## FEATURES

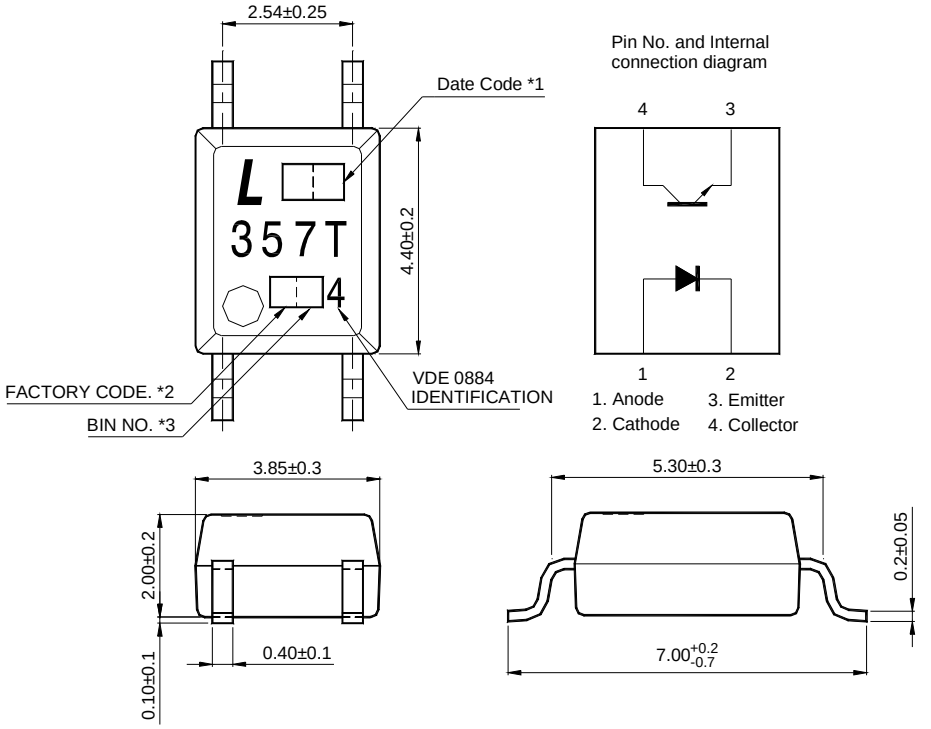
* This specification shall be applied to photocoupler. Model No. LTV-357T as an option.
* Current transfer ratio
  ( CTR : MIN. 50% at $I_F$ = 5mA, $V_{CE}$ = 5V )
* Isolation voltage between input and output LTV-357T-V
  ( Viso = 3,750Vrms )
* Employs double transfer mold technology
* Subminiature type
  ( The volume is smaller than that of conventional DIP type by as far as 30% )
* Mini-flat package :
  2.0mm profile : LTV-357T-V
* UL approved ( No. E113898 )
* CUL approved ( No. E113898 , 01SC19287 )
* CSA approved ( No. 1243207 )
* FIMKO approved ( No. FI-16420 )
* NEMKO approved ( No. P01100403 )
* DEMKO approved ( No. 310475-01 )
* SEMKO approved ( No. 0109173 / 01-08 )
* VDE approved ( No. 094722 )
* RoHS compliance

