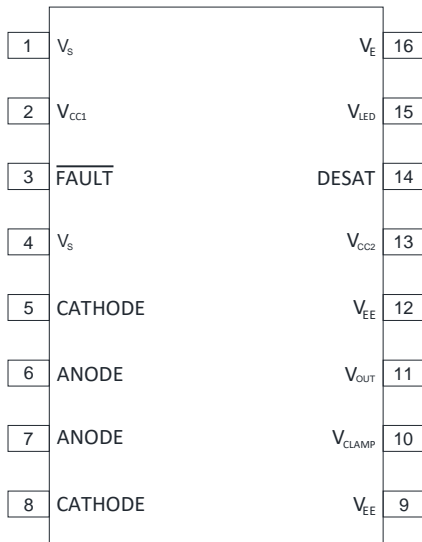




## Photocoupler LTV-332J series

### 1.5 Pin description



Pin	Symbol	Description
1	V <sub>S</sub>	Input Ground
2	V <sub>CC1</sub>	Positive input supply voltage (3.3 V to 5.5 V)
3	FAULT	Fault output. FAULT changes from a high impedance state to a logic low output within 5 μs of the voltage on the DESAT pin exceeding an internal reference voltage of 7 V. FAULT output is an open collector which allows the FAULT outputs from all LTV-332J in a circuit to be connected together in a "wired OR" forming a single fault bus for interfacing directly to the micro-controller.
4	V <sub>S</sub>	Input Ground
5	CATHODE	Cathode
6	ANODE	Anode
7	ANODE	Anode
8	CATHODE	Cathode
9	V <sub>EE</sub>	Output supply voltage
10	V <sub>CLAMP</sub>	Miller clamp
11	V <sub>OUT</sub>	Gate drive voltage output
12	V <sub>EE</sub>	Output supply voltage
13	V <sub>CC2</sub>	Positive output supply voltage
14	DESAT	Desaturation voltage input. When the voltage on DESAT exceeds an internal reference voltage of 6.5 V while the IGBT is on, FAULT output is changed from a high impedance state to a logic low state within 5 μs.
15	V <sub>LED</sub>	LED anode. This pin must be left unconnected for guaranteed data sheet performance. (For optical coupling testing only)
16	V <sub>E</sub>	Common (IGBT emitter) output supply voltage

## Photocoupler LTV-332J series

### 1.6 Ordering Information

LTV-332J is UL Recognized with 5000 Vrms for 1 minute per UL1577.

Part number	Package	Option	Tape & Reel	IEC/EN/DIN/EN 60747-5-5 (V <sub>PR</sub> method b)	Quantity	Others
		Name				
LTV-332J	SOP-16	-			45 per tube	Location at lower right of tape
		-V		●		
		-TP1	●		850 per reel	
		TP1-V	●	●		

To order, choose a part number from the part number column and combine with the desired option from the option column to form an order entry.

Example 1:

LTV332J-V to order product of SOP-16 Surface Mount package in Tube packaging(Quantity: 45pcs per tube) with IEC/EN/DIN EN 60747-5-5 Safety Approval (V<sub>PR</sub> method b).

Example 2:

LTV332JTP1-V to order product of SOP-16 Surface Mount package in tape& reel packaging with IEC/EN/DIN EN 60747-5-5 Safety Approval (V<sub>PR</sub> method b).

Above option datasheets are available. Please contact your LITEON sales representative or authorized distributor for information.

Example 3:

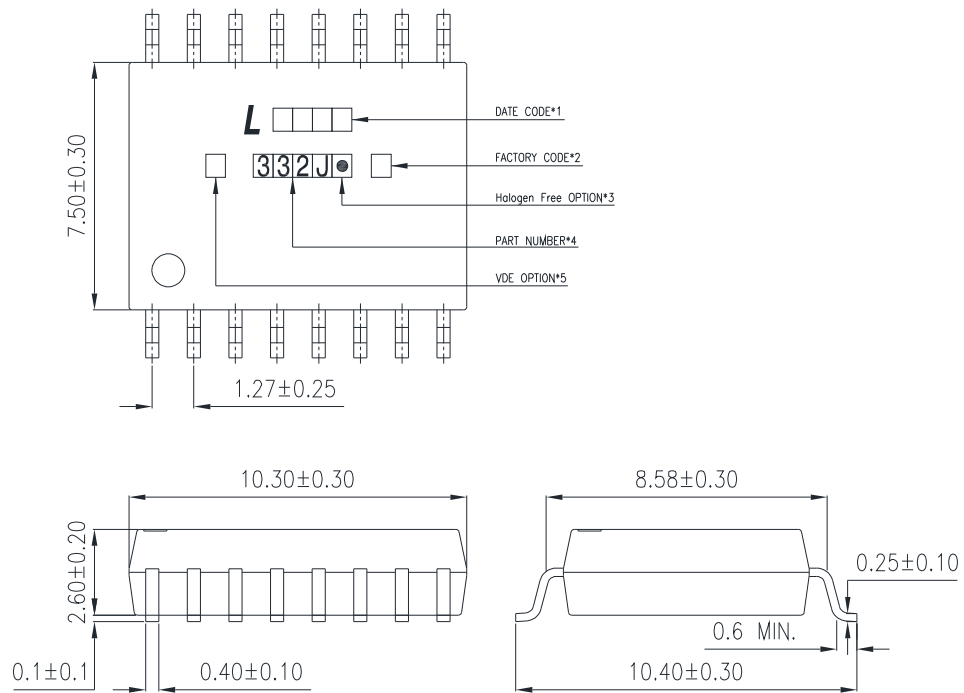
LTV-332J-TP1 to order product of SOP-16 Surface Mount package in tape& reel packaging with IEC/EN/DIN EN 60747-5-5 Safety Approval (Without V<sub>PR</sub> method b).

