

## ISP817, ISP827, ISP847



### DESCRIPTION

The ISP817, ISP827 and ISP847 series of optically coupled isolator consist 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<sub>RMS</sub>
- CTR Selections Available
- Wide Operating Temperature Range  
-55°C to +110°C ISP817  
-30°C to +100°C ISP827 / ISP847
- Lead Free and RoHS Compliant
- UL File E91231 Package Code "EE"
- VDE Approval Certificate No. 40028086

### APPLICATIONS

- Computer Terminals
- Industrial System Controllers
- Measuring Instruments
- Signal Transmission between Systems of Different Potentials and Impedances

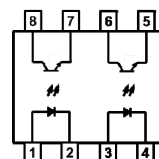
### ORDER INFORMATION

- 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  
(Available for ISP817SM and ISP827SM)
- Consult Factory for Tape and Reel version of ISP847SM

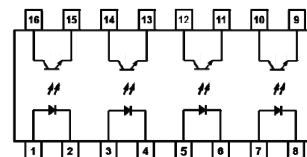
ISP817



ISP827



ISP847



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 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
Peak Forward Current (100µs, 100Hz)	1A
Reverse Voltage	6V
Power dissipation	70mW

#### Output

Collector to Emitter Voltage V <sub>CEO</sub>	ISP817	80V
	ISP827 / ISP847	35V
Emitter to Collector Voltage V <sub>ECO</sub>		6V
Collector Current		50mA
Power Dissipation		150mW

#### Total Package

Isolation Voltage		5300V <sub>RMS</sub>
Total Power Dissipation		200mW
Operating Temperature	ISP817	-55 to 110 °C
	ISP827 / ISP847	-30 to 100 °C
Junction Temperature		125 °C
Storage Temperature		-55 to 125 °C
Lead Soldering Temperature (10s)		260°C

#### ISOCOM COMPONENTS 2004 LTD

Unit 25B, Park View Road West, Park View Industrial Estate  
Hartlepool, Cleveland, TS25 1PE, United Kingdom  
Tel : +44 (0)1429 863 609 Fax : +44 (0)1429 863 581  
e-mail : sales@isocom.co.uk  
<http://www.isocom.com>

#### ISOCOM COMPONENTS ASIA LTD

Hong Kong Office  
Block A, 8/F, Wah Hing Industrial Mansion  
36 Tai Yau Street, San Po Kong, Kowloon, Hong Kong  
Tel : +852 2995 9217 Fax : +852 8161 6292  
e-mail : sales@isocom.com.hk

## ISP817, ISP827, ISP847

### 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	$\mu\text{A}$
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	$BV_{CEO}$	$I_C = 0.1\text{mA}, I_F = 0\text{mA}$				V
		ISP817	80			
		ISP827 / ISP847	35			
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

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

**COUPLED**

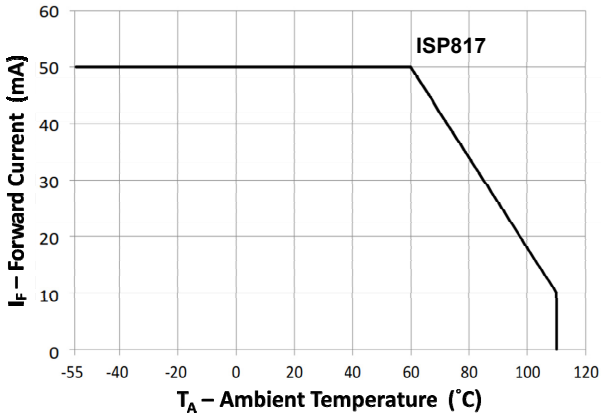
Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Current Transfer Ratio	CTR	$I_F = 5\text{mA}, V_{CE} = 5\text{V}$	50		600	%
		Optional CTR Grades				
		GB	100		600	
		BL	200		600	
		GR	100		300	
		A	80		160	
		B	130		260	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F = 20\text{mA}, I_C = 1\text{mA}$		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
Output Rise Time	$t_r$	$V_{CE} = 2\text{V}, I_C = 2\text{mA}, R_L = 100\Omega$		4	18	$\mu\text{s}$
Output Fall Time	$t_f$			3	18	

**ISOLATION**

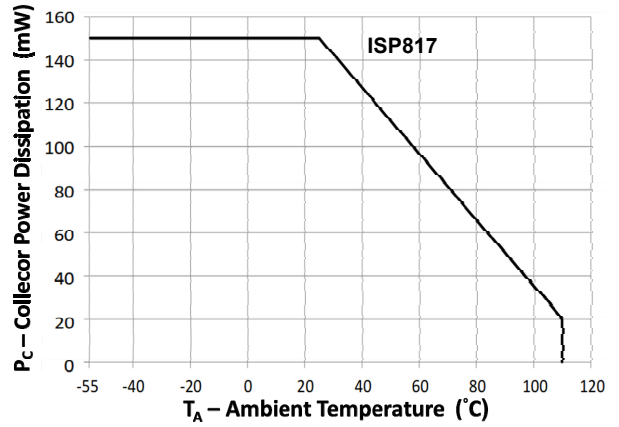
Parameter	Symbol	Test Condition	Min	Typ.	Max	Unit
Input to Output Isolation Voltage	$V_{ISO}$	AC 1 minute, RH = 40% to 60% Note 1	5300			$V_{RMS}$
Input to Output Isolation Resistance	$R_{ISO}$	$V_{IO} = 500\text{V}, \text{RH} = 40\% \text{ to } 60\%$ Note 1	$5 \times 10^{10}$	$1 \times 10^{11}$		$\Omega$

