

Description

The CYHCPL3120 consists of a GaAsP LED optically coupled to an integrated circuit with a power output stage. This optocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications. The high operating voltage range of the output stage provides the drive voltages required by gate controlled devices. The voltage and current supplied by this optocoupler makes it ideally suited for directly driving IGBTs with ratings up to 1200 V/100 A. For IGBTs with higher ratings, the CYHCPL3120 can be used to drive a discrete power stage which drives the IGBT gate.

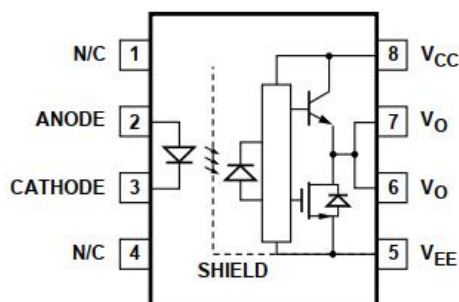
Features

- 2.0 A Minimum Peak Output Current
- 15 kV/ μ s Minimum Common Mode Rejection (CMR) at $V_{CM} = 1500$ V
- 0.5 V Maximum Low Level Output Voltage (VOL) Eliminates Need for Negative Gate Drive
- $I_{CC} = 5$ mA Maximum Supply Current
- Under Voltage Lock-Out Protection (UVLO) with Hysteresis
- Wide Operating VCC Range: 15 to 30 Volts
- 500 ns Maximum Switching Speeds
- Industrial Temperature Range: -40°C to 100°C

Applications

- Isolated IGBT/MOSFET Gate Drive
- AC and Brushless DC Motor Drives
- Industrial Inverters
- Switch Mode Power Supplies (SMPS)

Functional Diagram



Truth Table

LED	V _{CC} -V _{EE} "Positive Going" (i.e., Turn on)	V _{CC} -V _{EE} "Negative Going" (i.e., Turn on)	V _O
OFF	0-30V	0-30V	Low
ON	0-11V	0-9.5V	Low
ON	11-13.5V	9.5-12V	Transition
ON	13.5-30V	12-30V	High

Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Value	Unit
Storage Temperature	T _{STG}	-55 to +125	°C
Operating Temperature	T _{OPR}	-40 to +100	°C
Lead Solder Temperature (10S 1.6mm below seating plane)	T _{SOL}	260	°C
Max Forward Input Current	I _{FM}	25	mA
Reverse Input Voltage	V _R	5.0	V
Peak Output Current	I _{O(PEAK)}	3.0	A
Input Current(Rise/Fall time)	t _{r(IN)} / t _{f(IN)}	500	ns
Supply Voltage	V _{CC} -V _{SS}	0-30	V
Peak Output Voltage	V _{O(PEAK)}	0-V _{DD}	V

Note: When the maximum rating is exceeded, the device may be damaged. It is recommended that the device not work outside the recommended operating conditions, which may affect the function of the device. In addition, the reliability of components may be affected if the devices work in conditions beyond the recommended operating conditions for a long time. The maximum rating indicates stress class only.

Isolation Characteristics (Ta=25°C, unless specified otherwise)

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Input-Output Momentary Withstand Voltage	V _{ISO}	RH<50%, TA=25°C t=1min, 50Hz	5000			V _{RMS}
Resistance(Input-Output)	R _{ISO}	V _{I-O} =500V _{DC}		10 ¹¹		Ω
Capacitance(Input-Output)	C _{ISO}	f=1MHz, V _{I-O} =0V		1		pF

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units
Operating Temperature	T _A	-40	100	°C
Power Supply Voltage	V _{CC} -V _{SS}	0	30	V
Output Voltage	V _{O(PEAK)}	15	V _{DD}	V
Input Current (ON)	I _{F(ON)}	7	16	mA
Input Voltage (OFF)	V _{F(OFF)}	-3.0	0.8	V

Electrical Specification (Ta=25°C, V_{CC}=30V, V_{SS}=GND, unless specified otherwise)

Parameter	Symbol	Condition	Min.	Typ.*	Max.	Unit
Input Forward Voltage	V _F	I _F =10mA	1.2	1.5	1.8	V
Reverse Input Current	I _R	V _R =5V			0.1	uA
High Level Output Current	I _{OH}	V _O =V _{DD} -3V	-1.0	-2.0	-2.5	A
		V _O =V _{DD} -6V	-2.0		-2.5	
Low Level Output Current	I _{OL}	V _O =V _{SS} +3V	1.0	2.0	2.5	A
		V _O =V _{EE} +6V	2.0		2.5	
High Level Output Voltage	V _{OH}	I _O =-2.5A, I _F =10mA	V _{CC} - 6.25V	V _{CC} - 2.5V		V
		I _O =-100mA, I _F =10mA	V _{CC} - 0.25V	V _{CC} - 0.1V		
Low Level Output Voltage	V _{OL}	I _O =2.5A, I _F =0mA		V _{SS} + 2.5V	V _{SS} + 6.25V	V
		I _O =100mA, I _F =0mA		V _{SS} + 0.1V	V _{SS} + 0.25V	
High Level Supply Current	I _{CCH}	I _F = 7 to 16mA, V _O =Open		2.8	3.8	mA
Low Level Supply Current	I _{CCL}	V _F = 0 to 0.8V, V _O =Open		2.8	3.8	mA
Threshold Input Current Low to High	I _{FLH}	V _O > 5V, I _O =0A		2.3	5.0	mA
Threshold Input Voltage High to Low	V _{FHL}	V _O < 5V, I _O =0A	0.8			V
UVLO Threshold	V _{UVLO+}	V _O >5V, I _F = 10mA	11.5	12.7	13.5	V
	V _{UVLO-}	V _O < 5V, I _F = 10mA	10.0	11.2	12.0	V
UVLO Hysteresis	UVLO _{HYS}			1.5		V

