# ISP281

## DESCRIPTION

The ISP281 series optocoupler each consists of an infrared emitting diode optically coupled to an NPN silicon photo transistor.

This device belongs to Isocom Compact Range of Optocouplers.

## FEATURES

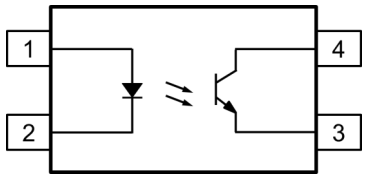
- Half Pitch 1.27mm
- CTR Selections Available
- Wide Operating Temperature Range - 55°C to +110°C
- High AC Isolation voltage 3750$V_{RMS}$
- Lead Free and RoHS Compliant
- Safety Approvals Pending

## APPLICATIONS

- Switching Mode Power Supplies
- Computer Terminals
- Industrial System Controllers
- Measuring Instruments
- Signal Transmission between Systems of Differential Potentials and Impedances

## ORDER INFORMATION

- Available in Tape and Reel with 3000 pieces per 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 |
| Pulse Forward Current | 1A |
| Reverse Voltage | 6V |
| Power Dissipation | 70mW |
| Junction Temperature | 125°C |

### Output

| | |
|---|---|
| Collector to Emitter Voltage $V_{CEO}$ | 80V |
| Emitter to Collector Voltage $V_{ECO}$ | 7V |
| Collector Current | 50mA |
| Power Dissipation | 150mW |
| Junction Temperature | 125°C |

### Total Package

| | |
|---|---|
| Isolation Voltage | 3750$V_{RMS}$ |
| Total Power Dissipation | 200mW |
| Operating Temperature | -55 to 110°C |
| Storage Temperature | -55 to 150°C |
| Lead Soldering Temperature (10s) | 260°C |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## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C, unless otherwise specified. Typical Values at $T_A$ = 25°C)

### INPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$ = 20mA | | | 1.4 | V |
| Reverse Current | $I_R$ | $V_R$ = 4V | | | 10 | µA |
| Terminal Capacitance | $C_{IN}$ | V = 0V, f = 1KHz | | 30 | 250 | pF |

### OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector-Emitter Breakdown Voltage | $V_{CEO}$ | $I_C$ = 0.1mA, $I_F$ =0mA | 80 | | | V |
| Emitter-Collector Breakdown Voltage | $V_{ECO}$ | $I_E$ = 0.01mA, $I_F$ = 0mA | 7 | | | V |
| Collector Dark Current | $I_{CEO}$ | $V_{CE}$ = 20V, $I_F$ = 0mA | | | 100 | nA |

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C, unless otherwise specified. Typical Values at $T_A$ = 25°C)

### COUPLED

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Current Transfer Ratio | CTR | $I_F$ = 5mA, $V_{CE}$ = 5V | | | | % |
| | | ISP281 | 50 | | 600 | |
| | | ISP281A | 80 | | 160 | |
| | | ISP281B | 130 | | 260 | |
| | | ISP281C | 200 | | 400 | |
| | | ISP281D | 300 | | 600 | |
| | | ISP281E | 100 | | 200 | |
| | | ISP281GR | 100 | | 300 | |
| | | ISP281GB | 100 | | 600 | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_F$ = 8mA, $I_C$ = 2.4mA | | | 0.4 | V |
| Floating Capacitance | $C_f$ | V = 0V, f = 1MHz | | 0.6 | 1 | pF |
| Rise Time | $t_r$ | $V_{CC}$ = 10V, $I_C$ = 2mA, $R_L$ = 100Ω, f = 100Hz | | 2 | 18 | µs |
| Fall Time | $t_f$ | | | 3 | 18 | |
| Turn-On Time | $t_{ON}$ | | | 3 | | |
| Turn-Off Time | $t_{OFF}$ | | | 3 | | |
| Storage Time | $t_S$ | $V_{CC}$ = 5V, $I_F$ = 16mA, $R_L$ = 1.9kΩ | | 25 | | |
| Turn-On Time | $t_{ON}$ | | | 2 | | |
| Turn-Off Time | $t_{OFF}$ | | | 40 | | |

Any grade of the ISP281 will satisfy the base ISP281 specification.
Grade B will satisfy the ISP281GR specification
Grade B / C / D / E will satisfy the ISP281GB specification

### ISOLATION

| Parameter | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Isolation Voltage | $V_{ISO}$ | R.H. = 40% to 60 %, t = 1 min | 3750 | | | $V_{RMS}$ |
| Input - Output Resistance | $R_{I-O}$ | $V_{I-O}$ = 500VDC, R.H. = 40% to 60 % | $5 \times 10^{10}$ | $1 \times 10^{11}$ | | Ω |

Device is considered a two terminal device : pins 1 and 2 are shorted together and pins 3 and 4 are shorted together.

