# ISOCOM
## COMPONENTS

## 6N135, 6N136, ICPL4502, ICPL4503

## ELECTRICAL CHARACTERISTICS ($T_A$ = 0°C to 70°C unless otherwise specified)

### INPUT

| Parameter | Symbol | Test Condition | Min | Typ.* | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | $I_F$ = 16mA | | 1.45 | 1.8 | V |
| Reverse Voltage | $V_R$ | $I_R$ = 10µA | 5.0 | | | V |
| Forward Voltage Temperature Coefficient | $\Delta V_F / \Delta T_A$ | $I_F$ = 16mA | | -1.9 | | mV/°C |

### OUTPUT

| Parameter | Symbol | Test Condition | Min | Typ.* | Max | Unit |
|---|---|---|---|---|---|---|
| Logic High Output Current | $I_{OH}$ | $I_F$ = 0mA, $V_O$ = $V_{CC}$ = 5.5V, $T_A$ = 25°C | | 0.001 | 0.5 | µA |
| | | $I_F$ = 0mA, $V_O$ = $V_{CC}$ = 15V, $T_A$ = 25°C | | 0.01 | 1 | |
| | | $I_F$ = 0mA, $V_O$ = $V_{CC}$ = 15V | | | 50 | |
| Logic Low Output Voltage | $V_{OL}$ | 6N135 $I_F$ = 16mA, $I_O$ = 1.1mA, $V_{CC}$ = 4.5V, $T_A$ = 25°C | | 0.18 | 0.4 | V |
| | | $I_F$ = 16mA, $I_O$ = 0.8mA, $V_{CC}$ = 4.5V, | | | 0.5 | |
| | | 6N136 / ICPL4502 / ICPL4503 $I_F$ = 16mA, $I_O$ = 3mA, $V_{CC}$ = 4.5V, $T_A$ = 25°C | | 0.25 | 0.4 | |
| | | $I_F$ = 16mA, $I_O$ = 2.4mA, $V_{CC}$ = 4.5V | | | 0.5 | |
| Logic Low Supply Current | $I_{CCL}$ | $I_F$ = 16mA, $V_O$ = Open, $V_{CC}$ = 15V | | 140 | 200 | µA |
| Logic High Supply Current | $I_{CCH}$ | $I_F$ = 0mA, $V_O$ = Open, $V_{CC}$ = 15V, $T_A$ = 25°C | | 0.01 | 1 | µA |
| | | $I_F$ = 0mA, $V_O$ = Open, $V_{CC}$ = 15V | | | 2 | |

\* Typical values at $T_A$ = 25°C

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## ELECTRICAL CHARACTERISTICS ($T_A$ = 0°C to 70°C unless otherwise specified)

### COUPLED

| Parameter | Symbol | Test Condition | Min | Typ.* | Max | Unit |
|---|---|---|---|---|---|---|
| Current Transfer Ratio | CTR | 6N135 | 7 | | 50 | % |
| | | 6N136 / ICPL4502 / ICPL4503 | 19 | | 50 | |
| | | $I_F$ = 16mA, $V_O$ = 0.4V $V_{CC}$ = 4.5V, $T_A$ = 25°C | | | | |
| | | 6N135 | 5 | | | |
| | | 6N136 / ICPL4502 / ICPL4503 | 15 | | | |
| | | $I_F$ = 16mA, $V_O$ = 0.5V $V_{CC}$ = 4.5V | | | | |

### ISOLATION

| Parameter | Symbol | Test Condition | Min | Typ.* | Max | Unit |
|---|---|---|---|---|---|---|
| Insulation Voltage | $V_{ISO}$ | $T_A$ = 25°C, RH = 40 % to 60%, t = 1 min, | 5000 | | | $V_{RMS}$ |

* Typical values at $T_A$ = 25°C

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 0°C to 70°C unless otherwise specified)

