

1. Description

The HCPL-3150 is a gate driven optocoupler with an output current of 1.0A, with an AlGaAs LED, which is coupled to a photosensitive integrated circuit through infrared light. This optocoupler can drive most low-power IGBTs and MOSFETs. In the motor control inverter and high-performance power system applications, it is very suitable for fast switching drive power IGBTs and MOSFETs.

3. Features

- 35kV/ μ s minimum Common Mode Rejection
- 1A maximum peak output current
- Wide operating V_{CC} Range: 15V~30V
- 400ns maximum propagation delay

2. Applications

- Uninterrupted Power Supply
- IGBT isolation / power MOSFET gate drive
- Induction heating
- Industrial inverters

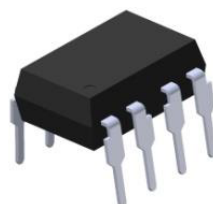
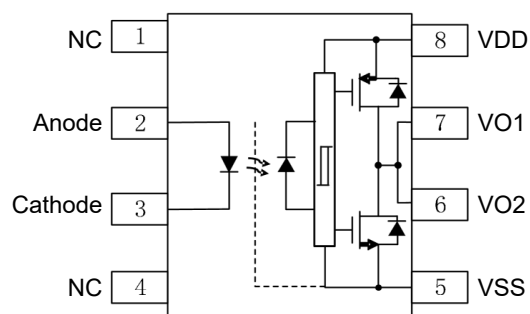
- 100ns of pulse width distortion
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Operating temperature range: -40°C~ +110°C

4. Truth Table

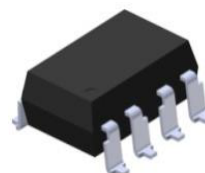
LED	$V_{CC}-V_{SS}$ “ POSITIVE GOING” (TURN-ON)	$V_{CC}-V_{SS}$ “ NEGATIVE GOING” (TURN-OFF)	VO
OFF	0~30V	0~30V	LOW
ON	0~11.5V	0~10V	LOW
ON	11.5~13.5V	10~12V	TRANSITION
ON	13.5~30V	12~30V	HIGH



5. Pinning Information



DIP-8



SOP- 8

Note: 0.1uF bypass capacitor must be connected between pins 5 and 8.

6. Insulation And Safety Related Specifications

Parameter	Symbol	Note	Value	Unit
Creepage Distance	L	Measured from input terminals to output terminals, shortest distance path along body	≥7	mm
Clearance Distance	L	Measured from input terminals to output terminals, shortest distance through air	≥7	mm
Insulation Thickness	DTI	Insulation thickness between emitter and detector	≥0.4	mm
Peak Isolation Voltage	V_{IORM}	DIN/EN/IEC EN60747-5-5.	1500	V_{peak}
Transient Isolation Voltage	V_{IOTM}	DIN/EN/IEC EN60747-5-5.	7000	V_{peak}
Isolation Voltage	V_{ISO}	For 1 min	5000	V_{rms}



7. Absolute Maximum Ratings $T_A = 25^\circ\text{C}$

Parameter		Symbol	Value	Units
Input	Forward Input Current	I_{FM}	25	mA
	Reverse Voltage	V_R	5	V
Output	Peak Output Current ^{a,b}	$I_{O(PEAK)}$	1	A
	Supply Voltage	$V_{DD}-V_{SS}$	0 to 35	V
	Output Voltage	V_O	0 to V_{DD}	V
Isolation Voltage		V_{ISO}	5000	V_{rms}
Output Power Dissipation ^{a,c}		P_O	250	mW
Total Power Dissipation ^{a,d}		P_T	295	mW
Operating Temperature		T_{opr}	-40 to 110	$^\circ\text{C}$
Storage Temperature		T_{stg}	-55 to 125	$^\circ\text{C}$
Soldering Temperature		T_{sol}	260	$^\circ\text{C}$

a. Each channel.

b. Maximum pulse width = 10 μs , maximum duty cycle = 0.2%. This value is intended to allow for component tolerances for designs with I_O peak minimum = 0.5A. See the Applications section for additional details on limiting I_{OH} peak.

c. Derate linearly above 70°C free-air temperature at a rate of 4.8 mW/ $^\circ\text{C}$.

d. Derate linearly above 70°C free-air temperature at a rate of 5.4 mW/ $^\circ\text{C}$. The maximum LED junction temperature should not exceed 125°C .

8. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Power Supply Voltage	$V_{CC}-V_{SS}$	15	30	V
Input Current (ON)	$I_{F(ON)}$	7	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	0	0.8	V
Operating Temperature	T_A	-40	110	$^\circ\text{C}$



9. Electro-optical Characteristics ($T_A=25^\circ\text{C}$)

All minimum and maximum specifications are at recommended operating conditions, unless otherwise noted

All typical values are at $T_A=25^\circ\text{C}$, $V_{DD}=30\text{V}$, and $V_{SS}=\text{GND}$.

Parameter	Symbol	Conditions	Min	Typ ^a	Max	Units
Forward Voltage	V_F	$I_F=10\text{mA}$	1.2	1.5	1.8	V
Reverse Current	I_R	$V_R=5\text{V}$			10	μA
High Level Output Current ^b	I_{OH}	$V_O=V_{DD}-1\text{V}$		0.4		A
		$V_O=V_{DD}-4\text{V}$		1		A
Low Level Output Current ^{c,b}	I_{OL}	$V_O=V_{SS}+1\text{V}$	0.2	1		A
		$V_O=V_{SS}+4\text{V}$	1			A
High Level Output Voltage ^{d,e}	V_{OH}	$I_F=10\text{mA}$, $I_O=-1\text{A}$	$V_{DD}-4\text{V}$	$V_{DD}-2.5\text{V}$		V
		$I_O=-100\text{mA}$	$V_{DD}-0.5\text{V}$	$V_{DD}-0.1\text{V}$		V
Low Level Output Voltage	V_{OL}	$I_F=0\text{mA}$, $I_O=1\text{A}$		$V_{SS}+2.5\text{V}$	$V_{SS}+4\text{V}$	V
		$I_O=100\text{mA}$		$V_{SS}+0.1\text{V}$	$V_{SS}+0.5\text{V}$	V
High Level Power Supply Current ^f	I_{cch}	$V_O=\text{Open}$, $I_F=7$ to 16mA		1.8	3.8	mA
Low Level Power Supply Current ^f	I_{ccl}	$V_O=\text{Open}$, $V_F=0$ to 0.8V		2.1	3.8	mA
Input The Turn On Current	I_{FLH}	$I_O=0\text{mA}$, $V_O>5\text{V}$		2.8	5	mA
Input The Turn Off Voltage	V_{FHL}	$I_O=0\text{mA}$, $V_O<5\text{V}$	0.8			V
UVLO Threshold	V_{UVLO+}	$I_F=10\text{mA}$, $V_O>5\text{V}$	11.5	12.7	13.5	V
	V_{UVLO-}	$I_F=10\text{mA}$, $V_O<5\text{V}$	10	11.2	12	V
UVLO Hysteresis	$UVLO_{HYS}$			1.5		V
Isolation Resistance	R_{ISO}	$V_{I-O}=500\text{V}$, 40~60%R.H.		10^{11}		Ω
Isolation Capacitance	C_{ISO}	$V_{I-O}=0\text{V}$, Freq=1MHZ		1		pF
Propagation Delay Time to Low Output Level ^g	T_{PHL}	$I_F=7\text{mA}$ to 16mA $R_g=10\Omega$ $C_g=10\text{nF}$ $F=10\text{KHZ}$ Duty Cycle=50%		100	300	ns
Propagation Delay Time to High Output Level ^g	T_{PLH}			100	300	ns
Pulse Width Distortion ^h	PWD			3	100	ns
Propagation Delay Difference Between Any Two Parts ^k	P_{DD}		-250		250	ns

