

Photocoupler LTV-178 series

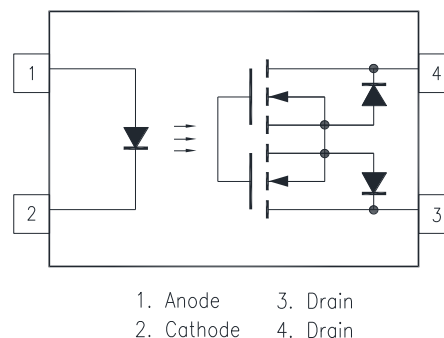
1. DESCRIPTION

The LITEON LTV-178 consists of an aluminum gallium arsenide infrared emitting diode optically coupled to a photo-MOSFET in a SOP4 package, which is suitable for surface mount assembly. The LTV-178 is suitable for the battery management systems which require space savings.

1.1 Features

- Normally open (1-form-A)
- Operating temperature range: 110°C(max)
- Trigger LED current: 3 mA (max)
- Isolation voltage: 3750 Vrms (min)
- OFF-state output terminal voltage : 100V (min)
- ON-state current : 150mA (max)
- ON-state resistance : 8Ω (max)
- Safety standards
 - UL1577
 - CUL CA5A
 - VDE DIN EN60747-5-5 (VDE 0884-5)
- MSL class 1
- RoHS Compliance: All materials be used in device are followed EU RoHS directive (No.2002/95/EC, 2011/65/EU, and 2015/863).
- Halogen Free

1.2 Functional Diagram



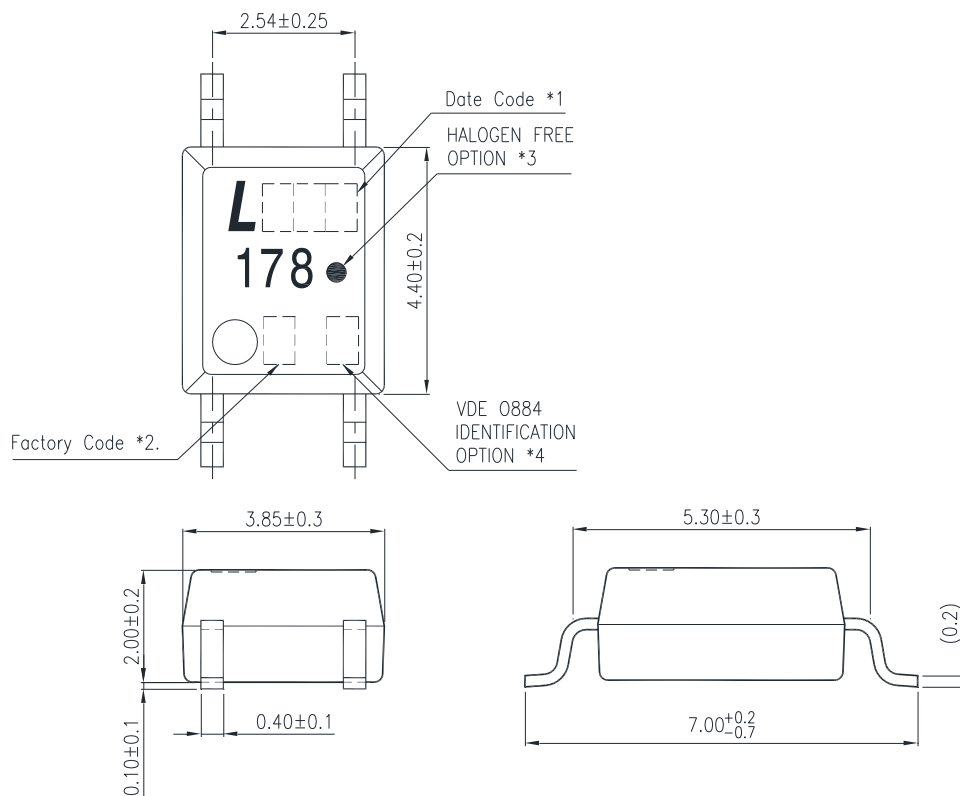
1.3 Applications

- Battery Management System (BMS)
- Factory Automation (FA)
- Security Systems
- Measuring Instruments
- Smart Meters
- Mechanical relay replacements

