LITEON OPTOELECTRONICS

Photocoupler

Product Data Sheet

LTV-3120 series

Spec No.: DS70-2012-0008

Effective Date: 05/21/2014

Revision: E

LITE-ON DCC

RELEASE

BNS-OD-FC001/A4

LITE-ON Technology Corp. / Optoelectronics
No.90,Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C.
Tel: 886-2-2222-6181 Fax: 886-2-2221-1948 / 886-2-2221-0660
http://www.liteon.com/opto

Photocouplers
LTV-3120 series

1. DESCRIPTION

The LTV-3120 optocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications and inverters in power supply system. It contains an AlGaAs LED optically coupled to an integrated circuit with a power output stage. The 2.5A peak output current is capable of directly driving most IGBTs with ratings up to 1200 V/100 A. For IGBTs with higher ratings, the LTV-3120 series can be used to drive a discrete power stage which drives the IGBT gate.

The Optocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +105°C.

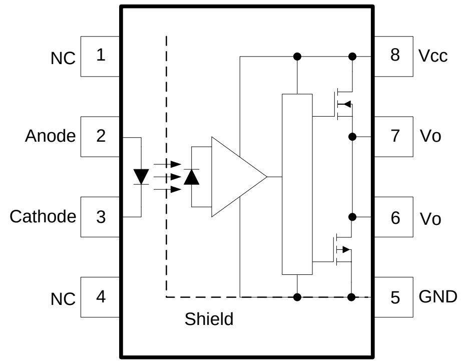
1.1 Features

- 2.5 A maximum peak output current
- 2.0 A minimum peak output current
- Rail-to-rail output voltage
- 400 ns maximum propagation delay
- 150 ns maximum propagation delay difference
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- 15 kV/us minimum Common Mode Rejection (CMR) at V_{CM} = 1500 V
- I_{CC} = 3.0 mA maximum supply current
- Wide operating range: 15 to 30 Volts (V_{CC})
- Guaranteed performance over temperature -40°C ~ +105°C.
- Offer low power dissipation with $R_{ON} \leq 1\Omega$
- MSL Level 1
- Safety approval:
  - UL/ cUL Recognized 5000 V_{RMS}/1 min
  - IEC/EN/DIN EN 60747-5-5 V_{IORM} = 630 Vpeak

1.2 Applications

- IGBT/MOSFET gate drive
- Uninterruptible power supply (UPS)
- Industrial Inverter
- AC/Brushless DC motor drives

Functional Diagram



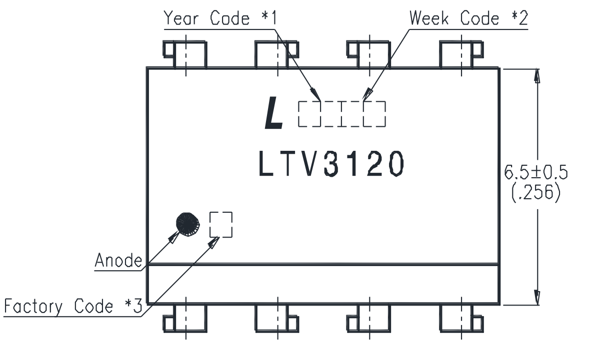
A 0.1μF bypass Capacitor must be connected between Pin 5 and 8. See note 11.

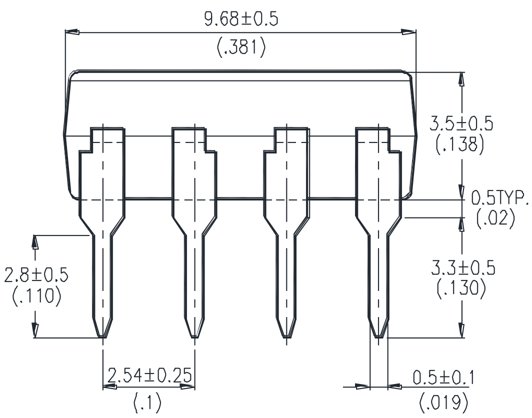
Truth Table

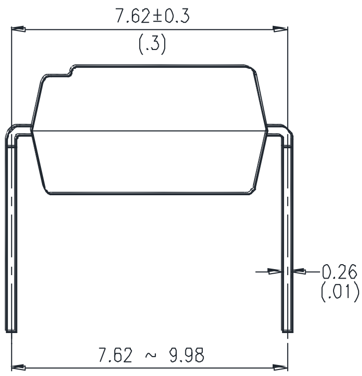
LED	V_{CC}-GND (Turn-ON, +ve going)	V_{CC}-GND (Turn-OFF, -ve going)	V_O
OFF	0 - 30 V	0 - 30 V	Low
ON	0 – 11.0 V	0 – 9.5 V	Low
ON	11.0 - 13.5 V	9.5 - 12 V	Transition
ON	13.5 - 30 V	12 - 30 V	High

2. PACKAGE DIMENSIONS

2.1 LTV-3120







Notes :

*1. Year date code.

