

## 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

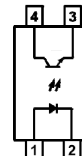
### APPLICATIONS

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

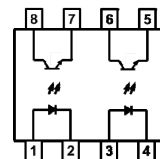
### ORDER INFORMATION

- 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

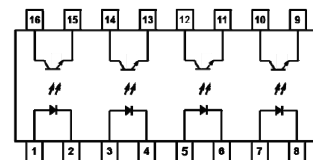
ISP817



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         | 1A   |
| Pulse 100µs, Frequency 100Hz |      |
| 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        |
| Storage Temperature              |                 | -55 to 125 °C        |
| Lead Soldering Temperature (10s) |                 | 260°C                |

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## 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   |

## ISP817, ISP827, ISP847

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

#### COUPLED

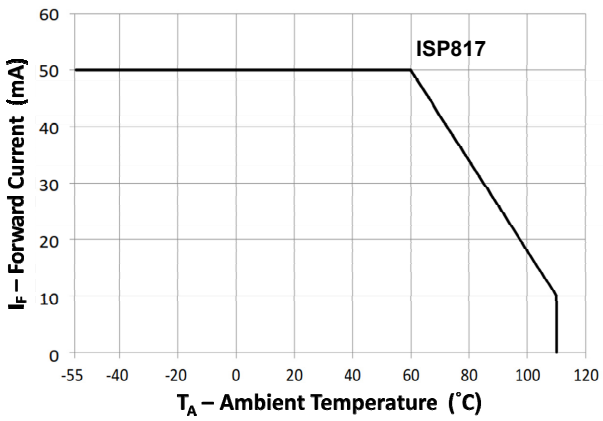
| Parameter                            | Symbol        | Test Condition   | Min | Typ. | Max | Unit          |
|--------------------------------------|---------------|--|-----|------|-----|---------------|
| Current Transfer Ratio               | CTR           | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$                               | 50  |      | 600 | %             |
|                                      |               | Optional CTR Grades  |     |      |     |               |
|                                      |               | GB   | 100 |      | 600 |               |
|                                      |               | BL   | 200 |      | 600 |               |
|                                      |               | A  | 80  |      | 160 |               |
|                                      |               | B  | 130 |      | 260 |               |
|                                      |               | C  | 200 |      | 400 |               |
| D                                    | 300           |  | 600 |      |     |               |
| 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

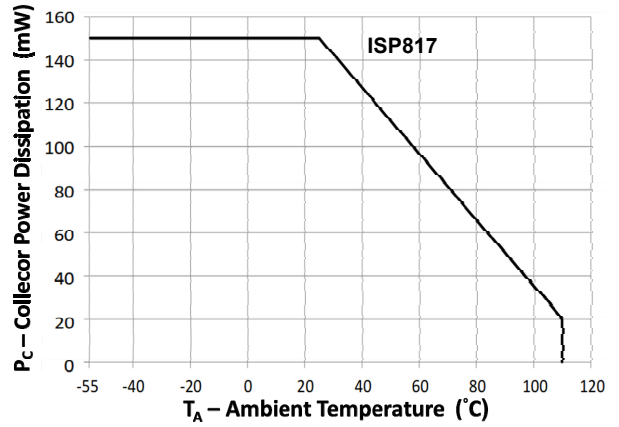
| Parameter                            | Symbol    | Test Condition  | Min                | Typ.               | Max | Unit      |
|--------------------------------------|-----------|---|--------------------|--------------------|-----|-----------|
| Input to Output Isolation Voltage    | $V_{ISO}$ |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