**Switching Characteristics** ($T_A$ = 0°C to 70°C, $I_F$ = 16mA, $V_{CC}$ = 5V unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ.* | Max | Unit |
|---|---|---|---|---|---|---|
| Propagation Delay Time to Logic Low | $T_{PHL}$ | 6N135<br><br>$R_L$ = 4.1kΩ, $T_A$ = 25°C<br>$R_L$ = 4.1kΩ | | 0.35 | 1.5<br>2.0 | µs |
| | | 6N136 / ICPL4502 / ICPL4503<br><br>$R_L$ = 1.9kΩ, $T_A$ = 25°C<br>$R_L$ = 1.9kΩ | | 0.35 | 0.8<br>1.0 | |
| Propagation Delay Time to Logic High | $T_{PLH}$ | 6N135<br><br>$R_L$ = 4.1kΩ, $T_A$ = 25°C<br>$R_L$ = 4.1kΩ | | 0.5 | 1.5<br>2.0 | µs |
| | | 6N136 / ICPL4502 / ICPL4503<br><br>$R_L$ = 1.9kΩ, $T_A$ = 25°C<br>$R_L$ = 1.9kΩ | | 0.3 | 0.8<br>1.0 | |
| Common Mode Transient Immunity at Logic High | $CM_H$ | 6N135<br><br>$I_F$ = 0mA, $V_{CM}$ = 10Vp-p,<br>$R_L$ = 4.1kΩ, $T_A$ = 25°C | 1000 | | | V/µs |
| | | 6N136 / ICPL4502<br><br>$I_F$ = 0mA, $V_{CM}$ = 10Vp-p,<br>$R_L$ = 1.9kΩ, $T_A$ = 25°C | 1000 | | | |
| | | ICPL4503<br><br>$I_F$ = 0mA, $V_{CM}$ = 1500Vp-p,<br>$R_L$ = 1.9kΩ, $T_A$ = 25°C | 15000 | 20000 | | |
| Common Mode Transient Immunity at Logic Low | $CM_L$ | 6N135<br><br>$I_F$ = 16mA, $V_{CM}$ = 10Vp-p,<br>$R_L$ = 4.1kΩ, $T_A$ = 25°C | 1000 | | | V/µs |
| | | 6N136 / ICPL4502<br><br>$I_F$ = 16mA, $V_{CM}$ = 10Vp-p,<br>$R_L$ = 1.9kΩ, $T_A$ = 25°C | 1000 | | | |
| | | ICPL4503<br><br>$I_F$ = 16mA, $V_{CM}$ = 1500Vp-p,<br>$R_L$ = 1.9kΩ, $T_A$ = 25°C | 15000 | 20000 | | |

* Typical values at $T_A$ = 25°C
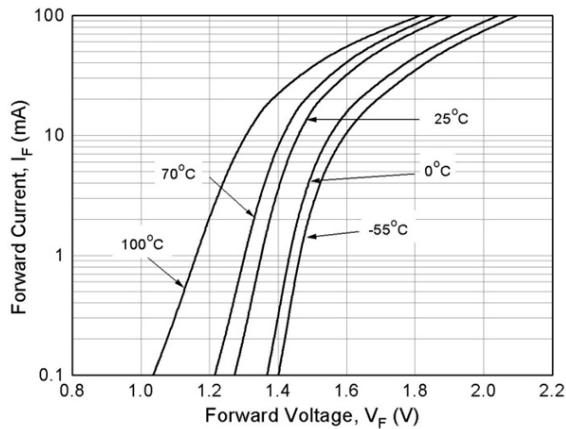
Fig 1  Forward Current vs Forward Voltage