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2. PACKAGE DIMENSIONS

2.1 LTV-178 series



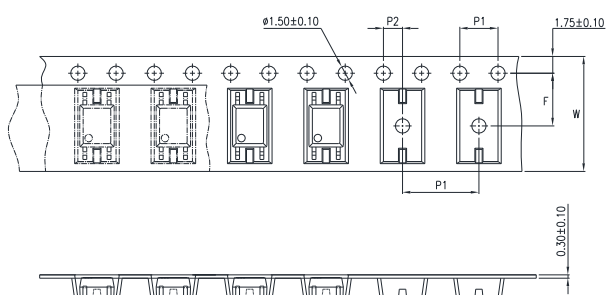
Notes:

- 1-digit year code, Example : 2010 = A
2-digit work week ranging from '01' to '53'
- Factory identification mark shall be marked (W: China -CZ, X: China -TJ)
- "●" indicates halogen free option.
- "4" or "V" for VDE option.

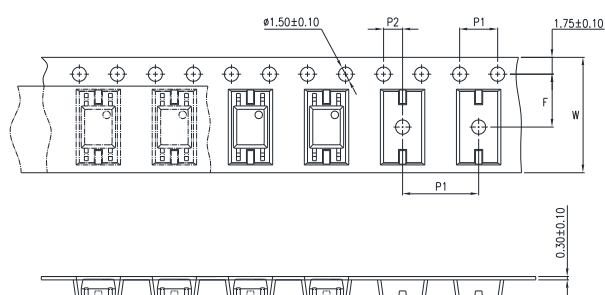
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3. TAPING DIMENSIONS

3.1 LTV-178-TP



3.2 LTV-178



Description	Symbol	Dimension in mm (inch)
Tape wide	W	12 $\pm$ 0.3 (0.472)
Pitch of sprocket holes	P ₀	4 $\pm$ 0.1 (0.157)
Distance of compartment	F	5.5 $\pm$ 0.1 (0.217)
	P ₂	2 $\pm$ 0.1 (0.079)
Distance of compartment to compartment	P ₁	8 $\pm$ 0.1 (0.315)

3.3 Quantities Per Reel

Package Type	LTV-178 Series
Quantities (pcs)	3000

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4. RATING AND CHARACTERISTICS

4.1 Absolute Maximum Ratings at $T_A=25^{\circ}\text{C}$

Parameter		Symbol	Rating	Unit
Input	Forward Current	I_F	50	mA
	Forward Current Derating ($T_A \geq 25^{\circ}\text{C}$)	$\Delta I_F/^{\circ}\text{C}$	-0.5	mA/ $^{\circ}\text{C}$
	Peak Forward Current (100 μs pulse, 100pps)	I_{FP}	1	A
	Reverse Voltage	V_R	6	V
	Input Power Dissipation	P_D	70	mW
	Junction Temperature	T_J	125	$^{\circ}\text{C}$
Output	OFF-State Output Terminal Voltage	V_{OFF}	100	V
	ON-State Current	I_{ON}	150	mA
	ON-State Current Derating ($T_A \geq 25^{\circ}\text{C}$)	$\Delta I_{ON}/^{\circ}\text{C}$	-0.5	mA/ $^{\circ}\text{C}$
	ON-State Current (pulsed) ($t=100\text{ms}$, Duty=1/10)	I_{ONP}	0.25	A
	Output Power dissipation	P_O	400	mW
	Isolation Voltage (Note 1.)	V_{iso}	3750	V
	Operating Temperature	T_{opr}	-40 ~ +85	$^{\circ}\text{C}$
	Storage Temperature	T_{stg}	-55 ~ +125	$^{\circ}\text{C}$
	Soldering Temperature	T_{sol}	260 (For 10 seconds)	$^{\circ}\text{C}$

4.2 RECOMMENDED OPERATING CONDITIONS (Note)

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	-	-	80	V
Forward Current	I_F	5	7.5	25	mA
On-state Current	I_{ON}	-	-	150	
Operating Temperature	T_{opr}	-20	-	85	$^{\circ}\text{C}$

Note : The recommended operating conditions are given as a design guide necessary to obtain the intended performance of the device. Each parameter is an independent value. When creating a system design using this device, the electrical characteristics specified in this datasheet should also be considered.

