

1 Mbps, OPEN-COLLECTOR OUTPUT FOR GATE DRIVE INTERFACE INTELLIGENT POWER MODULE 5-PIN SOP PHOTOCOUPLER

PS9713

FEATURES

- **HIGH INSTANTANEOUS COMMON MODE REJECTION VOLTAGE**
CMH, CML = ±15 kV/μs MIN
- **HIGH SPEED RESPONSE**
tPHL= 500 ns MAX, tPLH = 750 ns MAX
- **MAXIMUM PROPAGATION DELAYS**
tPLH- tPHL = 270 ns TYP
- **PULSE WIDTH DISTORTION**
| tPHL- tPLH | = 270 ns TYP
- **SMALL THIN PACKAGE**
5-pin SOP
- **TAPING PRODUCT NUMBER**
PS9713-F3, F4: 3,500 pcs/reel

DESCRIPTION

PS9713 is an optically coupled isolator containing a GaAlAs LED on the input side and a photo diode and a signal processing circuit on the output side on one chip.

APPLICATIONS

- **IPM DRIVER**
- **GENERAL PURPOSE INVERTER**

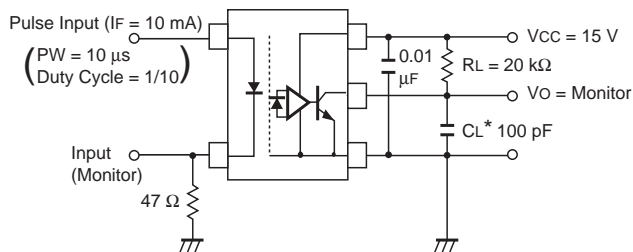
ELECTRICAL CHARACTERISTICS¹ (TA = -40 to +100°C, Vcc = 15 V unless otherwise specified)

		PART NUMBER	PS9713			
	SYMBOL	PARAMETERS	UNITS	MIN	TYP	MAX
Diode	VF	Forward Voltage, IF = 10 mA	V	1.3	1.65	2.1
	IR	Reverse Current, VR = 3 V	μA			200
	Ct	Terminal Capacitance, V = 0 V, f = 1 MHz, TA = 25°C	pF		30	
Detector	VOL	Low Level Output Voltage IF = 10 mA, Vcc = 5 V, Io = 2.4 mA	V		0.13	0.6
	IoH	High Level Output Current Vcc = 30 V, VF = 0.8 V	μA		1.0	50
	IcCH	High Level Supply Current, Vcc = 30 V, VF = 0.8 V, Vo = open	mA		0.6	1.3
	IcCL	Low Level Supply Current, Vcc = 30 V, IF = 10 mA, Vo = open	mA		0.6	1.3
Coupled	IFHL	Threshold Input Current (High → Low), Vo = 0.8 V, Io = 0.75 mA	mA		1.5	5.0
	CTR	Current Transfer Ratio, IF = 10 mA, Vo = 0.6 V	%	44	110	
	RI-O	Isolation Resistance, Vi-O = 1 k Vdc, RH = 40 to 60%, TA = 25°C	Ω	10 ¹¹		
	CI-O	Isolation Capacitance, V = 0, f = 1 MHz, TA = 25°C	pF		0.6	
	tPHL	Propagation Delay Time ² , High → Low IF = 10 mA, RL = 20 kΩ, CL = 100 pF, VTHHL = 1.5 V, VTHLH = 2.0 V	ns		250	500
	tPLH	Propagation Delay Time ² , High → Low IF = 10 mA, RL = 20 kΩ, CL = 100 pF, VTHHL = 1.5 V, VTHLH = 2.0 V	ns		520	750
	tPLH-tPHL	Maximum Propagation Delays IF = 10 mA, RL = 20 kΩ, CL = 100 pF, VTHHL = 1.5 V, VTHLH = 2.0 V	ns	-200	270	650
	tPLH-tPHL	Pulse Width Distortion (PWD) ² IF = 10 mA, RL = 20 kΩ, CL = 100 pF, VTHHL = 1.5 V, VTHLH = 2.0 V	ns		270	650
	CMH	Instantaneous Common Mode Rejection Voltage (Output:High) ³ TA = 25°C, IF = 0 mA, Vo > = 3.0 V, VCM = 1.5 kV, RL = 20 kΩ, CL = 100 pF	kV/μs	15		
	CML	Instantaneous Common Mode Rejection Voltage (Output:High) ³ TA = 25°C, IF = 10 mA, Vo < = 1.0 V, VCM = 1.5 kV, RL = 20 kΩ, CL = 100 pF	kV/μs	15		