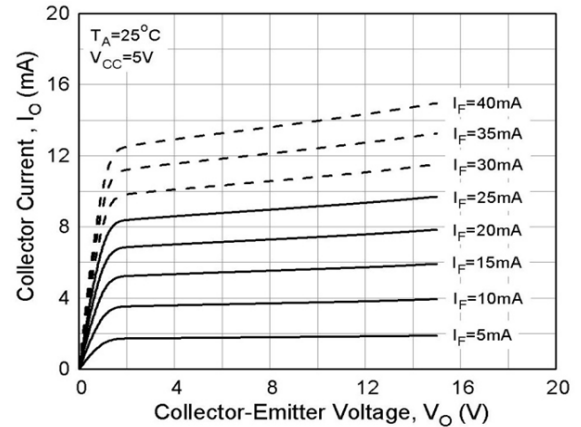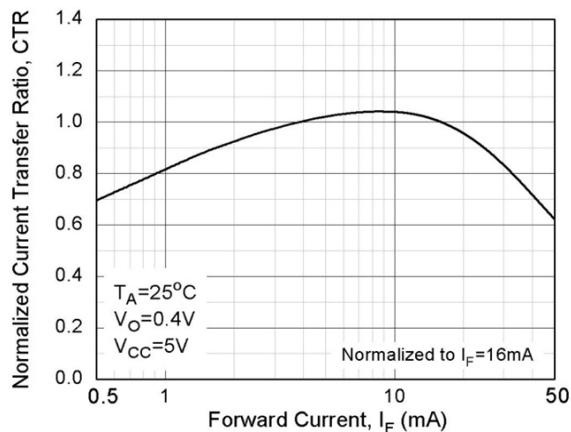
Fig 2  Output Current vs Output Voltage
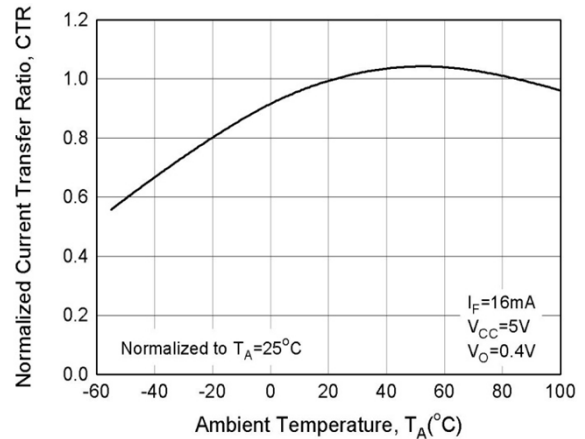


Fig 3  Normalized CTR vs Forward Current
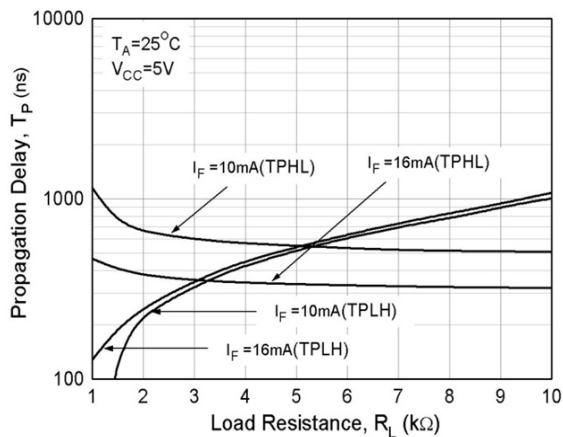


Fig 4  Normalized CTR vs $T_A$



Fig 5  Propagation Delay vs Load Resistance
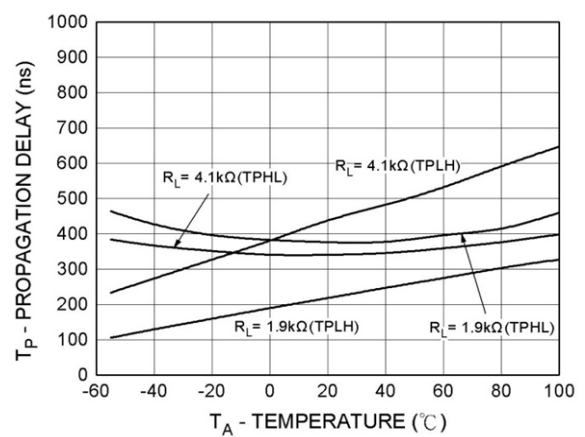