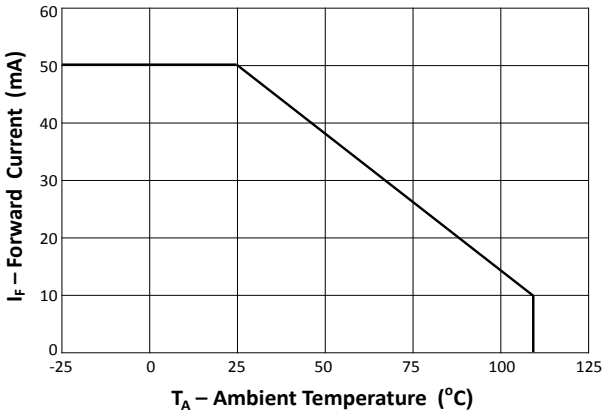



Fig 1 Forward Current vs Ambient Temperature

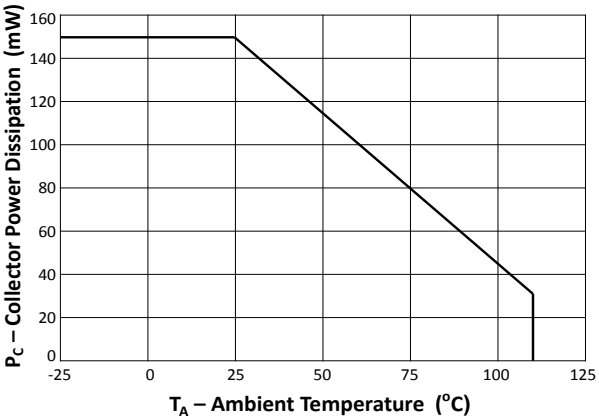



Fig 2 Collector Power vs Ambient Temperature

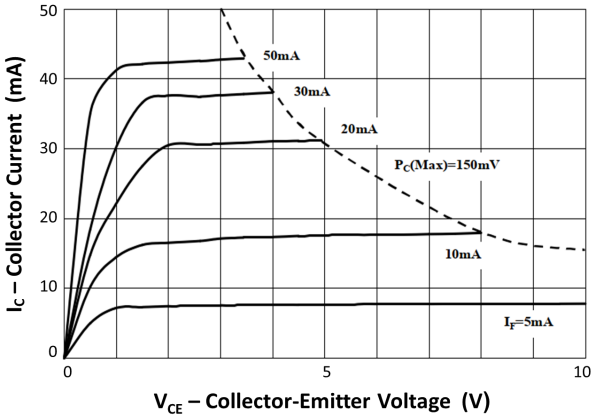



Fig 3 Collector Current vs Collector-Emitter Voltage (1)

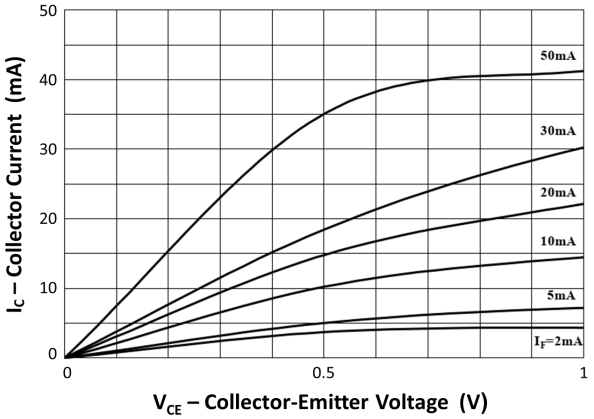



Fig 4 Collector Current vs Collector-Emitter Voltage (2)