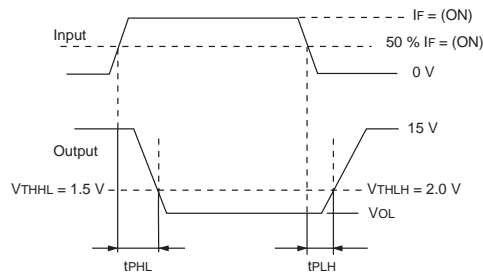
Notes: See Next Page

Notes:

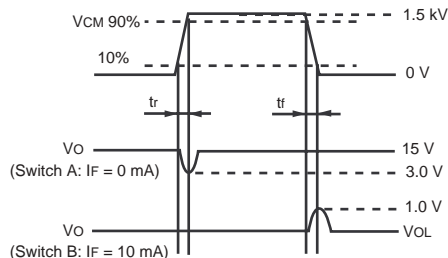
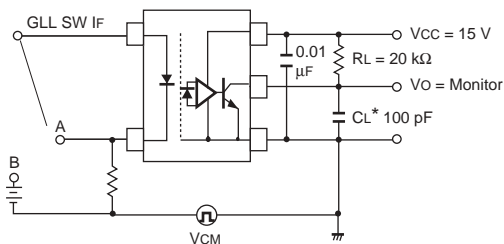
1. Typical values at $T_A = 25\text{ }^\circ\text{C}$.
2. Test Circuit for Propagation delay time



*CL includes probe and stray wiring capacitance.



3. Test circuit for common mode transient immunity



USAGE CAUTION

Bypass capacitor of more than 0.1 μF is used between V_{CC} and GND near device. Also, ensure that the distance between the leads of the photocoupler and capacitor is no more than 10 mm.

ABSOLUTE MAXIMUM RATINGS¹ ($T_A = 25\text{ }^\circ\text{C}$)

SYMBOLS	PARAMETERS	UNITS	RATINGS
Diode			
I_F	Forward Current	mA	25
V_R	Reverse Voltage	V	3.0
Detector			
V_{CC}	Supply Voltage	V	-0.5 to +35
V_O	Output Voltage	V	-0.5 to +35
I_O	Output Current	mA	15
P_C	Power Dissipation	mW	100
Coupler			
B_V	Isolation Voltage ²	$V_{r.m.s.}$	2500
T_A	Operating Ambient Temp.	$^\circ\text{C}$	-40 to +100
T_{STG}	Storage Temperature	$^\circ\text{C}$	-55 to +125

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. AC voltage for 1 minute at $T_A = 25\text{ }^\circ\text{C}$, $RH = 60\%$ between input and output.

