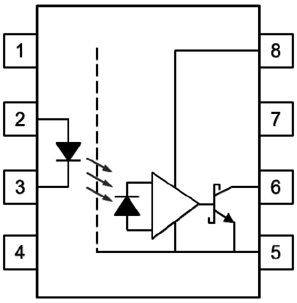
ISOCOM
COMPONENTS

ICPL4506

DESCRIPTION

The ICPL4506 contains an AlGaAs LED optically coupled to an integrated high gain photo detector. Minimized propagation delay difference between devices makes these Photocouplers excellent solutions for improving inverter efficiency through reduced switching dead time. Specifications and performance plots are given for typical IPM applications.



1	NC
2	Anode
3	Cathode
4	NC
5	GND
6	V_O
7	NV
8	V_{CC}

A 0.1µF bypass Capacitor must be connected between Pins 8 and 5.

FEATURES

- Performance specified for Common IPM Applications over Industrial Temperature range - 40°C to +100°C
- Short maximum Propagation Delays t_{PHL} 400ns, t_{PLH} 550ns
- Minimized Pulse Width Distortion (PWD) maximum 450ns
- Very high Common Mode Rejection (CMR) 15kV/µs minimum at V_{CM} 1500V
- High CTR minimum 44% at I_F 10mA
- Wide Operating Voltage Range V_{CC} maximum 30 V
- MSL 1
- Lead Free and RoHS Compliant
- Safety Approvals Pending

APPLICATIONS

- IPM Isolation
- Isolated IGBT / MOSFET Gate Drive
- Industrial Inverters
- AC and Brushless DC Motor Drives

ORDER INFORMATION

- 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

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	25mA
Forward Peak Current (Pulse Width < 1µs, 300pps)	1A
Reverse Voltage	5V
Output	
Output Current	15mA
Supply Voltage	-0.5 to 30V
Output Voltage	-0.5 to 30V
Power Dissipation	145mW
Total Package	
Isolation Voltage	$5000V_{RMS}$
Operating Temperature	-40 to 100 °C
Storage Temperature	-55 to 125 °C
Lead Soldering Temperature (10s)	260°C

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Truth Table

LED	V_O
ON	LOW
OFF	HIGH

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-40	100	°C
Supply Voltage	V_{CC}	4.5	30	V
Output Voltage	V_O	0	30	V
Input Current (ON)	$I_{F(ON)}$	10	20	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-5	0.8	V

ELECTRICAL CHARACTERISTICS (Over Recommended Operating Conditions unless Otherwise Specified : V_{CC} = 4.5V to 30V, I_F(on) = 10mA to 20mA, V_F(off) = –5V to 0.8V, T_A = –40°C to 100°C. All Typical Values at T_A = 25°C unless otherwise specified)

INPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward Voltage	V_F	I_F = 10mA		1.38	1.8	V
Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	I_F = 10mA		−1.6		mV/°C
Reverse Voltage	V_R	I_R = 10µA	5			V
Input Threshold Current	I_{TH}	V_O = 0.8V, I_O = 0.75mA		1.5	5	mA
Input Capacitance	C_{IN}	V_F = 0V, f = 1MHz		34		pF

OUTPUT

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Current Transfer Ratio	CTR	I_F = 10mA, V_O = 0.6V	44			%
Low Level Output Current	I_{OL}	I_F = 10mA, V_O = 0.6V	4.4			mA
High Level Output Current	I_{OH}	V_F = 0.8V		1	50	µA
Low Level Supply Current	I_{CCL}	I_F = 10mA, V_O = Open		0.7	1.3	mA
High Level Supply Current	I_{CCH}	V_F = 0.8V, V_O = Open		0.7	1.3	mA
Low Level Output Voltage	V_{OL}	I_O = 2.4mA		0.15	0.4	V

ELECTRICAL CHARACTERISTICS (Over Recommended Operating Conditions unless Otherwise Specified : V_{CC} = 4.5V to 30V, I_F(on) = 10mA to 20mA, V_F(off) = –5V to 0.8V, T_A = –40°C to 100°C. All Typical Values at T_A = 25°C unless otherwise specified)

