# Photocoupler
# CNY17-1 THRU CNY17-4 SERIES

## 1. DESCRIPTION

### 1.1 Features

- Current transfer ratio (CTR : MIN. 40% at $I_F$ = 10mA, $V_{CE}$ = 5V)
- High collector-emitter voltage
  $V_{CEO}$ = 70V
- High input-output isolation voltage
  Viso = 5,000Vrms
- Response time (tr : TYP. 5μs at VCE = 10V, IC = 2mA, RL = 100Ω)
- Dual-in-line package:
  CNY17-1, CNY17-2, CNY17-3, CNY17-4
- Wide lead spacing package:
  CNY17-1M, CNY17-2M, CNY17-3M, CNY17-4M
- Surface mounting package:
  CNY17-1S, CNY17-2S, CNY17-3S, CNY17-4S
- Tape and reel packaging:
  CNY17-1S-TA, CNY17-2S-TA, CNY17-3S-TA, CNY17-4S-TA
  CNY17-1S-TA1, CNY17-2S-TA1, CNY17-3S-TA1, CNY17-4S-TA1
- Safety approval
  * UL approved
  * cUL approved
  * CSA approved
  * DEMKO approved
  * VDE approved
  * CQC approved
- Creepage distance > 8.0 mm ; Clearance > 8.0 mm
- The relevant models are the models Approved by VDE according to DIN EN 60747-5-5
  Approved Model No.: CNY17-1-V, CNY17-2-V, CNY17-3-V, CNY17-4-V
  CNY17-1M-V, CNY17-2M-V, CNY17-3M-V, CNY17-4M-V
  CNY17-1S-V, CNY17-2S-V, CNY17-3S-V, CNY17-4S-V
  CNY17-1S-TA-V, CNY17-2S-TA-V, CNY17-3S-TA-V, CNY17-4S-TA-V
  CNY17-1S-TA1-V, CNY17-2S-TA1-V, CNY17-3S-TA1-V, CNY17-4S-TA1-V
- Operating isolation voltage VIORM : 850V (Peak)
- Transient voltage VTR : 6000V (Peak)
- Pollution : 2 (According to VDE 0110-1 : 1997-04)
- Clearances distance (Between input and output) : 7.0mm (MIN.)
- Creepage distance (Between input and output) : 7.0mm (MIN.)
- Isolation thickness between input and output : 0.4mm (MIN.)



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- Safety limit values Current (Isi) : 400mA (Diode side)
  Power (Psi) : 700mW (Phototransistor side)
  Temperature(Tsi) : 175ºC
  In order to keep safety electric isolation of photocoupler, please set the protective circuit to keep within safety limit values when the actual application equipment troubled.
- Indication of VDE approval prints " " on sleeve package.
- RoHS Compliance
  All materials be used in device are followed EU RoHS directive (No.2002/95/EC, 2011/65/EU, and 2015/863).
- MSL class1

## 1.2 Applications

- Power Supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance Sensor Systems
- Industrial Controls



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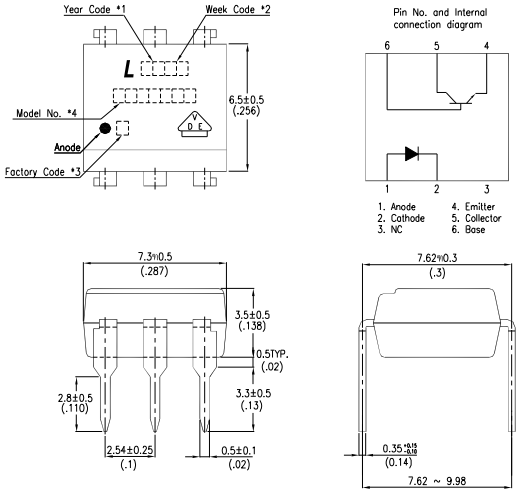
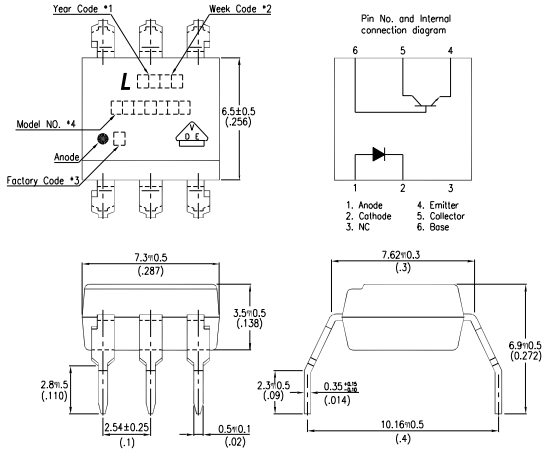
## 2. PACKAGE DIMENSIONS

