T_{SMAX} (t_s)	150°C 200°C 60s - 120s
Soldering Zone - Peak Temperature (T_P) - Time at Peak Temperature - Liquidous Temperature (T_L) - Time within 5°C of Actual Peak Temperature ($T_P - 5^\circ\text{C}$) - Time maintained above T_L (t_L) - Ramp Up Rate (T_L to T_P) - Ramp Down Rate (T_P to T_L)	260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T_{smax} to T_P)	3°C/s max
Time 25°C to Peak Temperature	8 minutes max



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