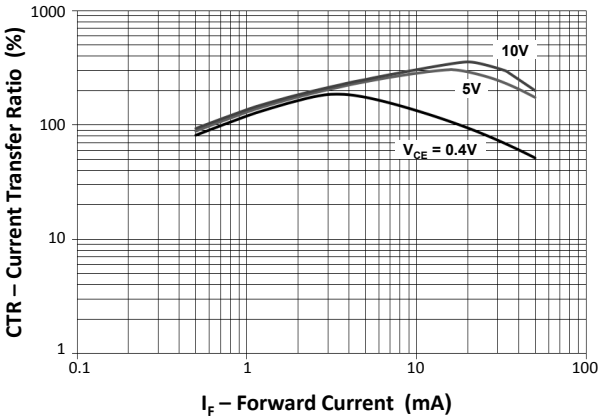



Fig 5 Current Transfer Ratio vs Forward Current

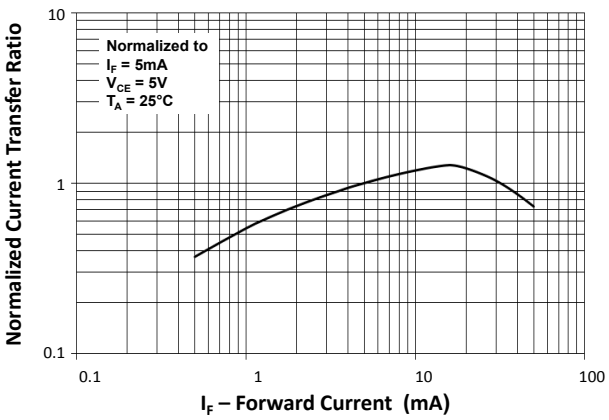



Fig 6 Normalized Current Transfer Ratio vs Forward Current

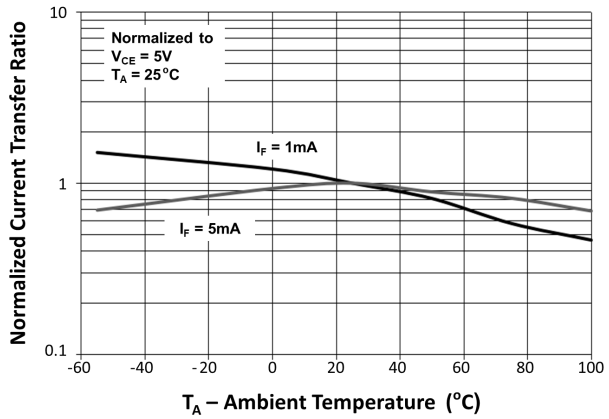



Fig 7 Normalized Current Transfer Ratio vs Ambient Temperature

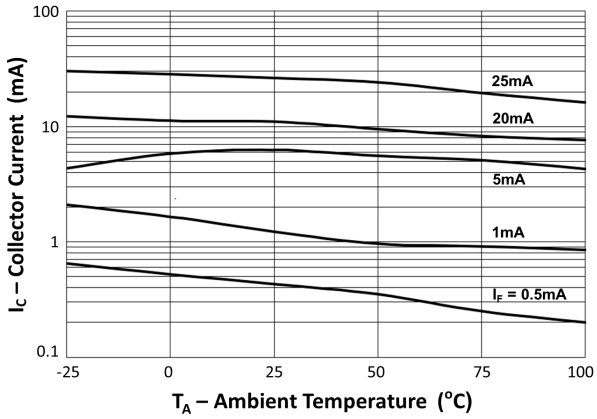



Fig 8 Collector Current vs Ambient Temperature

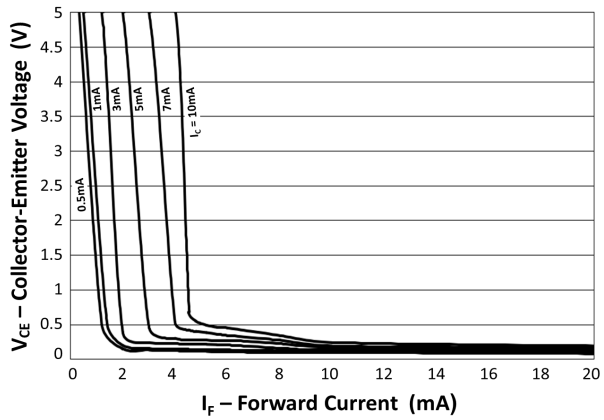