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

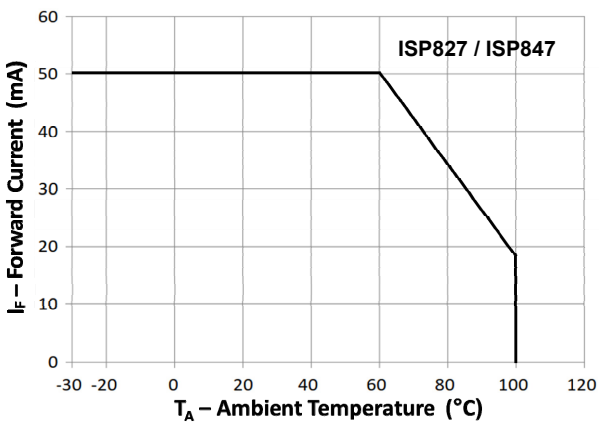
## ISP817, ISP827, ISP847



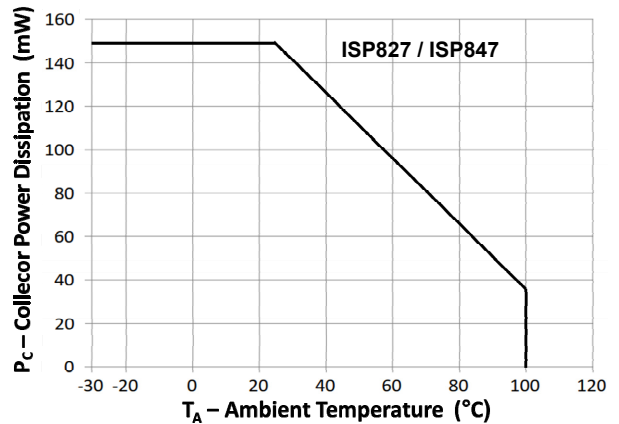
**Fig 1 Forward Current vs Ambient Temperature (1)**



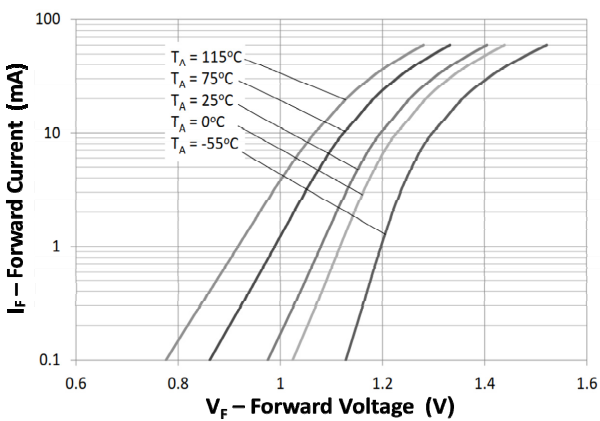
**Fig 2 Collector Power Dissipation vs Ambient Temperature (1)**



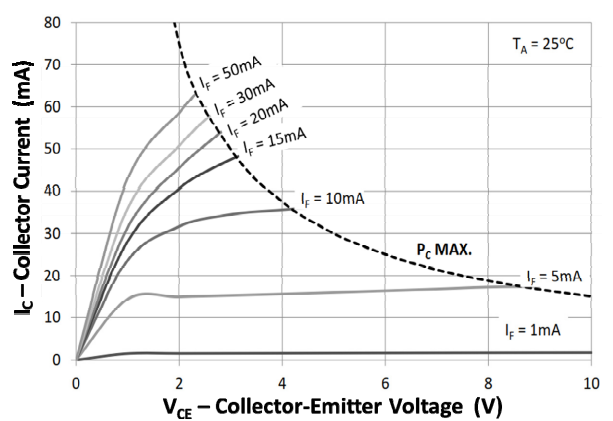
**Fig 3 Forward Current vs Ambient Temperature (2)**