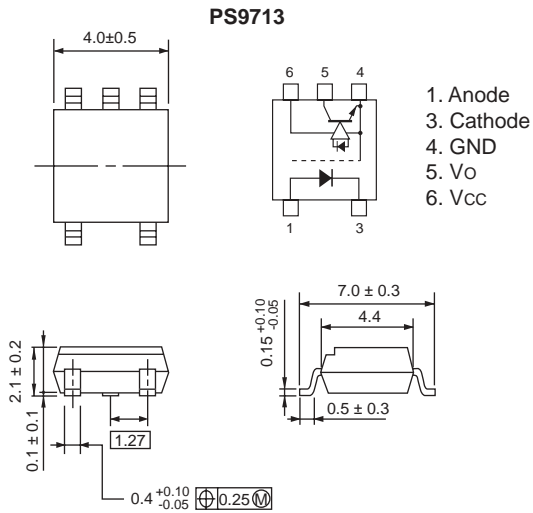
RECOMMENDED OPERATING CONDITIONS

PART NUMBER			PS9713		
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
I_{FH}	High Level Input Current	mA	10		20
V_O	Output Voltage	V	0		30
V_{CC}	Supply Voltage	V	4.5		30
V_F	LED off Voltage	V	0		0.8

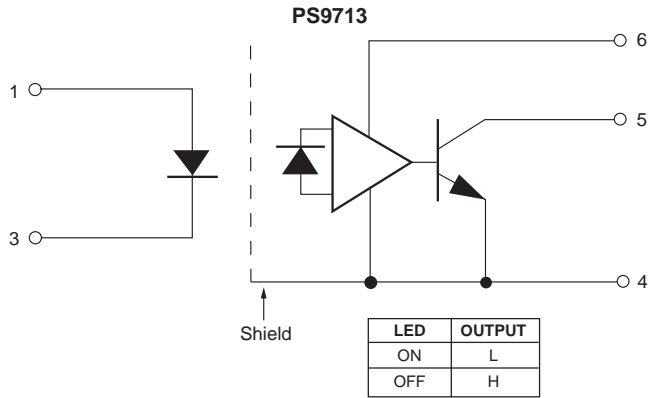
ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKING STYLE
PS9713	5-pin SOP	Magazine case 100 pcs
PS9713-F3		Embossed Tape 3500 pcs/reel
PS9713-F4	5-pin SOP	Magazine case 100 pcs
PS9713-V		
PS9713-V-F3		

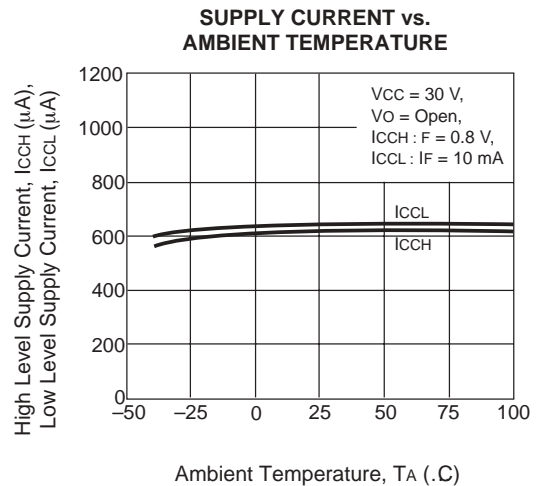
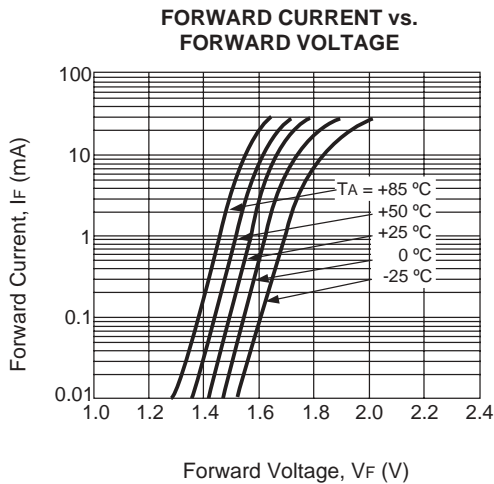
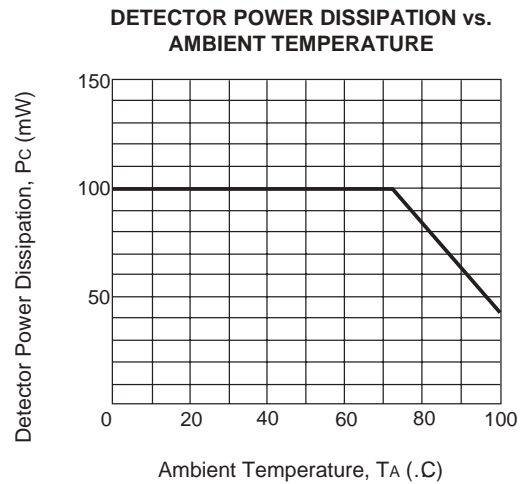
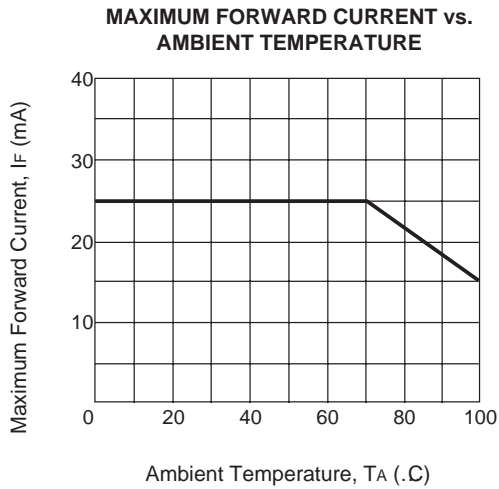
OUTLINE DIMENSIONS (Units in mm)