### 2.1 CNY17-1, CNY17-2, CNY17-3, CNY17-4 :




### 2.2 CNY17-1M, CNY17-2M, CNY17-3M, CNY17-4M :




**Notes :**

1. 2-digit year code, example : 2016 = 16
2. 2-digit work week ranging from ‘01’ to ‘53’
3. Factory identification mark shall be marked (Y: Thailand, W: China-CZ, X: China-TJ).
4. Model No.: CNY17-1, CNY17-2, CNY17-3, CNY17-4



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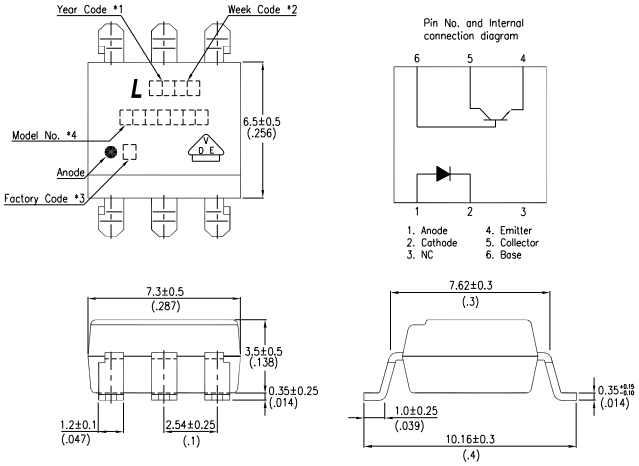
## 2.3 CNY17-1S, CNY17-2S, CNY17-3S, CNY17-4S :




**Notes :**

1. 2-digit year code, example : 2016 = 16
2. 2-digit work week ranging from ‘01’ to ‘53’
3. Factory identification mark shall be marked (Y: Thailand, W: China-CZ, X: China-TJ).
4. Model No.: CNY17-1, CNY17-2, CNY17-3, CNY17-4



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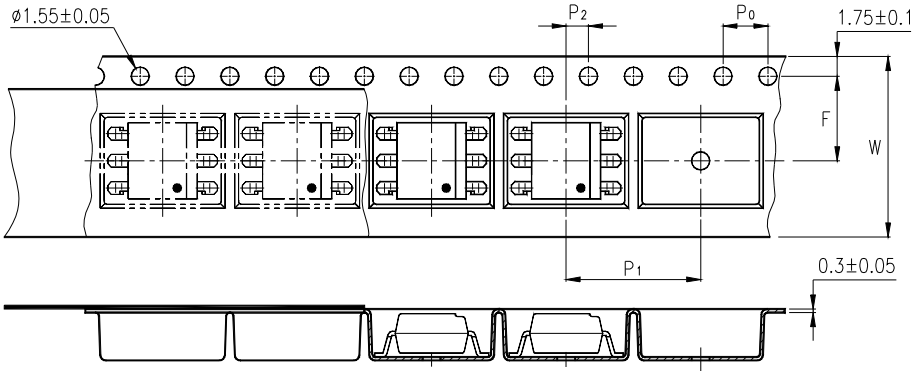
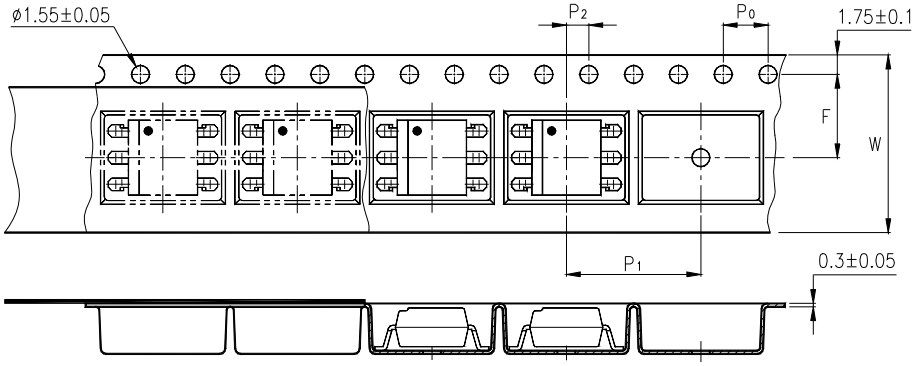
## 2. TAPING DIMENSIONS