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



**Fig 5 Forward Current vs Forward Voltage**



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

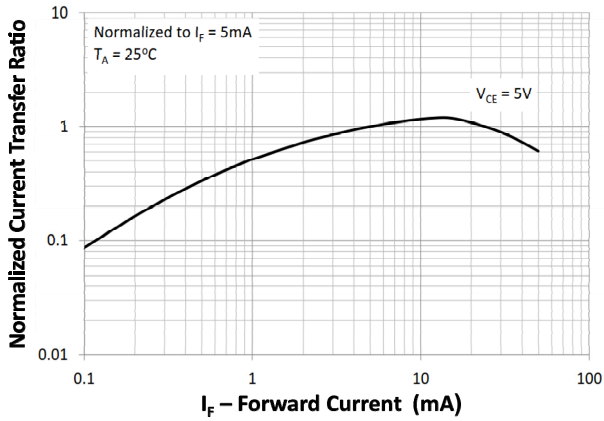


Fig 7 Normalized Current Transfer Ratio vs Forward Current

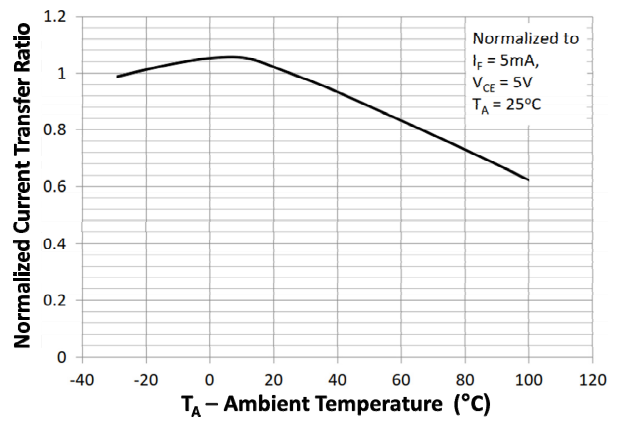


Fig 8 Normalized Current Transfer Ratio vs Ambient Temperature

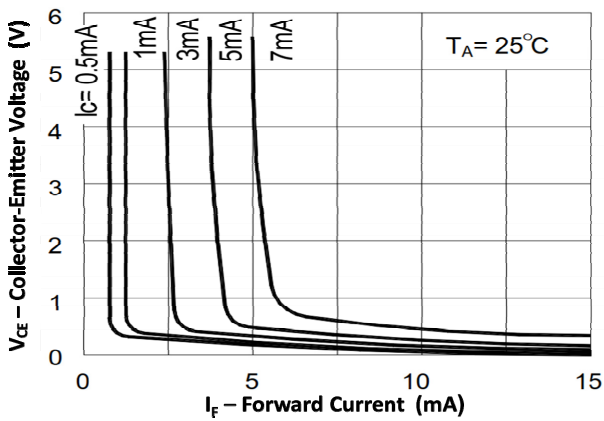


Fig 9 Collector-Emitter Voltage vs Forward Current

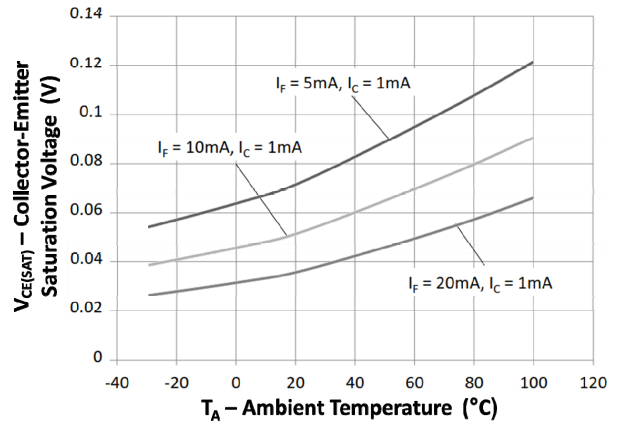


Fig 10 Collector-Emitter Saturation Voltage vs Ambient Temperature

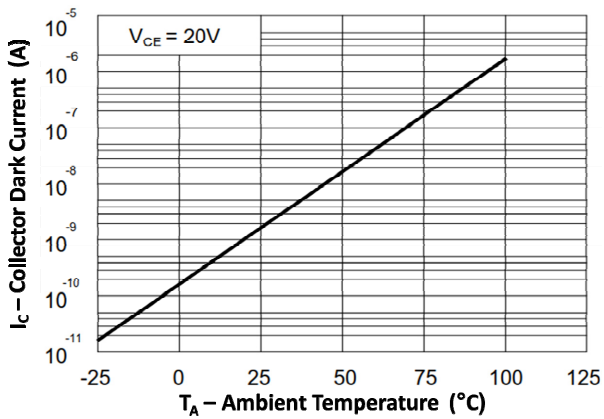
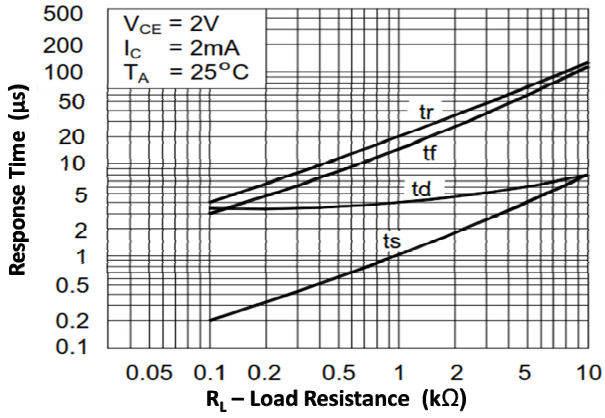
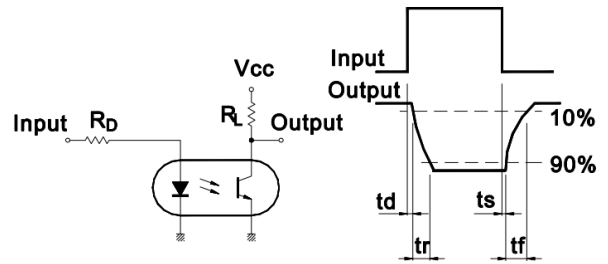