SWITCHING

Parameter	Symbol	Test Condition		Min	Typ.	Max	Unit
Propagation Delay Time to Low Output Level	t_{PHL}	$I_{F(ON)}$ = 10mA, V_{CC} = 15V, $V_{F(off)}$ = 0.8V, V_{THLH} = 2.0V, V_{THHL} = 1.5V, f = 20kHz, Duty Cycle = 10%	C_L = 100pF	30	140	400	ns
			C_L = 10pF		125		
Propagation Delay Time to High Output Level	t_{PLH}		C_L = 100pF	270	440	550	
			C_L = 10pF		170		
Pulse Width Distortion $\|t_{PHL}$ - $t_{PLH}\|$ for any given device	PWD	$I_{F(ON)}$ = 10mA, V_{CC} = 15V, $V_{F(off)}$ = 0.8V, V_{THLH} = 2.0V, V_{THHL} = 1.5V,	C_L = 100pF		300	450	
Propagation Delay Difference (t_{PHL} - t_{PLH}) between any two Devices	PDD	$I_{F(ON)}$ = 10mA, V_{CC} = 15V, $V_{F(off)}$ = 0.8V, V_{THLH} = 2.0V, V_{THHL} = 1.5V,		-150		450	
Common Mode Transient Immunity at High Output Level	CM_H	I_F = 0mA, V_{CC} = 15V, V_O > 3V, C_L = 100pF, V_{CM} = 1500V_{P-P}, T_A = 25°C		15	30		kV/µs
Common Mode Transient Immunity at Low Output Level	CM_L	I_F = 10mA, V_{CC} = 15V, V_O < 1.0V, C_L = 100pF, V_{CM} = 1500V_{P-P}, T_A = 25°C		15	30		kV/µs

ELECTRICAL CHARACTERISTICS

(Over Recommended Operating Conditions unless Otherwise Specified :
V_{CC} = 4.5V to 30V, I_F(on) = 10mA to 20mA, V_F(off) = –5V to 0.8V,
T_A = –40°C to 100°C.
All Typical Values at T_A = 25°C unless otherwise specified)

ISOLATION

Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Isolation Voltage	V_{ISO}	R.H. ≤ 40% - 60%, T_A = 25°C, t = 1 min	5000			V
Input - Output Resistance	$R_{I\text{-}O}$	$V_{I\text{-}O}$ = 500VDC		10^{12}		Ω
Input - Output Capacitance	$C_{I\text{-}O}$	f = 1MHz, T_A = 25°C		0.92		pF

Device is considered a two terminal device : pins 1, 2, 3 and 4 are shorted together and pins 5, 6, 7 and 8 are shorted together

Notes :

1. A 0.1uF bypass capacitor must be connected across pin 8 and pin 5.
2. PDD is the difference of t_{PHL} and t_{PLH} between any two ICPL4506 under same test conditions.
3. Common Mode Transient Immunity in High stage is the maximum tolerable negative dV_{CM}/dt on the trailing edge of the common mode impulse signal, V_{CM}, to assure that the output will remain high (V_O > 3.0V).
4. Common Mode Transient Immunity in Low stage is the maximum tolerable positive dV_{CM}/dt on the leading edge of the common mode impulse signal, V_{CM}, to assure that the output will remain low (V_O < 1.0V).