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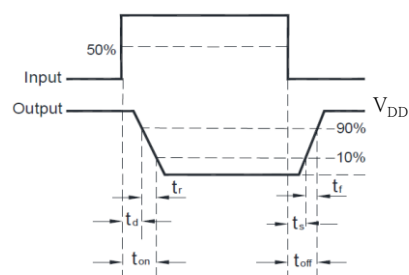
4.3 ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C

	Parameter	Sym bol	Min.	Typ.	Max.	Unit	Test Condition
Input	Forward Voltage	V_F	1.0	1.18	1.3	V	$I_F=10\text{mA}$
	Reverse Current	I_R	-	-	10	μA	$V_R=5\text{V}$
Out-put	OFF-State Current	I_{OFF}	-	-	1	μA	$V_{OFF}=100\text{V}$
Coupled	Trigger LED Current	I_{FT}	-	0.8	2	mA	$I_{ON}=150\text{mA}$
	Return LED Current	I_{FC}	0.2	0.6	-	mA	$I_{OFF}=100\mu\text{A}$
	On Resistance	R_{on}	-	2.6	8	Ω	$I_F=5\text{mA}$, $I_{ON}=150\text{mA}$
Transfer characteristics	Turn on time (Note 2.)	T_{on}	-	0.25	2	ms	$R_L=200\Omega$, $V_{DD}=20\text{V}$ $I_F=5\text{mA}$
	Turn off time (Note 2.)	T_{off}	-	0.1	0.5	ms	
	Isolation Resistance	R_{iso}	5×10^{10}	-	-	Ω	DC500V, R.H.40 ~ 60%

Note :