## APPLICATIONS

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

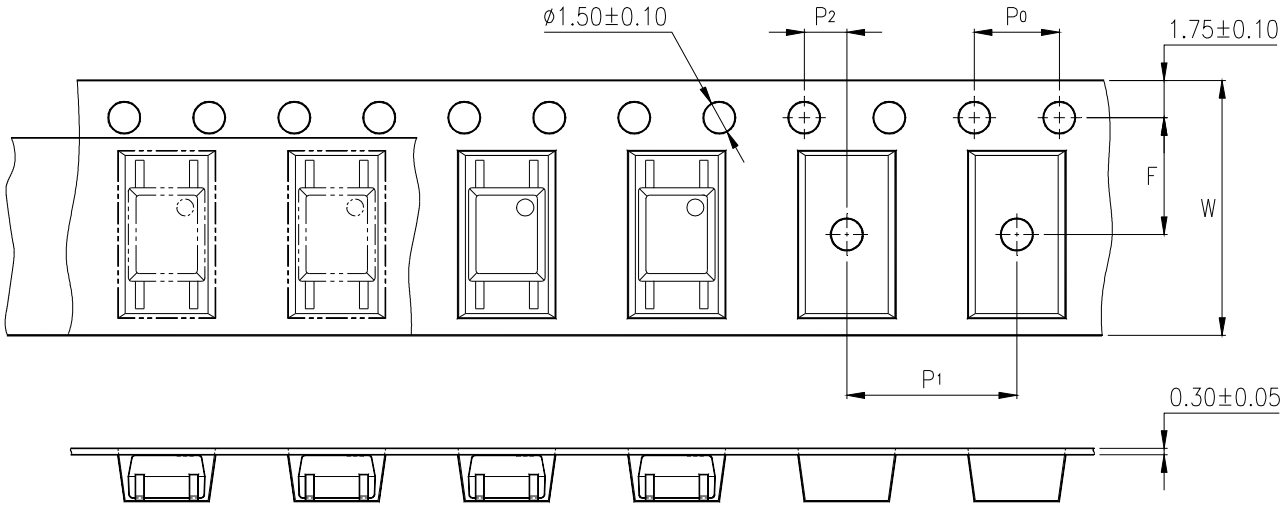
## OUTLINE DIMENSIONS

**LTV-357T-V :**




*1. 2-digit date code.
*2. Factory identification mark shall be marked (Z : Taiwan, Y : Thailand, X : China).
*3. Rank shall be or shall not be marked.

## TAPING DIMENSIONS




| Description | Symbol | Dimensions in mm ( inches ) |
|---|---|---|
| Tape wide | W | 12 ± 0.3 ( .47 ) |
| Pitch of sprocket holes | $P_0$ | 4 ± 0.1 ( .15 ) |
| Distance of compartment | F<br>$P_2$ | 5.5 ± 0.1 ( .217 )<br>2 ± 0.1 ( .079 ) |
| Distance of compartment to compartment | $P_1$ | 8 ± 0.1 ( .315 ) |

# ABSOLUTE MAXIMUM RATING

( 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 |
| OUTPUT | Collector - Emitter Voltage | $V_{CEO}$ | 35 | V |
| | Emitter - Collector Voltage | $V_{ECO}$ | 6 | V |
| | Collector Current | $I_C$ | 50 | mA |
| | Collector Power Dissipation | $P_C$ | 150 | mW |
| Total Power Dissipation | | Ptot | 170 | mW |
| *1 Isolation Voltage | | Viso | 3,750 | Vrms |
| Operating Temperature | | Topr | -55 ~ +100 | °C |
| Storage Temperature | | Tstg | -55 ~ +150 | °C |
| *2 Soldering Temperature | | Tsol | 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

# ELECTRICAL - OPTICAL CHARACTERISTICS

( Ta = 25°C )

| PARAMETER | | SYMBOL | MIN. | TYP. | MAX. | UNIT | CONDITIONS |
|---|---|---|---|---|---|---|---|
| INPUT | Forward Voltage | $V_F$ | — | 1.2 | 1.4 | V | $I_F$=20mA |
| | Reverse Current | $I_R$ | — | — | 10 | μA | $V_R$=4V |
| | Terminal Capacitance | $C_t$ | — | 30 | 250 | pF | V=0, f=1KHz |
| OUTPUT | Collector Dark Current | $I_{CEO}$ | — | — | 100 | nA | $V_{CE}$=20V, $I_F$=0 |
| | Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | 35 | — | — | V | $I_C$=0.1mA<br>$I_F$=0 |
| | Emitter-Collector Breakdown Voltage | $BV_{ECO}$ | 6 | — | — | V | $I_E$=10μA<br>$I_F$=0 |
| TRANSFER CHARACTERISTICS | Collector Current | $I_C$ | 2.5 | — | 30 | mA | $I_F$=5mA<br>$V_{CE}$=5V |
| | *1 Current Transfer Ratio | CTR | 50 | — | 600 | % | |
| | Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | — | 0.2 | V | $I_F$=20mA<br>$I_C$=1mA |
| | Isolation Resistance | $R_{iso}$ | $5\times10^{10}$ | $1\times10^{11}$ | — | Ω | DC500V<br>40 ~ 60% R.H. |
| | Floating Capacitance | $C_f$ | — | 0.6 | 1 | pF | V=0, f=1MHz |
| | Response Time (Rise) | $t_r$ | — | 4 | 18 | μs | $V_{CE}$=2V, $I_C$=2mA<br>$R_L$=100Ω |
| | Response Time (Fall) | $t_f$ | — | 3 | 18 | μs | |