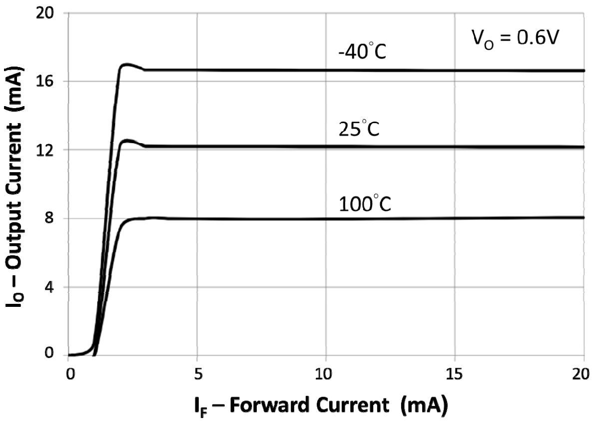


Fig 1 Transfer Characteristics

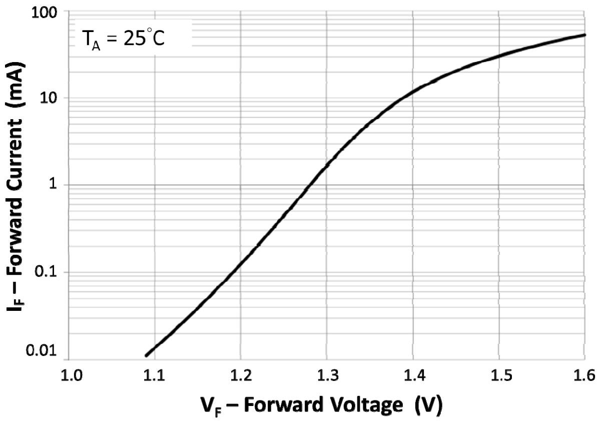


Fig 2 Forward Current vs Forward Voltage

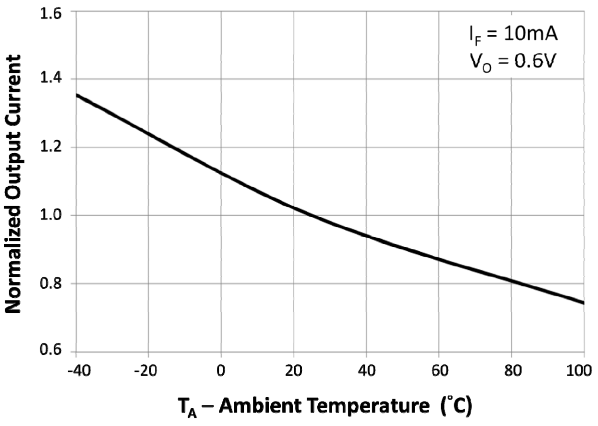


Fig 3 Normalized Output Current vs Ambient Temperature

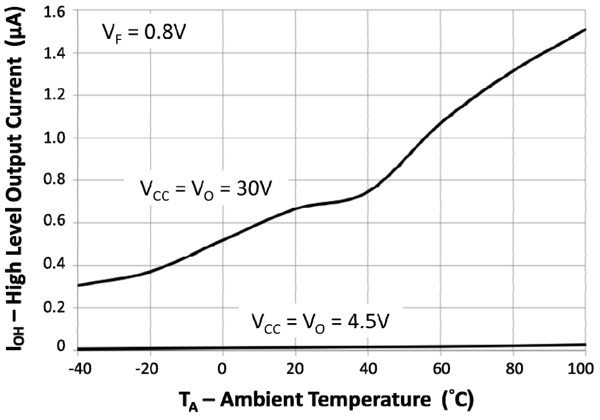


Fig 4 High Level Output Current vs Ambient Temperature

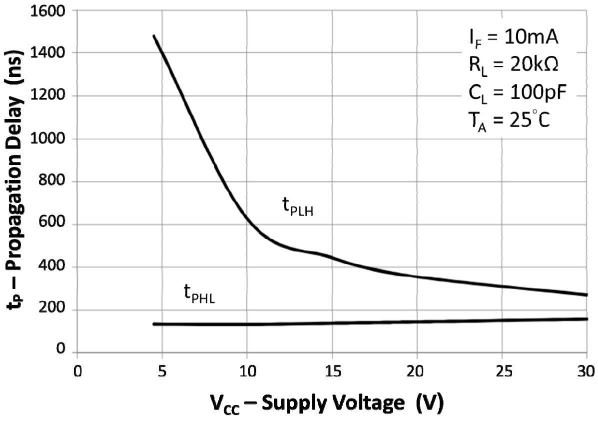


