

## Photocoupler LTV-816-AB series

### 1. DESCRIPTION

#### 1.1 Features

- Current transfer ratio ( CTR : MIN. 50% at  $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$  )
- High input-output isolation voltage (  $V_{iso} = 5,000\text{Vrms}$  )
- Response time (  $t_r$  : TYP.  $4\mu\text{s}$  at  $V_{CE} = 2\text{V}$ ,  $I_C = 2\text{mA}$ ,  $R_L = 100\Omega$  )
- Dual-in-line package :
  - LTV-816-AB : 1-channel type
- Wide lead spacing package :
  - LTV-816M-AB : 1-channel type
- Surface mounting package :
  - LTV-816S-AB : 1-channel type
  - LTV-816S1-AB : 1-channel type
  - LTV-816S2-AB : 1-channel type
- Tape and reel packaging :
  - LTV-816S-TA-AB : 1-channel type
  - LTV-816S-TA1-AB : 1-channel type
  - LTV-816S-TP-AB : 1-channel type
  - LTV-816S1-TA-AB : 1-channel type
  - LTV-816S1-TA1-AB : 1-channel type
  - LTV-816S1-TP-AB : 1-channel type
  - LTV-816S2-TP-AB : 1-channel type
  - LTV-816S2-TP1-AB : 1-channel type
- Safety approval
  - UL 1577
  - VDE DIN EN60747-5-5 (VDE 0884-5)
  - CSA CA5A
  - CQC GB4943.1-2011/ GB8898-2011 (meet Altitude up to 5000m)
  - Nordic Safety ( FIMKO/NEMKO/SEMKO/DEMKO)
- Halogen Free
- RoHS Compliance
  - All materials be used in device are followed EU RoHS directive (No.2002/95/EC).
- ESD pass HBM 8000V/MM2000V
- MSL class1

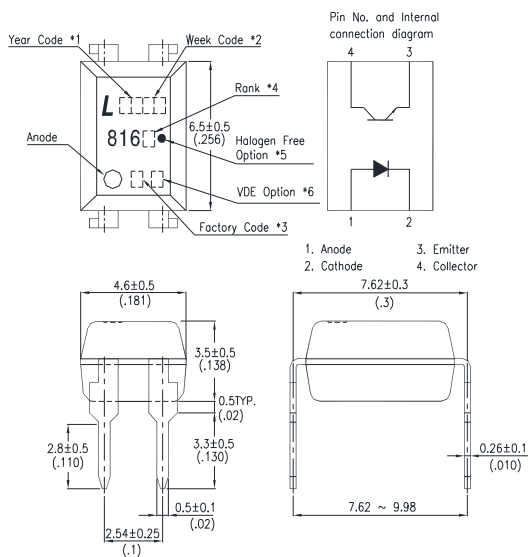
#### 1.2 Applications

- Hybrid substrates that require high density mounting.
- Programmable controllers