Fig 6  Propagation Delay vs $T_A$
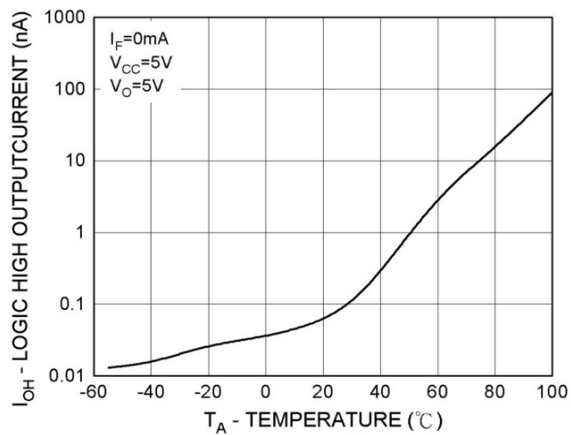
**Fig 7  Logic High Output Current vs T$_A$**
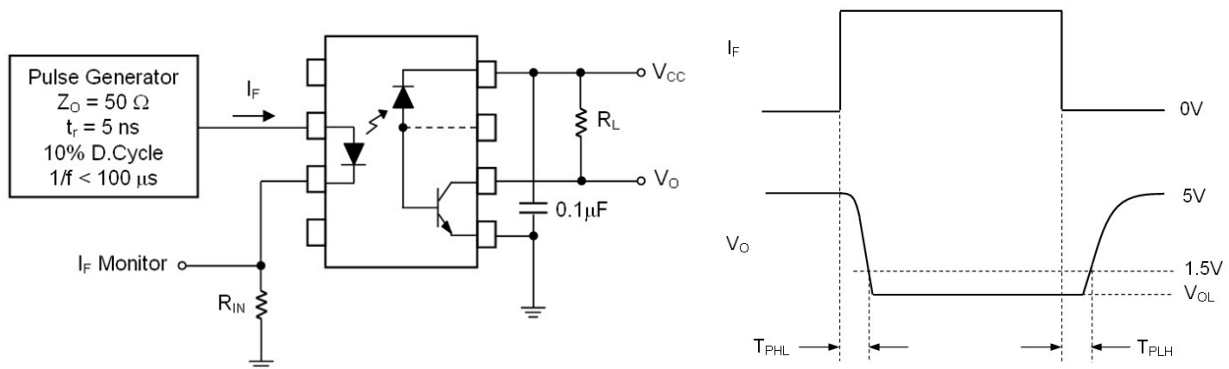


**Switching Time Test Circuit**
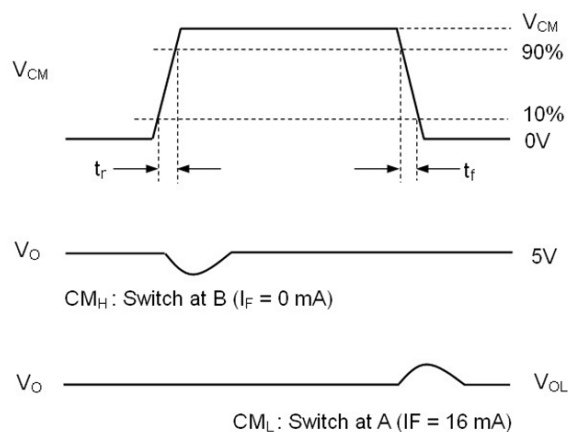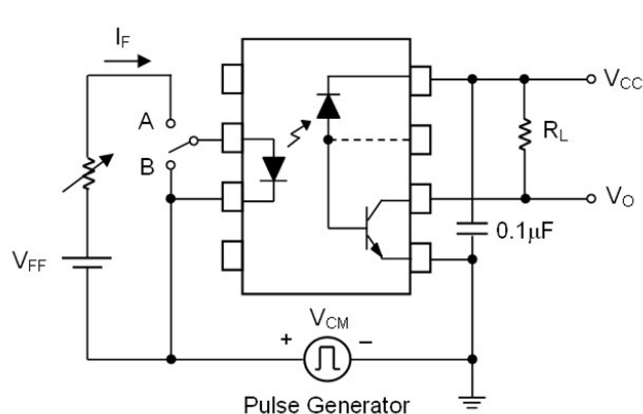
**Common Mode Transient Immunity Test Circuit**