Switching Characteristics (Ta=25°C, V_{CC}=30V, V_{SS}=GND, unless specified otherwise)

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time to Output HIGH Level	T _{PLH}	C _g =10nF, f=10kHz, R _g = 10Ω Duty Cycle=50% I _F =7mA to 16mA V _{CC} = 30V, V _{SS} =Ground	150	255	400	ns
Propagation Delay Time to Output LOW Level	T _{PHL}		150	275	400	ns
Pulse Width Distortion	PWD			20	100	ns
Propagation Delay Difference Between Any Two Part of channels	T _{PHL} - T _{PLH}		-250		250	ns
Rise Time	T _r			60		ns
Fall Time	T _f			60		ns
Common Mode Transient Immunity (at Output HIGH Level)	CMH	T _A = 25°C, I _F = 7 to 16mA, V _{CM} = 2000V, V _{CC} = 30V	35	50		kV/μs
Common Mode Transient Immunity (at Output LOW Level)	CML	T _A = 25°C, V _F = 0V V _{CM} = 2000V, V _{CC} = 30V	35	50		kV/μs

Typical Performance Curves

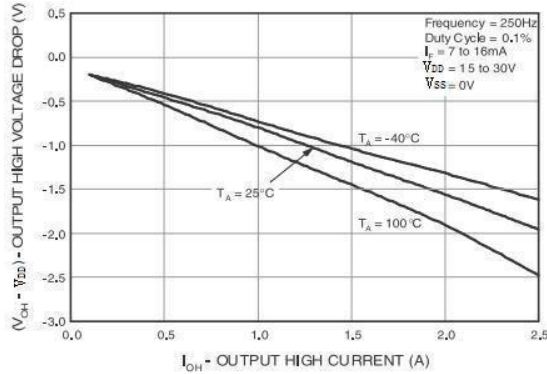


Fig.1: Output Voltage vs Output Current