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

# RANK TABLE OF CURRENT TRANSFER RATIO CTR

| MODEL NO. | RANK MARK | CTR ( % ) |
|---|---|---|
| LTV-357T-V | A | 80 ~ 160 |
| | B | 130 ~ 260 |
| | C | 200 ~ 400 |
| | D | 300 ~ 600 |
| | E | 50 ~ 150 |
| | F | 100 ~ 300 |
| | A or B or C or D or E or F or No mark | 50 ~ 600 |

| | |
|---|---|
| **CONDITIONS** | IF = 5 mA<br>VCE = 5 V<br>Ta = 25 °C |

# ISOLATION SPECIFICATION ACCORDING TO VDE 0884

| Parameter | | Symbol | Conditions | Rating | Unit | Remark |
|---|---|---|---|---|---|---|
| Class of environmental test | | - | DIN IEC68 | 30/100/21 | - | |
| Pollution | | - | DIN VDE0110 | 2 | - | |
| Maximum Operating Isolation Voltage | | $V_{IORM}$ | - | 565 | $V_{PEAK}$ | Refer to the Diagram 1, 2 |
| Partial Discharge Test Voltage (Between Input and Output) | Diagram 1 | Vpr | tp=60s, qc<5pC | 848 | $V_{PEAK}$ | |
| | Diagram 2 | | tp=1s, qc<5pC | 1059 | $V_{PEAK}$ | |
| 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 | 150 | °C | |
| | 2) Input Current | Isi | Pc=0 | 200 | mA | |
| | 3) Electric Power (Output or Total Power Issipation) | Psi | - | 300 | 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.$10^{12}$ | | |

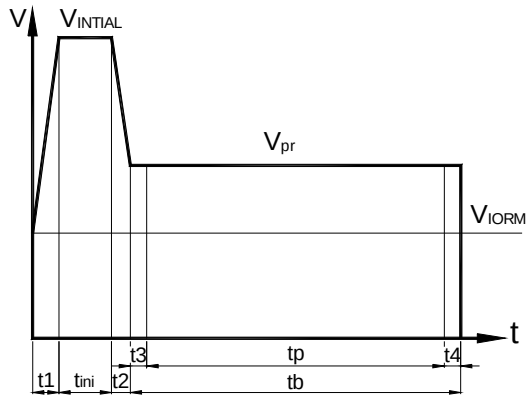
Precautions in performing isolation test

* Partial discharge test methods shall be the ones according to the specifications of VDE 0884:1992-06

* 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 ($V_{IORM}$)

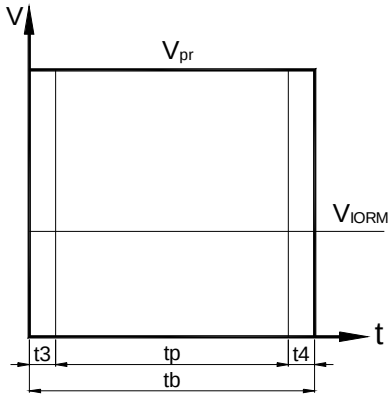
# PARTIAL DISCHARGE TEST METHOD

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.