### CNY17-1S-TA, CNY17-2S-TA, CNY17-3S-TA, CNY17-4S-TA :




### CNY17-1S-TA1, CNY17-2S-TA1, CNY17-3S-TA1, CNY17-4S-TA1 :




| Description | Symbol | Dimension in mm (inch) |
|---|---|---|
| Tape wide | W | 16±0.3 (0.63) |
| Pitch of sprocket holes | $P_0$ | 4±0.1 (0.15) |
| Distance of compartment | F | 7.5±0.1 (0.295) |
| | $P_2$ | 2±0.1 (0.079) |
| Distance of compartment to compartment | $P_1$ | 12±0.1 (0.472) |

| Package Type | TA/TA1 |
|---|---|
| Quantities (pcs) | 1000 |



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# 4. RATING AND CHARACTERISTICS

## 4.1 Absolute Maximum Ratings at Ta=25℃

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Input | Forward Current | $I_F$ | 60 | mA |
| | Reverse Voltage | $V_R$ | 6 | V |
| | Power Dissipation | P | 100 | mW |
| | Junction Temperature | $T_J$ | 125 | °C |
| Output | Collector - Emitter Voltage | $V_{CEO}$ | 70 | V |
| | Emitter - Collector Voltage | $V_{ECO}$ | 7 | V |
| | Collector - Base Voltage | $V_{CBO}$ | 70 | V |
| | Collector Current | $I_C$ | 150 | mA |
| | Collector Power Dissipation | $P_C$ | 150 | mW |
| Total Power Dissipation | | $P_{tot}$ | 250 | mW |
| *1 Isolation Voltage | | $V_{iso}$ | 5000 | $V_{rms}$ |
| Operating Temperature | | $T_{opr}$ | -55 ~ +100 | °C |
| Storage Temperature | | $T_{stg}$ | -55 ~ +150 | °C |
| *2 Soldering Temperature | | $T_{sol}$ | 260 | °C |

*1. AC For 1 Minute, R.H. = 40 ~ 60%

Isolation voltage shall be measured using the following method.

(1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side.

(2) The isolation voltage tester with zero-cross circuit shall be used.

(3) The waveform of applied voltage shall be a sine wave.

*2. For 10 Seconds



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## 4.2 ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25℃

| PARAMETER | | | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|---|---|---|---|---|---|---|---|---|
| INPUT | Forward Voltage | | VF | — | 1.45 | 1.65 | V | IF=60mA |
| | Reverse Current | | IR | — | — | 10 | μA | VR=6V |
| | Terminal Capacitance | | Ct | — | — | 100 | pF | V=0, f=1KHz |
| OUTPUT | Collector Dark Current | | ICEO | — | — | 50 | nA | VCE=10V, IF=0 |
| | Collector-Emitter Breakdown Voltage | | BVCEO | 70 | — | — | V | IC=0.1mA IF=0 |
| | Emitter-Collector Breakdown Voltage | | BVECO | 7 | — | — | V | IE=10μA IF=0 |
| | Collector-Base Breakdown Voltage | | BVCBO | 70 | — | — | V | IC=0.1mA IF=0 |
| TRANSFER CHARACTERISTICS | *Transfer Ratio Current | CNY17-1 | CTR | 40 | — | 80 | % | IF=10mA VCE=5V |
| | | CNY17-2 | | 63 | | 125 | | |
| | | CNY17-3 | | 100 | | 200 | | |
| | | CNY17-4 | | 160 | — | 320 | | |
| | Collector-Emitter Saturation Voltage | | VCE(sat) | — | — | 0.3 | V | IF=10mA IC=2.5mA |
| | Isolation Resistance | | Riso | 100 | — | — | GΩ | DC500V 40 ~ 60% R.H. |
| | Floating Capacitance | | Cf | — | — | 2 | pF | V=0, f=1MHz |
| | Response Time (Rise) | | tr | — | 5 | 10 | μs | VCE=10V, IC=2mA RL=100Ω |
| | Response Time (Fall) | | tf | — | 5 | 10 | μs | |