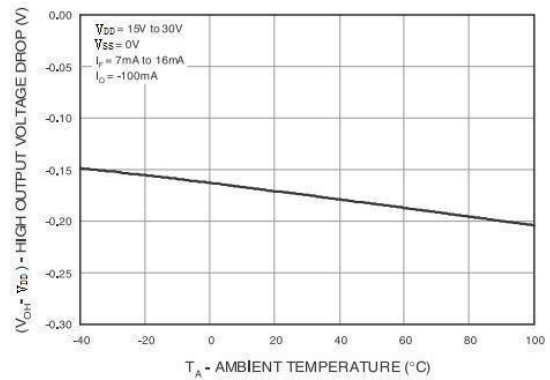


Fig.2: Output Voltage vs Temperature

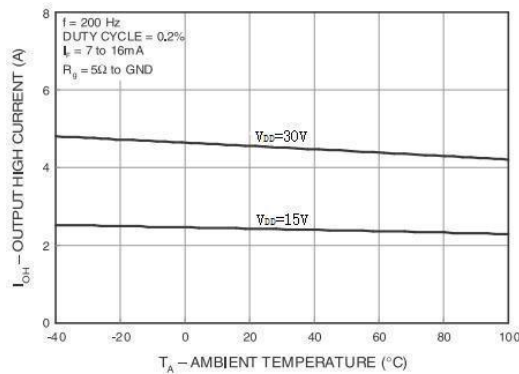


Fig.3: Output High Current vs Temperature

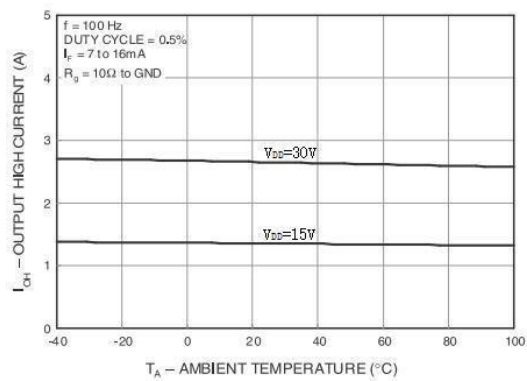


Fig.4: Output Current vs Temperature

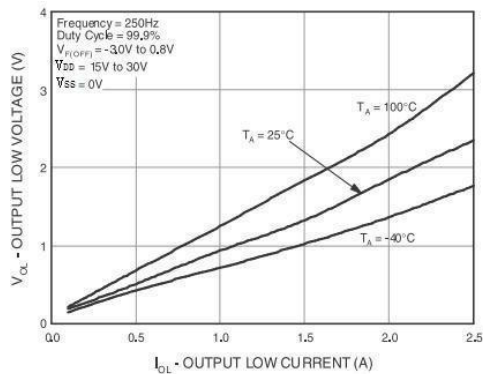


Fig.5: Output Low Voltage vs Output Current

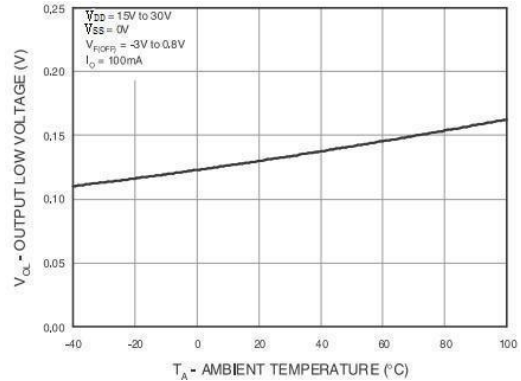


Fig.6: Output Low Voltage vs Temperature

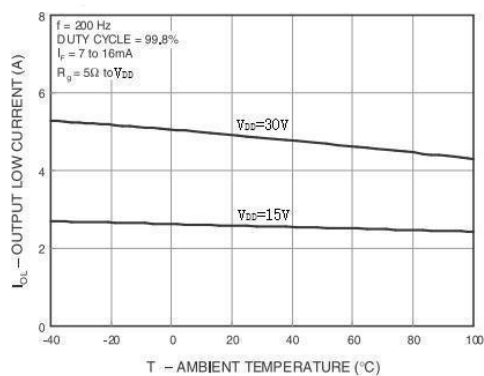


Fig.7: Output Current vs Temperature

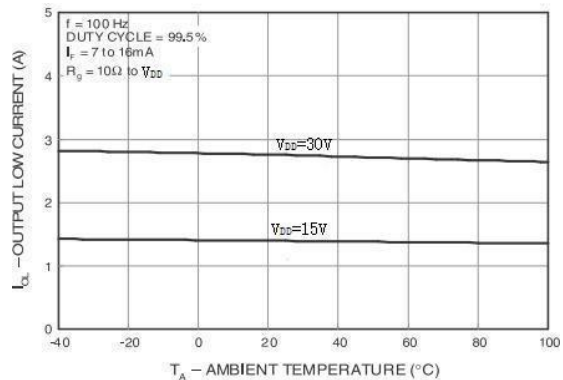
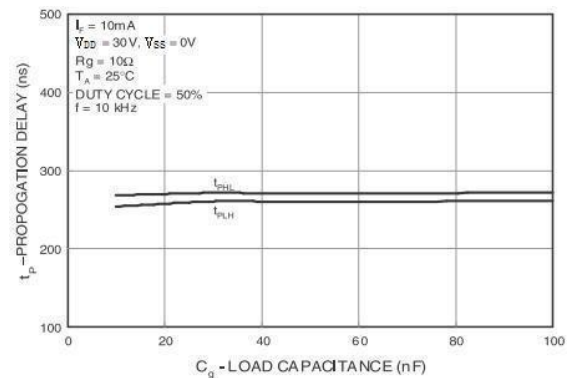
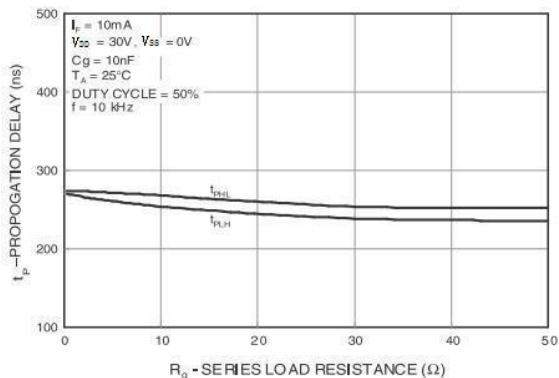
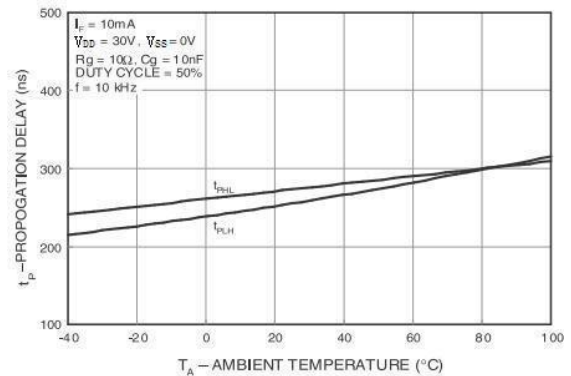
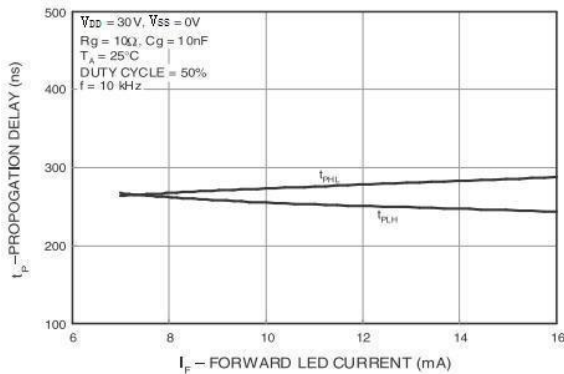
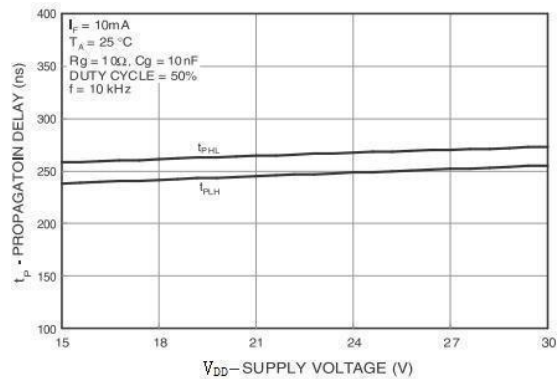
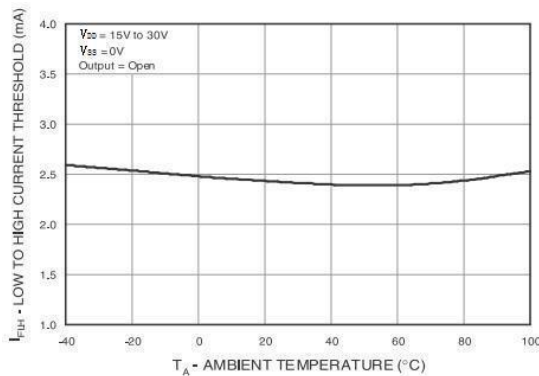
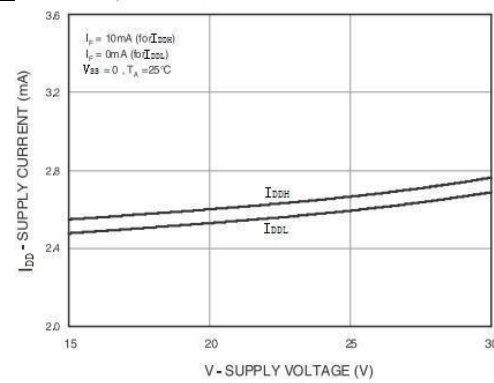
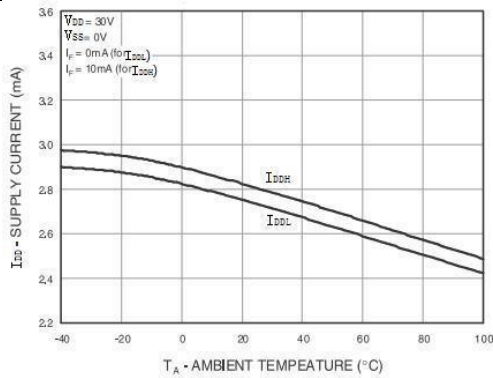