Above option datasheets are available. Please contact your LITEON sales representative or authorized distributor for information.

## Photocoupler LTV-332J series

### 2. PACKAGE DIMENSIONS

#### 2.1 LTV-332J



#### Notes :

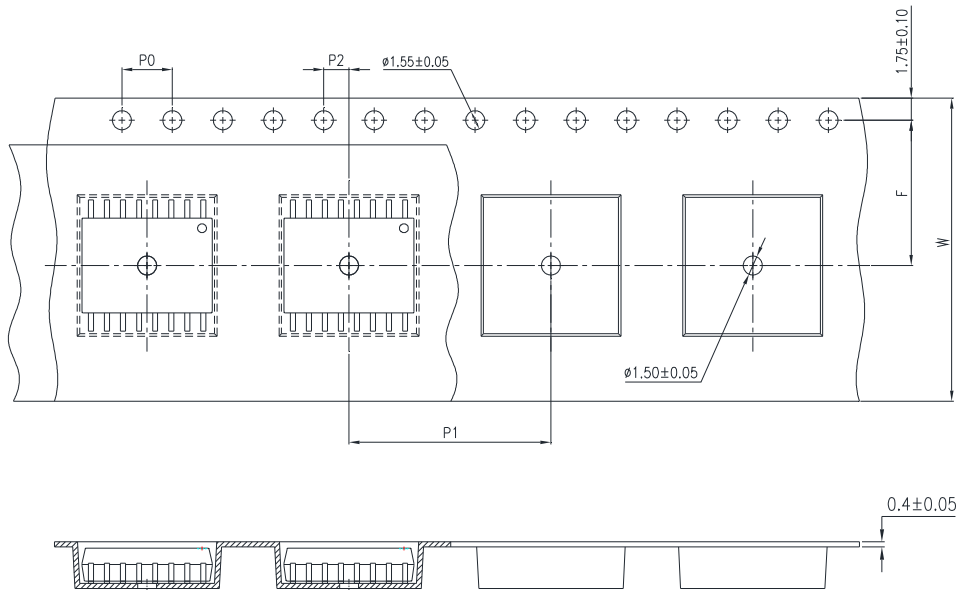
- \*1. Year date code.
- \*2. 2-digit work week.
- \*3. Factory identification mark  
(W: Changzhou).

Dimensions are in Millimeters and (Inches).

## Photocoupler LTV-332J series

### 3. TAPING DIMENSIONS

#### 3.1 LTV-332J-TP1



Description	Symbol	Dimension in mm (inch)
Tape wide	W	24±0.3 (0.94)
Pitch of sprocket holes	P <sub>0</sub>	4±0.1 (0.15)
Distance of compartment	F	11.5±0.1 (0.452)
	P <sub>2</sub>	2±0.1 (0.079)
Distance of compartment to compartment	P <sub>1</sub>	16±0.1 (0.63)

#### 3.3 Quantities Per Reel

Package Type	LTV-332J
Quantities (pcs)	850

## Photocoupler LTV-332J series

### 4. IEC/EN/DIN EN 60747-5-5 Insulation Characteristics

Isolation characteristics are guaranteed only within the safety maximum ratings which must be ensured by protective circuits in application.

Description	Symbol	Characteristics	Unit
Installation classification per DIN VDE 0110/39, Table 1 for rated mains voltage $\leq 150 V_{rms}$ for rated mains voltage $\leq 300 V_{rms}$ for rated mains voltage $\leq 600 V_{rms}$ for rated mains voltage $\leq 1000 V_{rms}$		I - IV I - IV I - IV I - III	
Climatic Classification		40/100/21	
Pollution Degree (DIN VDE 0110/39)		2	
Maximum Working Insulation Voltage	$V_{IORM}$	1414	$V_{peak}$
Input-to-Output Test Voltage, Method b *a, $V_{IORM} \times 1.875 = V_{PR}$ , 100% Production Test with $t_m = 1$ sec, Partial Discharge $< 5$ pC	$V_{PR}$	2651	$V_{peak}$
Input-to-Output Test Voltage, Method a *a, $V_{IORM} \times 1.6 = V_{PR}$ , Type and Sample Test, $t_m = 10$ sec, Partial Discharge $< 5$ pC	$V_{PR}$	2262	$V_{peak}$
Highest Allowable Overvoltage (Transient Overvoltage, $t_{ni} = 60$ sec)	$V_{IOTM}$	8000	$V_{peak}$
Safety Limiting Values (Maximum values allowed in the event of a failure)			
Case Temperature	$T_S$	175	$^{\circ}C$
Input Current *b	$I_{S, INPUT}$	400	mA
Output Power *b	$P_{S, OUTPUT}$	1200	mW
Insulation Resistance at $T_S$ , $V_{IO} = 500$ V	$R_S$	$\geq 10^9$	$\Omega$

\*a. Refer to the front of the optocoupler section of the current catalog, under Product Safety Regulations section, IEC/EN/DIN EN 60747-5-5, for a detailed description.

\*b. Ratings apply to all devices except otherwise noted in the Package column.