$$*CTR = \frac{I_C}{I_F} \times 100\%$$



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### 4.3 ISOLATION SPECIFICATION ACCORDING TO VDE

| Parameter | | Symbol | Conditions | Rating | Unit | Remark |
|---|---|---|---|---|---|---|
| Class of environmental test | | - | DIN IEC68 | 55/100/21 | - | |
| Pollution | | - | DIN VDE0110 | 2 | - | |
| Maximum Operating Isolation Voltage | | $V_{IORM}$ | - | 850 | $V_{PEAK}$ | |
| Partial Discharge Test Voltage (Between Input and Output) | Diagram 1 | Vpr | tp=60s, qc<5pC | 1275 | $V_{PEAK}$ | Refer to the Diagram 1, 2 |
| | Diagram 2 | | tp=1s, qc<5pC | 1594 | $V_{PEAK}$ | |
| Maximum Over-voltage | | $V_{INITIAL}$ | $t_{INI}$ = 10s | 6000 | $V_{PEAK}$ | |
| Safety Maximum Ratings | | | | | | Refer to the Figure 1, 3 |
| 1) Case Temperature | | Tsi | $I_F$ = 0, Pc = 0 | 175 | °C | |
| 2) Input Current | | Isi | Pc=0 | 400 | mA | |
| 3) Electric Power (Output or Total Power Dissipation) | | Psi | - | 700 | mW | |
| Isolation Resistance (Test Voltage Between Input and Output : DC500V) | | $R_{ISO}$ | Ta=Tsi | MIN.$10^9$ | Ω | |
| | | | Ta=Topr(MAX.) | MIN.$10^{11}$ | | |
| | | | Ta=25 °C | MIN.$10^{12}$ | | |

Precautions in performing isolation test

* Partial discharge test methods shall be the ones according to the specifications of DIN EN 60747-5-5

* Please don't carry out isolation test (Viso) over $V_{INITIAL}$ ,This product deteriorates isolation characteristics by partial discharge due to applying high voltage (ex. $V_{INITIAL}$ ). And there is possibility that this product occurs partial discharge in operating isolation voltage ($V_{IORM}$)



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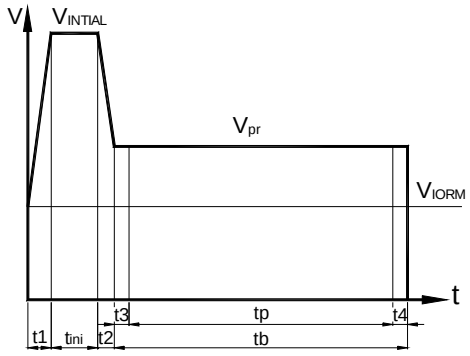
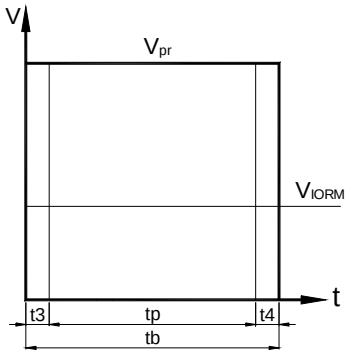
## 4.4 PARTIAL DISCHARGE TEST METHOD

Method (A) for type testing and random testing.




t1, t2 = 1 to 10s
t3, t4 = 1s
tp (Partial Discharge Measuring Time)= 60s
tb = 62s
tini = 10s

Method (B) for routine testing.




t3, t4 = 0.1s
tp (Partial Discharge Measuring Time)= 1s
tb = 1.2s

The partial discharge level shall not exceed 5 pc during the partial discharge measuring time interval $t_p$ under the test conditions shown above.