Fig.8: Output Low Current vs Temperature



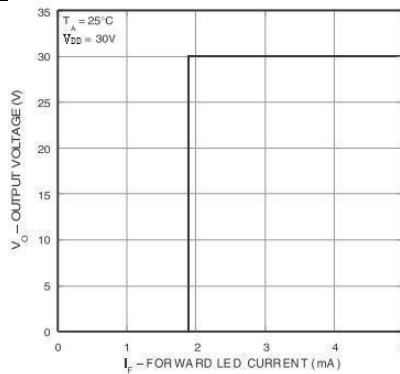


Fig.17: Output Current vs I_F

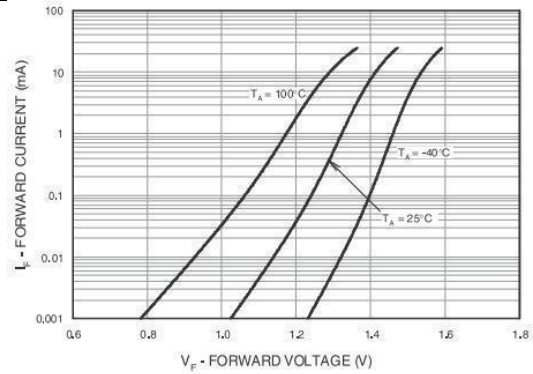
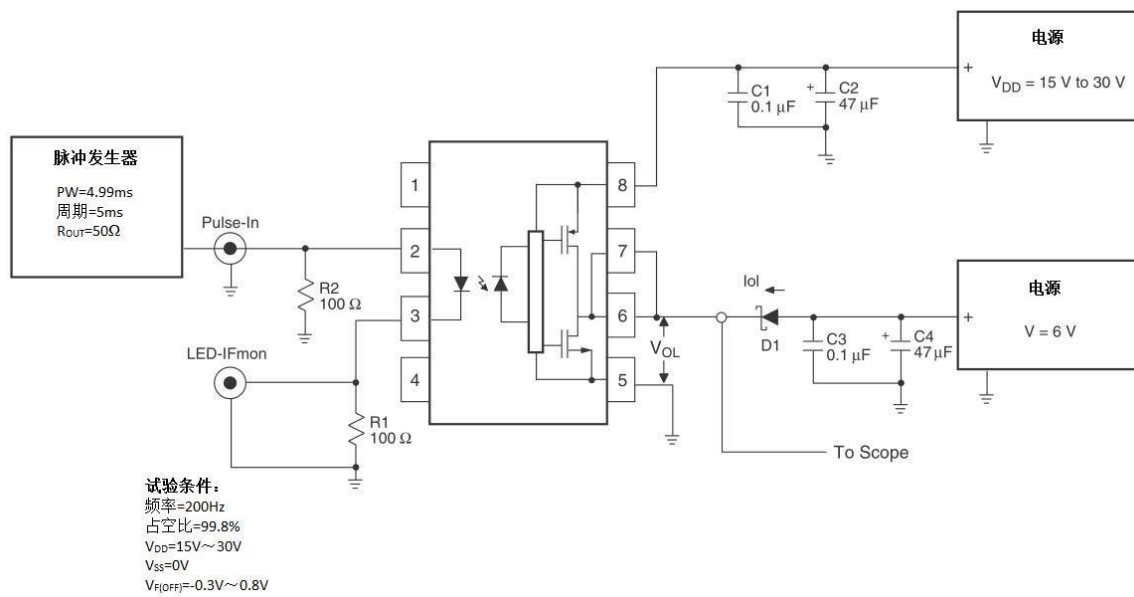
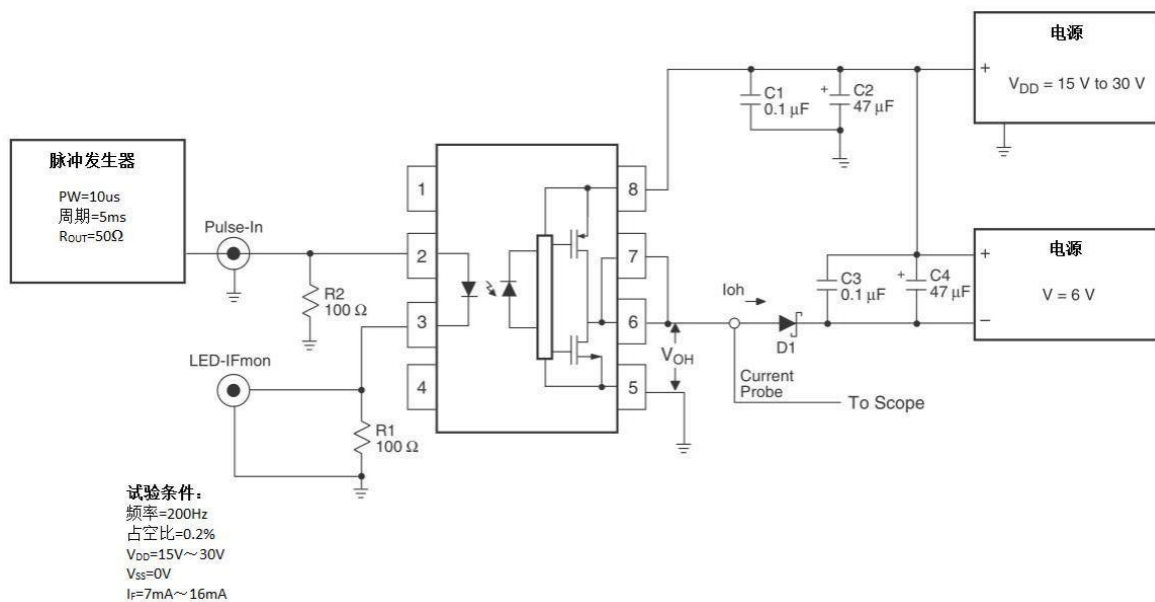