## Note:

Common mode transient immunity in logic high level is the maximum tolerable (positive) $dV_{CM}/dt$ on the leading edge of the common mode pulse signal $V_{CM}$, to assure that the output will remain in a logic high state (i.e., $V_O > 2.0V$).

Common mode transient immunity in logic low level is the maximum tolerable (negative) $dV_{CM}/dt$ on the trailing edge of the common mode pulse signal, $V_{CM}$, to assure that the output will remain in a logic low state (i.e., $V_O < 0.8V$).
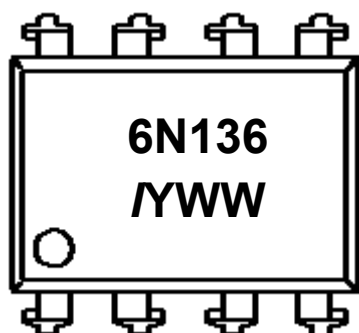
# ISOCOM
## COMPONENTS

## 6N135, 6N136, ICPL4502, ICPL4503

### ORDER INFORMATION

| 6N135, 6N136, ICPL4502, ICPL4503 (UL Approval) | | | |
|---|---|---|---|
| After PN | PN | Description | Packing quantity |
| None | 6N135, 6N136, ICPL4502, ICPL4503 | Standard Dip8 | 45 pcs per tube |
| G | 6N135G, 6N136G, ICPL4502G, ICPL4503G | 10mm Lead Spacing | 45 pcs per tube |
| SM | 6N135SM, 6N136SM, ICPL4502SM, ICPL4503SM | Surface Mount | 45 pcs per reel |
| SMT&R | 6N135SMT&R, 6N136SMT&R, ICPL4502SMT&R, ICPL4503SMT&R | Surface Mount Tape & Reel | 1000 pcs per reel |

| 6N135V, 6N136V (UL and VDE Approvals) | | | |
|---|---|---|---|
| After PN | PN | Description | Packing quantity |
| None | 6N135V, 6N136V | Standard Dip8 | 45 pcs per tube |
| G | 6N135VG, 6N136VG | 10mm Lead Spacing | 45 pcs per tube |
| SM | 6N135VSM, 6N136VSM | Surface Mount | 45 pcs per reel |
| SMT&R | 6N135VSMT&R, 6N136VSMT&R | Surface Mount Tape & Reel | 1000 pcs per reel |

### DEVICE MARKING (Example : 6N136)

**6N136**
*I*YWW

| | |
|---|---|
| 6N136 | denotes Device Part Number |
| Y | denotes 1 digit Year code |
| WW | denotes 2 digit Week code |
| *I* | denoted Isocom |