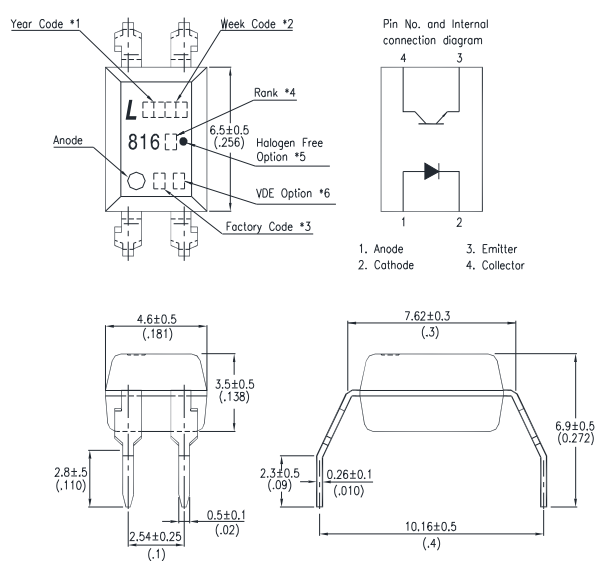
## Photocoupler LTV-816-AB series

### 2. PACKAGE DIMENSIONS

#### 2.1 LTV-816-AB



#### 2.2 LTV-816M-AB



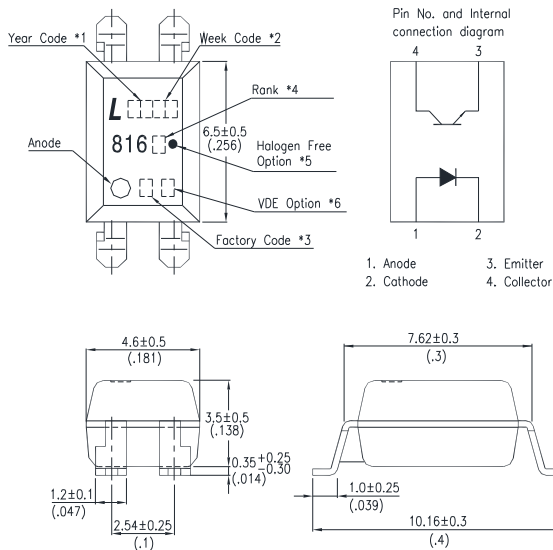
#### Notes :

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 (W:  
China-CZ, Y: Thailand)
4. Rank shall be or shall not be marked.
5. "●" for halogen free option.
6. "4" or "V" for VDE option.

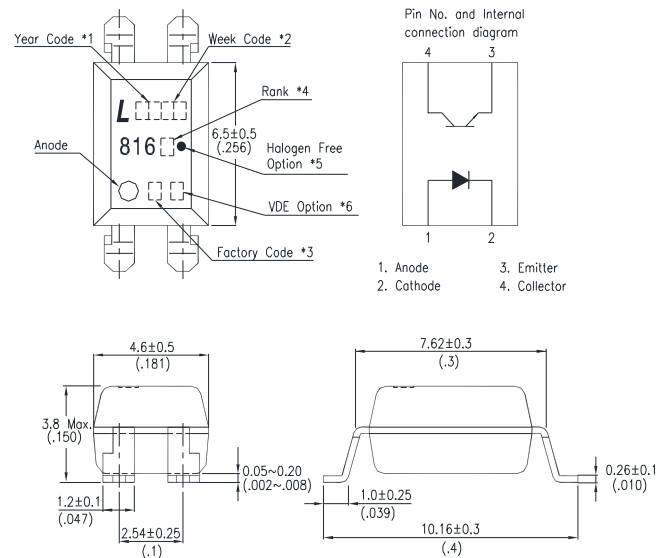
\* Dimensions are in Millimeters and (Inches).

## Photocoupler LTV-816-AB series

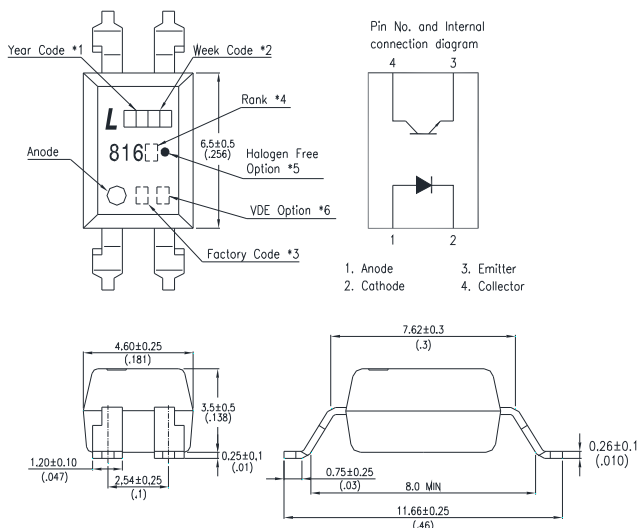
### 2.3 LTV-816S-AB



### 2.4 LTV-816S1-AB



### 2.5 LTV-816S2-AB



#### Notes :

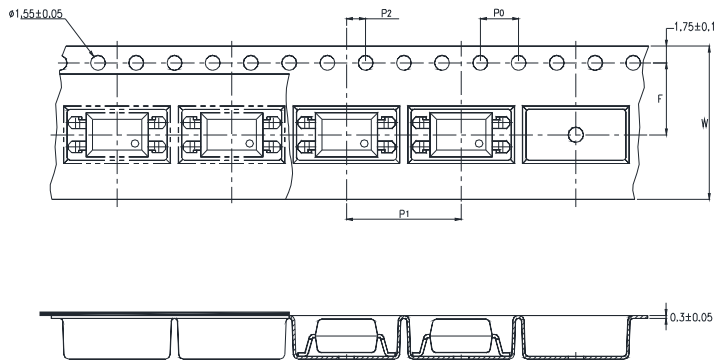
- 2-digit year code, example : 2016 = 16
- 2-digit work week ranging from '01' to '53'
- Factory identification mark shall be marked (W: China-CZ, Y: Thailand)
- Rank shall be or shall not be marked.
- "●" for halogen free option.
- "4" or "V" for VDE option.