Fig 9 Collector-Emitter Voltage vs Forward Current

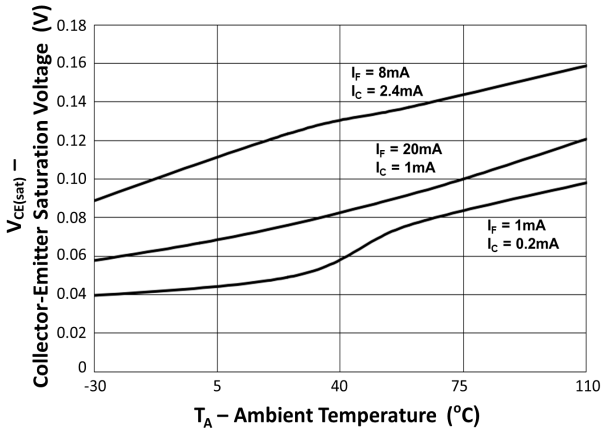



Fig 10 Collector-Emitter Saturation Voltage vs Ambient temperature

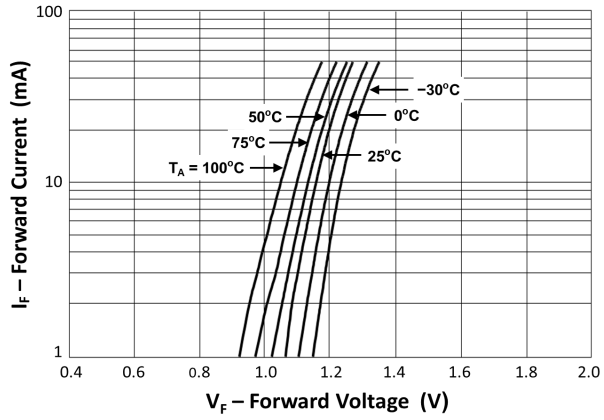



Fig 11 Forward Current vs Forward Voltage

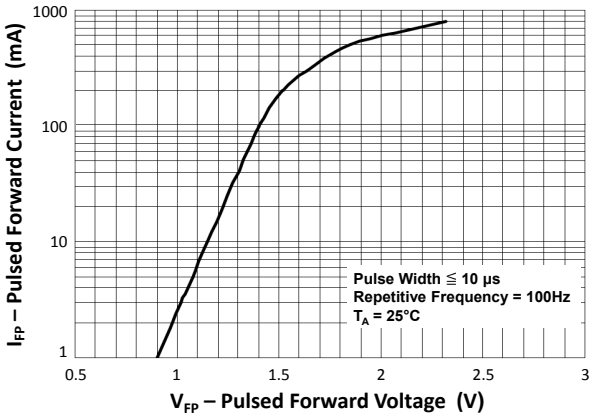



Fig 12 Pulsed Forward Current vs Pulsed Forward Voltage

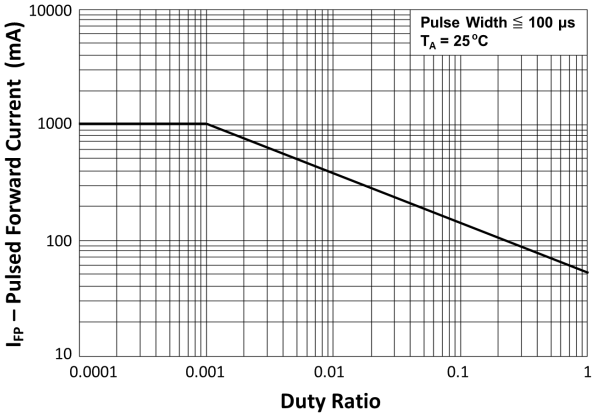



Fig 13 Pulsed Forward Current vs Duty Ratio