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

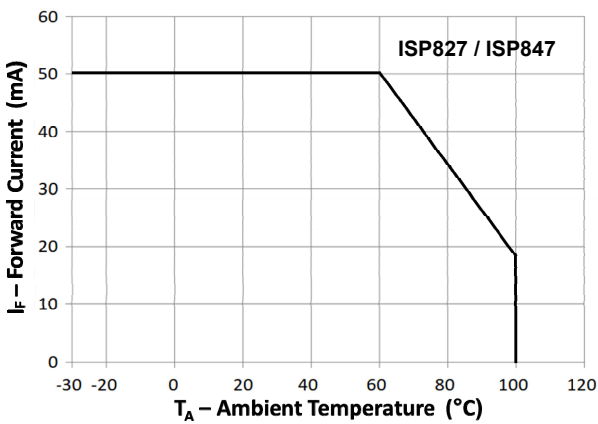
## ISP817, ISP827, ISP847



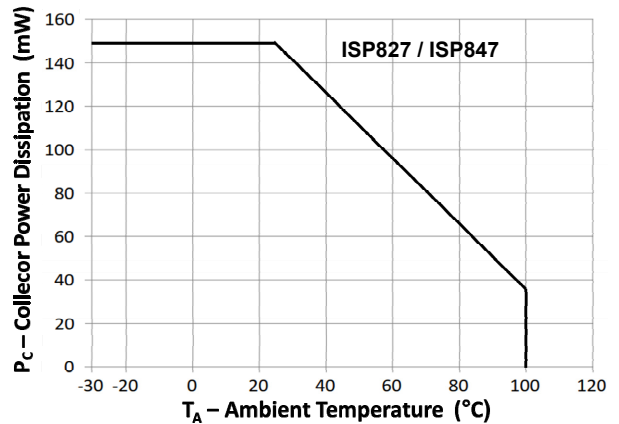
**Fig 1 Forward Current vs Ambient Temperature (1)**



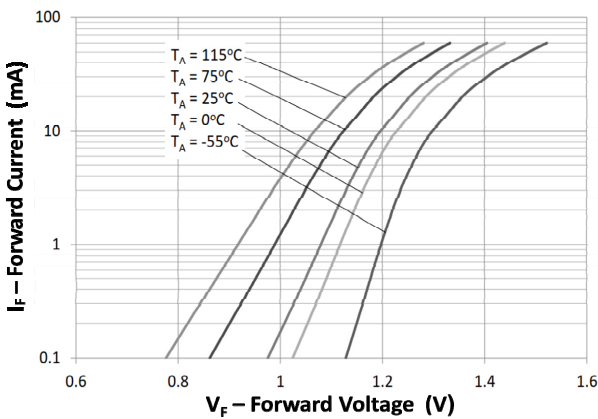
**Fig 2 Collector Power Dissipation vs Ambient Temperature (1)**



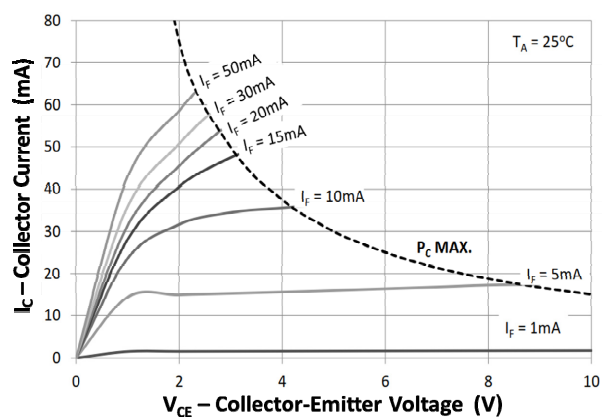
**Fig 3 Forward Current vs Ambient Temperature (2)**