\* Dimensions are in Millimeters and (Inches).

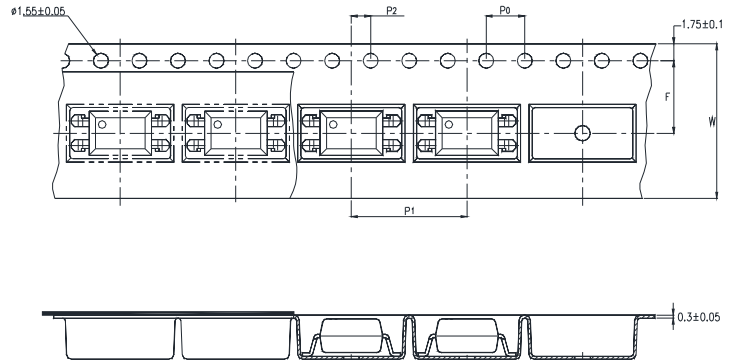
## Photocoupler LTV-816-AB series

### 3. TAPING DIMENSIONS

#### 3.1 LTV-816S-TA / LTV-816S1-TA



#### 3.2 LTV-816S-TA1 / LTV-816S1-TA1



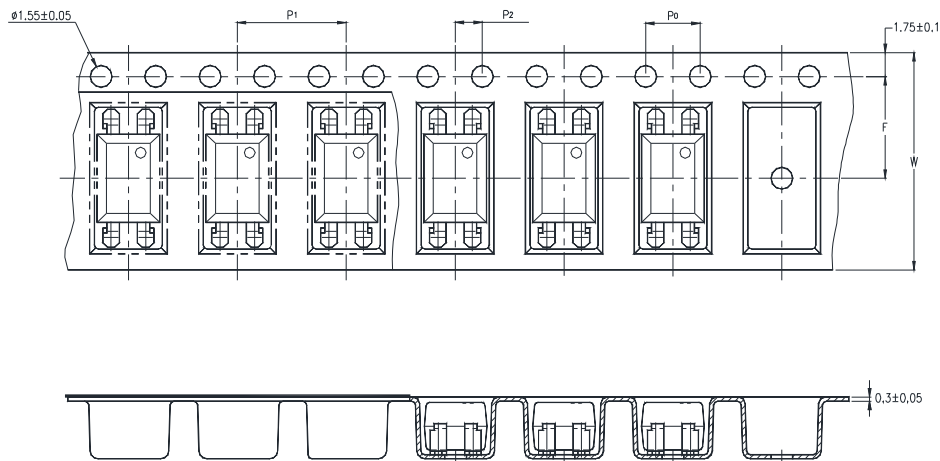
| Description                            | Symbol         | Dimension in mm (inch) |
|----------------------------------------|----------------|------------------------|
| Tape wide                              | W              | 16±0.3 (0.63)          |
| Pitch of sprocket holes                | P <sub>0</sub> | 4±0.1 (0.15)           |
| Distance of compartment                | F              | 7.5±0.1 (0.295)        |
|                                        | P <sub>2</sub> | 2±0.1 (0.079)          |
| Distance of compartment to compartment | P <sub>1</sub> | 12±0.1 (0.472)         |

#### 3.3 Quantities Per Reel

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

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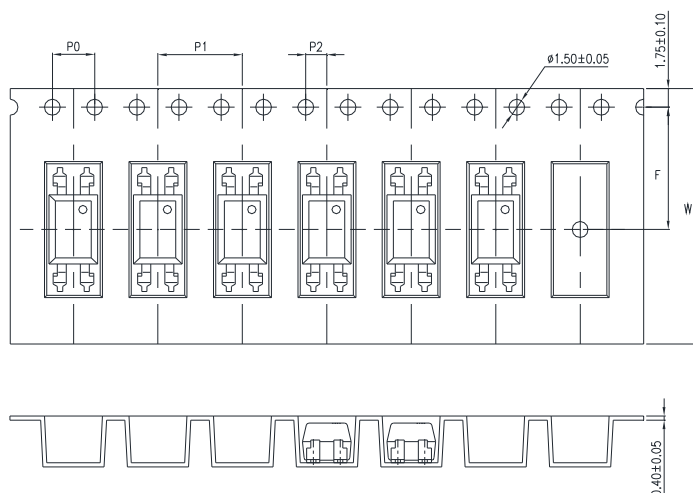
### 3.4 LTV-816S-TP / LTV-816S1-TP