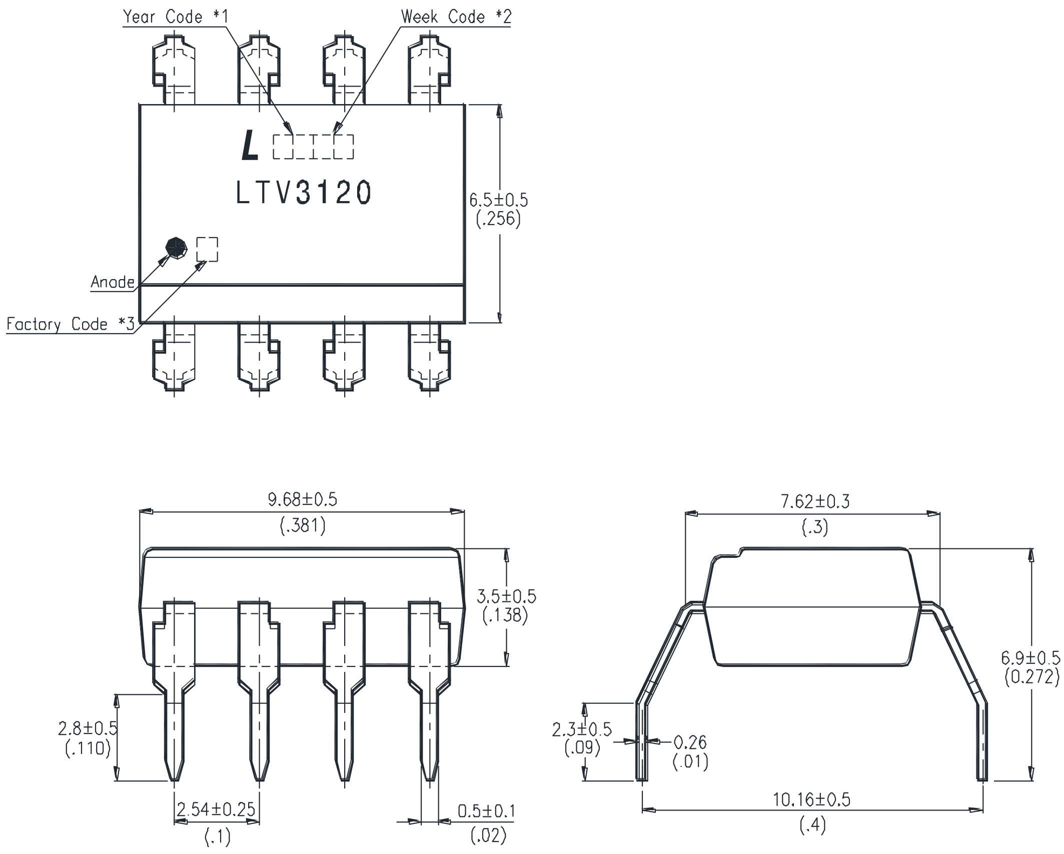
*2. 2-digit work week.

*3. Factory identification mark

(Y : Thailand).

Dimensions are in Millimeters and (Inches).

2.2 LTV-3120M



Notes

*1. Year date code.

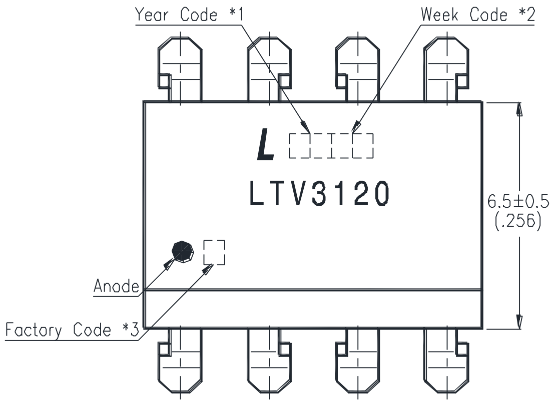
*2. 2-digit work week.

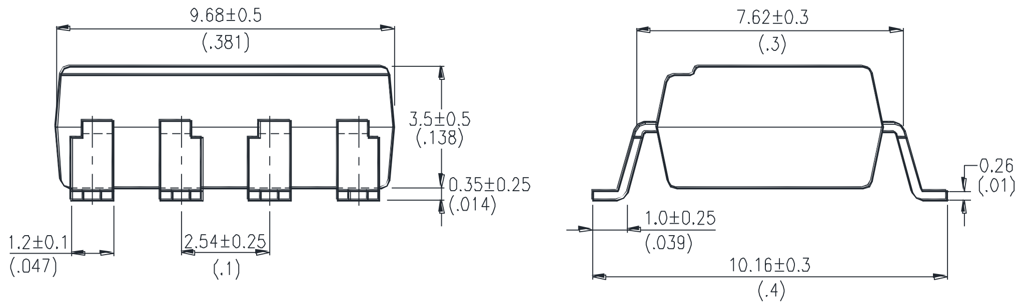
*3. Factory identification mark

(Y : Thailand).

Dimensions are in Millimeters and (Inches).

2.3 LTV-3120S





Notes :

*1. Year date code.

*2. 2-digit work week.

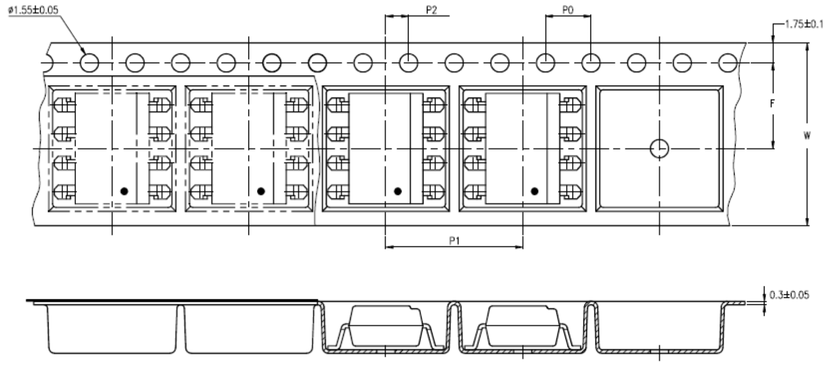
*3. Factory identification mark

(Y : Thailand).