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. Turn on / turn off time



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5. CHARACTERISTICS CURVES

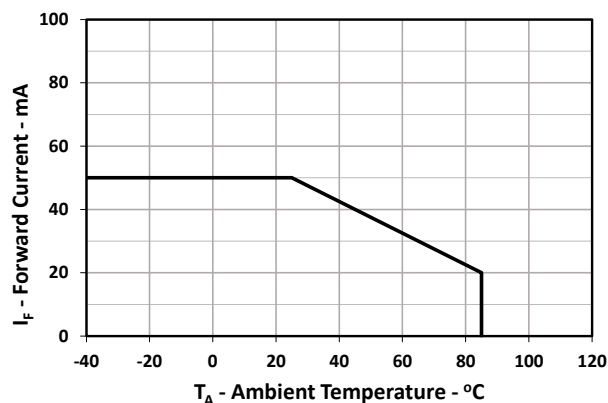


Fig. 1-1 Forward Current vs. Ambient Temperature

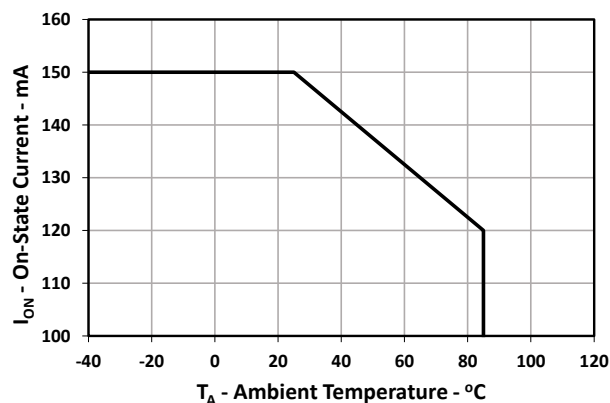


Fig. 1-2 On-State Current vs. Ambient Temperature

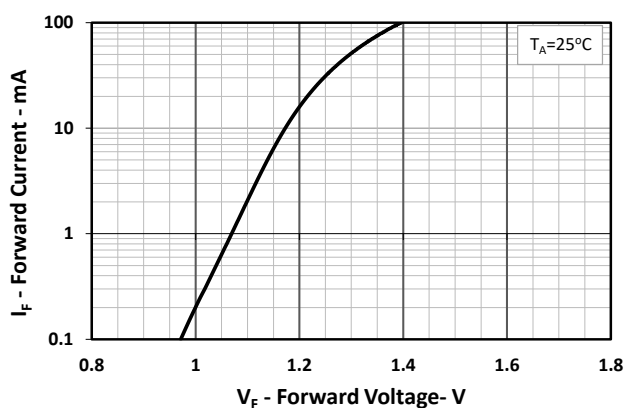


Fig. 2 Forward Current vs. Forward Voltage

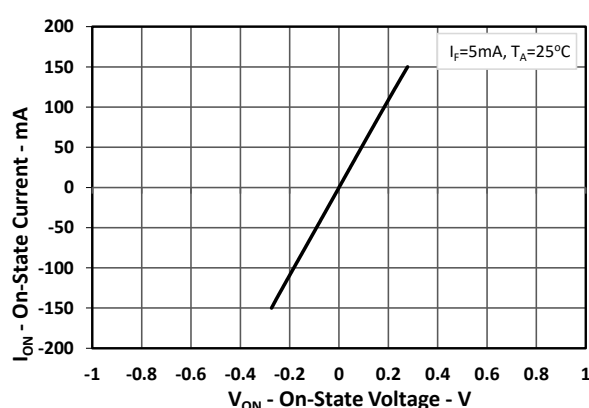


Fig. 3 On-State Current vs. On-State Voltage

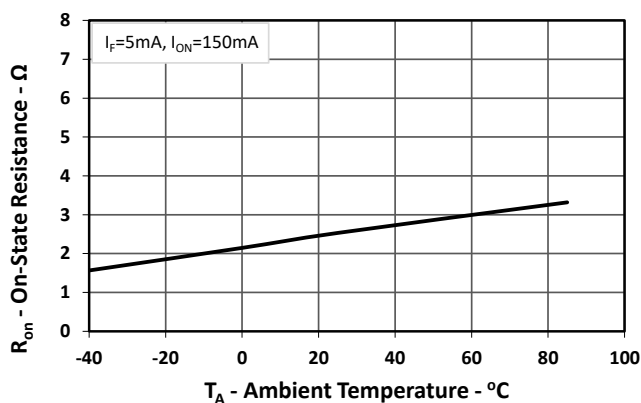


Fig. 4 On-State Resistance vs. Ambient Temperature

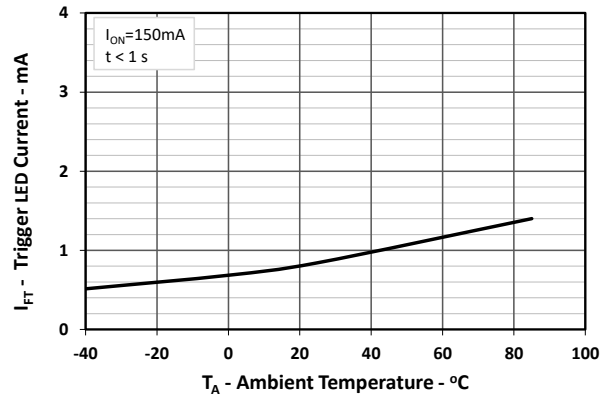


Fig. 5 Trigger LED Current vs. Ambient Temperature

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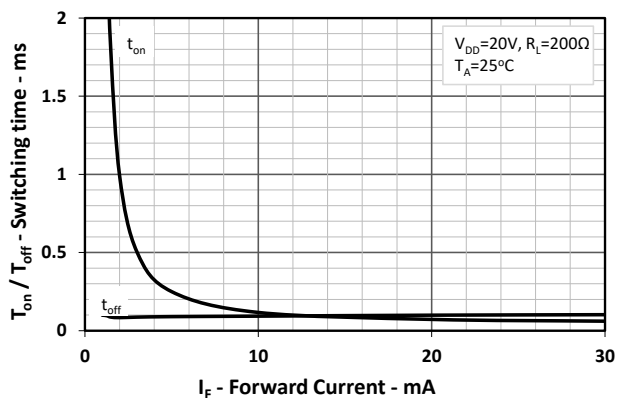