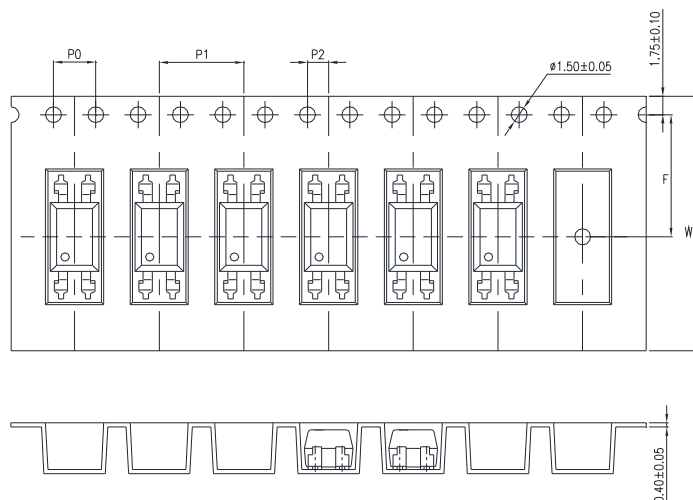
| Description                            | Symbol         | Dimension in mm (inch) |
|----------------------------------------|----------------|------------------------|
| Tape wide                              | W              | 16±0.3 (0.63)          |
| Pitch of sprocket holes                | P <sub>0</sub> | 4±0.1 (0.15)           |
| Distance of compartment                | F              | 7.5±0.1 (0.295)        |
|                                        | P <sub>2</sub> | 2±0.1 (0.079)          |
| Distance of compartment to compartment | P <sub>1</sub> | 8±0.1 (0.472)          |

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### 3.5 LTV-816S2-TP



### 3.6 LTV-816S2-TP1



| Description                            | Symbol | Dimension in mm (inch) |
|----------------------------------------|--------|------------------------|
| Tape wide                              | W      | 24±0.3 (0.63)          |
| Pitch of sprocket holes                | $P_0$  | 4±0.1 (0.15)           |
| Distance of compartment                | F      | 11.5±0.1 (0.295)       |
|                                        | $P_2$  | 2±0.1 (0.079)          |
| Distance of compartment to compartment | $P_1$  | 8±0.1 (0.472)          |

### 3.7 Quantities Per Reel

| Package Type     | TP/TP1 |
|------------------|--------|
| Quantities (pcs) | 2000   |

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### 4. RATING AND CHARACTERISTICS

#### 4.1 Absolute Maximum Ratings at Ta=25°C

|        | Parameter                   | Symbol    | Rating     | Unit      |
|--------|-----------------------------|-----------|------------|-----------|
| Input  | Forward Current             | $I_F$     | 50         | mA        |
|        | Reverse Voltage             | $V_R$     | 6          | V         |
|        | Power Dissipation           | $P$       | 70         | mW        |
|        | Junction Temperature        | $T_J$     | 125        | °C        |
| Output | Collector - Emitter Voltage | $V_{CEO}$ | 80         | V         |
|        | Emitter - Collector Voltage | $V_{ECO}$ | 6          | V         |
|        | Collector Current           | $I_C$     | 50         | mA        |
|        | Collector Power Dissipation | $P_C$     | 150        | mW        |
|        | Junction Temperature        | $T_J$     | 125        | °C        |
|        | Total Power Dissipation     | $P_{tot}$ | 200        | mW        |
| 1.     | Isolation Voltage           | $V_{iso}$ | 5000       | $V_{rms}$ |
|        | Operating Temperature       | $T_{opr}$ | -50 ~ +110 | °C        |
|        | Storage Temperature         | $T_{stg}$ | -55 ~ +125 | °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°C