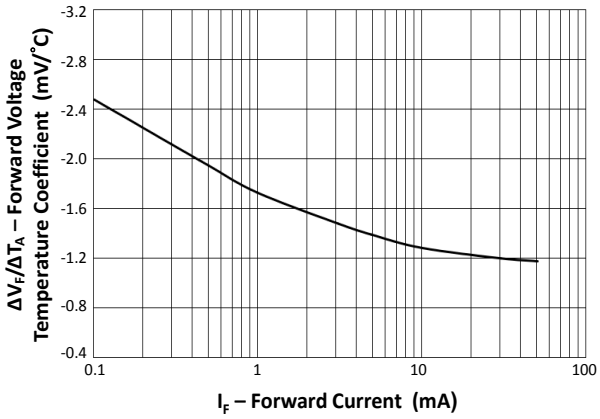



Fig 14 Forward Voltage Temperature Coefficient vs Forward Current

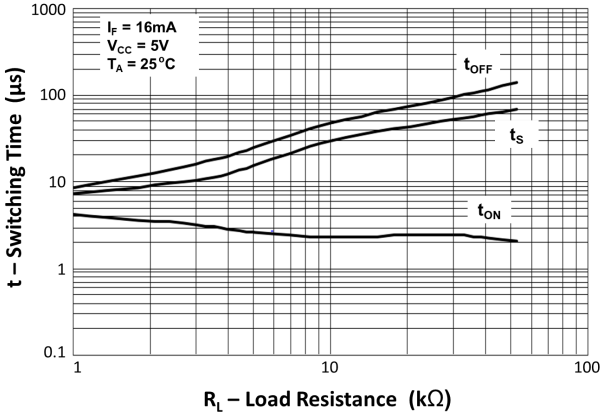



Fig 15 Switching Time vs Load Resistance

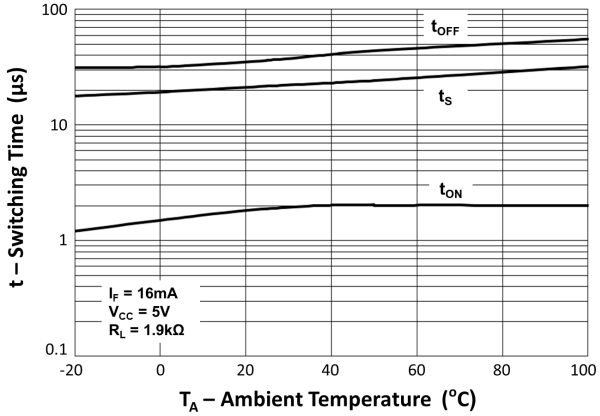



Fig 16 Switching Time vs Ambient temperature

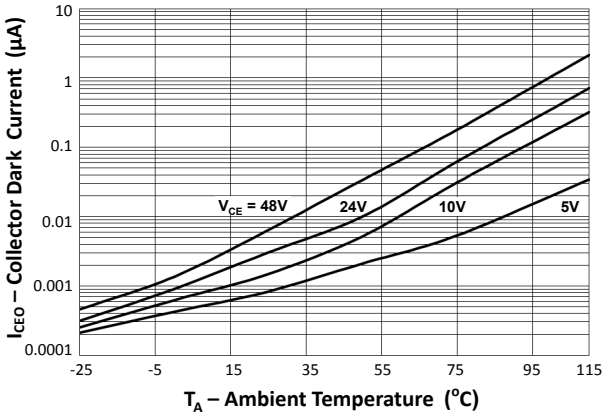



Fig 17 Collector Dark Current vs Ambient Temperature

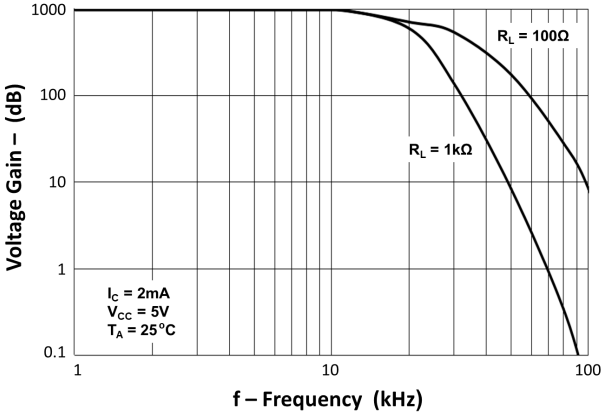
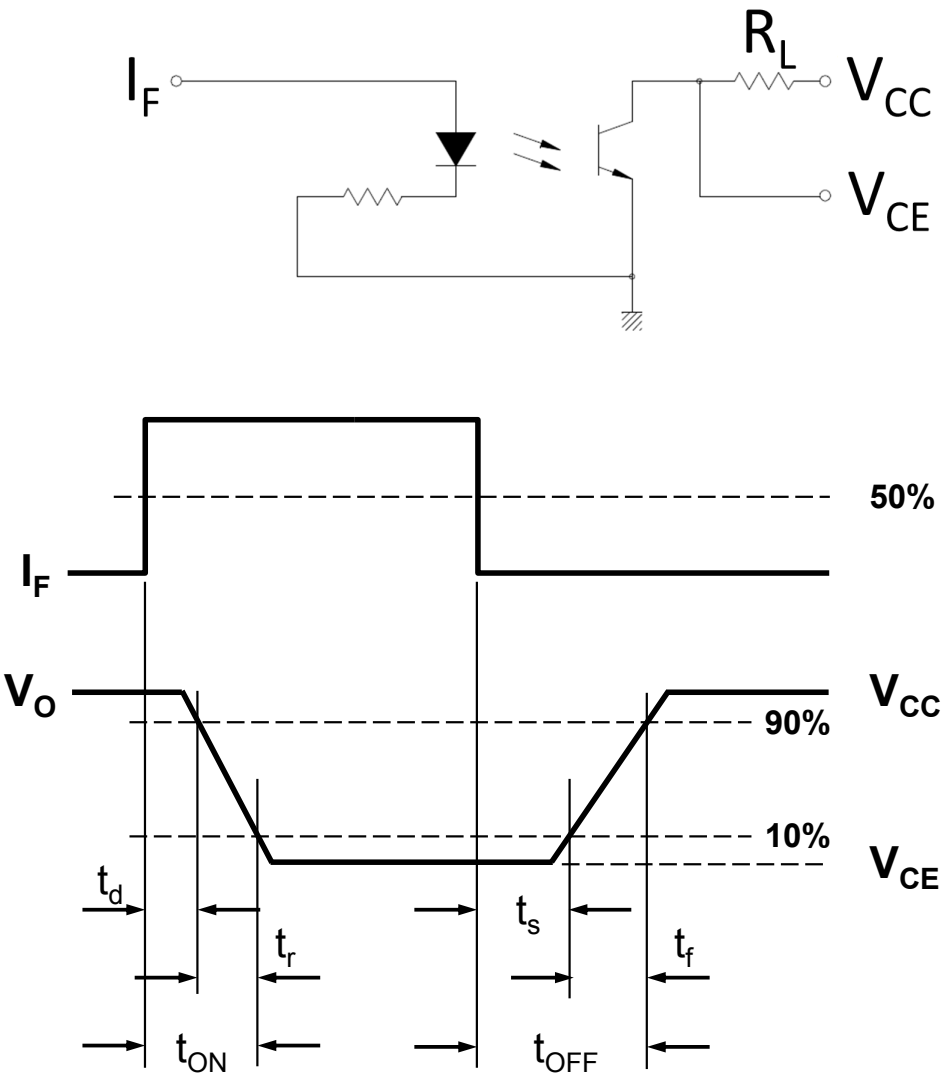