Fig 5 Propagation Delay vs Supply Voltage

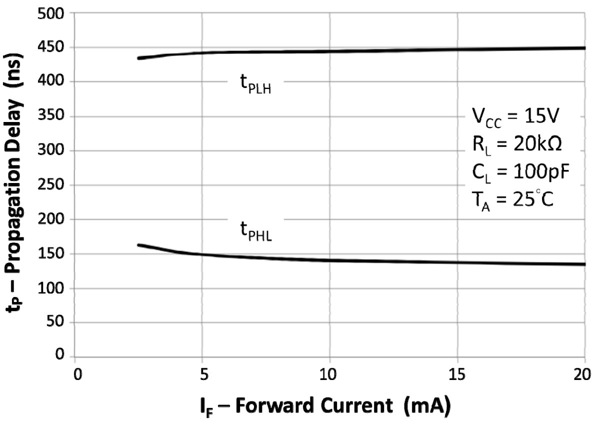


Fig 6 Propagation Delay vs Forward Current

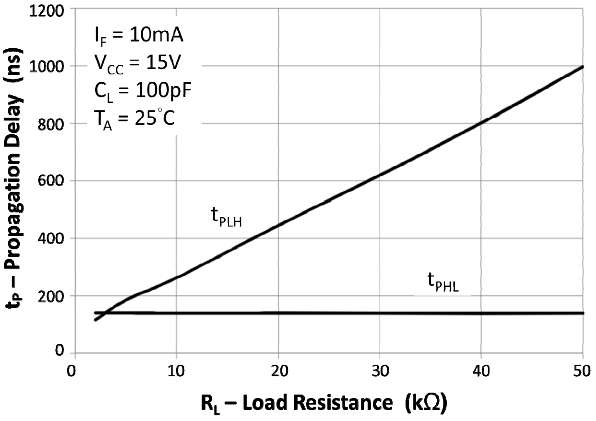


Fig 7 Propagation Delay vs Load Resistance

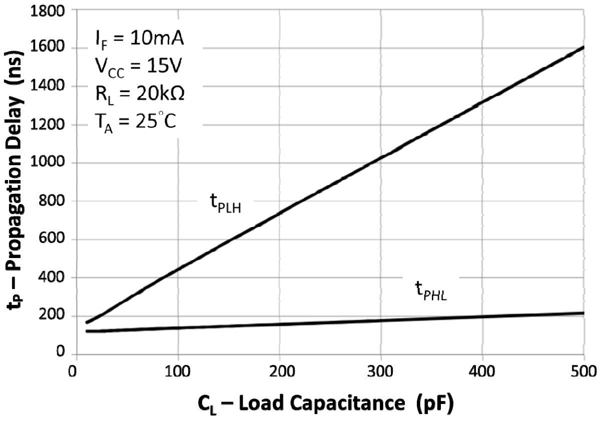


Fig 8 Propagation Delay vs Load Capacitance

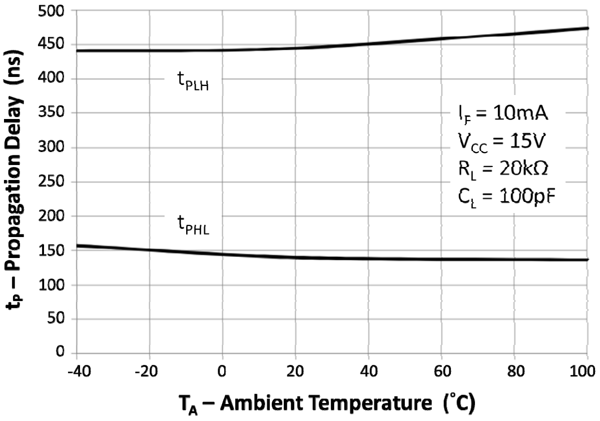
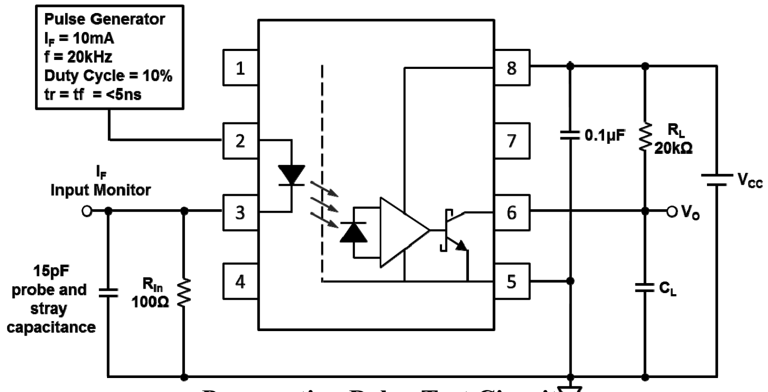
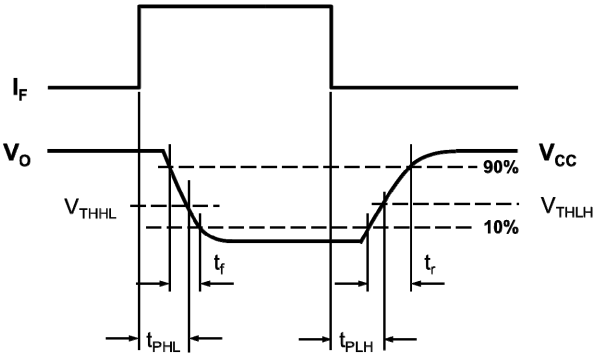