| Parameter                |                                      | Symbol        | Min.               | Typ.               | Max. | Unit          | Test Condition                                                     |
|--------------------------|--------------------------------------|---------------|--------------------|--------------------|------|---------------|--------------------------------------------------------------------|
| Input                    | Forward Voltage                      | $V_F$         | —                  | 1.2                | 1.4  | V             | $I_F=20\text{mA}$                                                  |
|                          | Reverse Current                      | $I_R$         | —                  | —                  | 10   | $\mu\text{A}$ | $V_R=4\text{V}$                                                    |
|                          | Terminal Capacitance                 | $C_t$         | —                  | 30                 | 250  | pF            | $V=0, f=1\text{KHz}$                                               |
| Output                   | Collector Dark Current               | $I_{CE0}$     | —                  | —                  | 100  | nA            | $V_{CE}=20\text{V}, I_F=0$                                         |
|                          | Collector-Emitter Breakdown Voltage  | $BV_{CEO}$    | 80                 | —                  | —    | V             | $I_C=0.1\text{mA}, I_F=0$                                          |
|                          | Emitter-Collector Breakdown Voltage  | $BV_{ECO}$    | 6                  | —                  | —    | V             | $I_E=10\mu\text{A}, I_F=0$                                         |
| TRANSFER CHARACTERISTICS | Collector Current                    | $I_C$         | 2.5                | —                  | 30   | mA            | $I_F=5\text{mA}$                                                   |
|                          | 1. Current Transfer Ratio            | CTR           | 50                 | —                  | 600  | %             | $V_{CE}=5\text{V}$                                                 |
|                          | Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | —                  | 0.1                | 0.2  | V             | $I_F=20\text{mA}$<br>$I_C=1\text{mA}$                              |
|                          | Isolation Resistance                 | $R_{iso}$     | $5 \times 10^{10}$ | $1 \times 10^{11}$ | —    | $\Omega$      | DC500V,<br>40 ~ 60% R.H.                                           |
|                          | Floating Capacitance                 | $C_f$         | —                  | 0.6                | 1    | pF            | $V=0, f=1\text{MHz}$                                               |
|                          | Cut-off Frequency                    | $f_c$         | —                  | 80                 | —    | kHz           | $V_{CE}=5\text{V}, I_C=2\text{mA}$<br>$R_L=100\Omega, -3\text{dB}$ |
|                          | Response Time (Rise)                 | $t_r$         | —                  | 4                  | 18   | $\mu\text{s}$ | $V_{CE}=2\text{V},$<br>$I_C=2\text{mA}$                            |
|                          | Response Time (Fall)                 | $t_f$         | —                  | 3                  | 18   | $\mu\text{s}$ | $R_L=100\Omega,$                                                   |

$$1. \text{ CTR} = \frac{I_C}{I_F} \times 100\%$$



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### 5. RANK TABLE OF CURRENT TRANSFER RATIO CTR

| CTR Rank              | Min | Max | Condition                             |
|-----------------------|-----|-----|---------------------------------------|
| L                     | 50  | 100 | $I_F=5mA, V_{CE}=5V, T_a=25^{\circ}C$ |
| A                     | 80  | 160 |                                       |
| B                     | 130 | 260 |                                       |
| C                     | 200 | 400 |                                       |
| D                     | 300 | 600 |                                       |
| L or A or B or C or D | 50  | 600 |                                       |