## Photocoupler LTV-332J series

### 5. Insulation and Safety Related Specifications

Part number	Symol	LTV-332J	Units	Conditions
Minimum External Air Gap (External Clearance)	L(101)	8.3	mm	Measured from input terminals to output terminals, shortest distance through air.
Minimum External Tracking (External Creepage)	L(102)	8.3	mm	Measured from input terminals to output terminals, shortest distance path along body.
Minimum Internal Plastic Gap (Internal Clearance)		0.5	mm	Through insulation distance, conductor to conductor, usually the direct distance between the photoemitter and photodetector inside the optocoupler cavity.
Tracking Resistance (Comparative Tracking Index)	CTI	>175	V	DIN IEC 112/VDE 0303 Part 1
Isolation Group		IIIa		Material Group (DIN VDE 0110, 1/89, Table 1)

## Photocoupler LTV-332J series

### 6. RATING AND CHARACTERISTICS

#### 6.1 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	$T_{stg}$	-55	+125	°C	—
Operating Temperature	$T_{opr}$	-40	+105	°C	—
Output IC Junction Temperature	$T_J$	—	125	°C	—
Average Forward Input Current	$I_F$	—	25	mA	3
Reverse Input Voltage	$V_R$	—	5	V	—
Peak Transient Input Current	$I_{F(TRAN)}$	—	1	A	1
“High” Peak Output Current	$I_{OH(PEAK)}$	—	5.0	A	2
“Low” Peak Output Current	$I_{OL(PEAK)}$	—	5.0	A	2
Positive Input Supply Voltage	$V_{CC1}$	-0.5	7	V	
FAULT Output Current	$I_{FAULT}$		8	mA	
FAULT Pin Voltage	$V_{FAULT}$	-0.5	$V_{CC1}$	V	
Total Output Supply Voltage	$(V_{CC2} - V_{EE})$	-0.5	35	V	—
Negative Output Supply Voltage	$(V_E - V_{EE})$	-0.5	15	V	
Positive Output Supply Voltage	$(V_{CC2} - V_E)$	-0.5	$35 - (V_E - V_{EE})$	V	
Output Voltage	$V_{O(PEAK)}$	-0.5	35	V	—
Peak Clamping Sinking Current	$I_{Clamp}$	—	1.7	A	
Miller Clamping Pin Voltage	$V_{Clamp}$	-0.5	$V_{CC2}$	V	
DESAT Voltage	$V_{DESAT}$	$V_E$	$V_E + 10$	V	
Power Dissipation	$P_I$		150	mW	—
Output Power Dissipation	$P_O$	—	600	mW	—
Lead Solder Temperature (10s)	$T_{sol}$	—	260	°C	—

Note: Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.



## Photocoupler LTV-332J series

### 6.2 Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	$T_A$	-40	105	°C
Total Output Supply Voltage	$(V_{CC2}-V_{EE})$	15	30	V
Negative Output Supply Voltage	$(V_E-V_{EE})$	0(-0.5)	15	V
Positive Output Supply Voltage	$(V_{CC2}-V_E)$	15(-0.5)	30- $(V_E-V_{EE})$	V
Input Current (ON)	$I_{FL(ON)}$	8	12	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.6(0)	0.8	V

### 6.3 ELECTRICAL OPTICAL CHARACTERISTICS

	Parameter	Symb	Min.	Typ.	Max.	Unit	Test Condition	Figure	Note
Input	Input Forward Voltage	$V_F$	1.2	1.37	1.8	V	$I_F = 10\text{mA}$		
	Input Forward Voltage Temperature Coefficient	$\frac{\Delta V_F}{\Delta T}$		-1.237		$\frac{\text{mV}^\circ}{\text{C}}$	$I_F = 10\text{mA}$		
	Input Reverse Voltage	$BV_R$	5			V	$I_R = 10\mu\text{A}$		
	Input Threshold Current (Low to High)	$I_{FLH}$		2.5	6	mA	$I_O = 0\text{A}, V_O > 5\text{V}$		
	Input Threshold Voltage (High to Low)	$V_{FHL}$	0.8	1.26		V			
	Input Capacitance	$C_{IN}$		33		pF	$f = 1\text{MHz}, V_F = 0\text{V}$		
Output	FAULT Logic Low Output Voltage	$V_{FAULT}$			0.4	V	$I_{FAULT} = 1.1\text{mA}, V_{CC1} = 5.5\text{V}$		
					0.4	V	$I_{FAULT} = 1.1\text{mA}, V_{CC1} = 3.3\text{V}$		
	FAULT Logic High Output Current	$I_{FAULT}$			0.5	$\mu\text{A}$	$V_{FAULT} = 5.5\text{V}, V_{CC1} = 5.5\text{V}$		
					0.3	$\mu\text{A}$	$V_{FAULT} = 3.3\text{V}, V_{CC1} = 3.3\text{V}$		
	High Level Supply Current	$I_{CC2H}$		2.4	4.5	mA	Output Open, $I_F = 7\text{ to }16\text{mA}$		8

## Photocoupler LTV-332J series

Low Level Supply Current	$I_{CC2L}$		2.5	4.5	mA	Output Open, $V_F = 0$ to $+0.8$ V		
High Level Output Current	$I_{OH}$			-2.0	A	$V_O = V_{CC2} - 3$ V	19	4
				-5.0		$V_O = V_{CC2} - 7$ V		2
Low Level Output Current	$I_{OL}$	2.0	1.5		A	$V_O = V_{EE} + 2$ V	20	4
		5.0				$V_O = V_{EE} + 6$ V		2
High Level Output Voltage	$V_{OH}$	$V_{CC} - 1.2$	$V_{CC} - 1.0$		V	$I_O = -100$ mA , $I_F = 10$ mA	17	5
Low Level Output Voltage	$V_{OL}$		$V_{EE} + 0.1$	$V_{EE} + 0.25$	V	$I_O = -100$ mA , $I_F = 0$ mA	18	6,7,8, 22
Clamp Low Level Sinking Current	$I_{CL}$	0.5	1.1		A	$V_{tClamp} = 2.0$ V		
Blanking Capacitor Charging Current	$I_{CHG}$	-0.13	-0.24	-0.33	mA	$V_{DESAT} = 2$ V		8.9
Blanking Capacitor Discharge Current	$I_{DSCHG}$	10	30		mA	$V_{DESAT} = 7$ V		
DESAT Threshold	$V_{DESAT}$	6	6.5	7.5	V	$V_{CC2} - V_E > V_{UVLO-}$		7
Clamp Pin Threshold Voltage	$V_{tClamp}$		2.0		V			
UVLO Threshold	$V_{UVLO+}$	10.5	11.6	12.5	V	$V_O > 5$ V, $I_F = 10$ mA	22	6,8,10
	$V_{UVLO-}$	9.2	10.3	11.1	V	$V_O < 5$ V, $I_F = 10$ mA		,11
UVLO Hysteresis	UVLO		1.3		V	$(V_{UVLO+} - V_{UVLO-})$		