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## 5. CHARACTERISTICS CURVES

Fig.1 Forward Current vs. Ambient Temperature

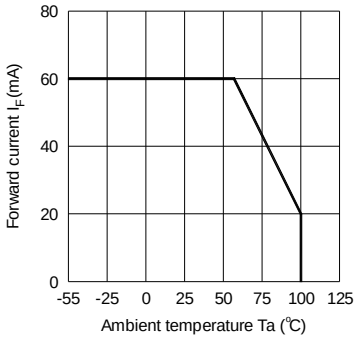


Fig.2 Collector Power Dissipation vs. Ambient Temperature

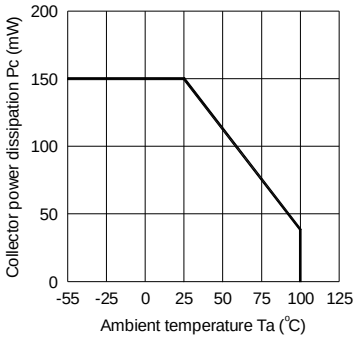


Fig.3 Collector-emitter Saturation Voltage vs. Forward Current

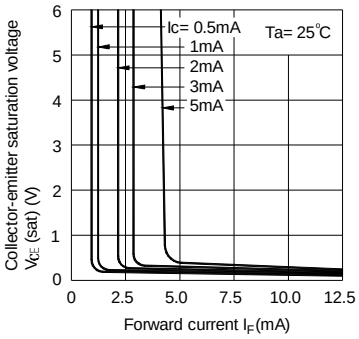


Fig.4 Forward Current vs. Forward Voltage

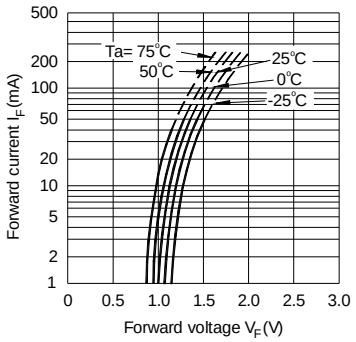


Fig.5 Current Transfer Ratio vs. Forward Current

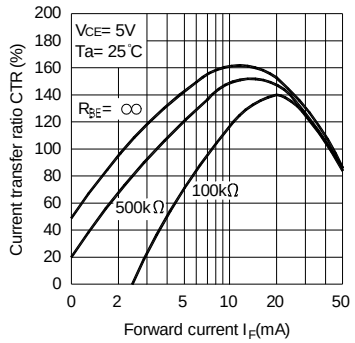


Fig.6 Collector Current vs. Collector-emitter Voltage

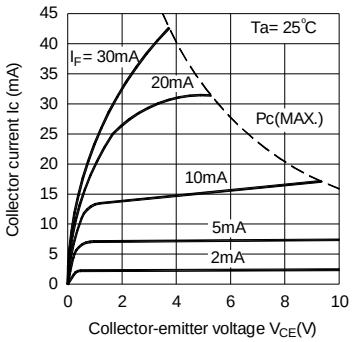




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Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