## PACKAGE DIMENSIONS (mm)

**DIP**

6.60 ±0.30

9.76 ±0.30

7.62
TYP.

0.25    5°~15°

4.50±0.30

0.50 ±0.10

2.54
TYP.

**G-Form**

6.60±0.30

9.76±0.30

7.62
TYP.

0.25

10.16
TYP.

4.50±0.30

0.50 ±0.10

2.54
TYP.

**ISOCOM**
→■ ■ ■■
COMPONENTS

## PACKAGE DIMENSIONS (mm)

**SMD**

6.60 ±0.30

1.30

9.76 ±0.30

7.62
TYP.

0.25

0.6MIN

10.30 MAX

3.50 ±0.30
4.30 ±0.30

2.54
TYP.
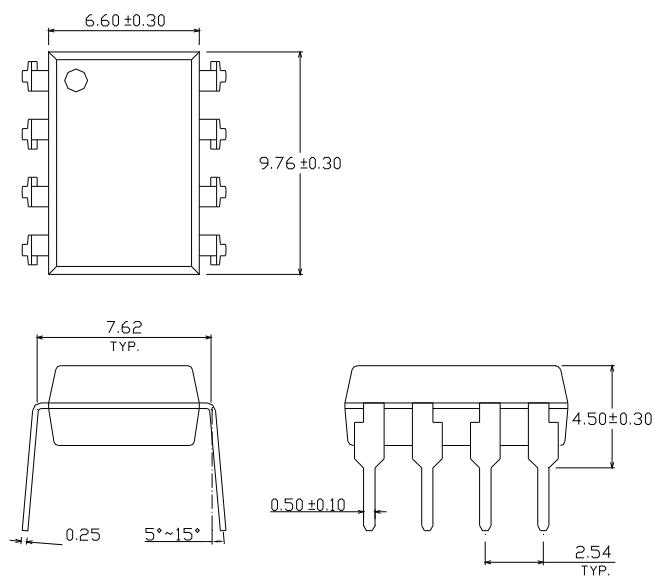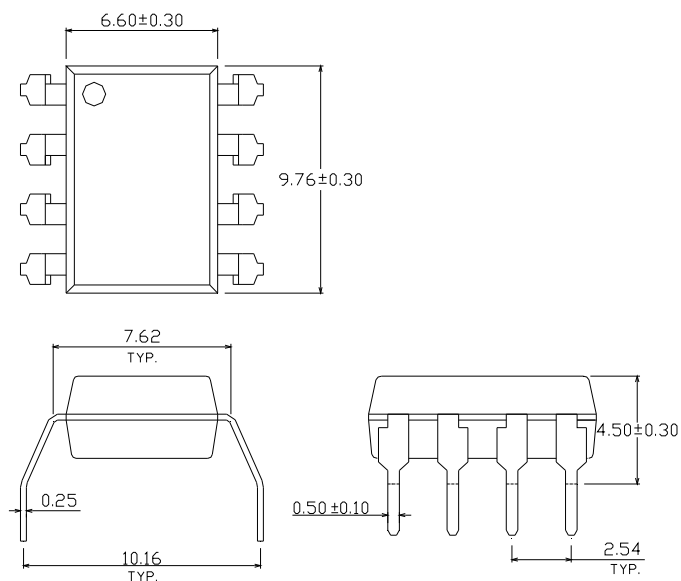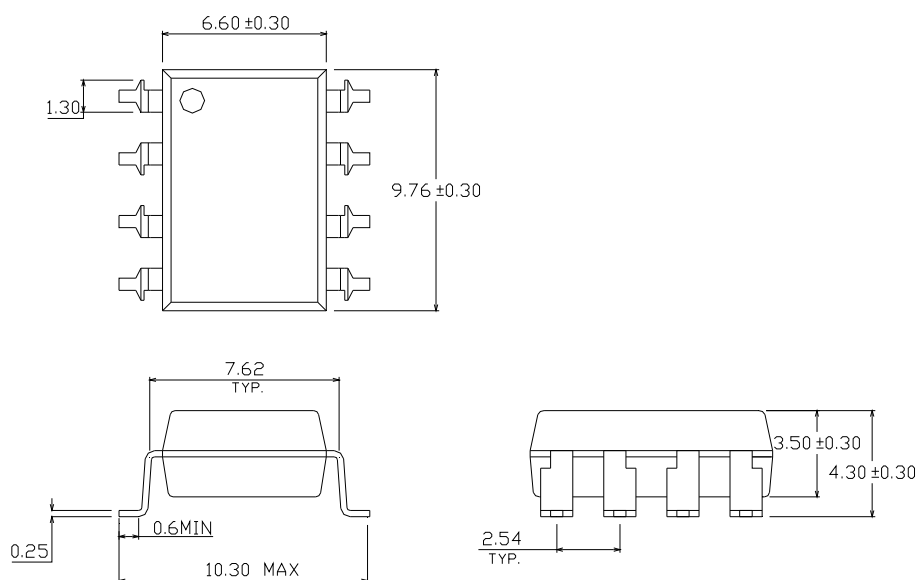
## RECOMMENDED PAD LAYOUT FOR SMD (mm)