## Photocoupler LTV-332J series

### 6.4 SWITCHING SPECIFICATION

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Figure	Note
Propagation Delay Time to High Output Level	$t_{PLH}$	50		200	ns	$R_g = 10 \Omega$ , $C_g = 10 \text{ nF}$ , $f = 10 \text{ kHz}$ , Duty Cycle = 50% $I_F = 10 \text{ mA}$ , $V_{CC2} = 30 \text{ V}$	23	12,14
Propagation Delay Time to Low Output Level	$t_{PHL}$	50		200				13,16
Pulse Width Distortion	PWD	-80		80				
Propagation delay difference between any two parts or channels	PDD	-100		100				
Output Rise Time (10 to 90%)	$T_r$		50				23	
Output Fall Time (90 to 10%)	$T_f$		50					
DESAT Sense to 90%VO Delay	$t_{DESAT(90\%)}$		0.25	0.5	$\mu\text{s}$	$C_{DESAT} = 100 \text{ pF}$ , $R_g = 10 \Omega$ , $C_g = 10 \text{ nF}$ , $V_{CC2} = 30 \text{ V}$		
DESAT Sense to 10%VO Delay	$t_{DESAT(10\%)}$		2	3	$\mu\text{s}$	$C_{DESAT} = 100 \text{ pF}$ , $R_g = 10 \Omega$ , $C_g = 10 \text{ nF}$ , $V_{CC2} = 30 \text{ V}$		
DESAT Sense to Low Level FAULT Signal Delay	$t_{DESAT(FAULT)}$		0.25	0.5	$\mu\text{s}$	$C_{DESAT} = 100 \text{ pF}$ , $R_F = 2.1 \text{ k}\Omega$ , $C_F = 1 \text{ nF}$ , $R_g = 10 \Omega$ , $C_g = 10 \text{ nF}$ , $V_{CC2} = 30 \text{ V}$		17
DESAT Sense to DESAT Low Propagation Delay	$t_{DESAT(LOW)}$		0.25		$\mu\text{s}$	$C_{DESAT} = 100 \text{ pF}$ , $R_F = 2.1 \text{ k}\Omega$ , $R_g = 10 \Omega$ , $C_g = 10 \text{ nF}$ , $V_{CC2} = 30 \text{ V}$		18

## Photocoupler LTV-332J series

DESAT Input Mute	$t_{\text{DESAT(MUTE)}}$	5			$\mu\text{s}$			19
RESET to High Level FAULT Signal Delay	$t_{\text{RESET(FAULT)}}$	0.2	1	2	$\mu\text{s}$	$C_{\text{DESAT}} = 100\text{pF}, R_{\text{F}} = 2.1\text{ k}\Omega,$ $R_{\text{g}} = 10\ \Omega, C_{\text{g}} = 10\text{nF},$ $V_{\text{CC1}} = 5.5\text{ V}, V_{\text{CC2}} = 30\text{ V}$		
Common mode transient immunity at high level output	CMH	15			$\text{kV}/\mu\text{s}$	$T_{\text{A}} = 25^{\circ}\text{C}, I_{\text{F}} = 10\text{ mA},$ $V_{\text{CM}} = 1500\text{ V}, V_{\text{CC2}} = 30\text{ V},$ $R_{\text{F}} = 2.1\text{ k}\Omega, C_{\text{F}} = 15\text{ pF}$		20,23
		50			$\text{kV}/\mu\text{s}$	$T_{\text{A}} = 25^{\circ}\text{C}, I_{\text{F}} = 10\text{ mA},$ $V_{\text{CM}} = 1500\text{ V}, V_{\text{CC2}} = 30\text{ V},$ $R_{\text{F}} = 2.1\text{ k}\Omega, C_{\text{F}} = 1\text{ nF}$		
Common mode transient immunity at low level output	CML	15			$\text{kV}/\mu\text{s}$	$T_{\text{A}} = 25^{\circ}\text{C}, V_{\text{F}} = 0\text{ V},$ $V_{\text{CM}} = 1500\text{ V}, V_{\text{CC2}} = 30\text{ V},$ $R_{\text{F}} = 2.1\text{ k}\Omega, C_{\text{F}} = 15\text{ pF}$		21
		50			$\text{kV}/\mu\text{s}$	$T_{\text{A}} = 25^{\circ}\text{C}, V_{\text{F}} = 0\text{ V},$ $V_{\text{CM}} = 1500\text{ V}, V_{\text{CC2}} = 30\text{ V},$ $R_{\text{F}} = 2.1\text{ k}\Omega, C_{\text{F}} = 1\text{ nF}$		

1. All Typical values at  $T_{\text{A}} = 25^{\circ}\text{C}$  and  $V_{\text{CC}} - V_{\text{EE}} = 30\text{ V}, V_{\text{E}} - V_{\text{EE}} = 0\text{ V}$ ; unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

2. Maximum pulse width = 10  $\mu\text{s}$ .

This value is intended to allow for component tolerances for designs with  $I_{\text{O}}$  peak minimum = 4.0 A.