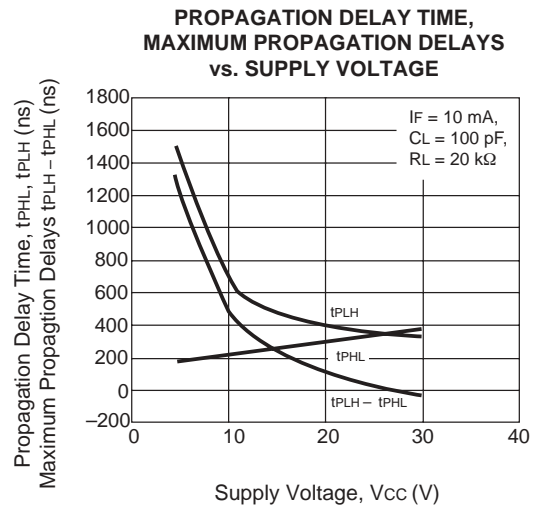
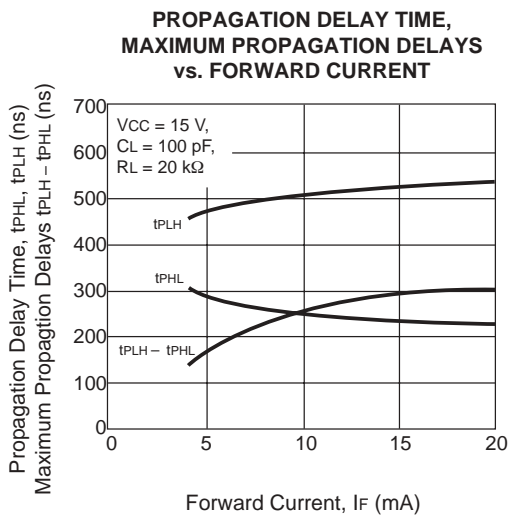
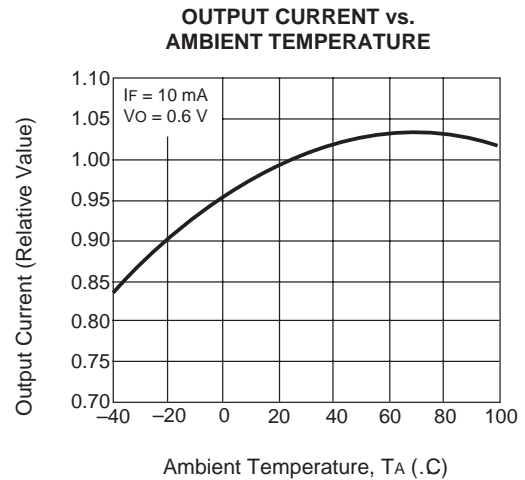
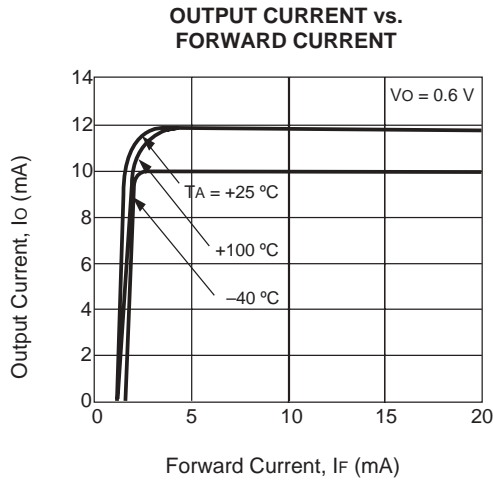
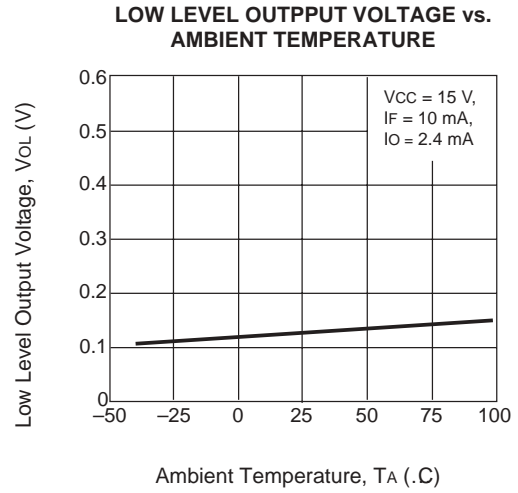
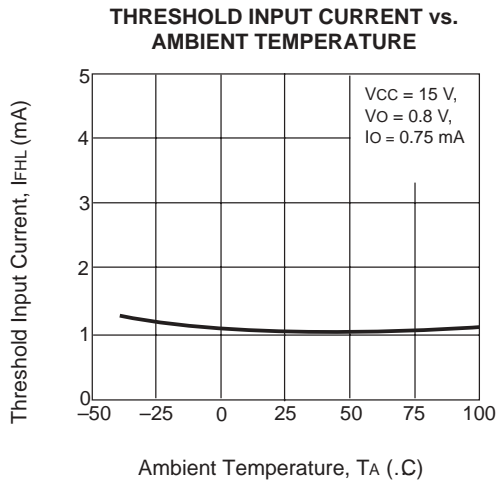
FUNCTIONAL DIAGRAM



TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$, unless otherwise specified)

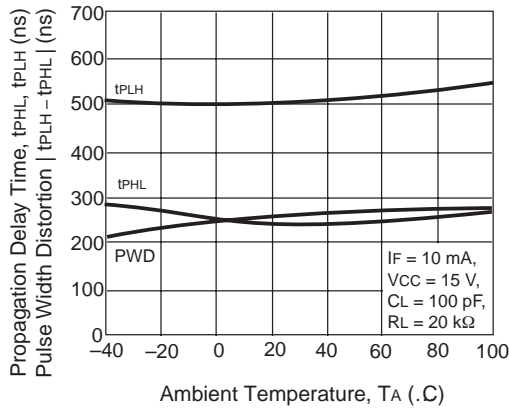


TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$, unless otherwise specified)

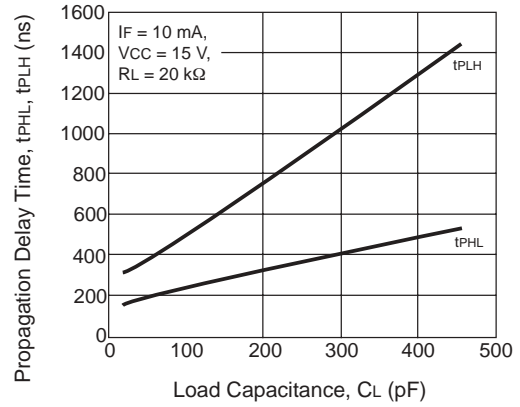


TYPICAL PERFORMANCE CURVES (TA = 25°C)