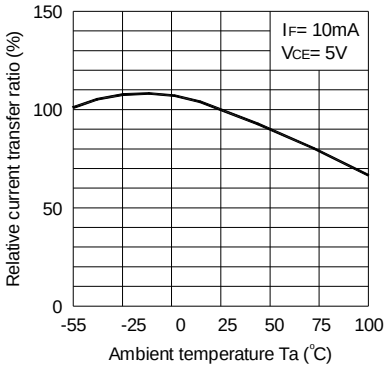



Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

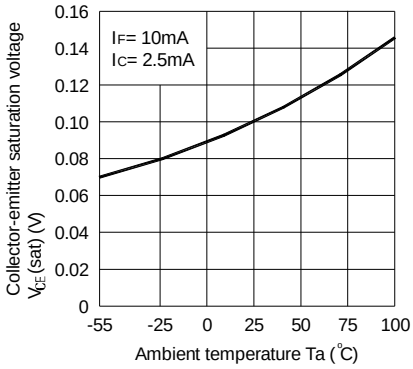



Fig.9 Collector Dark Current vs. Ambient Temperature

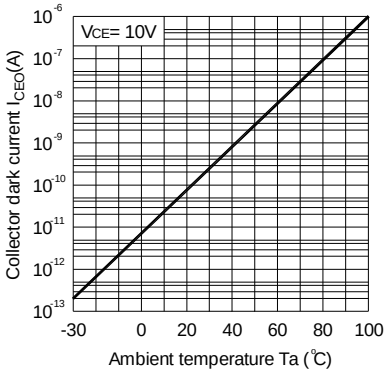



Fig.10 Response Time vs. Load Resistance

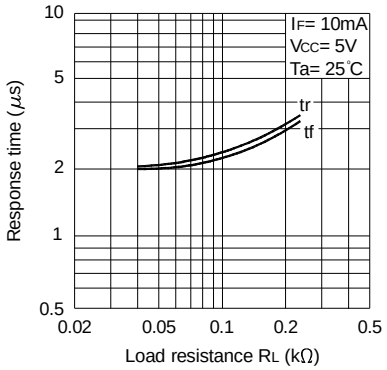
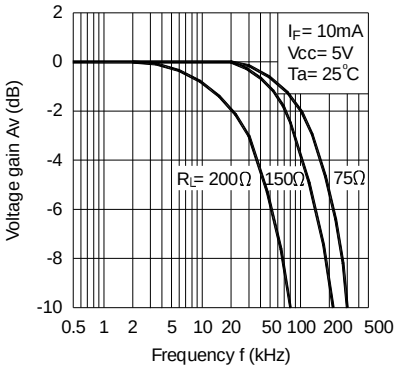
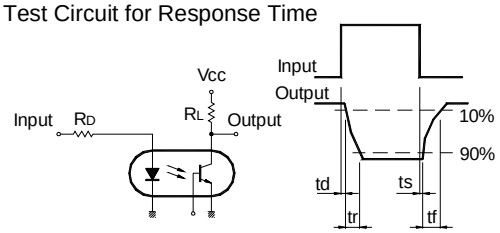


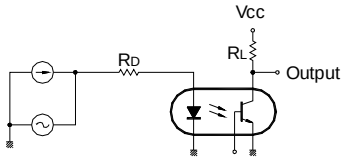

Fig.11 Frequency Response




Test Circuit for Response Time




Test Circuit for Frequency Response



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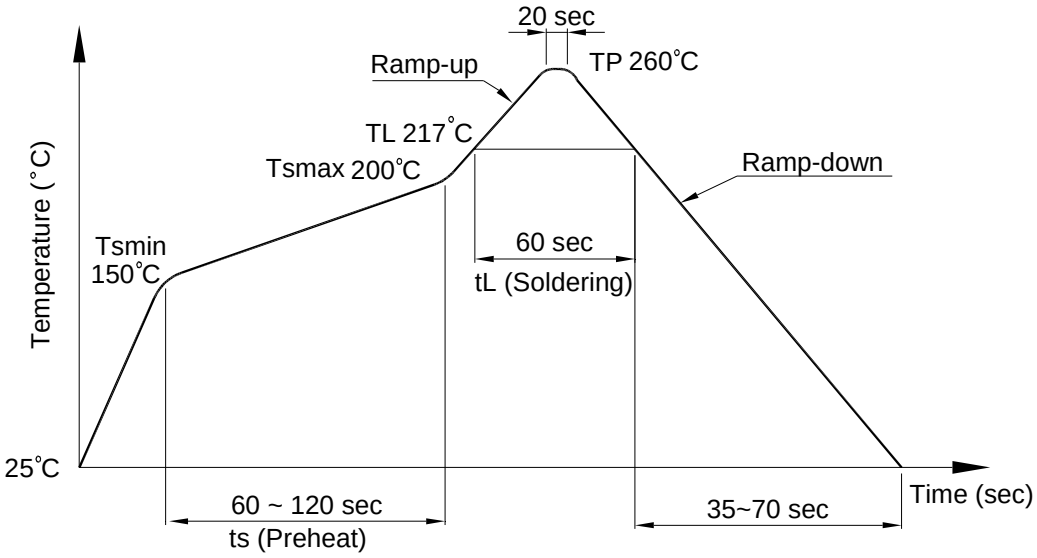
## 6. TEMPERATURE PROFILE OF SOLDERING

### 6.1 IR Reflow soldering (JEDEC-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

| Profile item | Conditions |
|---|---|
| Preheat | |
| - Temperature Min ($T_{Smin}$) | 150˚C |
| - Temperature Max ($T_{Smax}$) | 200˚C |
| - Time (min to max) (ts) | 90±30 sec |
| Soldering zone | |
| - Temperature ($T_L$) | 217˚C |
| - Time ($t_L$) | 60 sec |
| Peak Temperature ($T_P$) | 260˚C |
| Ramp-up rate | 3˚C / sec max. |
| Ramp-down rate | 3~6˚C / sec |