Derate linearly from 5.0 A at  $+25^{\circ}\text{C}$  to 2.5 A at  $+105^{\circ}\text{C}$ . This compensates for increased  $I_{\text{O}}$  PEAK due to changes in  $V_{\text{OL}}$  over temperature.

3. This supply is optional. Required only when negative gate drive is implemented.

4. Maximum pulse width = 50  $\mu\text{s}$ .

5. See the Slow IGBT Gate Discharge During Fault Condition section in the applications notes at the end of this data sheet for further details.

## Photocoupler LTV-332J series

6. 15 V is the recommended minimum operating positive supply voltage ( $V_{CC2} - V_E$ ) to ensure adequate margin in excess of the maximum  $V_{UVLO+}$  threshold of 12.5V. For High Level Output Voltage testing,  $V_{OH}$  is measured with a dc load current. When driving capacitive loads,  $V_{OH}$  will approach  $V_{CC}$  as  $I_{OH}$  approaches zero units.
7. Maximum pulse width = 1.0 ms.
8. Once  $V_O$  of the LTV-332J is allowed to go high ( $V_{CC2} - V_E > V_{UVLO+}$ ), the DESAT detection feature of the LTV-332J will be the primary source of IGBT protection. UVLO is needed to ensure DESAT is functional. Once  $V_{CC2}$  is increased from 0 V to above  $V_{UVLO+}$ , DESAT will remain functional until  $V_{CC2}$  is decreased below  $V_{UVLO-}$ . Thus, the DESAT detection and UVLO features of the LTV-332J work in conjunction to ensure constant IGBT protection.
9. See the DESAT fault detection blanking time section in the applications notes at the end of this data sheet for further details.
10. This is the "increasing" (i.e. turn-on or "positive going" direction) of  $V_{CC2} - V_E$
11. This is the "decreasing" (i.e. turn-off or "negative going" direction) of  $V_{CC2} - V_E$
12. This load condition approximates the gate load of a 1200 V/150A IGBT.
13. Pulse Width Distortion (PWD) is defined as  $|t_{PHL} - t_{PLH}|$  for any given unit.
14. As measured from  $I_F$  to  $V_O$ .
15. The difference between  $t_{PHL}$  and  $t_{PLH}$  between any two LTV-332J parts under the same test conditions.
16. As measured from ANODE, CATHODE of LED to VOUT
17. This is the amount of time from when the DESAT threshold is exceeded, until the FAULT output goes low.
18. This is the amount of time the DESAT threshold must be exceeded before  $V_{OUT}$  begins to go low, and the FAULT output to go low. This is supply voltage dependent.
19. Auto Reset: This is the amount of time when  $V_{OUT}$  will be asserted low after DESAT threshold is exceeded. See the Description of Operation (Auto Reset) topic in the application information section.
20. Common mode transient immunity in the high state is the maximum tolerable  $dV_{CM}/dt$  of the common mode pulse,  $V_{CM}$ , to assure that the output will remain in the high state (i.e.,  $V_O > 15$  V or FAULT  $> 2$  V).
21. Common mode transient immunity in the low state is the maximum tolerable  $dV_{CM}/dt$  of the common mode pulse,  $V_{CM}$ , to assure that the output will remain in a low state (i.e.,  $V_O < 1.0$  V or FAULT  $< 0.8$  V).
22. To clamp the output voltage at  $V_{CC} - 3 V_{BE}$ , a pull-down resistor between the output and  $V_{EE}$  is recommended to sink a static current of 650  $\mu$ A while the output is high. See the Output Pull-Down Resistor section in the application notes at the end of this data sheet if an output pull-down resistor is not used.
23. Split resistors network with a ratio of 1:1 is needed at input LED1. See Figure 13. together.

## Photocoupler LTV-332J series

### 6.5 PACKAGE CHARACTERISTICS

	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Withstand Insulation Test Voltage	$V_{ISO}$	5000	—	—	V	RH $\leq$ 40-60%, t = 1min, T <sub>A</sub> = 25°C,	1, 2
Input-Output Resistance	$R_{I-O}$	—	10 <sup>9</sup>	—	$\Omega$	V <sub>I-O</sub> = 500 V DC	1
Input-Output Capacitance	$C_{I-O}$	—	1.3	—	pF	f = 1MHz, T <sub>A</sub> = 25°C	1

Note.1. According to UL1577, each Photocoupler is tested by applying an insulation test voltage 6000V<sub>RMS</sub> for 1 second (leakage current less than 10uA). This test is performed before the 100% production test for partial discharge

Note.2. This is a two-terminal measurement: pins 1-8 are shorted together and pins 9-16 are shorted together.