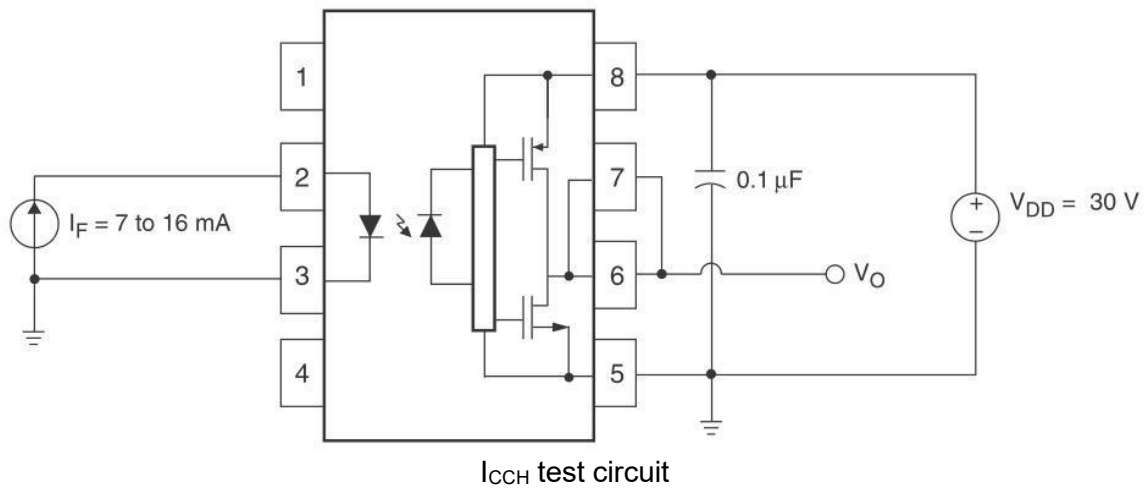
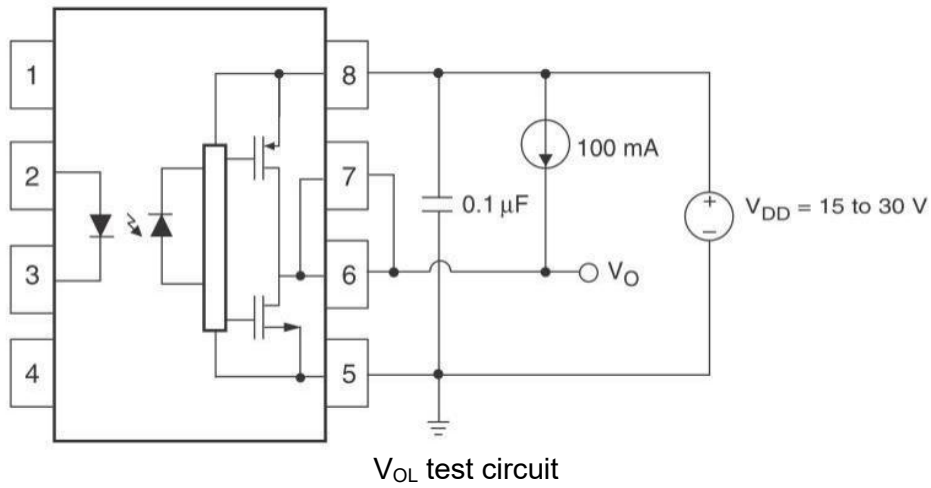
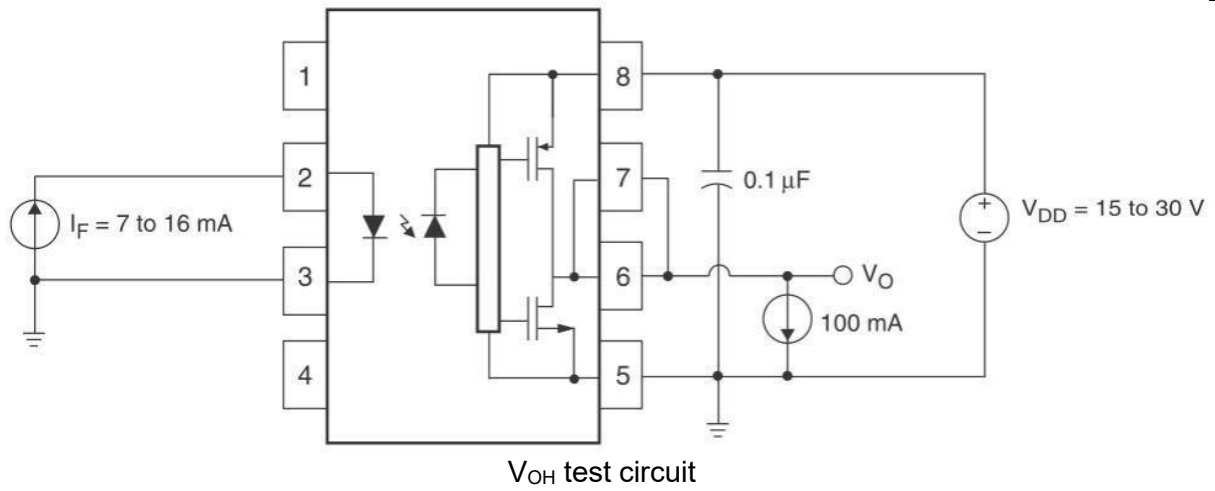
Fig.18: Forward Current vs Forward Voltage