# CHARACTERISTICS CURVES

Fig.1 Forword Current vs. Ambient Temperatute

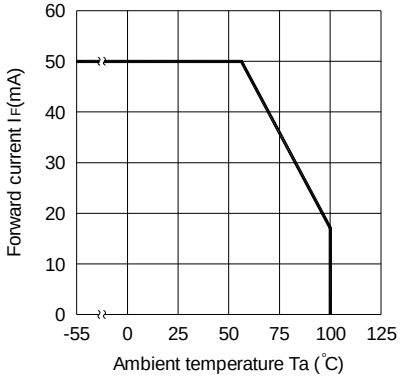



Fig.2 Collector Power Dissiption vs. Ambient Temperature

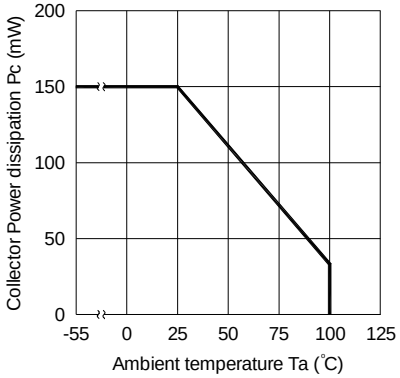



Fig.3 Collector-emitter Saturation Voltage vs. Forward Current

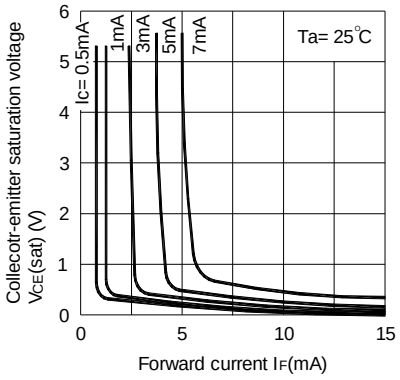



Fig.4 Forward Current vs. Forward Voltage

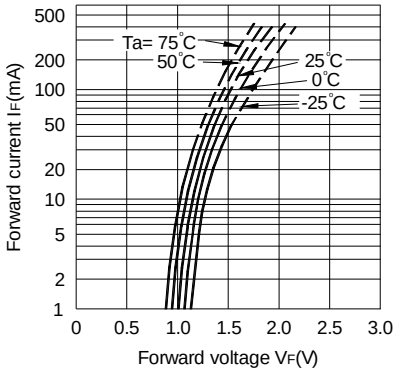



Fig.5 Current Transfer Ratio vs. Forward Current

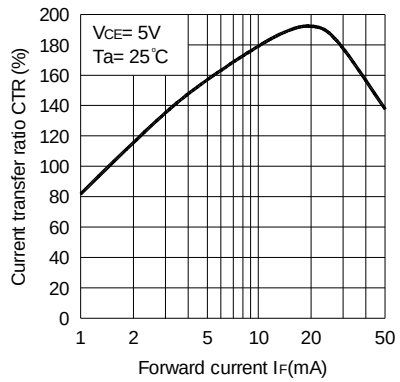
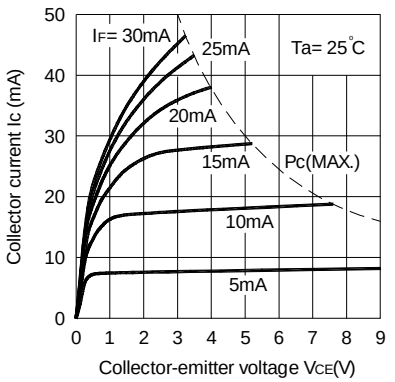