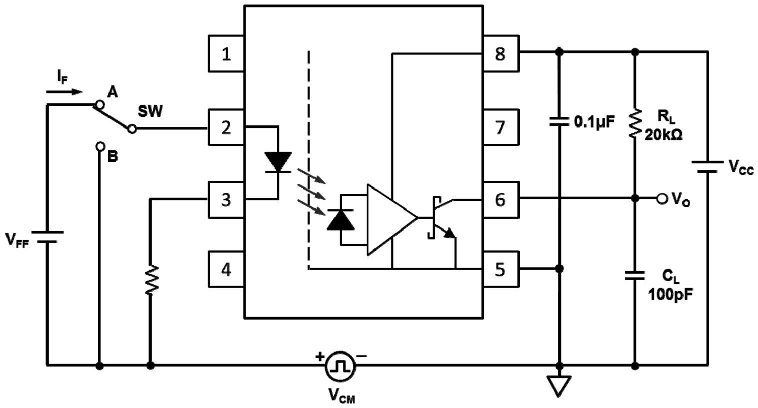
Fig 9 Propagation Delay vs Ambient Temperature

ICPL4506

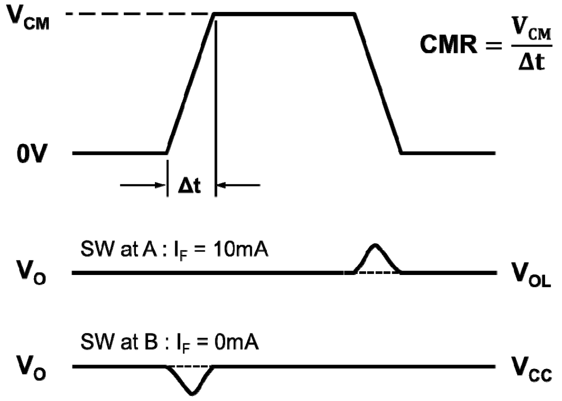


Propagation Delay Test Circuit





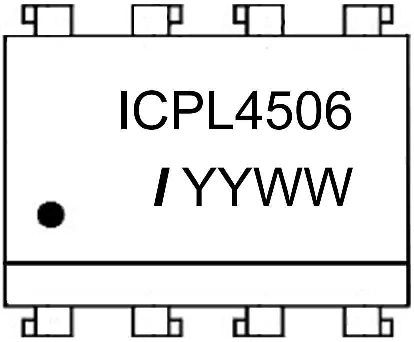
CMR Test Circuit



ORDER INFORMATION

ICPL4506			
After PN	**PN**	**Description**	**Packing quantity**
None	ICPL4506	Standard DIP8	50 pcs per tube
G	ICPL4506G	10mm Lead Spacing	50 pcs per tube
SM	ICPL4506SM	Surface Mount	50 pcs per tube
SMT&R	ICPL4506SMT&R	Surface Mount Tape & Reel	1000 pcs per reel