# Photocoupler LTV-332J series

## 7. TYPICAL TEST CIRCUITS

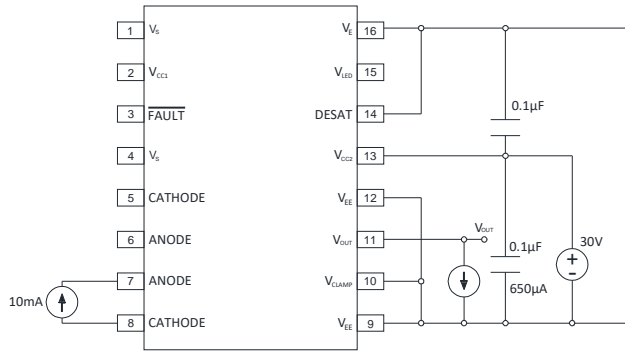


Figure 1 : VoH Test Circuit

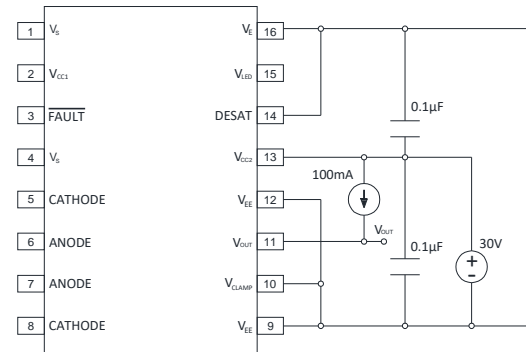


Figure 2 : VoL Test Circuit

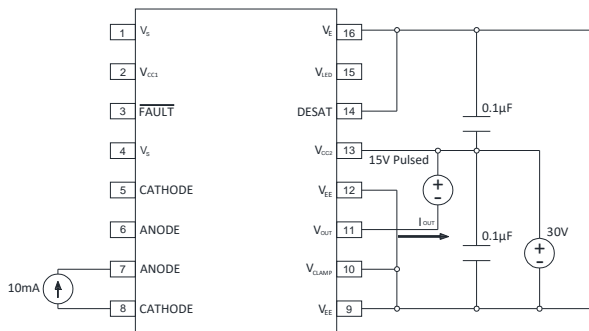


Figure 3 : IOH Test Circuit

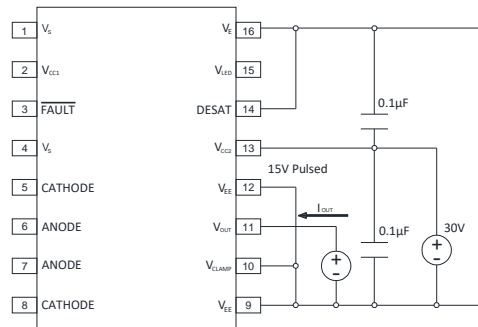


Figure 4 : IOL Test Circuit

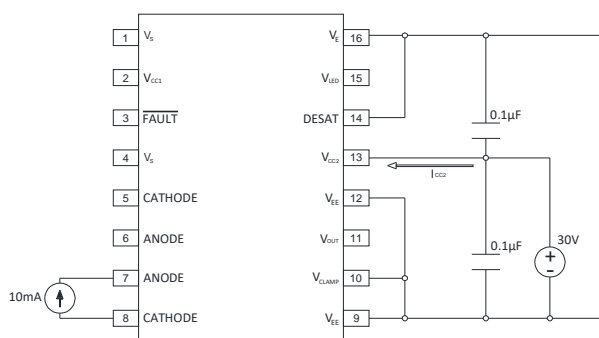


Figure 5 : Icc2H Test Circuit

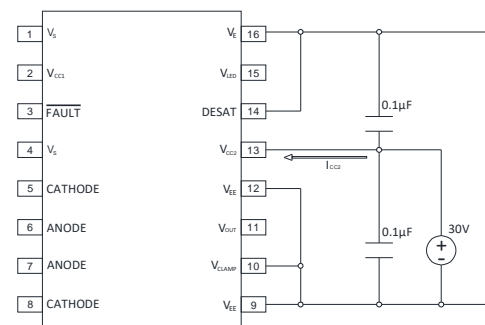


Figure 6 : Icc2L Test Circuit

# Photocoupler LTV-332J series

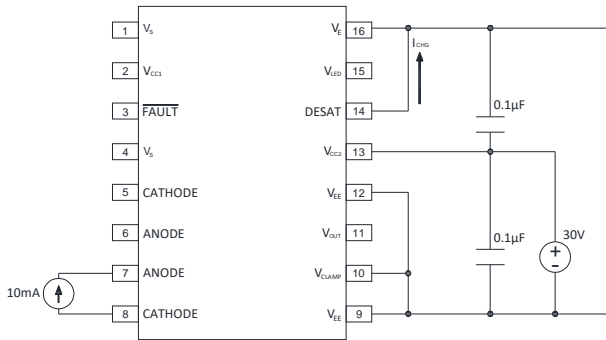


Figure 7 : ICHG Test Circuit

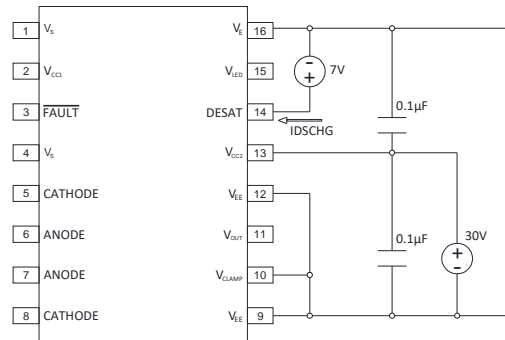
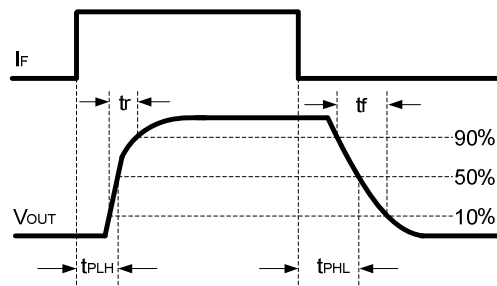
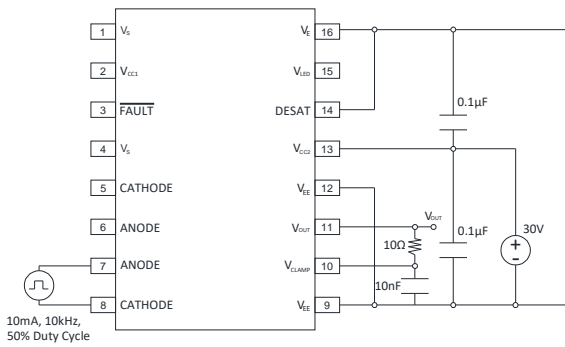