Fig.6 Collector Current vs. Collector-emitter Voltage



# CHARACTERISTICS CURVES

Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

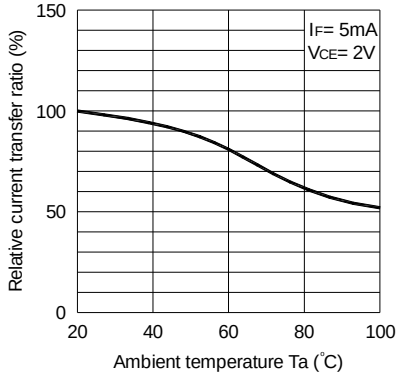



Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

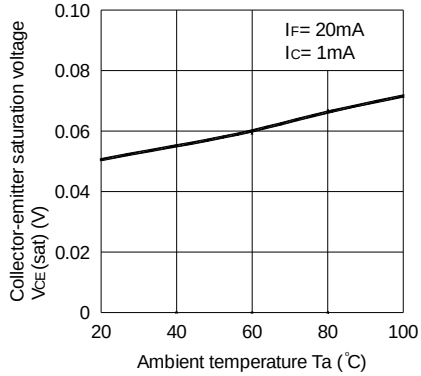



Fig.9 Collector Dark Current vs. Ambient Temperature

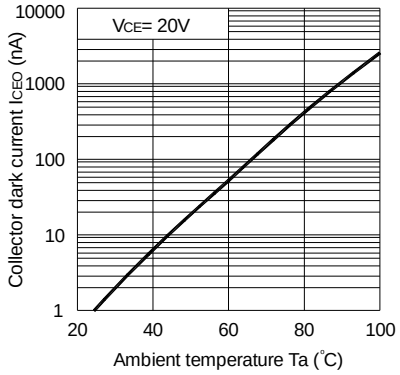



Fig.10 Response Time vs. Load Resistance

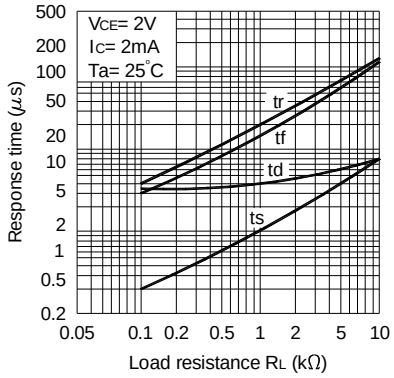
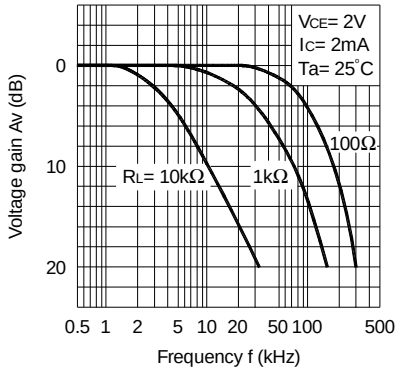
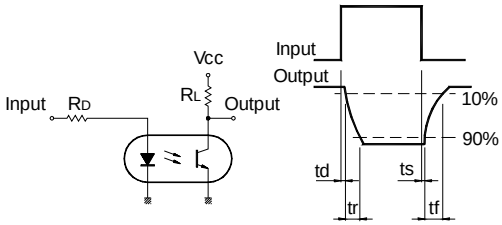


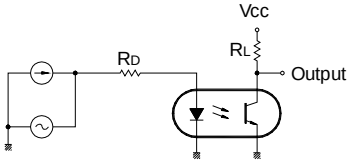

Fig.11 Frequency Response




Test Circuit for Response Time




Test Circuit for Frequency Response



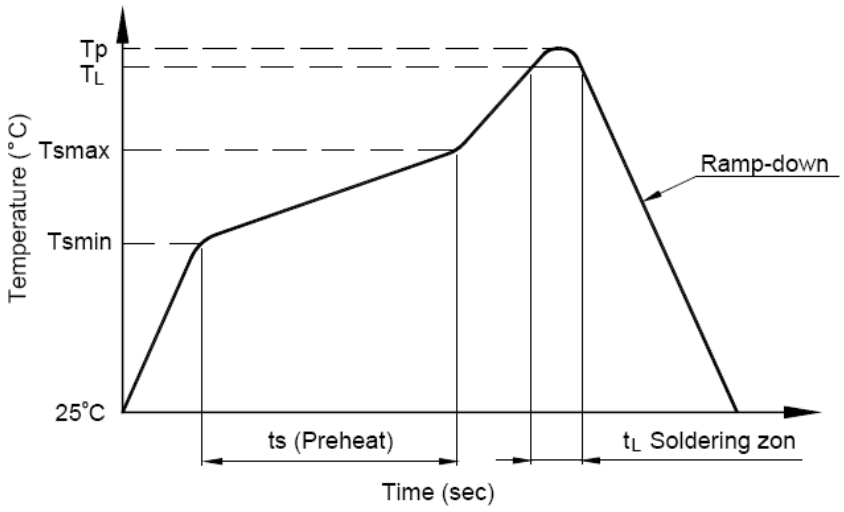
# TEMPERATURE PROFILE OF SOLDERING REFLOW

(1) One time soldering reflow is recommended within the condition of temperature and time profile shown below.

1. Wave solder
   - 260 °C / 10 sec

2. IR reflow

| Profile item | Condition |
|---|---|
| Preheat | |
| - Temperature Min ($Ts_{min}$) | 150 °C |
| - Temperature Max ($Ts_{max}$) | 180 °C |
| - Time (min to max) (ts) | 90 ± 30 sec |
| Soldering zone | |
| - Temperature ($T_L$) | 250 °C |
| - Time ($t_L$) | 10 ~15 sec |
| Peak temperature (Tp) | 260 °C |
| Ramp-down rate | 3 ~ 6 °C / sec |



## TEMPERATURE PROFILE OF SOLDERING REFLOW

(2) When using another soldering method such as infrared ray lamp, the temperature may rise partially in the mold of the device.
Keep the temperature on the package of the device within the condition of above (1)

## RECOMMENDED FOOT PRINT PATTERNS (MOUNT PAD)

Unit : mm