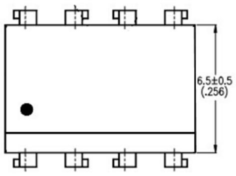
DEVICE MARKING

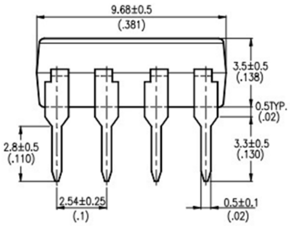


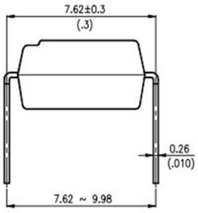
ICPL4506	denotes Device Part Number
I	denotes Isocom
YY	denotes 2 digit Year code
WW	denotes 2 digit Week code

PACKAGE DIMENSIONS in mm (inch)

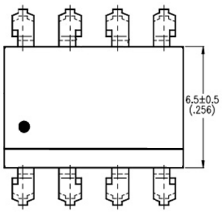
DIP

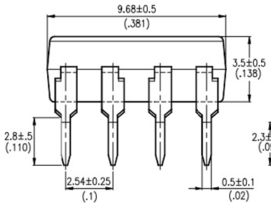


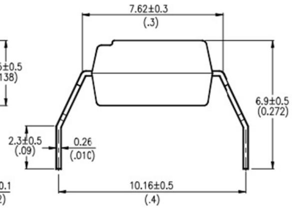




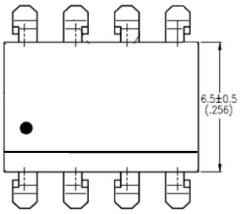
G Form

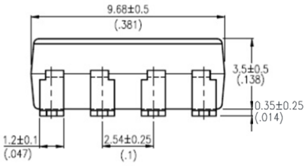


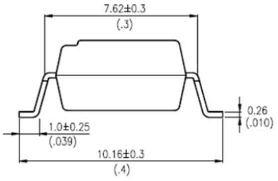




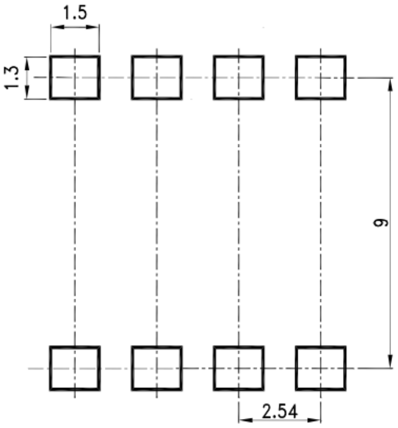
SMD



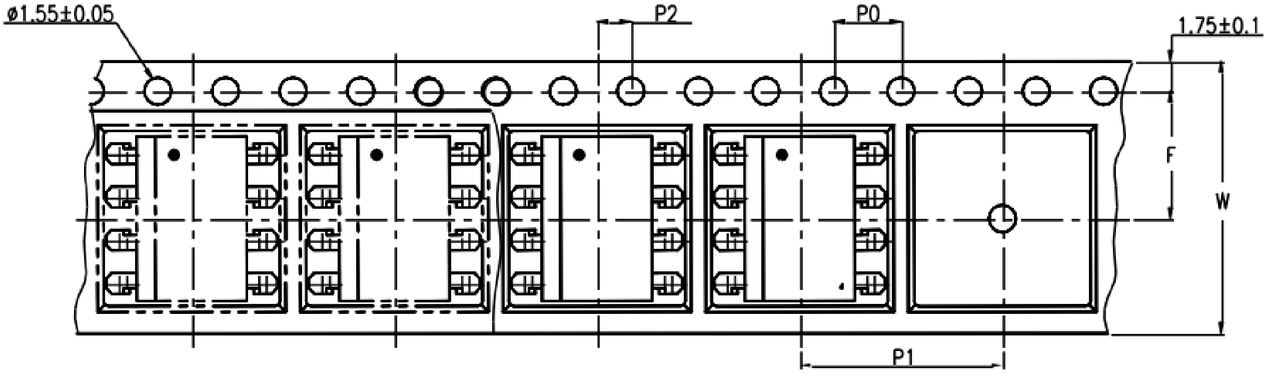


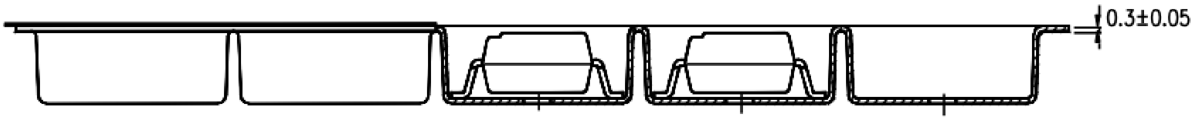


RECOMMENDED SOLDER PAD LAYOUT (mm)