## Photocoupler LTV-816-AB series

### 6. CHARACTERISTICS CURVES

Fig.1 Forward Current  
vs. Ambient Temperature

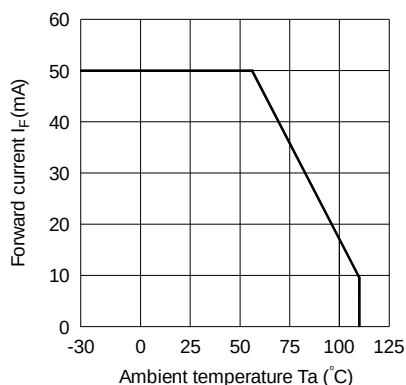


Fig.2 Collector Power Dissipation  
vs. Ambient Temperature

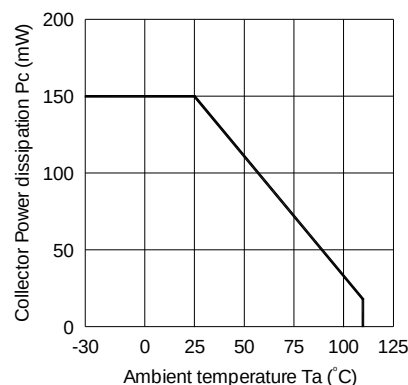


Fig.3 Collector-emitter Saturation  
Voltage vs. Forward Current

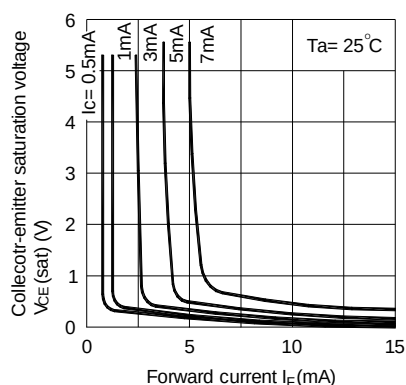


Fig.4 Forward Current vs. Forward  
Voltage

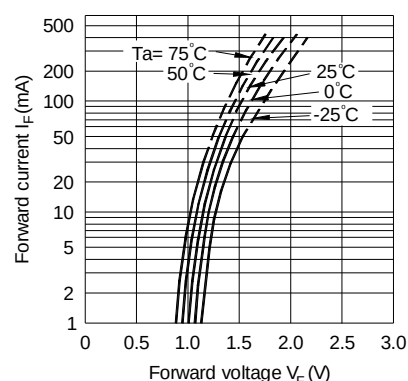


Fig.5 Current Transfer Ratio vs.  
Forward Current

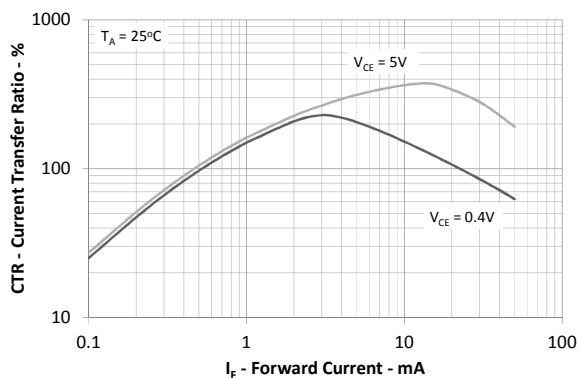
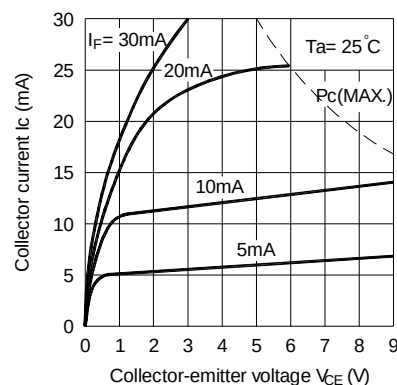


Fig.6 Collector Current vs.  
Collector-emitter Voltage



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Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