Fig. 6 Switching time vs. Forward Current

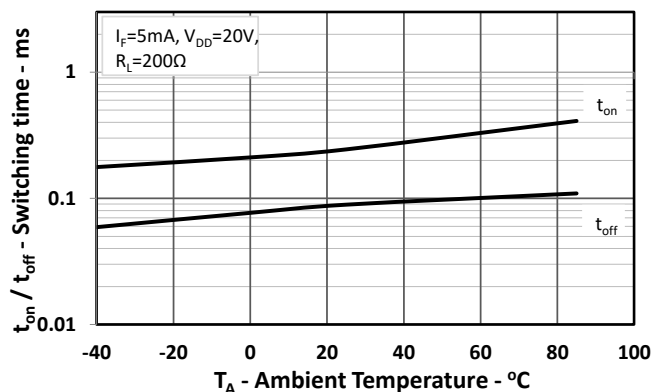


Fig. 7 Switching time vs. Ambient Temperature

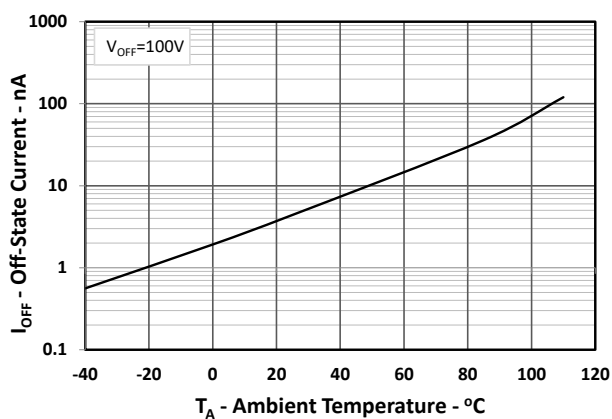


Fig. 8 Off-State Current vs. Ambient Temperature

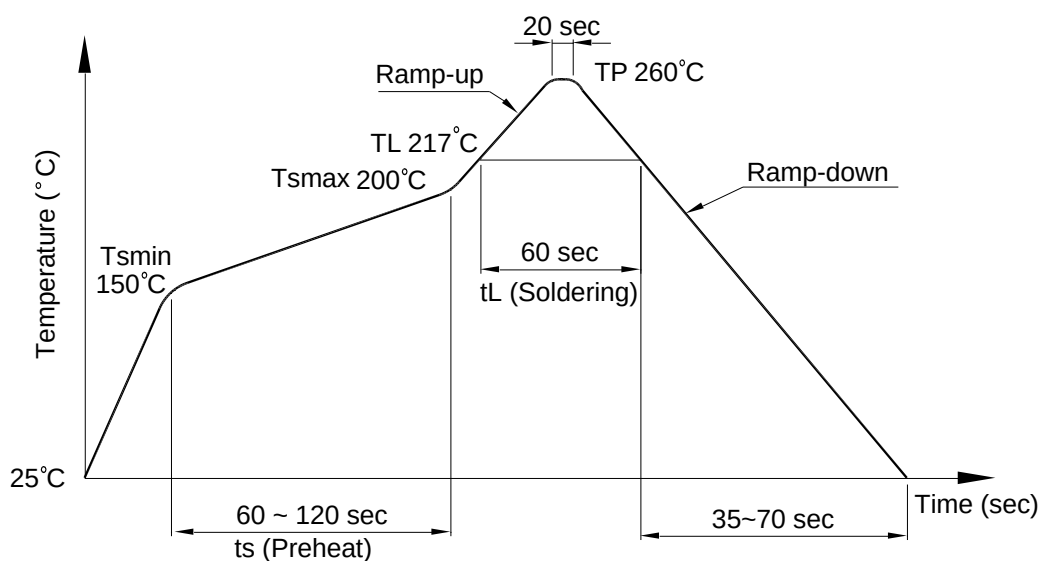
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6. TEMPERATURE PROFILE OF SOLDERING