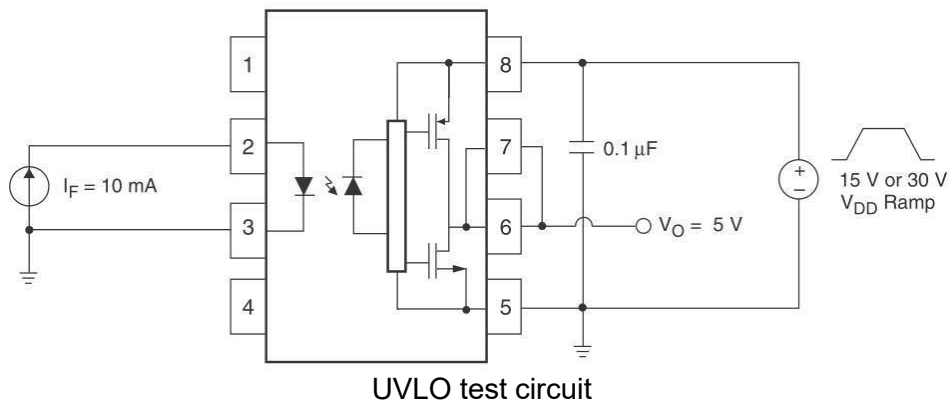
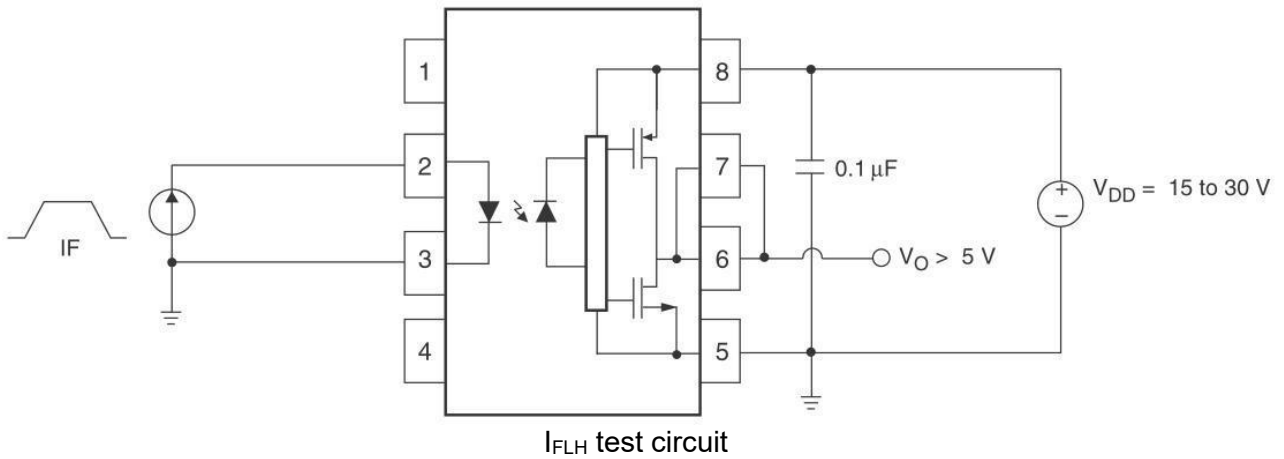
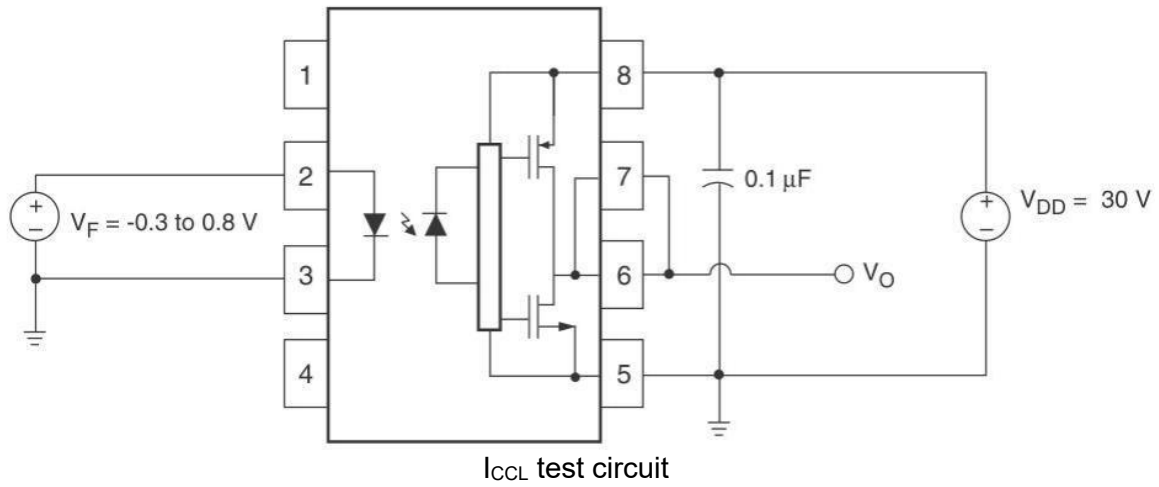