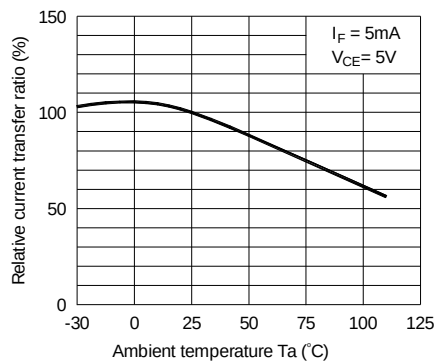


Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

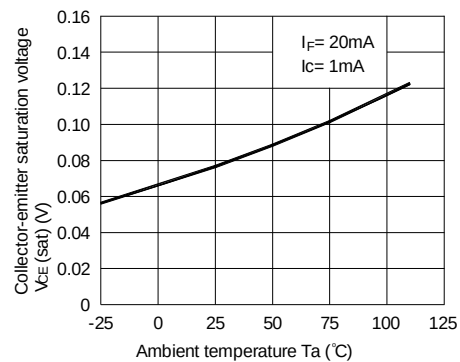


Fig.9 Collector Dark Current vs. Ambient Temperature

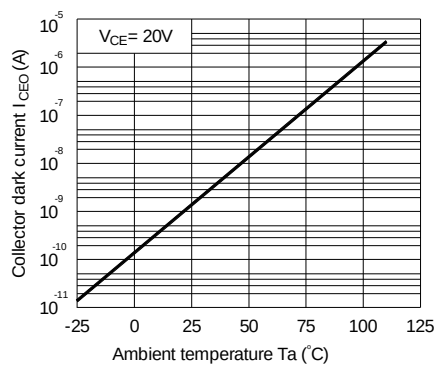


Fig.10 Response Time vs. Load Resistance

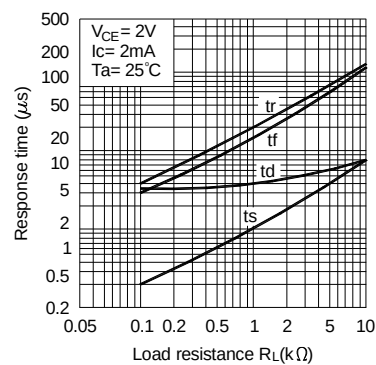
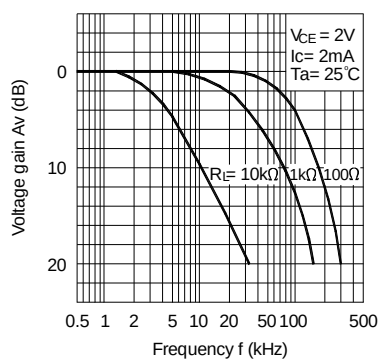
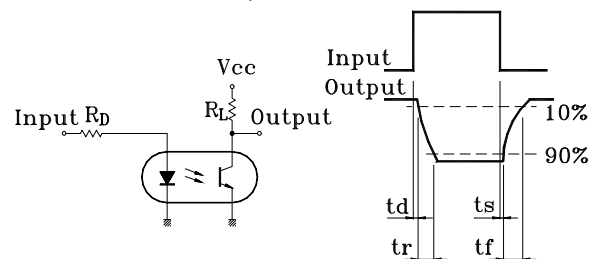


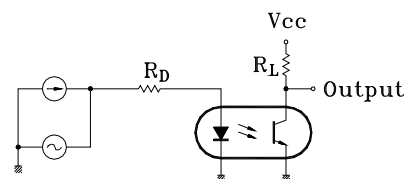
Fig.11 Frequency Response



Test Circuit for Response Time



Test Circuit for Frequency Response



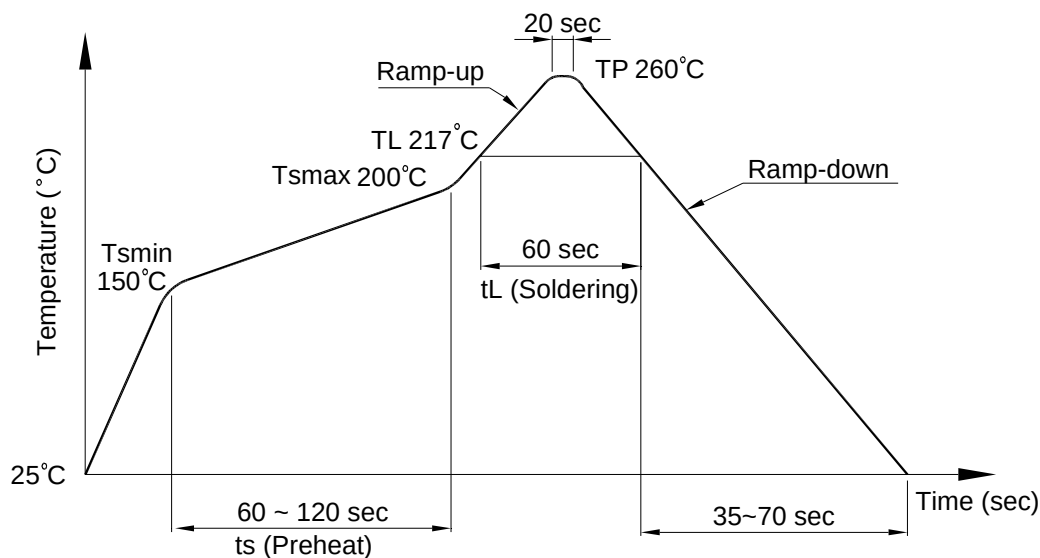
## Photocoupler LTV-816-AB series

### 7. TEMPERATURE PROFILE OF SOLDERING

#### 7.1 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) ( $t_s$ )    | 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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### 7.2 Wave soldering (JEDEC22A111 compliant)