1.52

2.54

0.76

1.78

7.75

10.79

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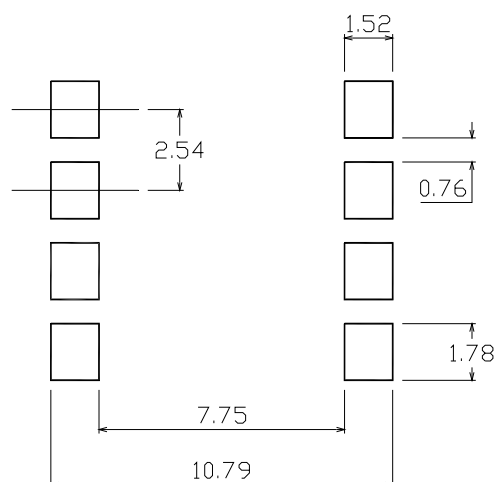
## TAPE AND REEL PACKAGING
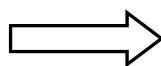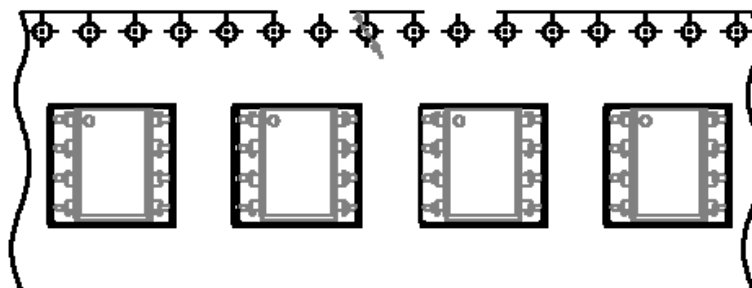


**Direction of feed from reel**
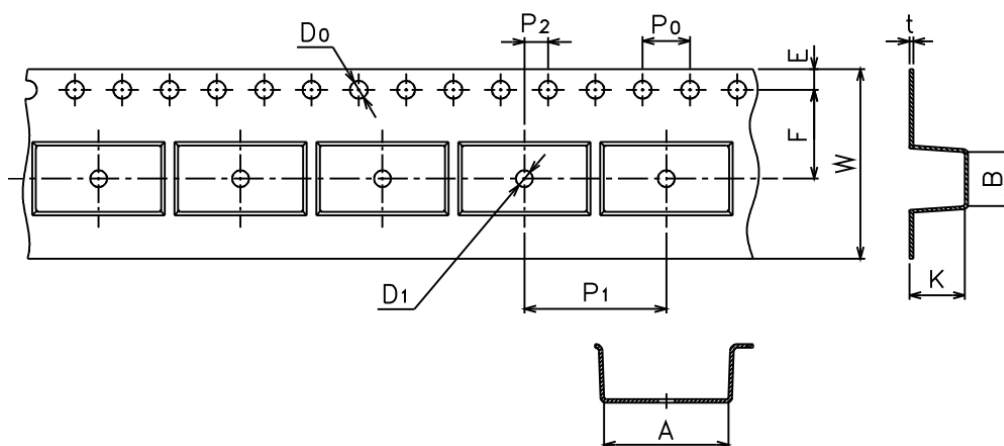


| Dimension No. | A | B | D₀ | D₁ | E | F |
|---|---|---|---|---|---|---|
| Dimension( mm) | 10.4±0.1 | 10.0±0.1 | 1.5±0.1 | 1.5±0.1 | 1.75±0.1 | 7.5±0.1 |
| Dimension No. | P₀ | P₁ | P₂ | t | W | K |
| Dimension (mm) | 4.0±0.1 | 12.0±0.1 | 2.0±0.1 | 0.4±0.1 | 16.0 ±0.3 / -0.1 | 4.5±0.1 |