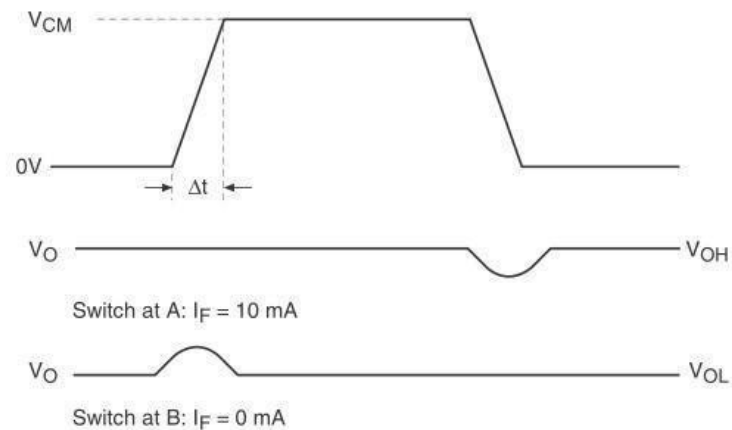
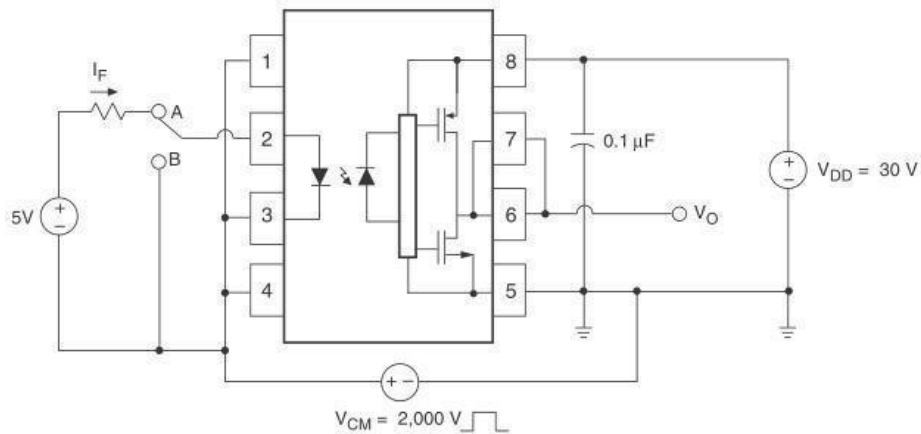
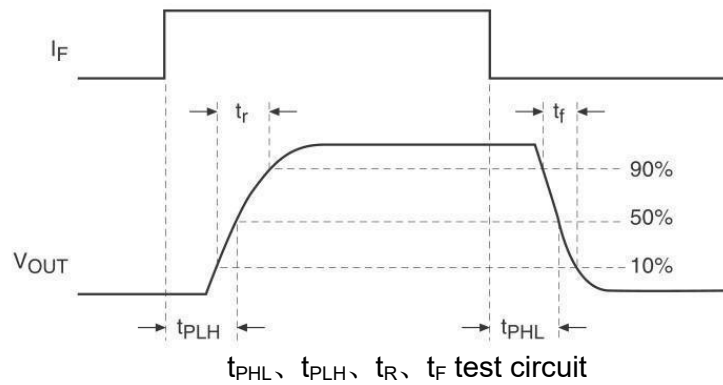
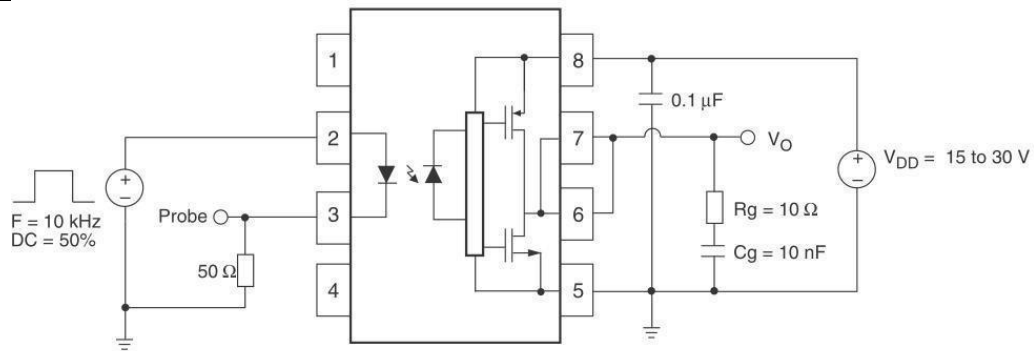
I_{OL} test circuit