Fig 18 Frequency Response

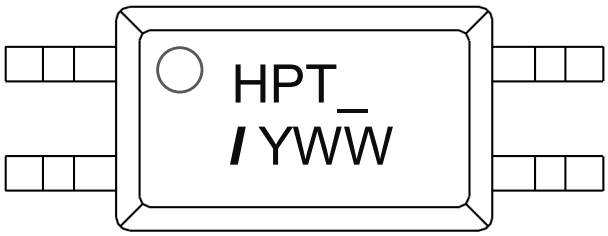



**Switching Time Test Circuit and Waveform**

## ORDER INFORMATION

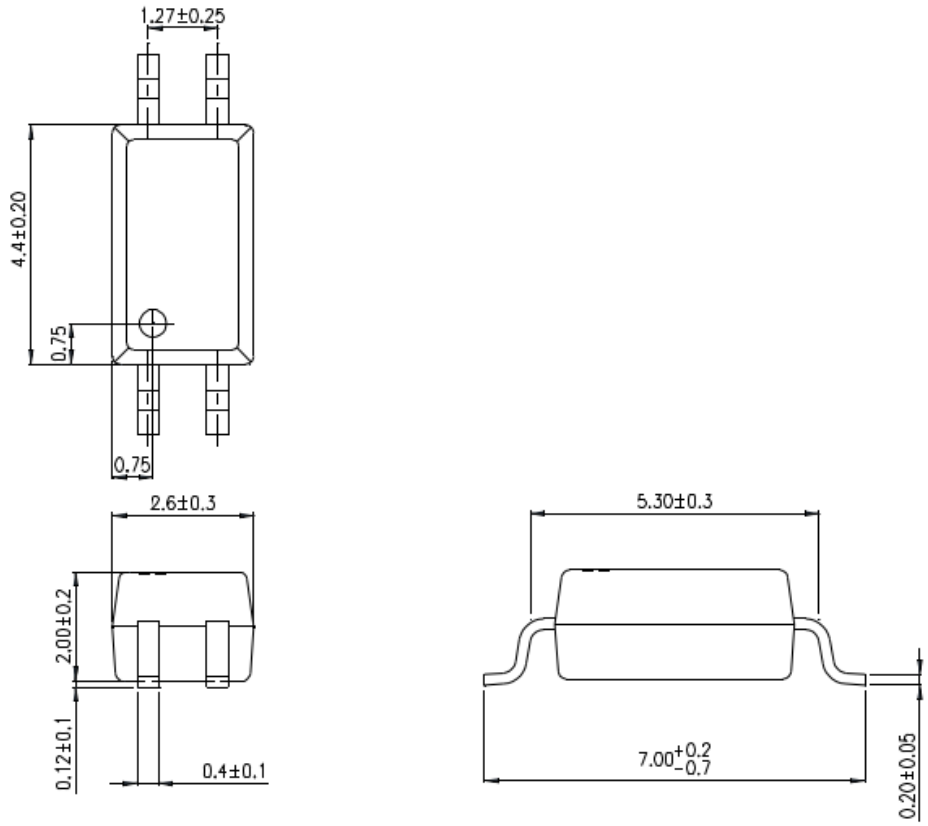
| ISP281 | | | |
|---|---|---|---|
| **After PN** | **PN** | **Description** | **Packing quantity** |
| None | ISP281 | Surface Mount Tape and Reel | 3000 pcs per reel |
| Any CTR Grades | ISP281A, ISP281B, ISP281C<br>ISP281D, ISP281E<br>ISP281GR, ISP281GB | Surface Mount Tape and Reel | 3000 pcs per reel |
| **NOTE : Multiple Grades may be supplied to meet the requested specification** | | | |