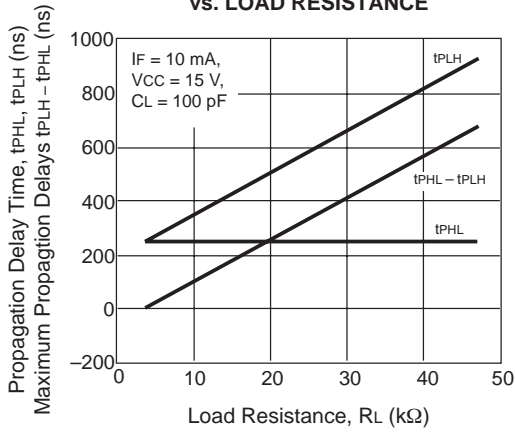
PROPAGATION DELAY TIME,
PULSE WIDTH DISTORTION
vs. AMBIENT TEMPERATURE



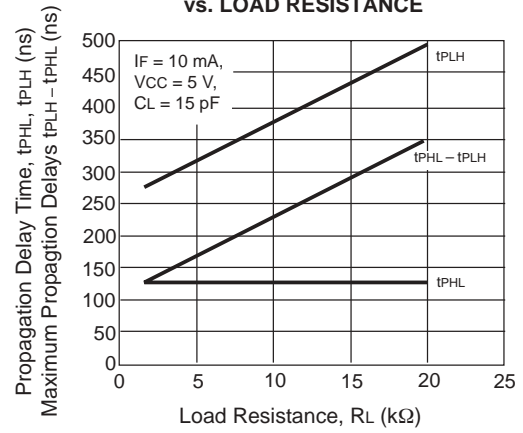
PROPAGATION DELAY TIME vs.
LOAD CAPACITANCE



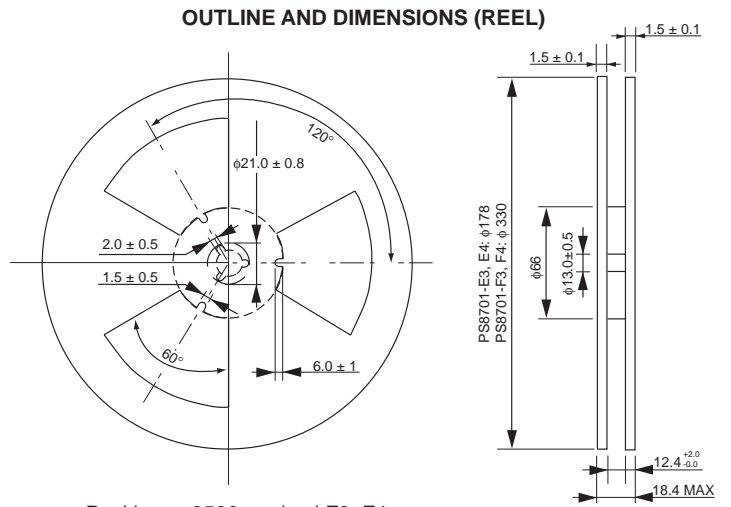
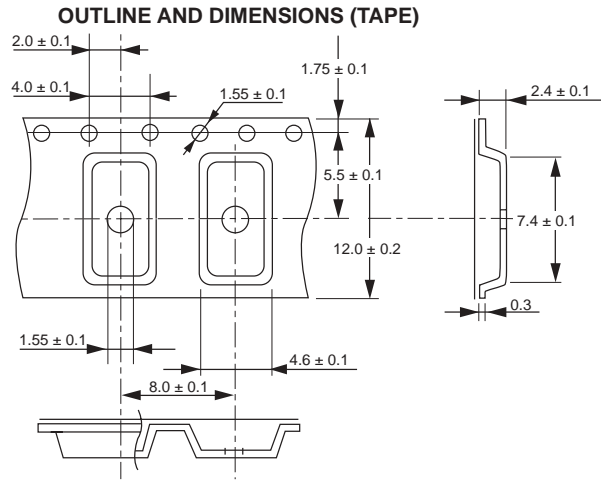
PROPAGATION DELAY TIME,
MAXIMUM PROPAGATION DELAYS
vs. LOAD RESISTANCE