I_{OH} test circuit



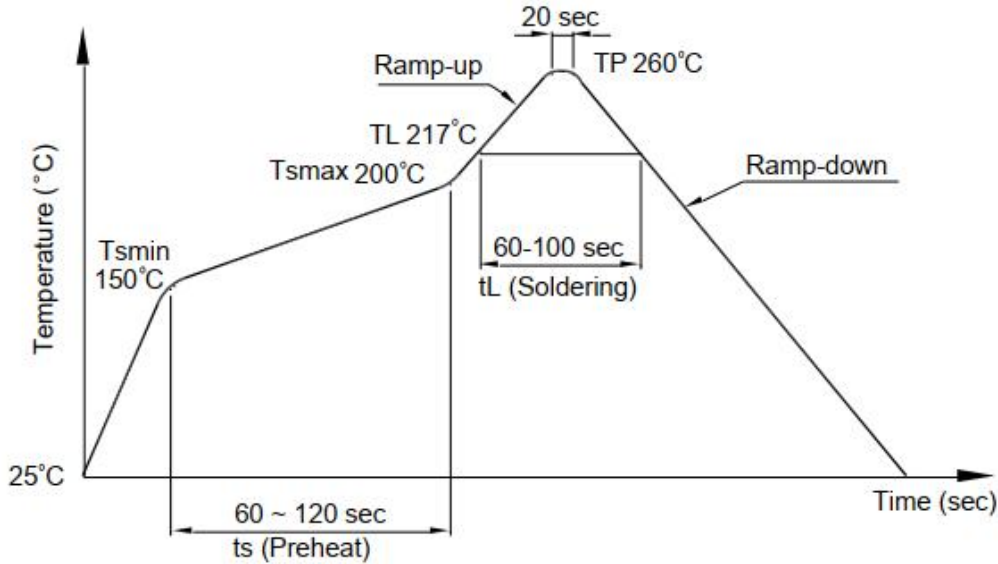




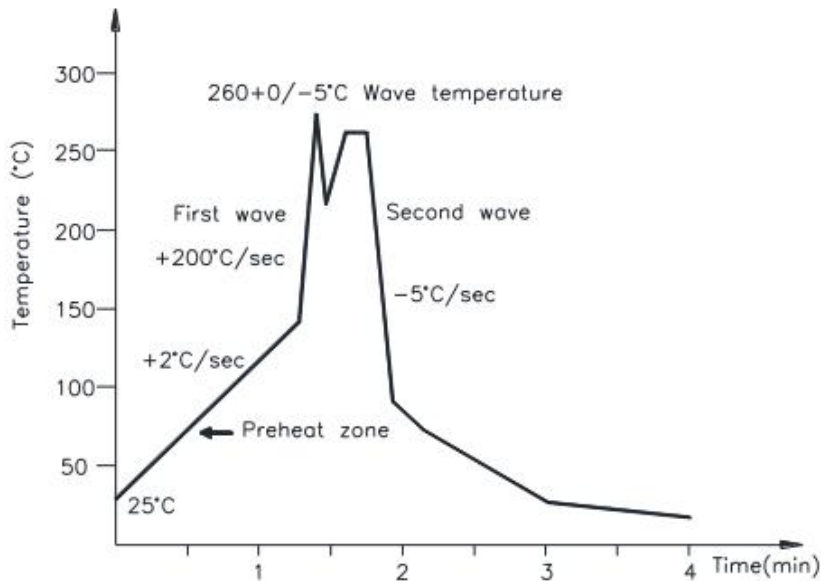
CRM test circuit

Temperature Profile of Soldering

1. Reflow soldering(JEDEC-STD-020C compliant)



2. Wave soldering(jedec22a111 compliant)



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.

Attention:

- CHEUK YUI will continuously improve the quality, reliability, function or design and provide better products. It reserves the right to modify this specification at any time without notice.
- Before the customer places an order, please confirm that the information on hand is the latest version. The customer needs to confirm that the chip really meets his needs and can meet his requirements.
- Please follow the product specifications. CHEUK YUI is not responsible for the quality problems caused by non-compliance with the conditions of the product specifications.
- If you need highly reliable products for the above specific equipment or devices, such as military, nuclear power control, medical, life support or life-saving equipment or devices that may cause personal injury or death, please contact our sales representative for advice.
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