TAPE AND REEL PACKAGING

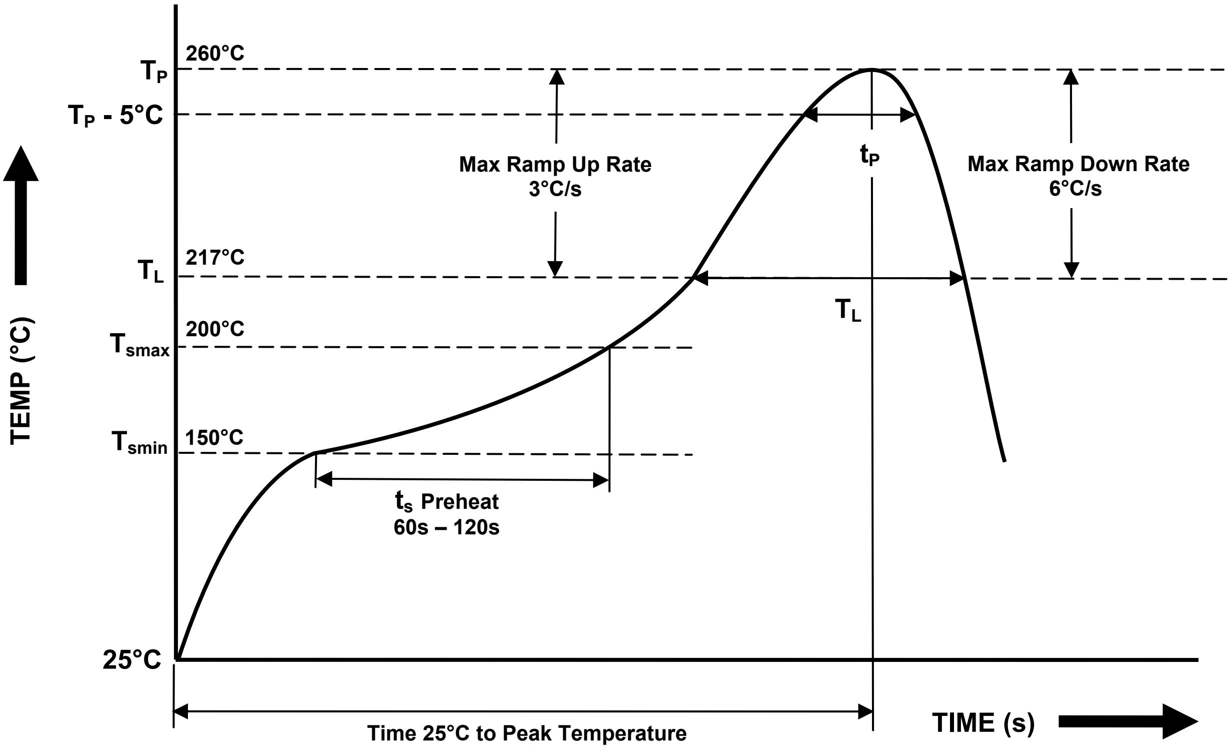




Description	Symbol	Dimension mm (inch)
Tape Width	W	16 ± 0.3 (0.63)
Pitch of Sprocket Holes	P_0	4 ± 0.1 (0.15)
Distance of Compartment to Sprocket Holes	F	7.5 ± 0.1 (0.295)
	P_2	2 ± 0.1 (0.079)
Distance of Compartment to Compartment	P_1	12 ± 0.1 (0.47)

IR REFLOW SOLDERING TEMPERATURE PROFILE

Note : 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°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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