## 6N135, 6N136, ICPL4502, ICPL4503

**REFLOW SOLDERING TEMPERATURE PROFILE**

**(One Time Reflow Soldering is Recommended)**
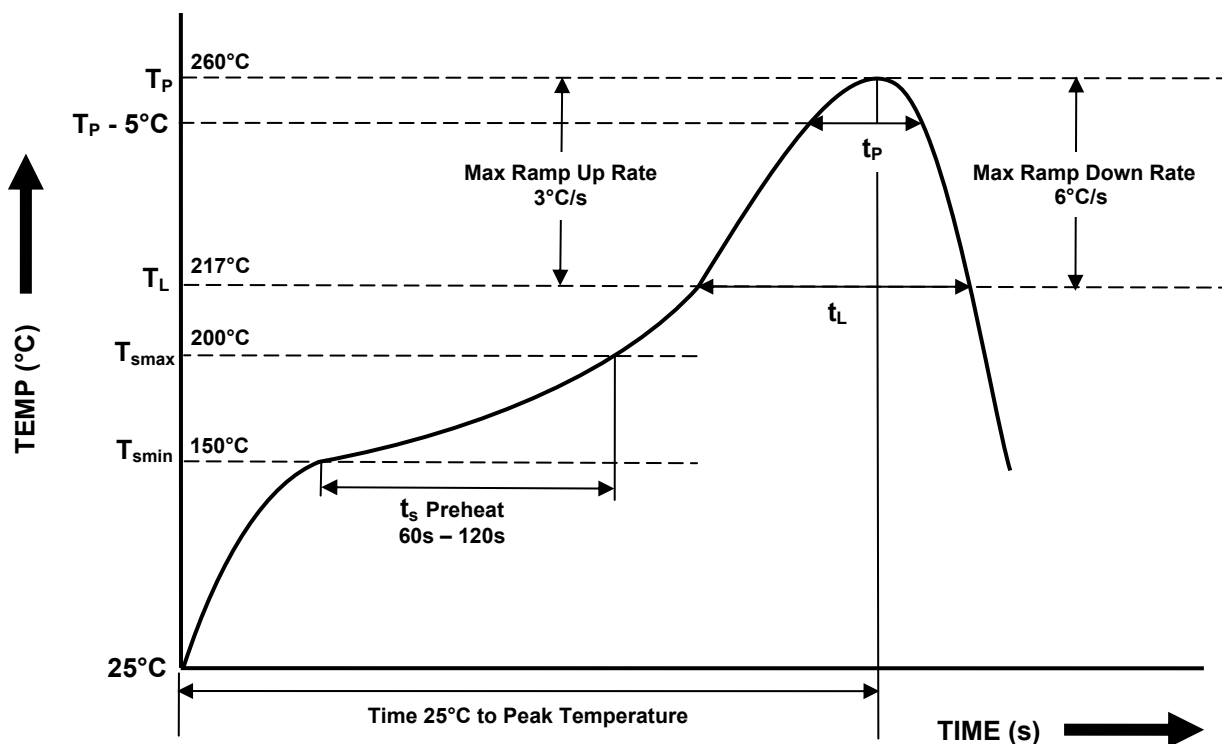


| Profile Details | Conditions |
|---|---|
| **Preheat**<br>  - Min Temperature ($T_{SMIN}$)<br>  - Max Temperature ($T_{SMAX}$)<br>  - Time $T_{SMIN}$ to $T_{SMAX}$ ($t_s$) | 150°C<br>200°C<br>60s - 120s |
| **Soldering Zone**<br>  - Peak Temperature ($T_P$)<br>  - Liquidous Temperature ($T_L$)<br>  - 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 $T_L$) | 260°C<br>217°C<br>30s<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 |
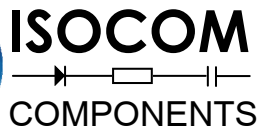
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- Do not immerse device body in solder paste.

# ISOCOM
## COMPONENTS

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