**Fig 4 Collector Power Dissipation vs Ambient Temperature (2)**



**Fig 5 Forward Current vs Forward Voltage**



**Fig 6 Collector Current vs Collector-Emitter Voltage**

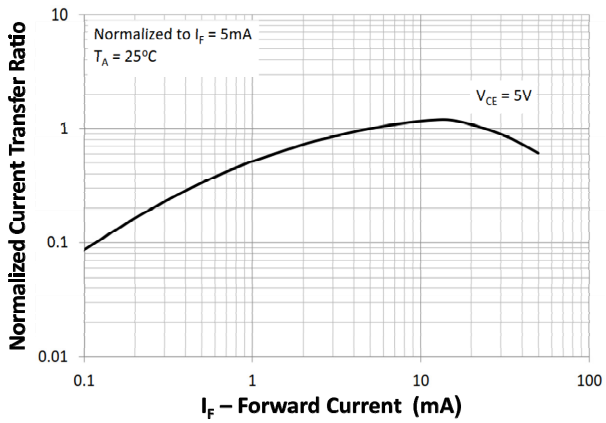


Fig 7 Normalized Current Transfer Ratio vs Forward Current

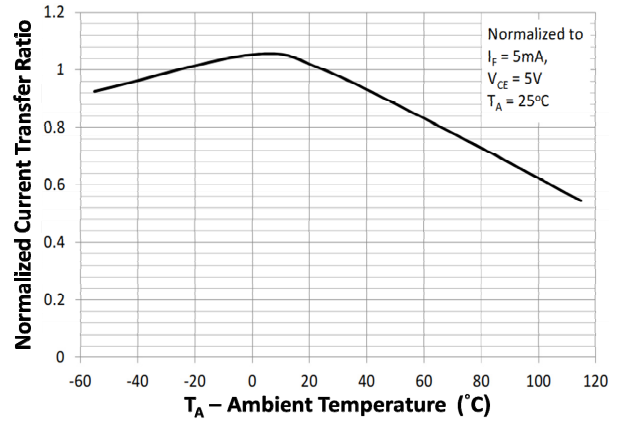


Fig 8 Normalized Current Transfer Ratio vs Ambient Temperature

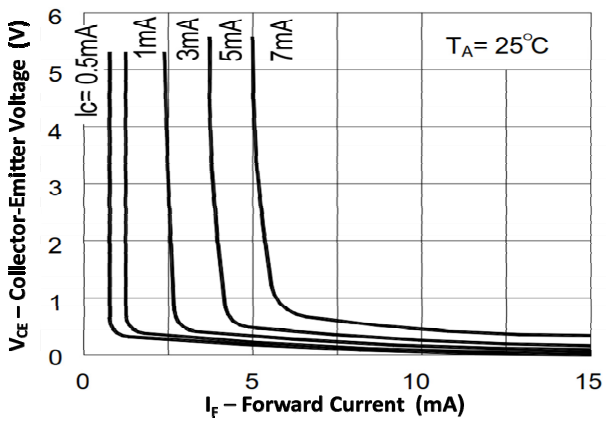


Fig 9 Collector-Emitter Voltage vs Forward Current

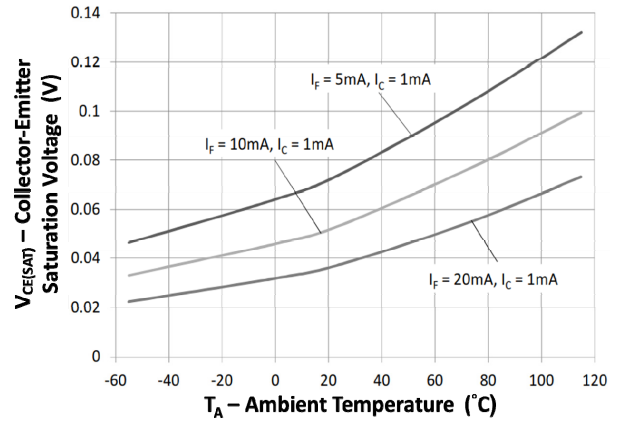


Fig 10 Collector-Emitter Saturation Voltage vs Ambient Temperature

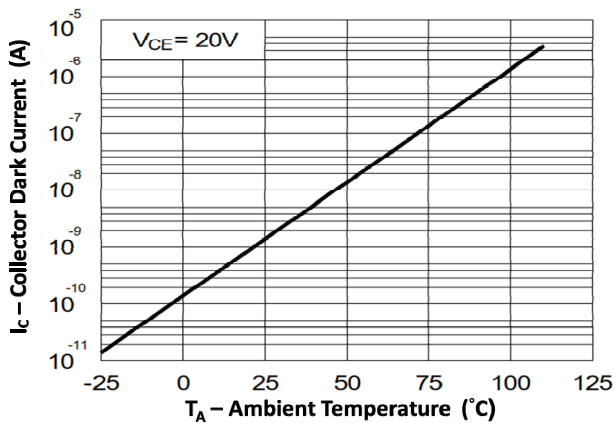
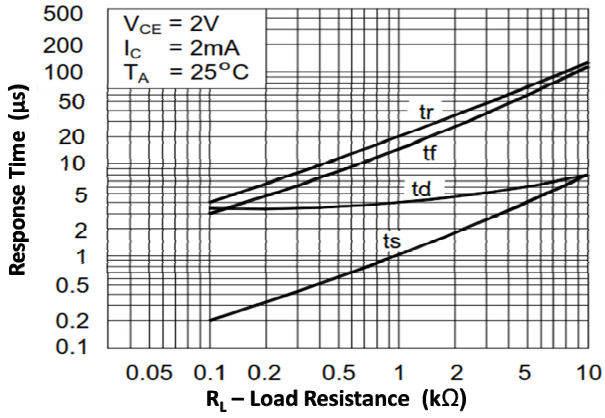
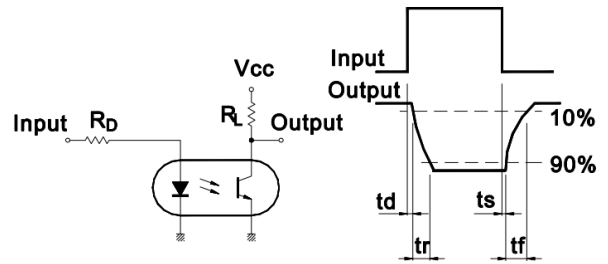