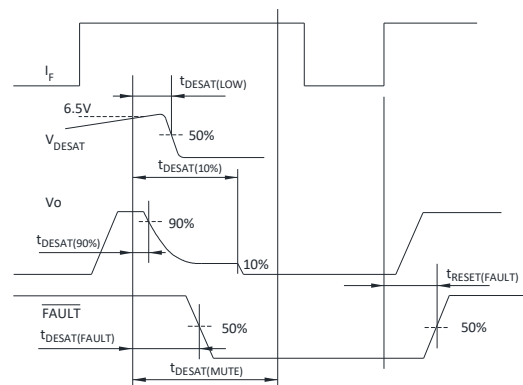
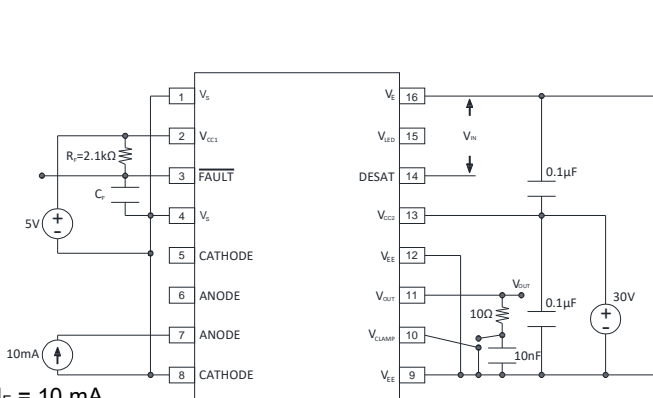
Figure 8 : Ibschg Test Circuit



$I_F = 10 \text{ mA}$

(  $f = 10 \text{ kHz}$ , duty = 50%,  $t_r = t_f = 5 \text{ ns}$  or less)

Figure 9 : tPLH , tPHL , tr , tf Test Circuit



$I_F = 10 \text{ mA}$

(  $f = 10 \text{ kHz}$ , duty = 50%,  $t_r = t_f = 5 \text{ ns}$  or less)

Figure 10 : tDESAT fault Test Circuit



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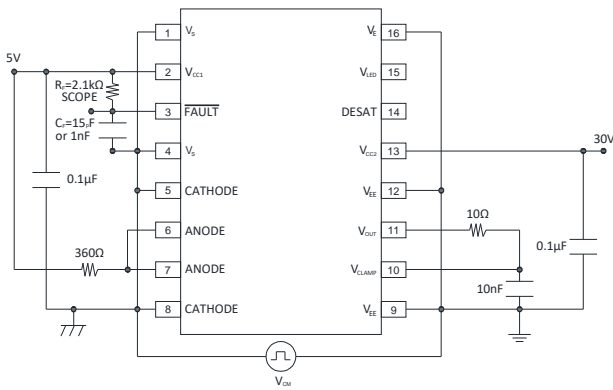


Figure 11 : CMR Test Circuit LED2 ON

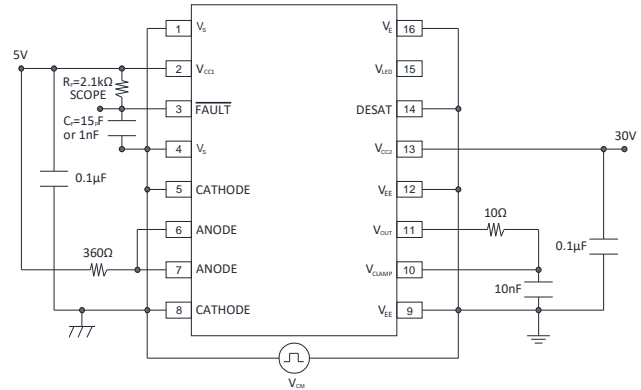


Figure 12 : CMR Test Circuit LED2 OFF

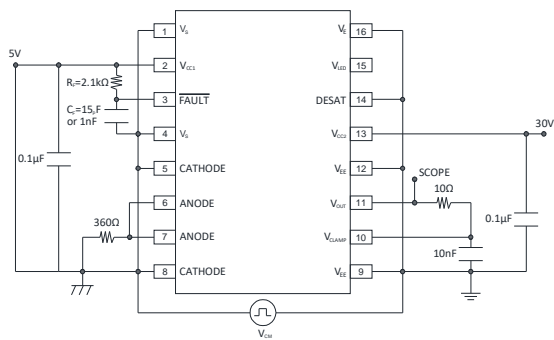


Figure 13 : CMR Test Circuit LED1 ON

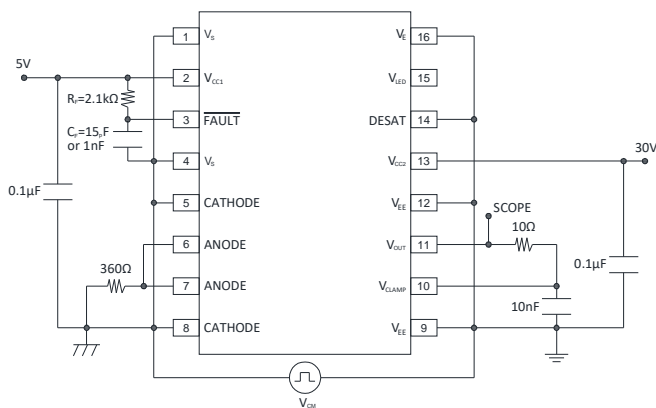
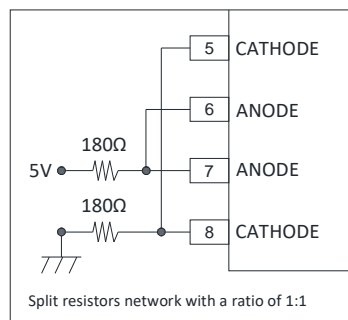