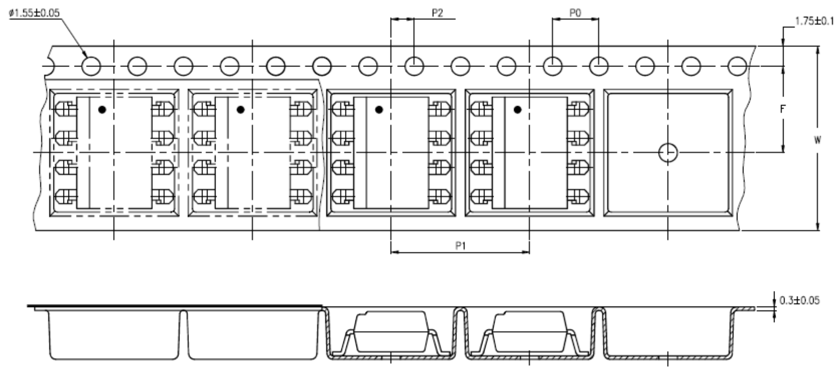
Dimensions are in Millimeters and (Inches).

3. TAPING DIMENSIONS

3.1 LTV-3120S-TA



3.2 LTV-3120S-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 (0.47)

3.3 Quantities Per Reel

Package Type	LTV-3120
Quantities (pcs)	1000

4. RATING AND CHARACTERISTICS

4.1 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	T_{stg}	-55	+125	^oC	
Operating Temperature	T_{opr}	-40	+105	^oC	
Output IC Junction Temperature	T_J		125	^oC	
Isolation Voltage	V_{iso}	5000		V_{RMS}	
Total Output Supply Voltage	$(V_{CC} - V_{EE})$	0	35	V	
Average Forward Input Current	I_F		25	mA	
Reverse Input Voltage	V_R		5	V	
Peak Transient Input Current (<1 μs pulse width, 300 pps)	$I_{F(TRAN)}$		1	A	
"High" Peak Output Current	$I_{OH(PEAK)}$		2.5	A	1
"Low" Peak Output Current	$I_{OL(PEAK)}$		2.5	A	1
Input Current (Rise/Fall Time)	$t_{r(IN)}$ / $t_{f(IN)}$		500	ns	
Output Voltage	$V_{O(PEAK)}$	-0.5	V_{CC}	V	
Power Dissipation	P_I		40	mW	
Output Power Dissipation	P_O		250	mW	
Total Power Dissipation	P_T		295	mW	
Lead Solder Temperature	T_{sol}		260	^oC	

Ambient temperature = 25^{o}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.

4.2 Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-40	105	^oC
Supply Voltage	V_{CC}	15	30	V
Input Current (ON)	$I_{FL(ON)}$	7	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3.0	0.8	V

4.3 ELECTRICAL OPTICAL CHARACTERISTICS

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Figure	Note
Input	Input Forward Voltage	V_F	1.2	1.37	1.8	V	I_F = 10mA	13	
	Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$		-1.237		mV/^{O}C	I_F = 10mA		
	Input Reverse Voltage	BV_R	5			V	I_R = 10μA		
	Input Threshold Current (Low to High)	I_{FLH}		1.4	5	mA	R_g = 10Ω, C_g = 25nF, V_O > 5V	6, 7 ,18	
	Input Threshold Voltage (High to Low)	V_{FHL}	0.8			V			
	Input Capacitance	C_{IN}		33		pF	f = 1 MHz, V_F = 0 V		
Output	High Level Supply Current	I_{CCH}		1.9	3.0	mA	R_g = 10Ω, C_g = 25nF, I_F = 10mA	4, 5	
	Low Level Supply Current	I_{CCL}		2.1	3.0	mA	R_g = 10Ω, C_g = 25nF, V_F = 0V		
	High level output current	I_{OH}		-2.0	-1.0	A	V_O = (V_{CC} – 2.5 V)	16	1
				-	-2.5		V_{CC} - V_O ≤15V		2
	Low level output current	I_{OL}	1.0	2.0		A	V_O = (V_{CC} + 2.0 V)	17	1
			2.5				V_{CC} – V_{EE} ≤15V		3
	High level output voltage	V_{OH}	V_{CC} - 0.25	V_{CC} - 0.1		V	I_F = 10mA, I_O = -100mA	1, 2, 14	4
	Low level output voltage	V_{OL}		V_{EE} + 0.1	V_{EE} + 0.25	V	I_F = 0mA, I_O = 100mA	3, 15	
	UVLO Threshold	V_{UVLO+}	11.0	12.7	13.5	V	V_O > 5V, I_F = 10 mA	19	
		V_{UVLO-}	9.5	11.2	12.0	V	V_O < 5V, I_F = 10 mA		
	UVLO Hysteresis	$UVLO_{HYS}$		1.5		V			

All Typical values at T_A = 25°C and V_{CC} – V_{EE} = 30 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition. (As page 6)

5. SWITCHING SPECIFICATION

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Figure	Note
Propagation Delay Time to High Output Level	t_{PHL}	100	242	400	ns	R_g = 10Ω, C_g = 25nF, f = 20 kHz, Duty Cycle = 50% I_F = 7 to 16 mA, V_{CC} = 15 to 30V V_{EE} = ground	8, 9, 10, 11, 12, 20	
Propagation Delay Time to Low Output Level	t_{PLH}	100	183	400				
Pulse Width Distortion	PWD		-60	-120				10
Propagation delay difference between any two parts or channels	PDD	-150		150				7
Output Rise Time (20 to 80%)	Tr		42				20	
Output Fall Time (80 to 20%)	Tf		50					
Common mode transient immunity at high level output	|CMH|	15			kV/μs	T_A = 25°C, I_F = 10 to 16 mA, V_{CM} = 1500 V, V_{CC} = 30 V	21	8
Common mode transient immunity at low level output	|CML|	15			kV/μs	T_A = 25°C, V_F = 0 V, V_{CM} = 1500 V, V_{CC} = 30 V		9