Fig 11 Collector Dark Current vs Ambient Temperature

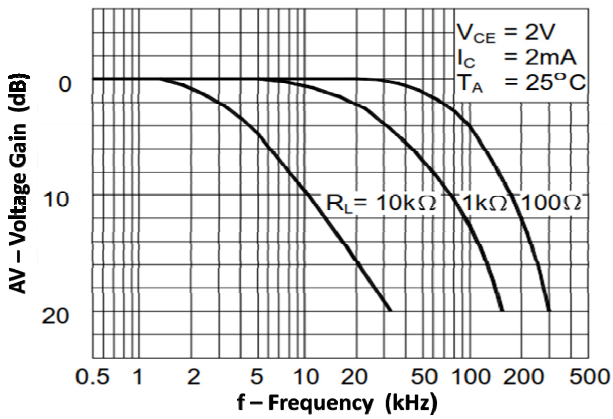
## ISP817, ISP827, ISP847



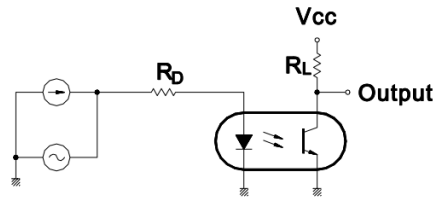
**Fig 12 Response Time vs Load Resistance**



**Response Time Test Circuit**



**Fig 13 Frequency Response**



**Frequency Response Test Circuit**

## ISP817, ISP827, ISP847

### ORDER INFORMATION

ISP817 (UL Approval)			
After PN	PN	Description	Packing quantity
None	ISP817, ISP817GB, ISP817BL, ISP817GR, ISP817A, ISP817B, ISP817C, ISP817D	Standard DIP4	100 pcs per tube
G	ISP817G, ISP817GBG, ISP817BLG, ISP817GRG, ISP817AG, ISP817BG, ISP817CG, ISP817DG	10mm Lead Spacing	100 pcs per tube
SM	ISP817SM, ISP817GBSM, ISP817BLSM, ISP817GRSM, ISP817ASM, ISP817BSM, ISP817CSM, ISP817DSM	Surface Mount	100 pcs per tube
SMT&R	ISP817SMT&R, ISP817GBSMT&R, ISP817GRSMT&R, ISP817BLSMT&R, ISP817ASMT&R, ISP817BSMT&R, ISP817CSMT&R, ISP817DSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

ISP827 (UL Approval)			
After PN	PN	Description	Packing quantity
None	ISP827, ISP827GB, ISP827BL, ISP827GR, ISP827A, ISP827B, ISP827C, ISP827D	Standard DIP8	50 pcs per tube
G	ISP827G, ISP827GBG, ISP827BLG, ISP827GRG, ISP827AG, ISP827BG, ISP827CG, ISP827DG	10mm Lead Spacing	50 pcs per tube
SM	ISP827SM, ISP827GBSM, ISP827BLSM, ISP827GRSM, ISP827ASM, ISP827BSM, ISP827CSM, ISP827DSM	Surface Mount	50 pcs per tube
SMT&R	ISP827SMT&R, ISP827GBSMT&R, ISP827GRSMT&R, ISP827BLSMT&R, ISP827ASMT&R, ISP827BSMT&R, ISP827CSMT&R, ISP827DSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

ISP847 (UL Approval)			
After PN	PN	Description	Packing quantity
None	ISP847, ISP847GB, ISP847BL, ISP847GR, ISP847A, ISP847B, ISP847C, ISP847D	Standard DIP16	25 pcs per tube
G	ISP847G, ISP847GBG, ISP847BLG, ISP847GRG, ISP847AG, ISP847BG, ISP847CG, ISP847DG	10mm Lead Spacing	25 pcs per tube
SM	ISP847SM, ISP847GBSM, ISP847BLSM, ISP847GRSM, ISP847ASM, ISP847BSM, ISP847CSM, ISP847DSM	Surface Mount	25 pcs per tube



**ISP817, ISP827, ISP847**

**ORDER INFORMATION**

<b>ISP817X (UL and VDE Approvals)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	ISP817X, ISP817XGB, ISP817XBL, ISP817XGR, ISP817XA, ISP817XB, ISP817XC, ISP817XD	Standard DIP4	100 pcs per tube
G	ISP817XG, ISP817XGBG, ISP817XBLG, ISP817XGRG, ISP817XAG, ISP817XBG, ISP817XCG, ISP817XDG	10mm Lead Spacing	100 pcs per tube
SM	ISP817XSM, ISP817XGBSM, ISP817XGRSM, ISP817XBLSM, ISP817XASM, ISP817XBXSM, ISP817XCSM, ISP817XDMSM	Surface Mount	100 pcs per tube
SMT&R	ISP817XSMT&R, ISP817XGBSMT&R, ISP817XGRSMT&R, ISP817XBLSMT&R, ISP817XASMT&R, ISP817XBSMT&R, ISP817XCSMT&R, ISP817XDSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