Figure 14 : CMR Test Circuit LED1 OFF

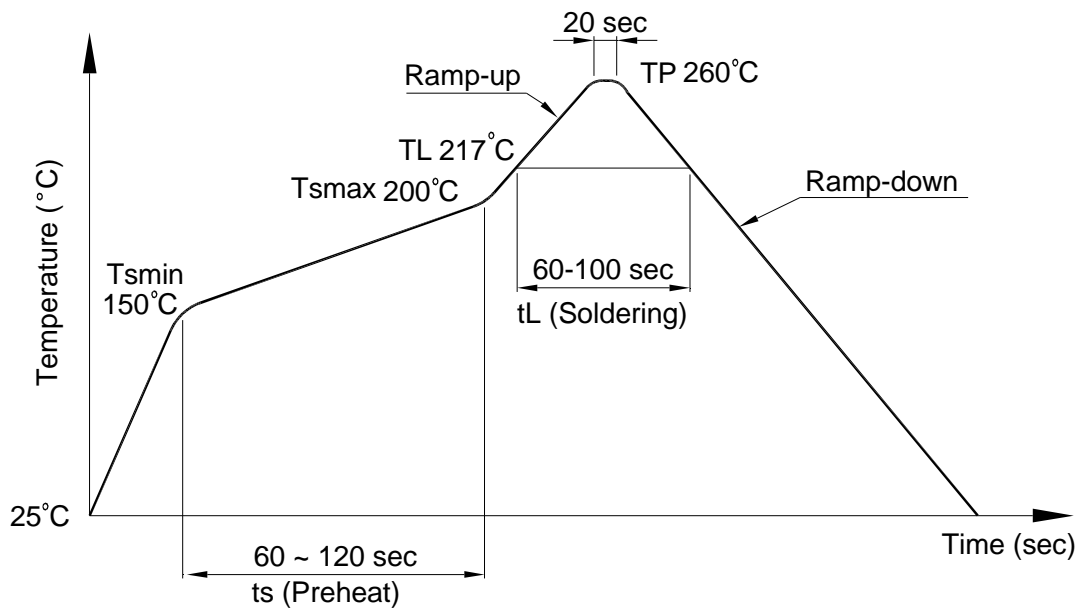
## Photocoupler LTV-332J series

### 8. TEMPERATURE PROFILE OF SOLDERING

#### 8.1 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 ~ 100 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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### 8.2 Wave soldering (JEDEC22A111 compliant)

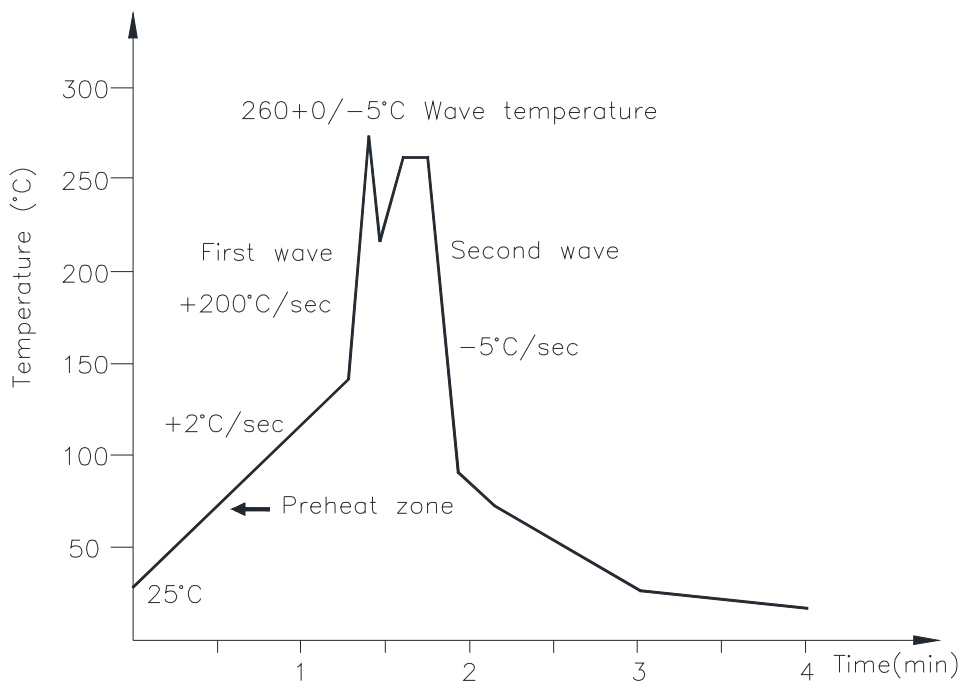
One time soldering is recommended within the condition of temperature.

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

Time: 10 sec.

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

Preheat time: 30 to 80 sec.



### 8.3 Hand soldering by soldering iron

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

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

Time: 3 sec max.

## 9. Notes:

Specifications of the products displayed herein are subject to change without notice.

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 instrumentation and application. 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.