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 twice

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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6.2 Wave soldering (JEDEC22A111 compliant)

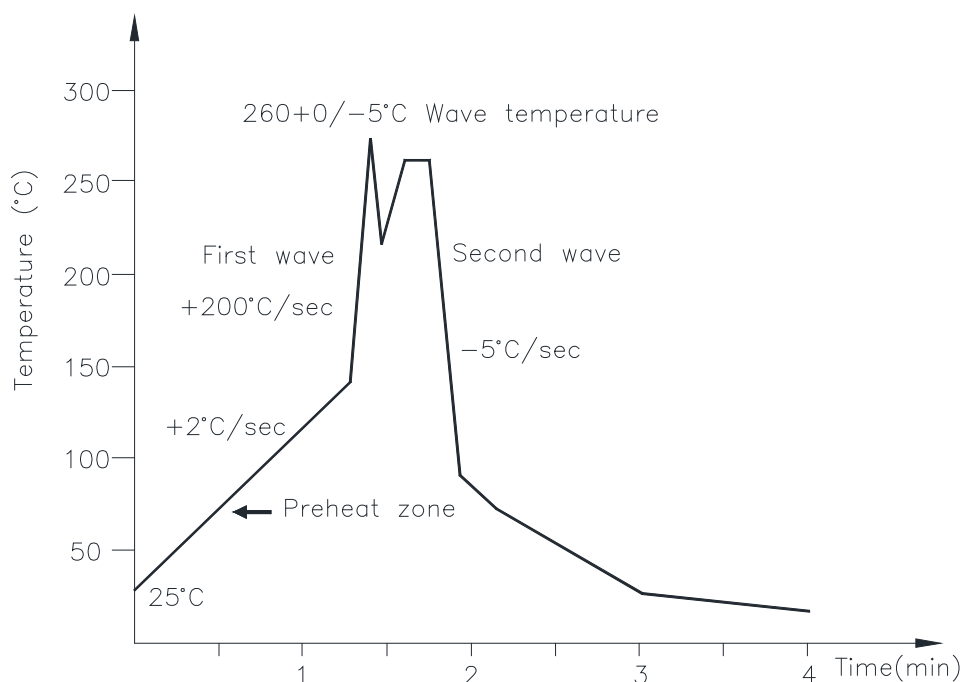
One time soldering is recommended within the condition of temperature.

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

Time: 10 sec.

Preheat temperature: 25 to 140°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.

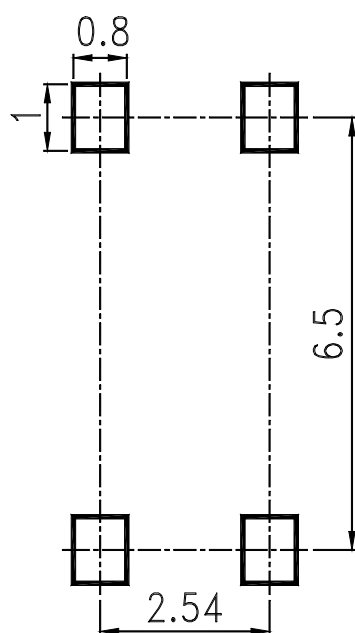
Temperature: $380 \pm 0/-5^{\circ}\text{C}$

Time: 3 sec max.

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7. RECOMMENDED FOOT PRINT PATTERNS (MOUNT PAD)

Unit: mm



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8. NAMING RULE

LTV-178-(1)-G

DEVICE PART NUMBER

(1) TAPING TYPE (TP, no suffix)

LTV-178 has tape and reel solution.

Please refer to orientation of taping on Page.3

(2) Halogen free option

Example : LTV-178-TP-G

LTV178(1)-V-G

DEVICE PART NUMBER

(1) TAPING TYPE (TP, no suffix)

LTV-178 has tape and reel solution.

Please refer to orientation of taping on Page.3

(2) VDE option

(3) Halogen free option

Example : LTV178TP-V-G

9. 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.