## DEVICE MARKING

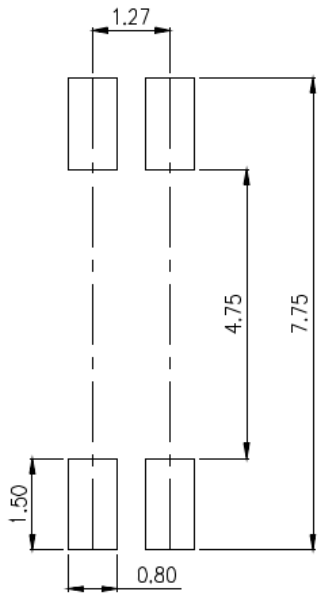



| | |
|---|---|
| HPT_ | denotes Device Part Number where "_" denotes CTR Grade |
| *I* | denotes Isocom |
| Y | denotes 1 digit Year code J = 2019, K = 2020 etc. |
| WW | denotes 2 digit Week code |

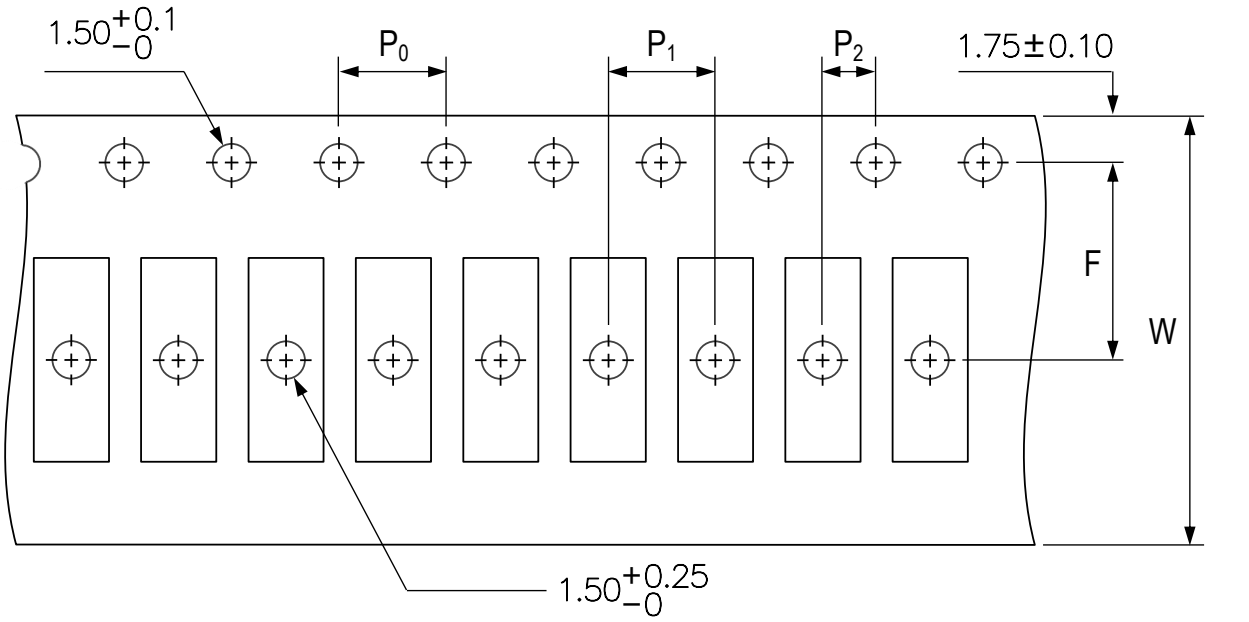
## PACKAGE DIMENSIONS in mm

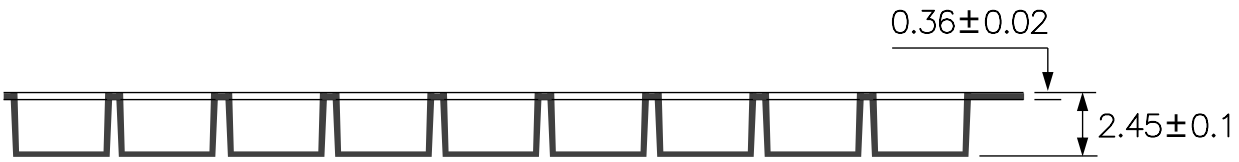



## RECOMMENDED PAD LAYPUT FOR SMD (mm)



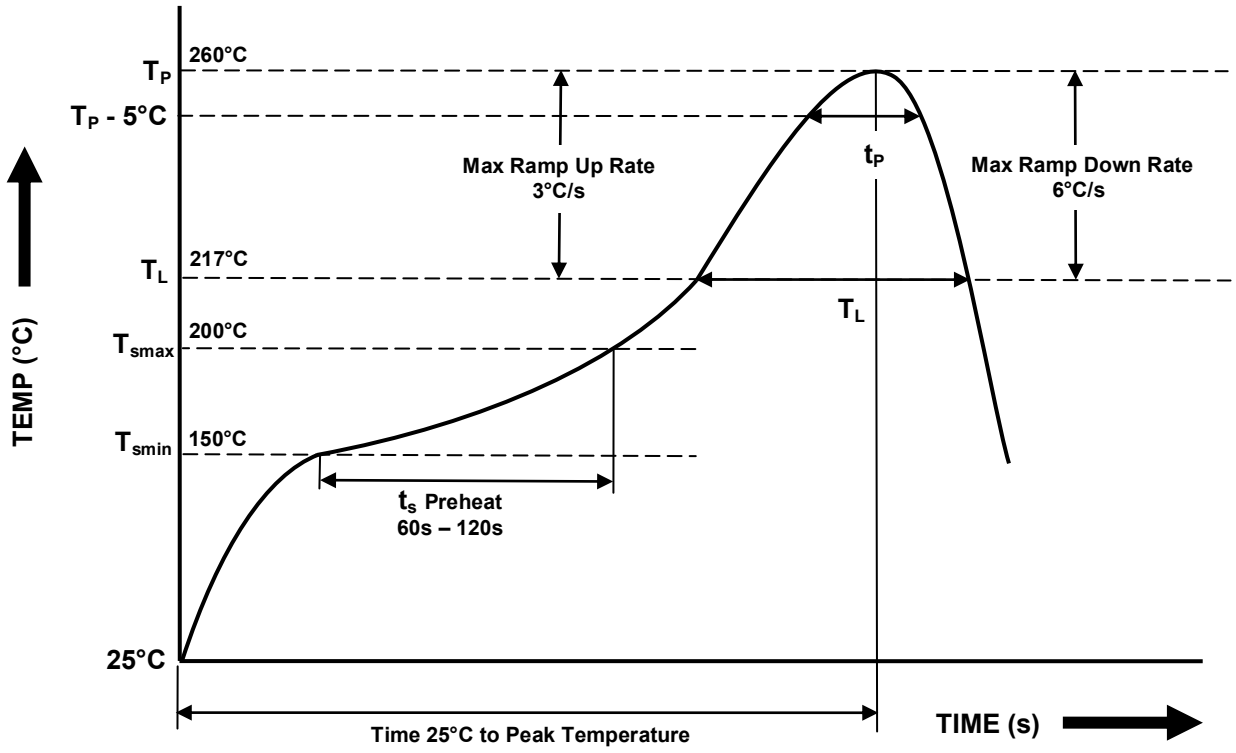
## TAPE AND REEL PACKAGING (mm)




| Description | Symbol | Dimension mm (inch) |
|---|---|---|
| Tape Width | W | 16.00 ± 0.30 (0.63) |
| Pitch of Sprocket Holes | $P_0$ | 4.00 ± 0.10 (0.16) |
| Distance of Compartment to Sprocket Holes | F | 7.50 ± 0.10 (0.30) |
| | $P_2$ | 2.00 ± 0.05 (0.079) |
| Distance of Compartment to Compartment | $P_1$ | 4.00 ± 0.10 (0.16) |

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




| Profile Details | Conditions |
|---|---|
| **Preheat**<br>- Min Temperature ($T_{SMIN}$)<br>- Max Temperature ($T_{SMAX}$)<br>- Time $T_{SMIN}$ to $T_{SMAX}$ ($t_s$) | <br>150°C<br>200°C<br>60s - 120s |
| **Soldering Zone**<br>- Peak Temperature ($T_P$)<br>- Time at Peak Temperature<br>- Liquidous Temperature ($T_L$)<br>- Time within 5°C of Actual Peak Temperature ($T_P$ – 5°C)<br>- Time maintained above $T_L$ ($t_L$)<br>- Ramp Up Rate ($T_L$ to $T_P$)<br>- Ramp Down Rate ($T_P$ to $T_L$) | <br>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 ($T_{smax}$ to $T_P$) | 3°C/s max |
| Time 25°C to Peak Temperature | 8 minutes max |

ISOCOM COMPONENTS

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