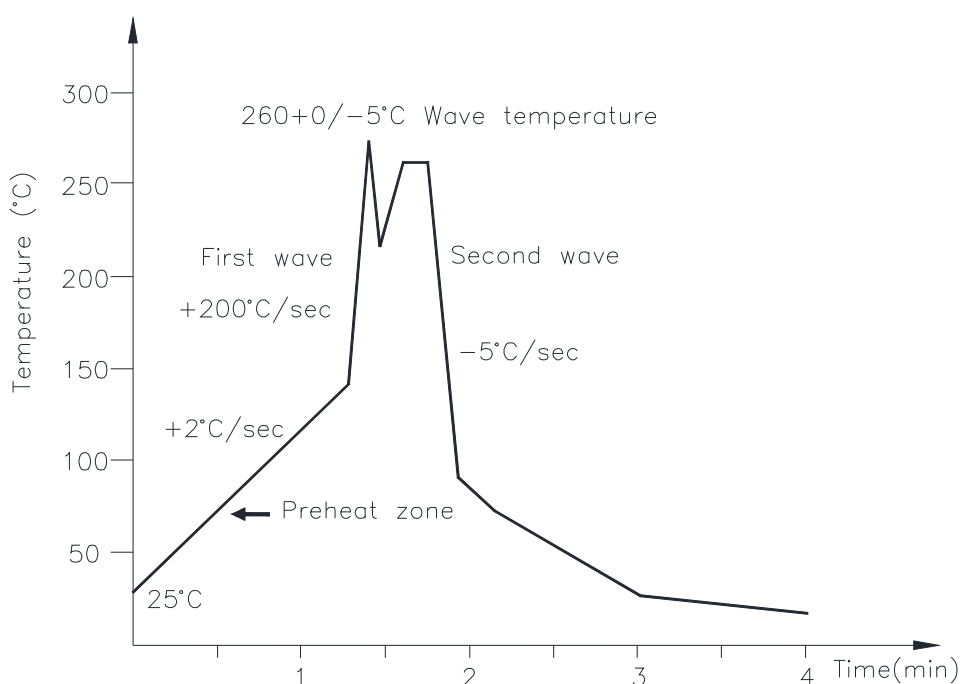
One time soldering is recommended within the condition of temperature.

Temperature:  $260 \pm 0/-5^{\circ}\text{C}$

Time: 10 sec.

Preheat temperature: 25 to  $140^{\circ}\text{C}$

Preheat time: 30 to 80 sec.



### 7.3 Hand soldering by soldering iron

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

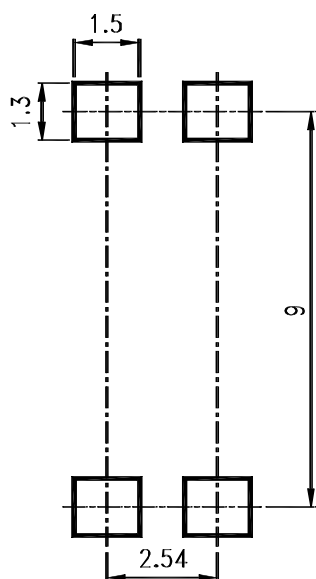
Temperature:  $380 \pm 0/-5^{\circ}\text{C}$

Time: 3 sec max.

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**8. RRECOMMENDED FOOT PRINT PATTERNS (MOUNT PAD)**

Unit: mm



## Photocoupler LTV-816-AB series

### 9. NAMING RULE

# LTV-816(1)-(2)-(3)-G-AB

DEVICE PART NUMBER

- (1) No suffix = Dual-in-Line package  
M = Wide lead spacing package  
S/S1/S2 = Surface mounting
- (2) TAPING TYPE(TA,TA1,TP or none)  
LTV-816 have tape and reel solution.  
S2 package only have TP and TP1 solution.  
Please refer to orientation of taping on Page P4-P6
- (3) CTR RANK (A,B or none)  
Please refer to the CTR table on Page P9
- (4) Halogen free option
- (5) Customer Code

Example : LTV-816S-TA1-A-G-AB

# LTV816(1)(2)(3)-V-G-AB

DEVICE PART NUMBER

- (1) No suffix = Dual-in-Line package  
M = Wide lead spacing package  
S/S1/S2 = Surface mounting
- (2) TAPING TYPE(TA,TA1,TP or none)  
S2 package only have TP and TP1 solution.  
LTV-816 have tape and reel solution  
Please refer to orientation of taping on Page P4-P6
- (3) CTR RANK (A,B or none)  
Please refer to the CTR table on Page P9
- (4) VDE order option
- (5) Halogen free option
- (6) Customer Code

Example : LTV816STA1A-V-G-AB

### **Photocoupler LTV-816-AB series**

#### **10. NOTES**

- LiteOn is continually improving the quality, reliability, function or design and LiteOn reserves the right to make changes without further notices.
- The products shown in this publication are designed for the general use in electronic applications such as office automation equipment, communications devices, audio/visual equipment, electrical application and instrumentation.
- For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.
- 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.