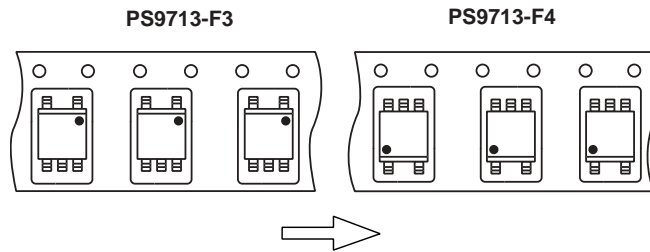
PROPAGATION DELAY TIME,
MAXIMUM PROPAGATION DELAYS
vs. LOAD RESISTANCE



TAPING SPECIFICATIONS (Units in mm)



TAPE DIRECTION

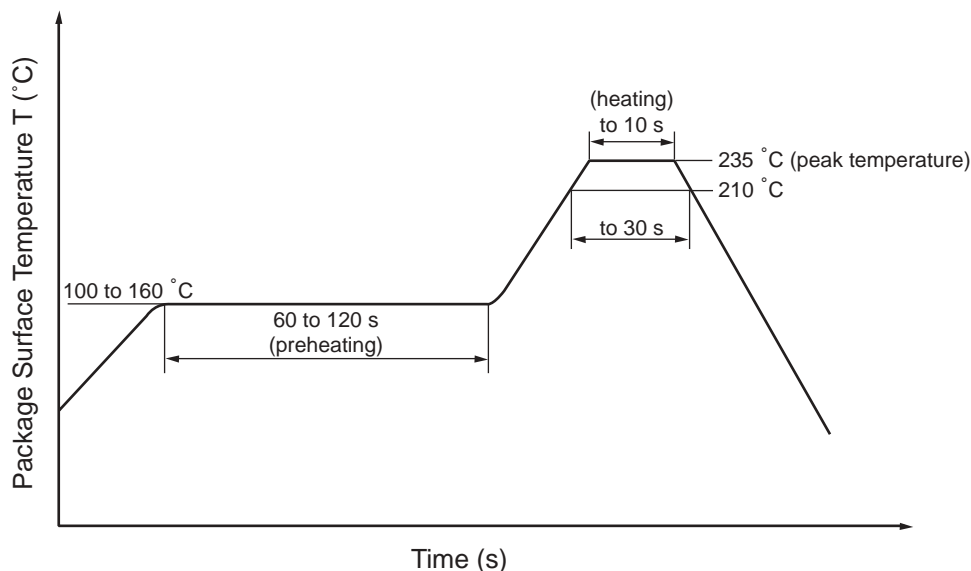


RECOMMENDED SOLDERING CONDITIONS

(1) Infrared reflow soldering

- **Peak reflow temperature** 235 °C (package surface temperature)
- **Time of temperature higher than 210 °C** 30 seconds or less
- **Number of reflows** Three
- **Flux** Rosin flux containing small amount of chlorine (The flux with a max. chlorine content of 0.2 Wt % is recommended)

Recommended Temperature Profile of Infrared Reflow



(2) Dip soldering

- **Temperature** 260 °C or below (molten solder temperature)
- **Time** 10 seconds or less
- **Number of times** One (Allowed to be dipped in solder including plastic mold portion.)
- **Flux** Rosin flux containing small amount of chlorine (The flux with a max. chlorine content of 0.2 Wt % is recommended.)

(3) Cautions

- **Fluxes** Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.