Fig 11 Collector Dark Current vs Ambient Temperature

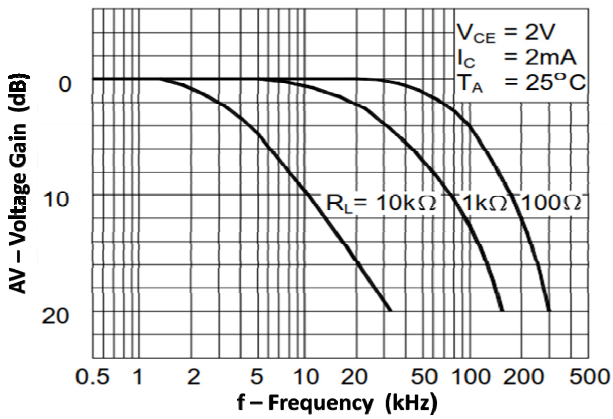
## ISP817, ISP827, ISP847



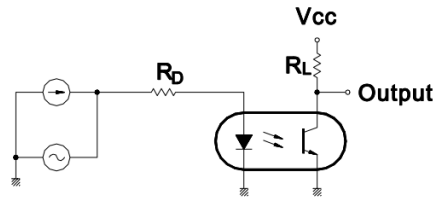
**Fig 12 Response Time vs Load Resistance**



**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,<br>ISP817A, ISP817B,<br>ISP817C, ISP817D                                       | Standard DIP4             | 100 pcs per tube  |
| G                    | ISP817G, ISP817GBG, ISP817BLG,<br>ISP817AG, ISP817BG,<br>ISP817CG, ISP817DG                                | 10mm Lead Spacing         | 100 pcs per tube  |
| SM                   | ISP817SM, ISP817GBSM, ISP817BLSM,<br>ISP817ASM, ISP817BSM,<br>ISP817CSM, ISP817DSM                         | Surface Mount             | 100 pcs per tube  |
| SMT&R                | ISP817SMT&R,<br>ISP817GBSMT&R, ISP817BLSMT&R,<br>ISP817ASMT&R, ISP817BSMT&R,<br>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,<br>ISP827A, ISP827B,<br>ISP827C, ISP827D                                       | Standard DIP8             | 50 pcs per tube   |
| G                    | ISP827G, ISP827GBG, ISP827BLG,<br>ISP827AG, ISP827BG,<br>ISP827CG, ISP827DG                                | 10mm Lead Spacing         | 50 pcs per tube   |
| SM                   | ISP827SM, ISP827GBSM, ISP827BLSM,<br>ISP827ASM, ISP827BSM,<br>ISP827CSM, ISP827DSM                         | Surface Mount             | 50 pcs per tube   |
| SMT&R                | ISP827SMT&R,<br>ISP827GBSMT&R, ISP827BLSMT&R,<br>ISP827ASMT&R, ISP827BSMT&R,<br>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,<br>ISP847A, ISP847B,<br>ISP847C, ISP847D               | Standard DIP16    | 25 pcs per tube  |
| G                    | ISP847G, ISP847GBG, ISP847BLG,<br>ISP847AG, ISP847BG,<br>ISP847CG, ISP847DG        | 10mm Lead Spacing | 25 pcs per tube  |
| SM                   | ISP847SM, ISP847GBSM, ISP847BLSM,<br>ISP847ASM, ISP847BSM,<br>ISP847CSM, ISP847DSM | Surface Mount     | 25 pcs per tube  |

## ISP817, ISP827, ISP847

### ORDER INFORMATION

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

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

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

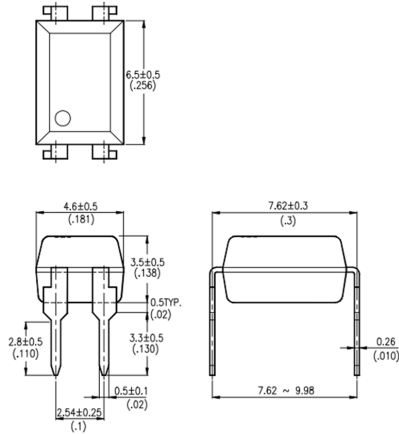


# ISP817, ISP827, ISP847

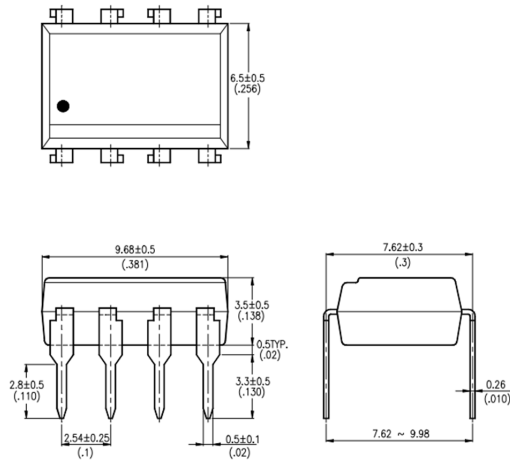
## PACKAGE DIMENSIONS in mm (inch)