All Typical values at T_A = 25°C and V_{CC} – V_{EE} = 30 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition. (As page 6)

6. ISOLATION CHARACTERISTIC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	Note
Withstand Insulation Test Voltage	V_{ISO}	5000	—	—	V	RH ≤ 50%, t = 1min, T_A = 25°C	5, 6
Input-Output Resistance	R_{I-O}	—	$6.5x10^{11}$	—	Ω	V_{I-O} = 500V DC	5
Input-Output Capacitance	C_{I-O}	—	1.0	—	pF	f = 1MHz	

All Typical values at T_A = 25°C unless otherwise specified. All minimum and maximum specifications are at recommended operating condition. (As page 6)

Notes:

1) Maximum pulse width = 10μs, maximum duty cycle = 0.2%.
2) Output is sourced at -2.5 A with a maximum pulse width = 10μs. V_{CC}-V_O is measured to ensure 15 V or below.
3) Output is sourced at 2.5 A with a maximum pulse width = 10μs. V_O-V_{EE} is measured to ensure 15 V or below.
4) In this test V_{OH} is measured with a DC load current. When driving capacitive loads, V_{OH} will approach V_{CC} as I_{OH} approaches zero amps.
5) Device is considered a two terminal device: pins 1, 2, 3 and 4 are shorted together and pins 5, 6, 7 and 8 are shorted together.
6) According to UL1577, each photocoupler is tested by applying an insulation test voltage 5250 V_{RMS} for one second (leakage current less than 10uA). This test is performed before the 100% production test for partial discharge
7) The difference between T_{PHL} and T_{PLH} between any two LTV-3120 parts under same test conditions.
8) Common mode transient immunity in high stage is the maximum tolerable negative dV_{CM}/dt on the trailing edge of the common mode impulse signal, V_{CM}, to assure that the output will remain high.
9) Common mode transient immunity in low stage is the maximum tolerable positive dV_{CM}/dt on the leading edge of the common mode impulse signal, V_{CM}, to assure that the output will remain low.
10) Pulse Width Distortion is defined as T_{PHL} - T_{PLH} for any given device.
11) At least a 0.1μF or bigger bypass capacitor must be connected/ closed across pin 8 and pin 5. Failure to provide the bypass may impair the switching property. Normally, it is recommended to place a 1μF multi-layer ceramic capacitor. To parallel one larger capacitor (>1μF) to optimize performance is better.

7. TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

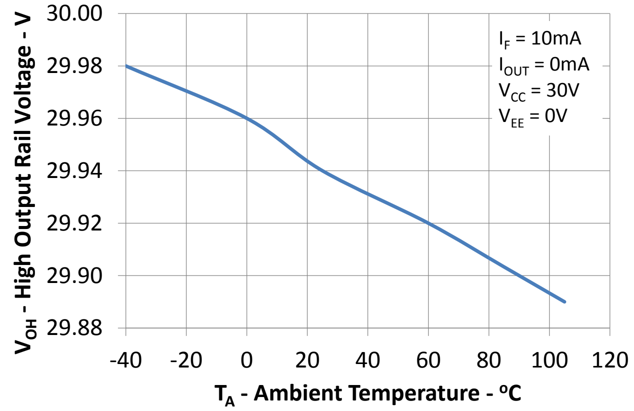


Figure 1: High output rail voltage vs. Temperature

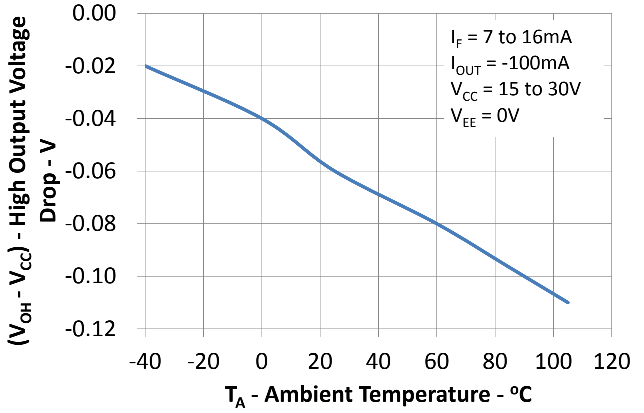


Figure 2: V_{OH} vs. Temperature

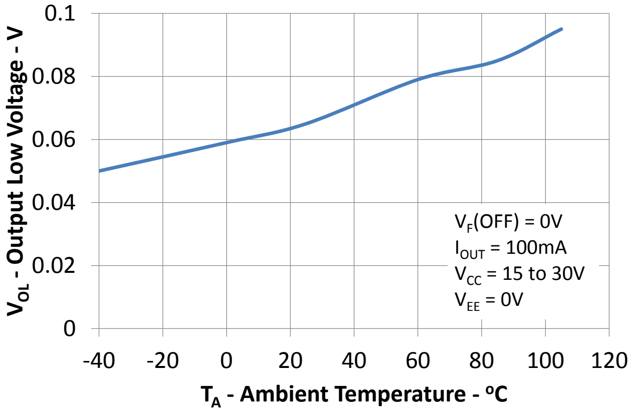


Figure 3: V_{OL} vs. Temperature

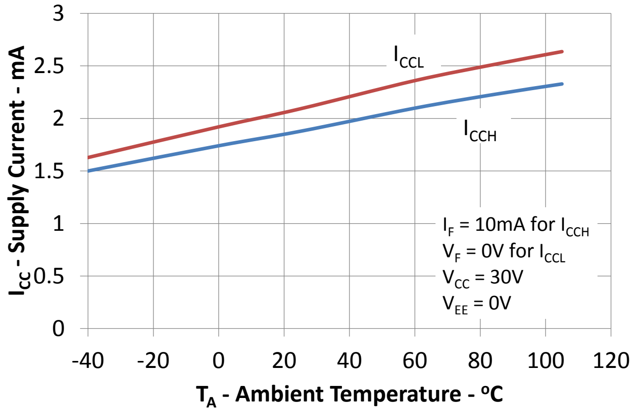


Figure 4: I_{CC} vs. Temperature

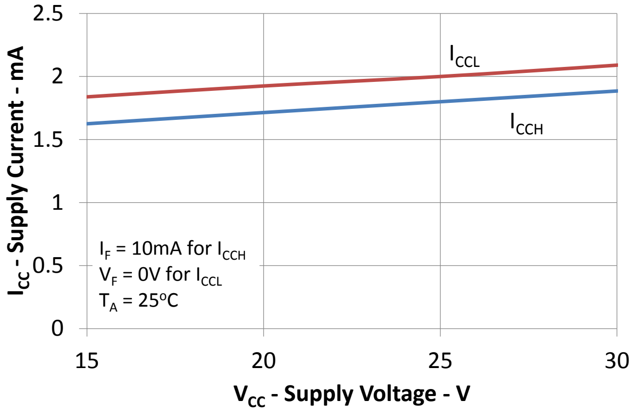


Figure 5: I_{CC} vs. V_{CC}

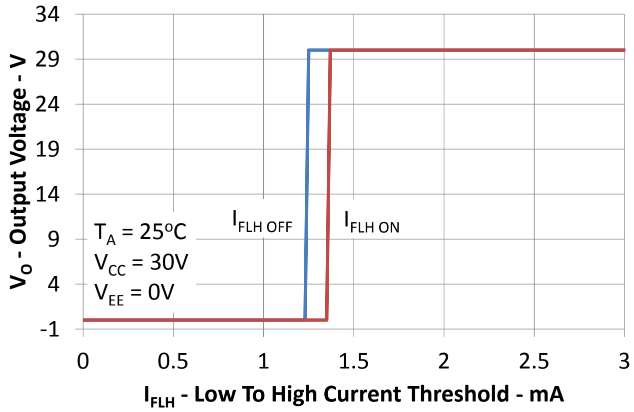


Figure 6: IFLH Hysteresis

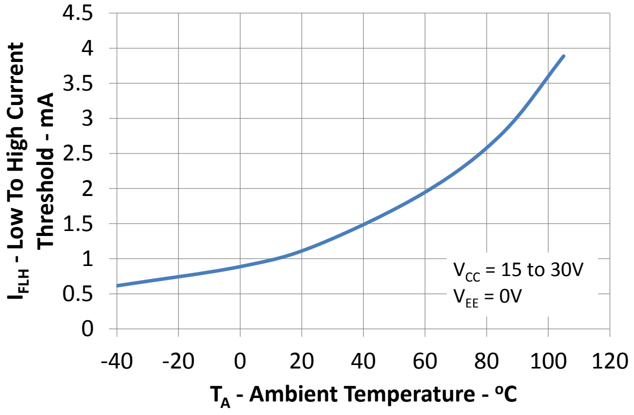


Figure 7: I_{FLH} vs. Temperature