<b>ISP827X (UL and VDE Approvals)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	ISP827X, ISP827XGB, ISP827XBL, ISP827XGR, ISP827XA, ISP827XB, ISP827XC, ISP827XD	Standard DIP8	50 pcs per tube
G	ISP827XG, ISP827XGBG, ISP827XBLG, ISP827XGRG, ISP827XAG, ISP827XBG, ISP827XCG, ISP827XDG	10mm Lead Spacing	50 pcs per tube
SM	ISP827XSM, ISP827XGBSM, ISP827XGRSM, ISP827XBLSM, ISP827XASM, ISP827XBBSM, ISP827XCSM, ISP827XDMSM	Surface Mount	50 pcs per tube
SMT&R	ISP827XSMT&R, ISP827XGBSMT&R, ISP827XGRSMT&R, ISP827XBLSMT&R, ISP827XASMT&R, ISP827XBSMT&R, ISP827XCSMT&R, ISP827XDSMT&R	Surface Mount Tape & Reel	1000 pcs per reel

<b>ISP847 (UL and VDE Approvals)</b>			
<b>After PN</b>	<b>PN</b>	<b>Description</b>	<b>Packing quantity</b>
None	ISP847X, ISP847XGBL, ISP847XBL, ISP847XGR, ISP847XA, ISP847XB, ISP847XC, ISP847XD	Standard DIP16	25 pcs per tube
G	ISP847XG, ISP847XGBG, ISP847XBLG, ISP847XGRG, ISP847XAG, ISP847XBG, ISP847XCG, ISP847XDG	10mm Lead Spacing	25 pcs per tube
SM	ISP847XSM, ISP847XGBSM, ISP847XGRSM, ISP847XBLSM, ISP847XASM, ISP847XBBSM, ISP847XCSM, ISP847XDMSM	Surface Mount	25 pcs per tube

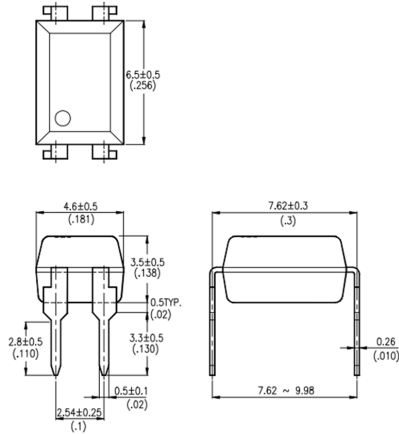


# ISP817, ISP827, ISP847

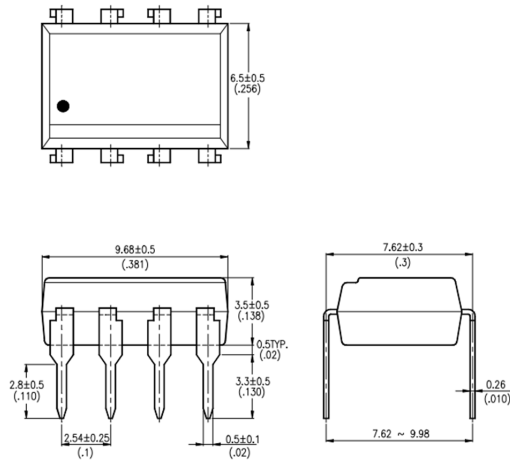
## PACKAGE DIMENSIONS in mm (inch)