### DIP

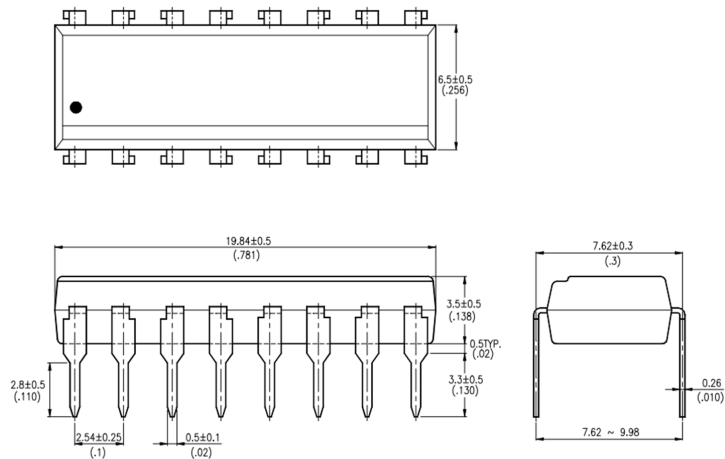
#### ISP817



#### ISP827



#### ISP847

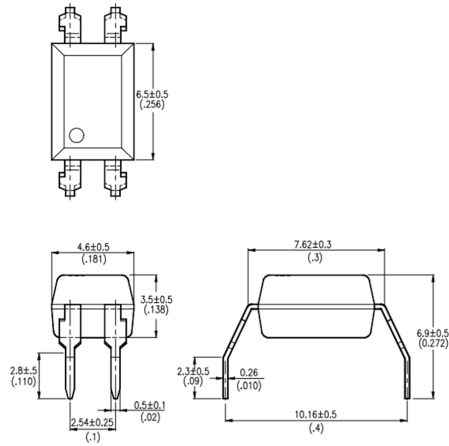


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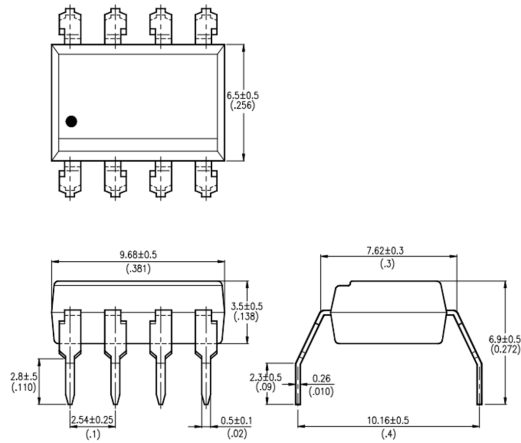
## PACKAGE DIMENSIONS in mm (inch)