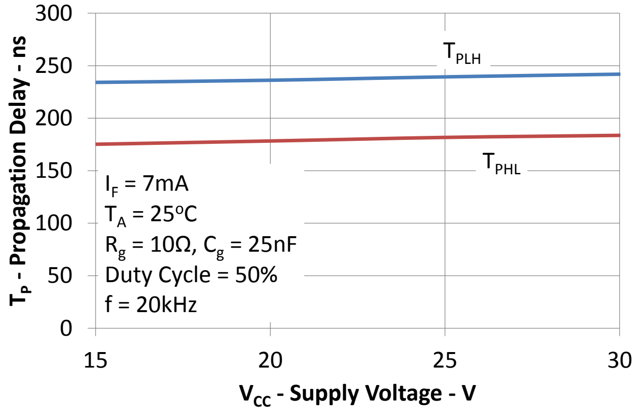


Figure 8: Propagation Delays vs. V_{CC}

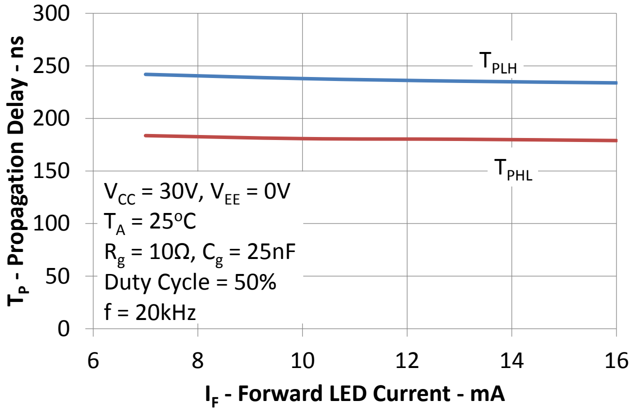


Figure 9: Propagation Delays vs. I_F

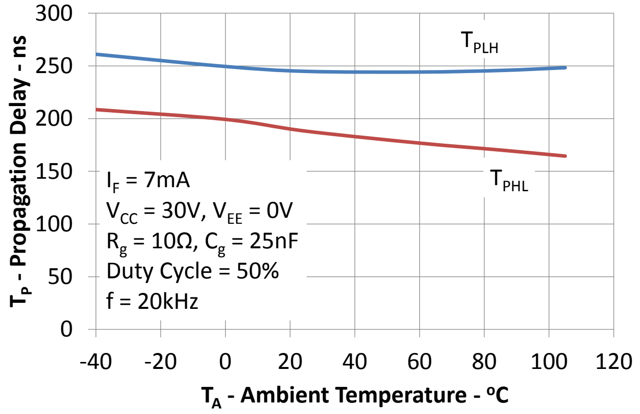


Figure 10: Propagation Delays vs. Temperature

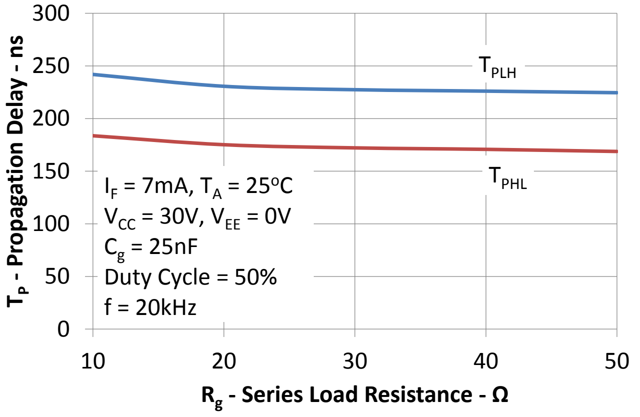


Figure 11: Propagation Delays vs. R_g

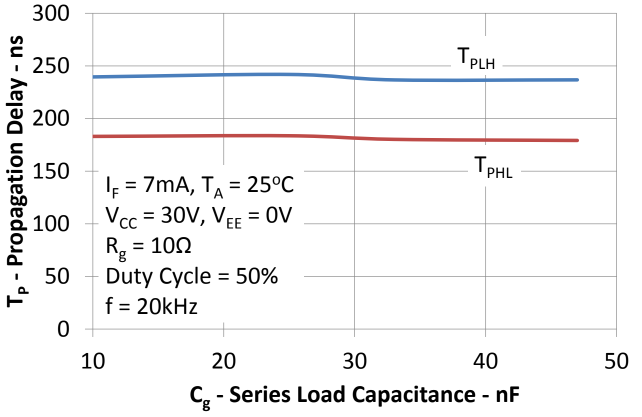


Figure 12: Propagation Delays vs. C_g

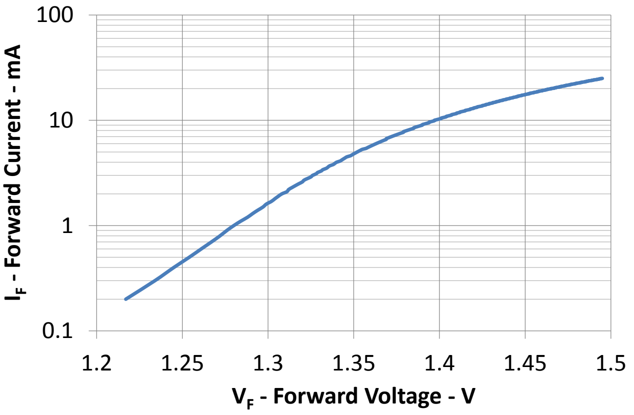


Figure 13: Input Current vs. Forward Voltage

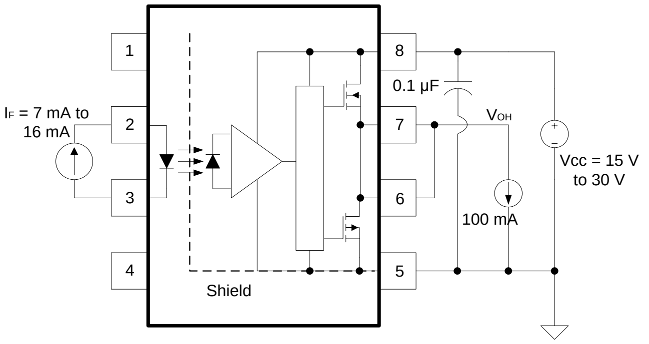


Figure 14 : V_{OH} Test Circuit

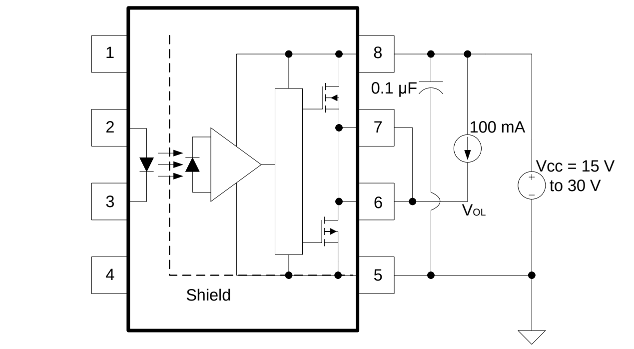