### DIP

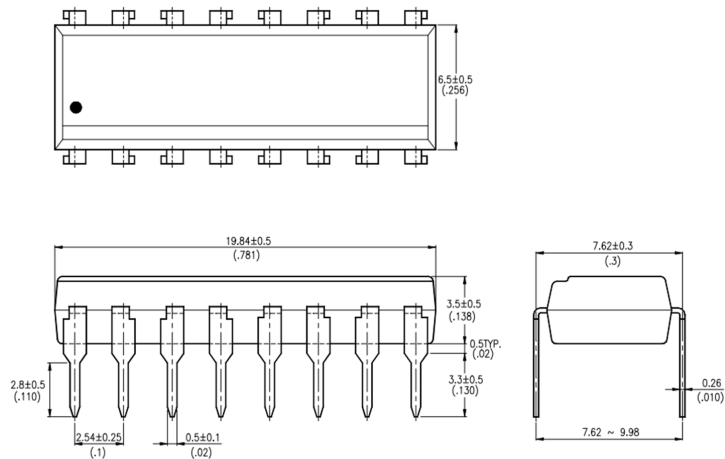
#### ISP817



#### ISP827



#### ISP847

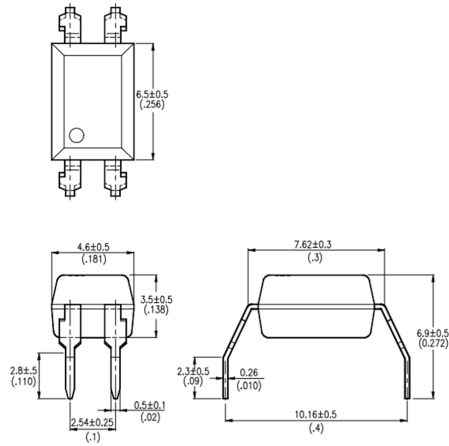


# ISP817, ISP827, ISP847

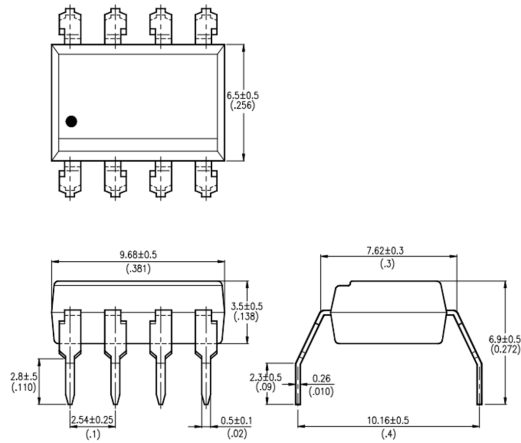
## PACKAGE DIMENSIONS in mm (inch)

### G Form

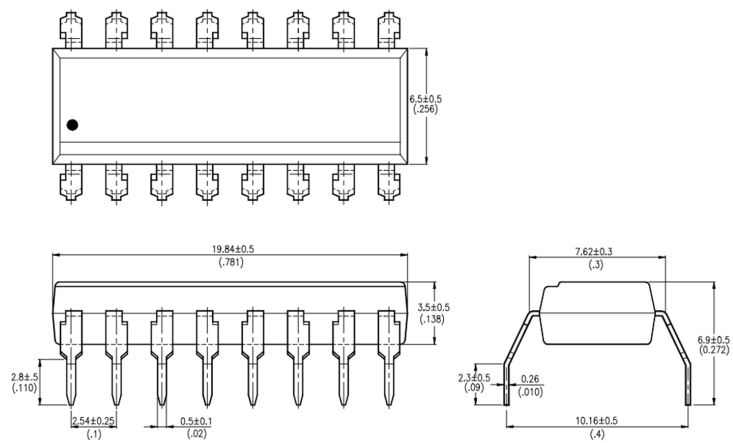
**ISP817G**



**ISP827G**



**ISP847G**

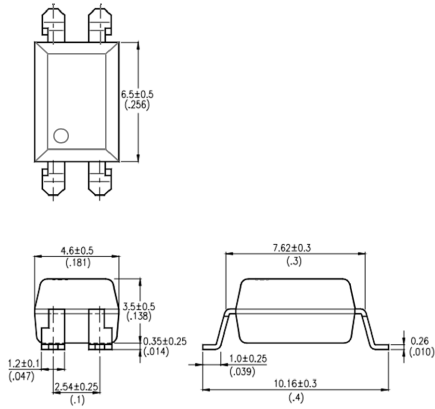


## ISP817, ISP827, ISP847

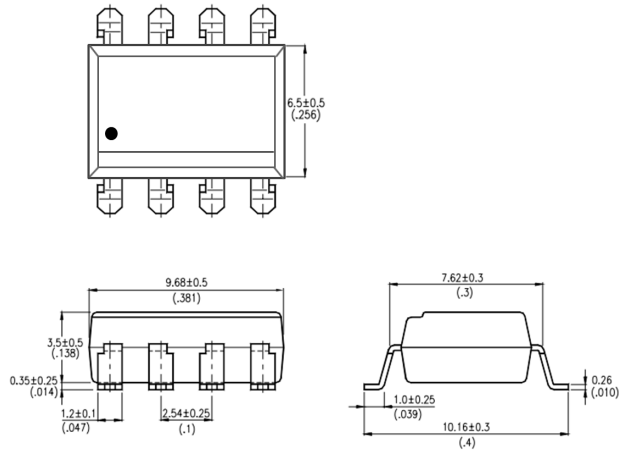
### PACKAGE DIMENSIONS in mm (inch)