### G Form

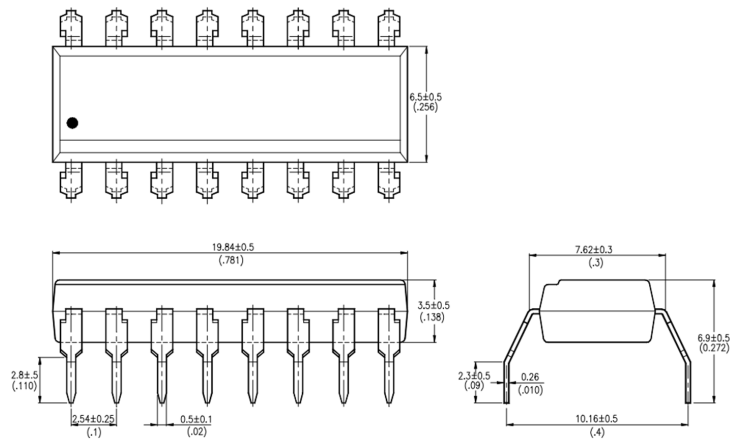
#### ISP817



#### ISP827



#### ISP847

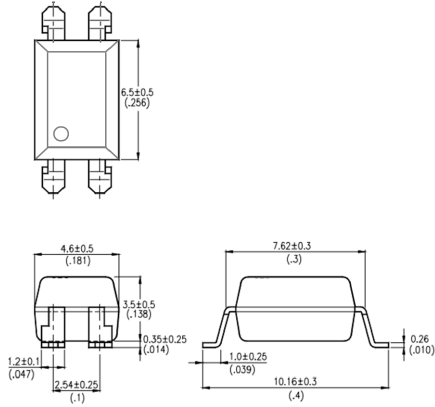


## ISP817, ISP827, ISP847

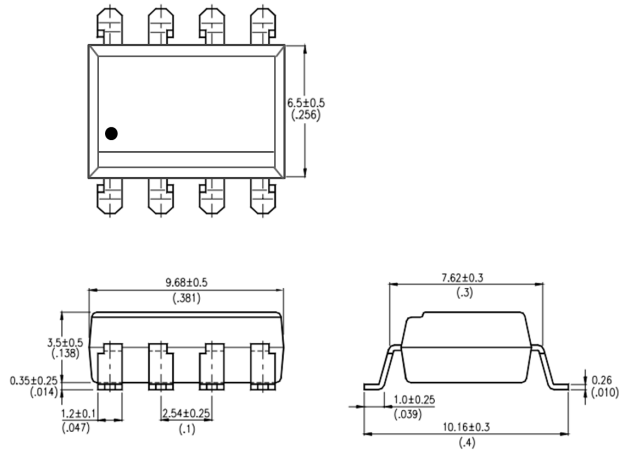
### PACKAGE DIMENSIONS in mm (inch)