Figure 15 : V_{OL} Test Circuit

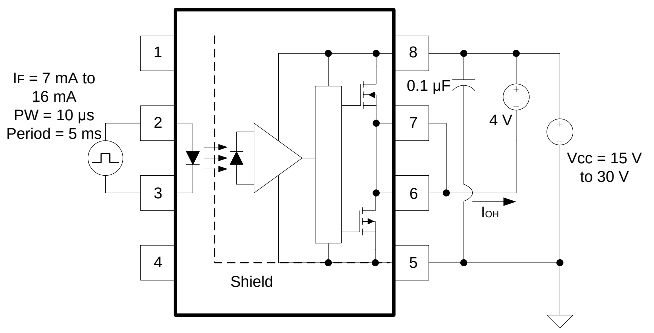


Figure 16 : I_{OH} Test Circuit

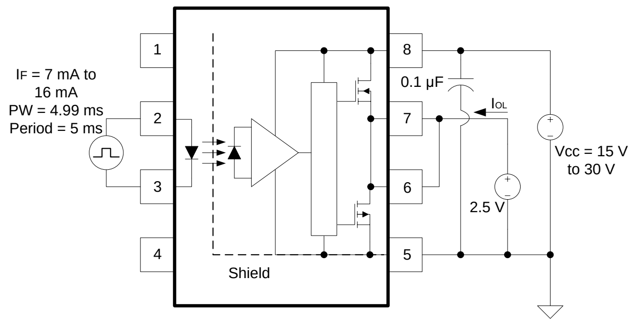


Figure 17 : I_{OL} Test Circuit

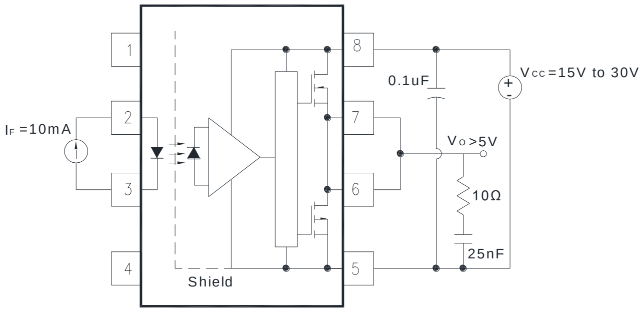


Figure 18 : IFLH Test Circuit

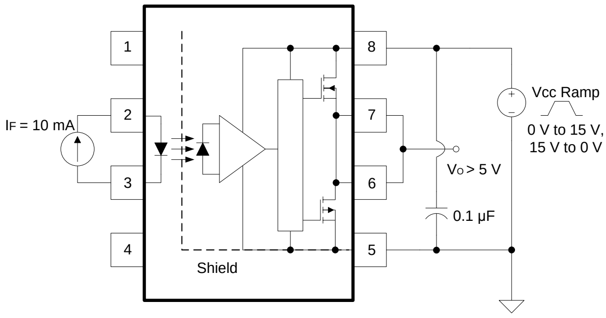


Figure 19 : UVLO Test Circuit

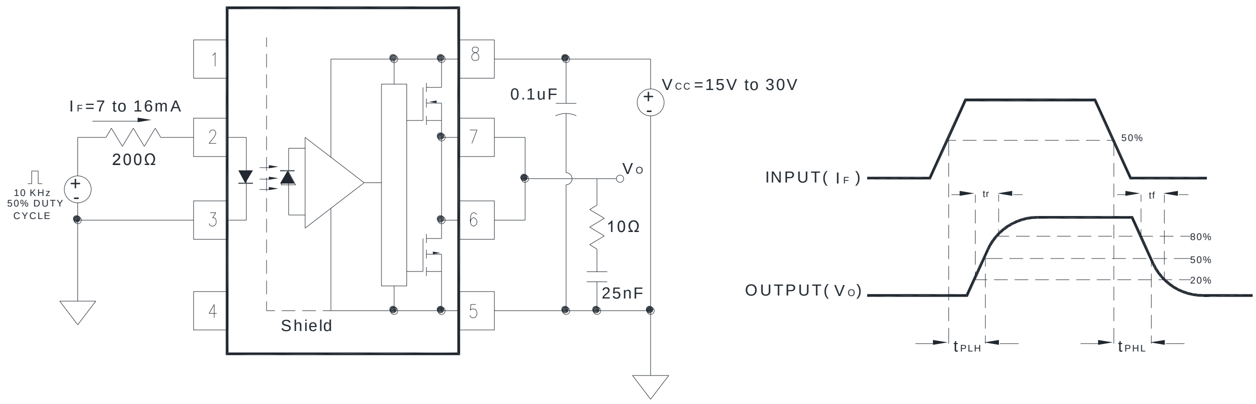


Figure 20 : tr, tf, tPLH and tPHL Test Circuit and Waveforms

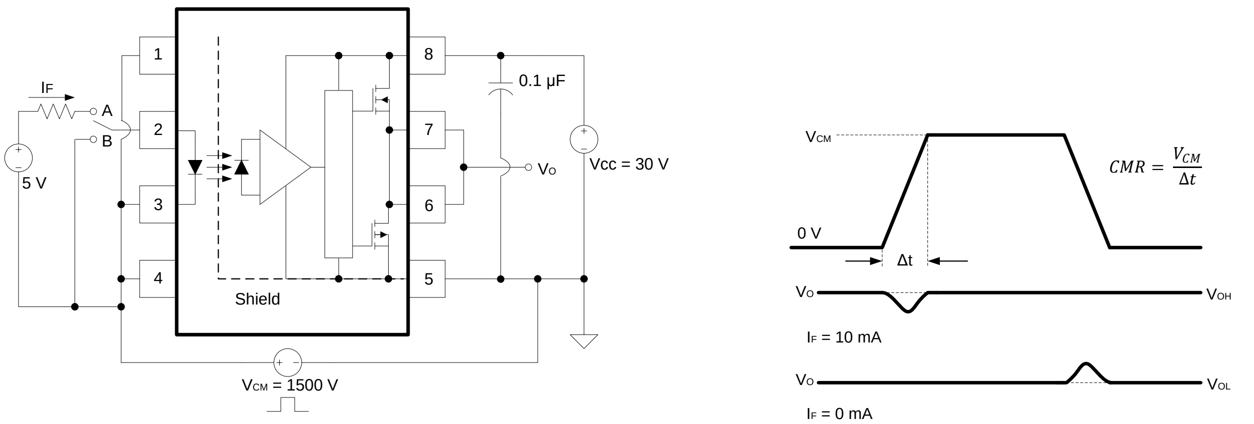


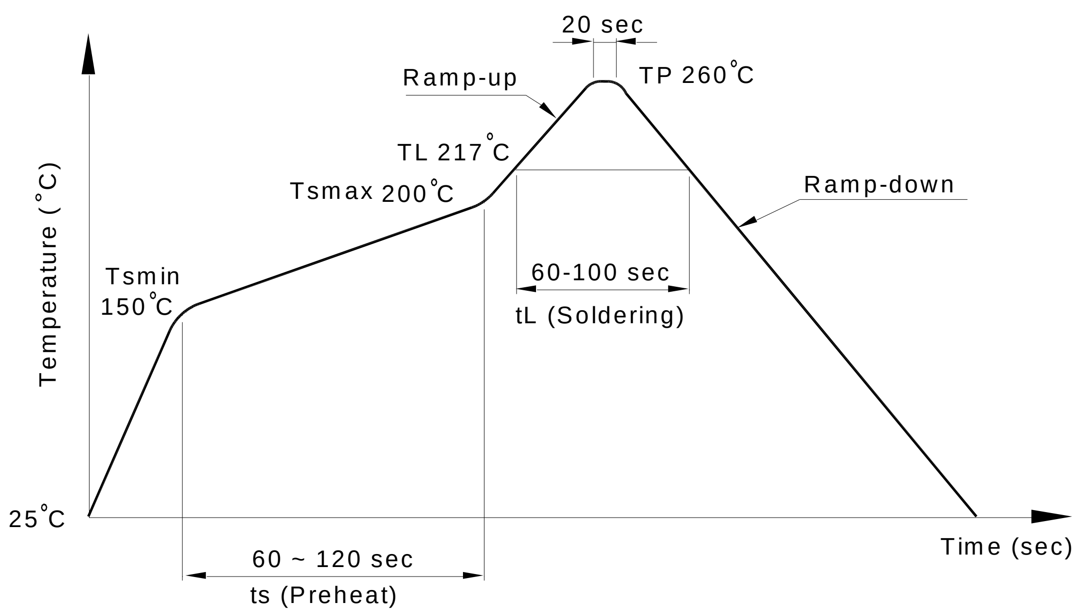
Figure 21 : CMR Test Circuit and Waveforms

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