#### SMD

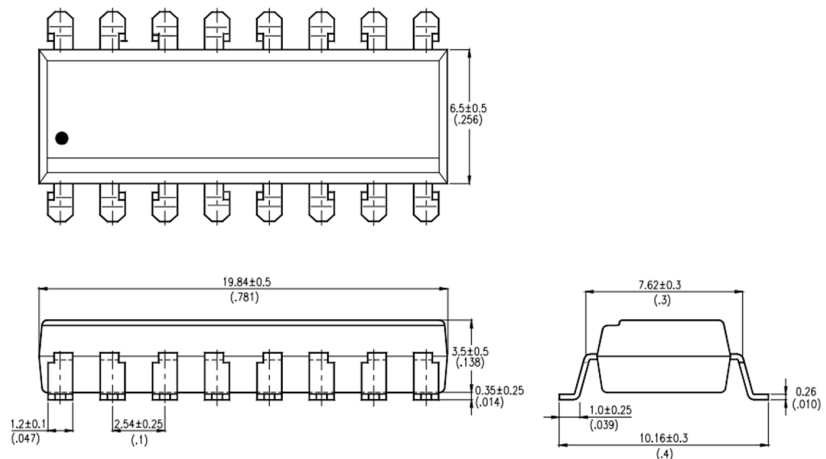
**ISP817SM**



**ISP827SM**

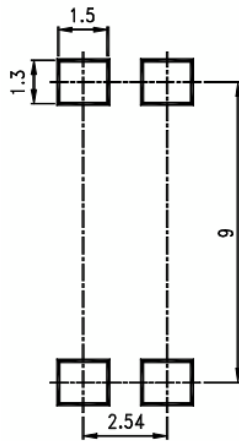


**ISP847SM**

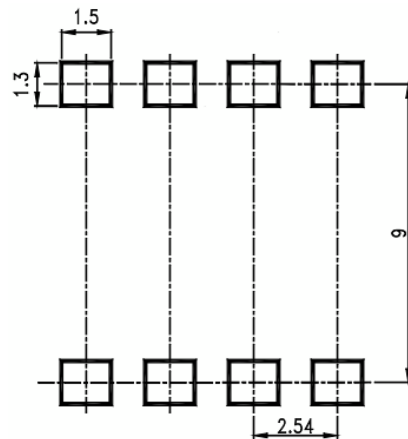


**RECOMMENDED PAD LAYOUT FOR SMD (mm)**

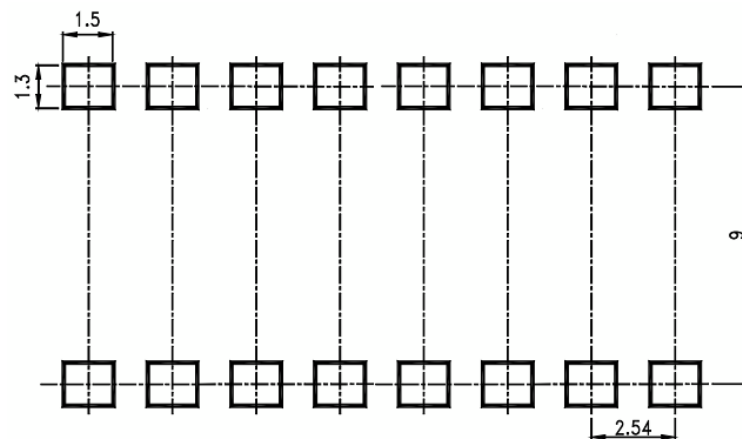
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**ISP827SM**