#### SMD

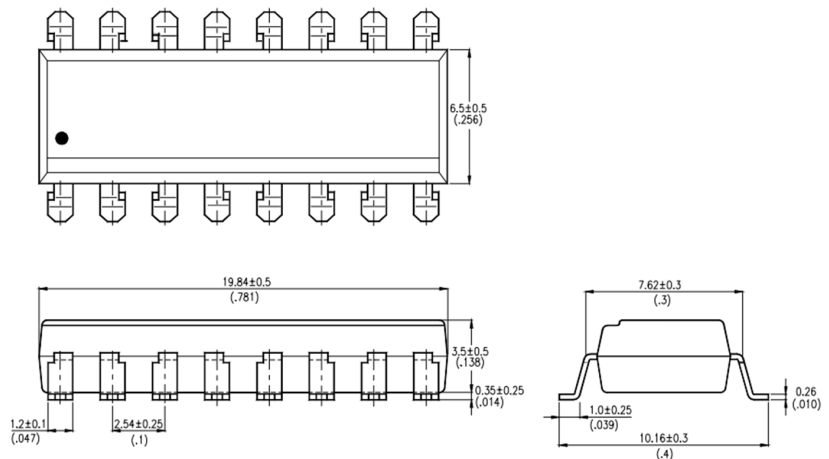
**ISP817**



**ISP827**



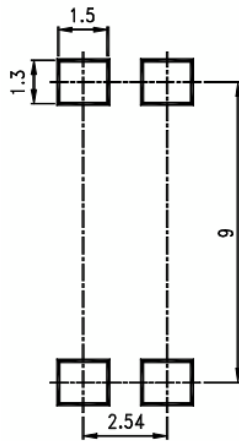
**ISP847**



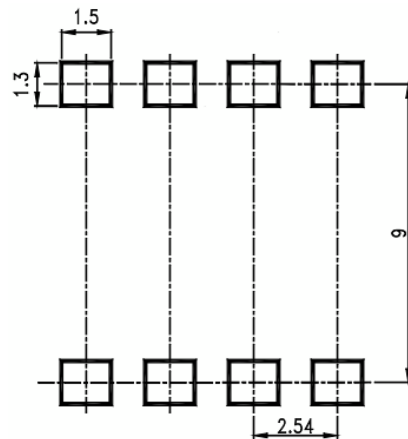
## ISP817, ISP827, ISP847

### RECOMMENDED PAD LAYOUT FOR SMD (mm)

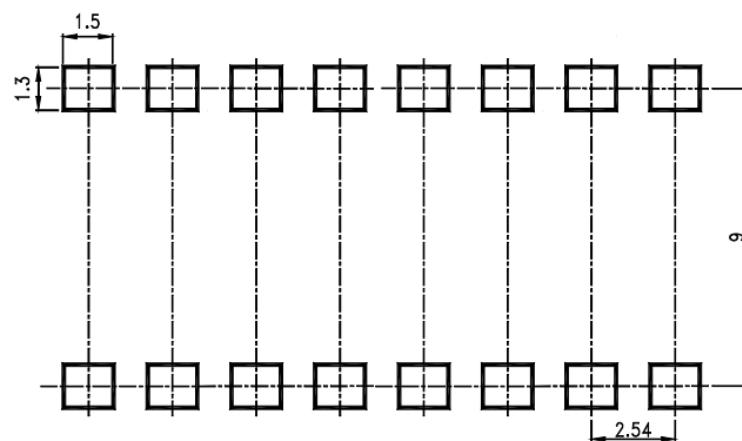
ISP817



ISP827



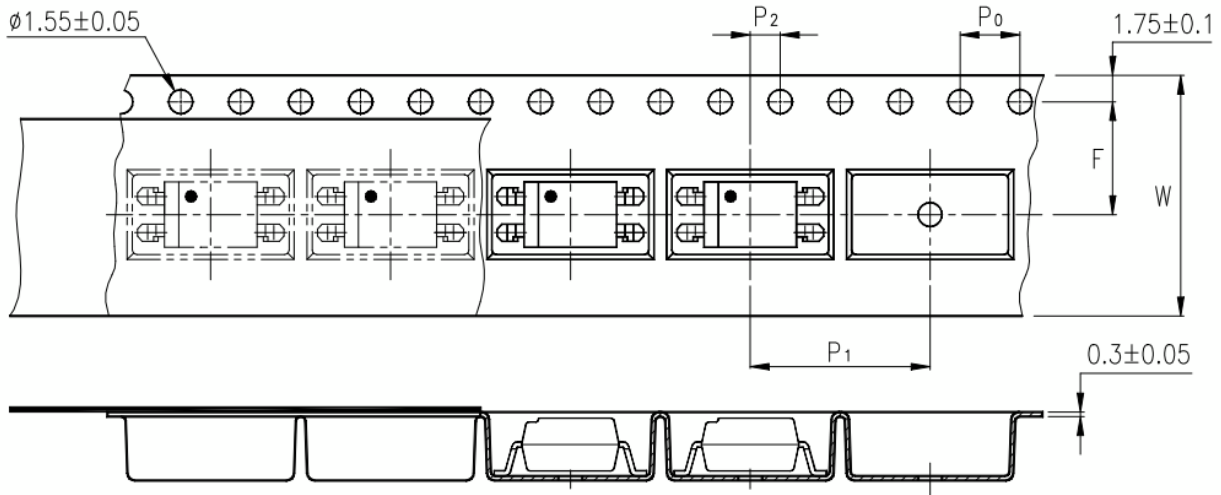
ISP847



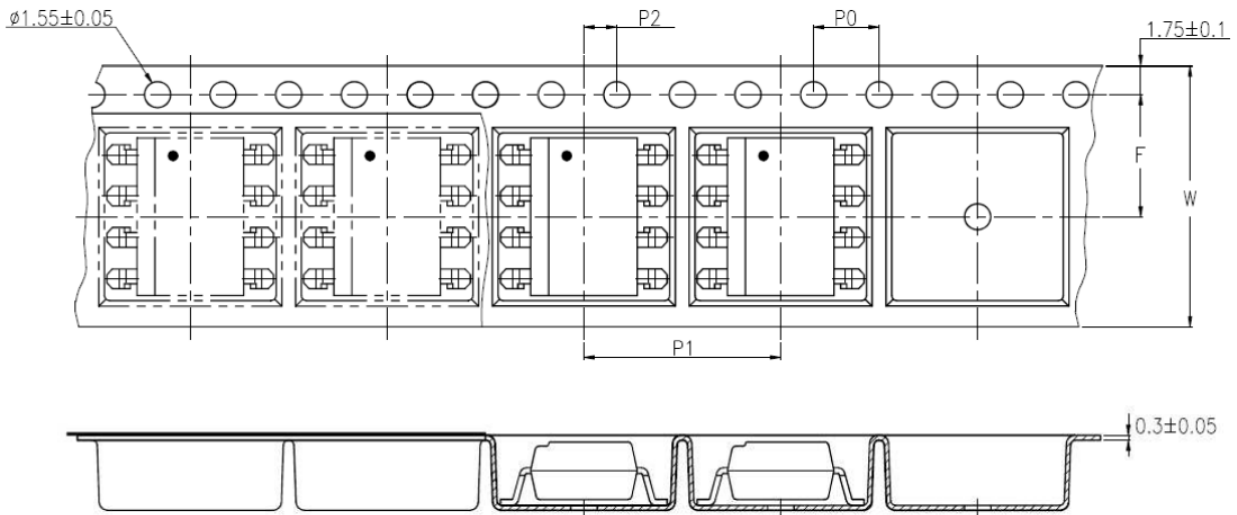
## ISP817, ISP827, ISP847

### TAPE AND REEL PACKAGING

#### ISP817SMT&R

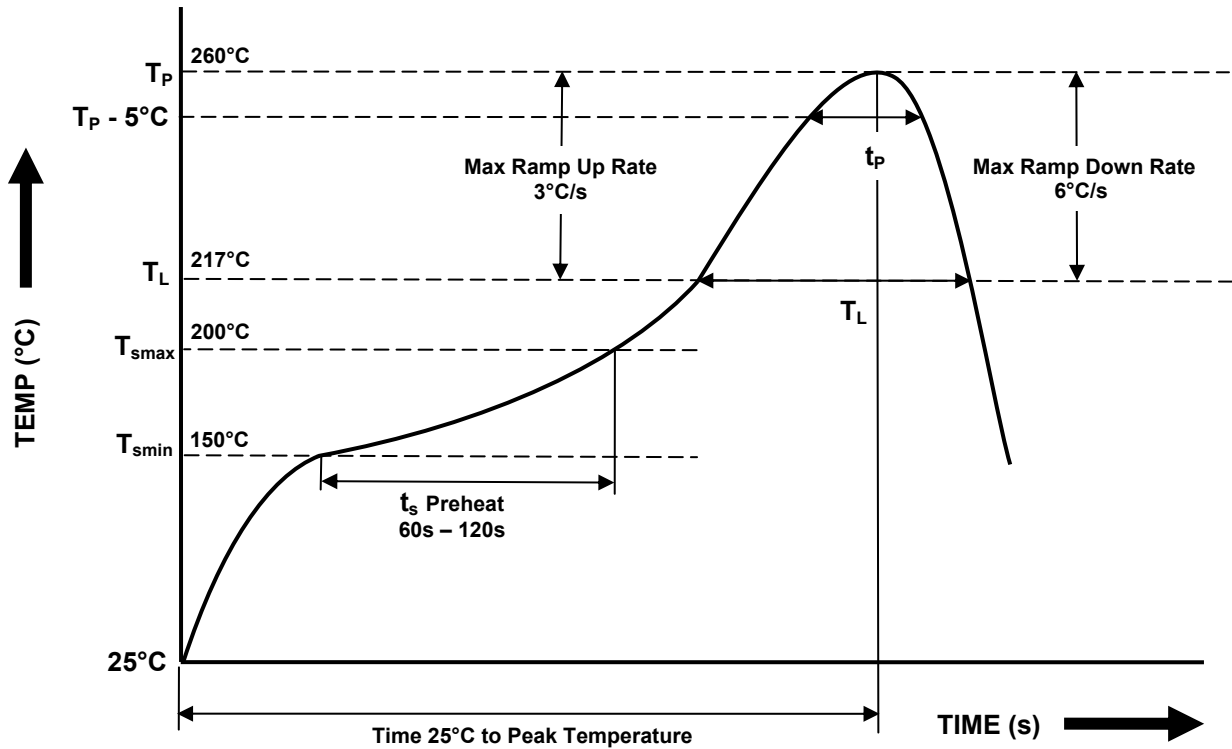


#### ISP827SMT&R



| Description                               | Symbol | Dimension<br>mm (inch) |
|---|--------|------------------------|
| Tape Width                                | W      | $16 \pm 0.3$ (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)   |

**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><br>- Min Temperature (T <sub>SMIN</sub> )<br>- Max Temperature (T <sub>SMAX</sub> )<br>- Time T <sub>SMIN</sub> to T <sub>SMAX</sub> (t <sub>s</sub> )   | 150°C<br>200°C<br>60s - 120s   |
| <b>Soldering Zone</b><br>- Peak Temperature (T <sub>P</sub> )<br>- Time at Peak Temperature<br>- Liquidous Temperature (T <sub>L</sub> )<br>- Time within 5°C of Actual Peak Temperature (T <sub>P</sub> - 5°C)<br>- Time maintained above T <sub>L</sub> (t <sub>L</sub> )<br>- Ramp Up Rate (T <sub>L</sub> to T <sub>P</sub> )<br>- Ramp Down Rate (T <sub>P</sub> to T <sub>L</sub> ) | 260°C<br>10s max<br>217°C<br>30s max<br>60s - 100s<br>3°C/s max<br>6°C/s max |
| Average Ramp Up Rate (T <sub>smax</sub> to T <sub>P</sub> )   | 3°C/s max  |
| Time 25°C to Peak Temperature   | 8 minutes max  |



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