8.2 Wave soldering (JEDEC22A111 compliant)

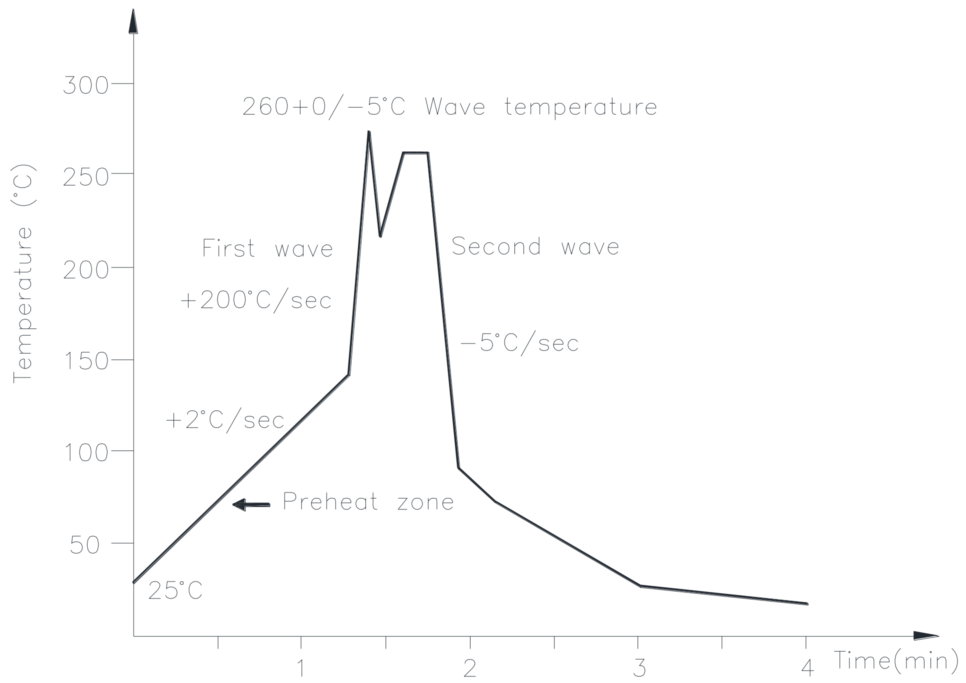
One time soldering is recommended within the condition of temperature.

Temperature: 260+0/-5˚C

Time: 10 sec.

Preheat temperature:25 to 140˚C

Preheat time: 30 to 80 sec.



8.3 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.

9. ORDERING INFORMATION

Parameter	Option	Minimum CMR		Input-On Current (mA)	Remark
		dV/dt (V/μs)	V_{CM} (V)		
LTV-3120		15,000	1500	10	Single Channel, DIP-8
	M				Single Channel, Wide Lead Spacing
	S				Single Channel, SMD-8

Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331