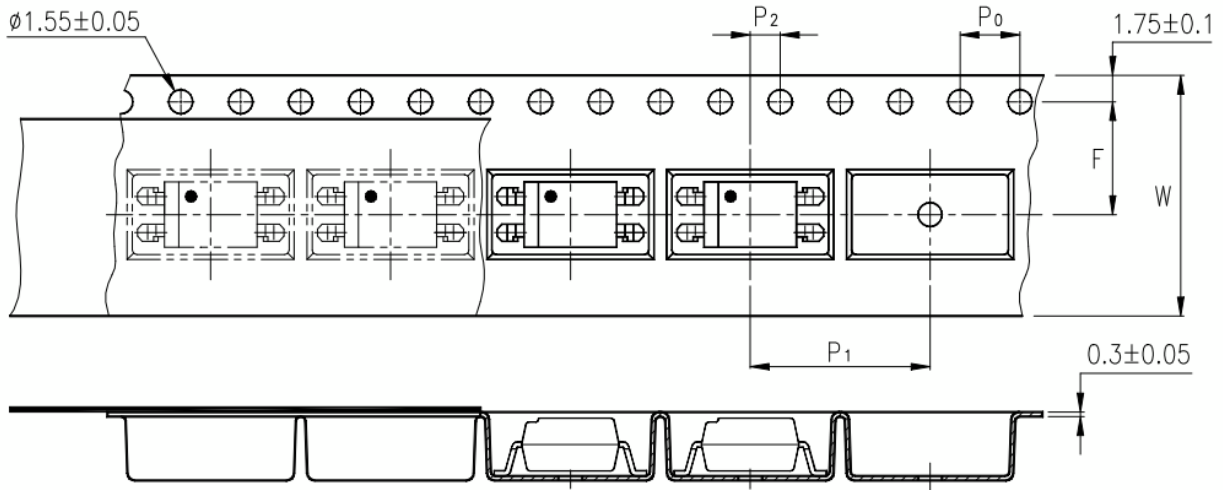
**ISP847SM**



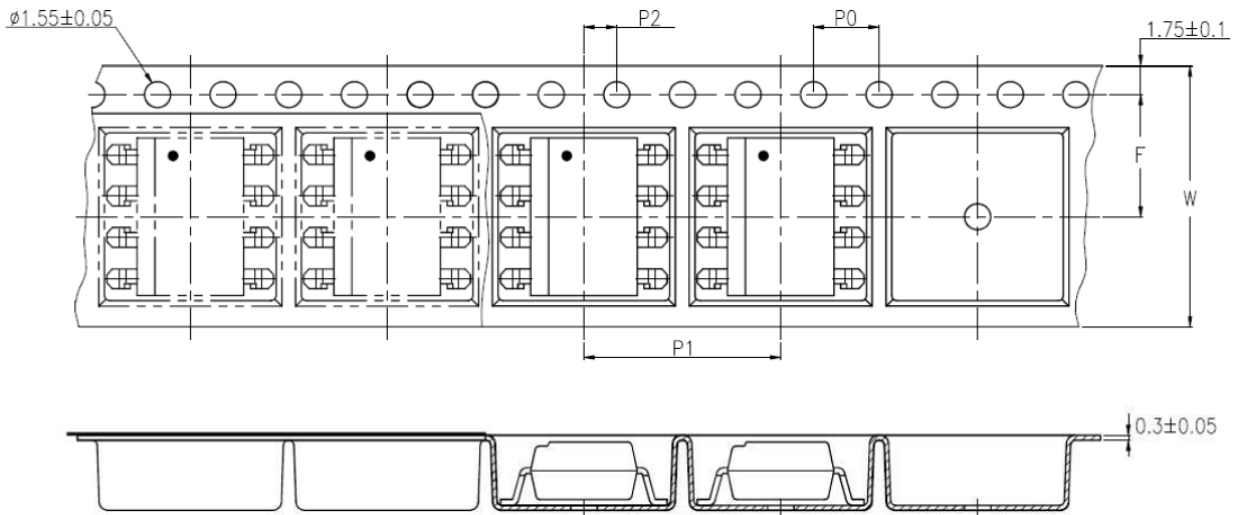
## ISP817, ISP827, ISP847

### TAPE AND REEL PACKAGING

#### ISP817SMT&R



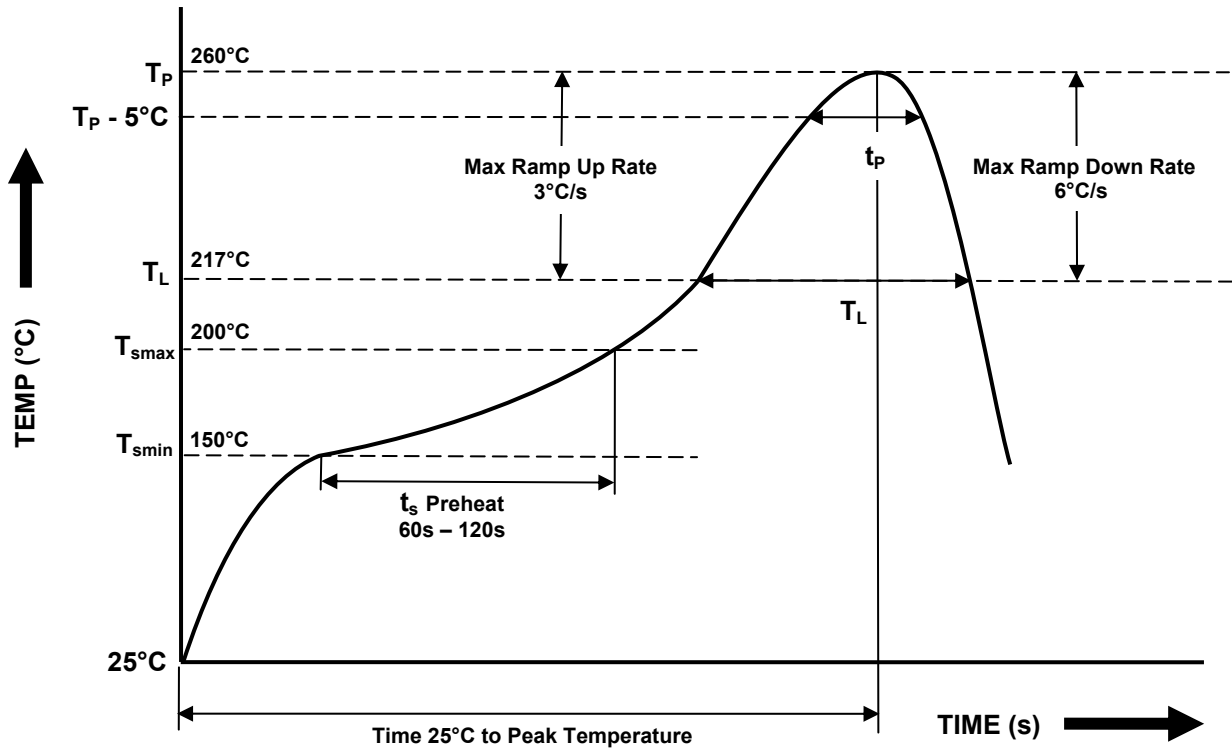
#### ISP827SMT&R



Description	Symbol	Dimension mm (inch)
Tape Width	W	$1.75 \pm 0.1$ (0.63)
Pitch of Sprocket Holes	$P_0$	$4 \pm 0.1$ (0.15)
Distance of Compartment to Sprocket Holes	F	$7.5 \pm 0.1$ (0.295)
	$P_2$	$2 \pm 0.1$ (0.079)
Distance of Compartment to Compartment	$P_1$	$12 \pm 0.1$ (0.472)

## ISP817, ISP827, ISP847

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



Profile Details	Conditions
<b>Preheat</b> - Min Temperature ( $T_{SMIN}$ ) - Max Temperature ( $T_{SMAX}$ ) - Time $T_{SMIN}$ to $T_{SMAX}$ ( $t_s$ )	150°C 200°C 60s - 120s
<b>Soldering Zone</b> - 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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