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### 6.2 Wave soldering (JEDEC22A111 compliant)

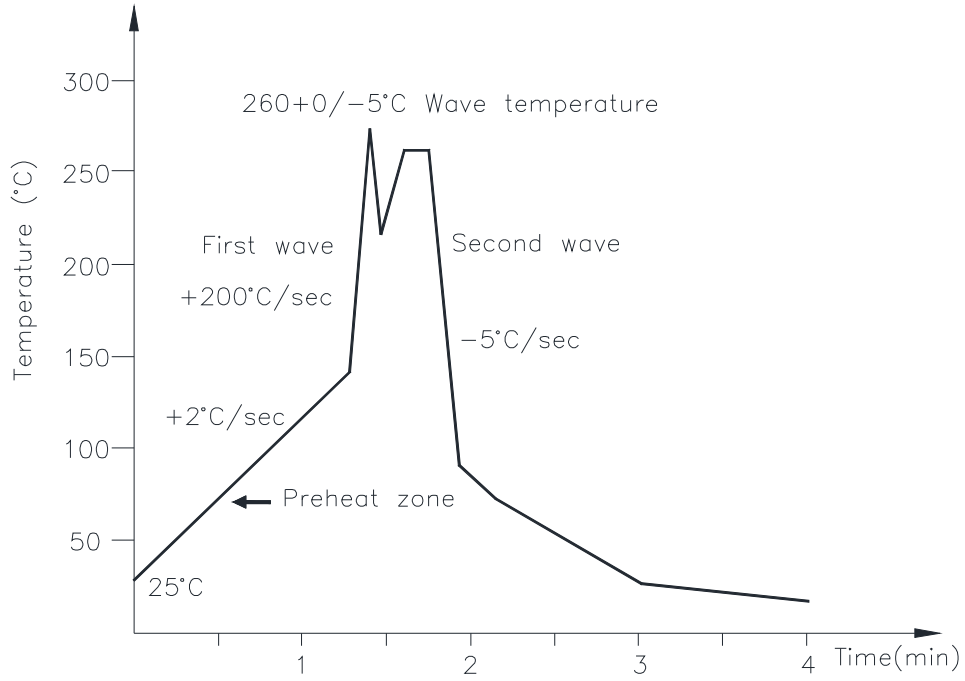
One time soldering is recommended within the condition of temperature.

Temperature: 260+0/-5˚C

Time: 10 sec.

Preheat temperature:25 to 140˚C

Preheat time: 30 to 80 sec.




### 6.3 Hand soldering by soldering iron

Allow single lead soldering in every single process. One time soldering is recommended.

Temperature: 380+0/-5˚C

Time: 3 sec max.



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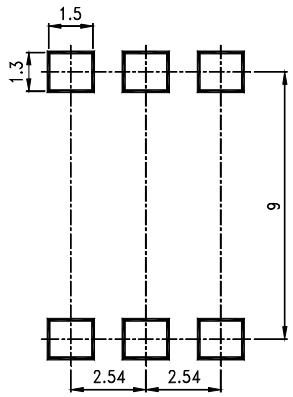
## 7. RECOMMENDED FOOT PRINT PATTERNS (MOUNT PAD)

Unit: mm




## 8. NAMING RULE

CNY17-X(1)-(2)

DEVICE PART NUMBER

(1) No suffix = Dual-in-Line package
M = Wide lead spacing package
S = Surface mounting package

(2) TAPING TYPE (TA, TA1 or none)
Please refer to orientation of taping on Page P5

CNY17-X(1)-(2)-V

DEVICE PART NUMBER

(1) No suffix = Dual-in-Line package
M = Wide lead spacing package
S = Surface mounting package

(2) TAPING TYPE (TA, TA1 or none)
Please refer to orientation of taping on Page P5

(3) VDE Option



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## 9. NOTES

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- When requiring a device for any “specific” application, please contact our sales in advice.
- If there are any questions about the contents of this publication, please contact us at your convenience.
- The contents described herein are subject to change without prior notice.
- Immerge unit’s body in solder paste is not recommended.



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