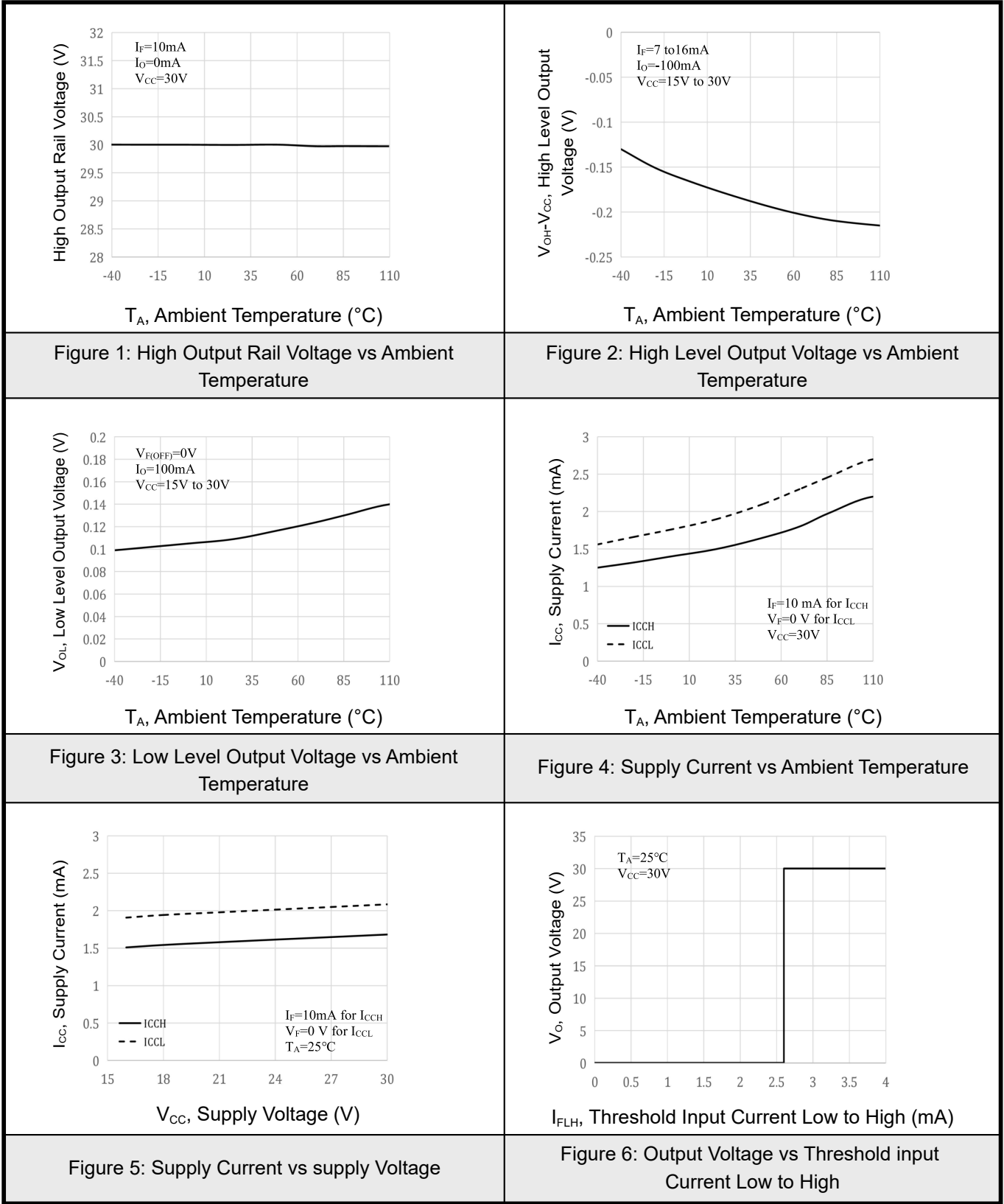


Parameter	Symbol	Conditions	Min	Typ	Max	Units
Output Rise Time (10% To 90%)	T_R	$I_F=7\text{mA to }16\text{mA}, R_g=10\Omega, C_g=10\text{NF}$ $F=10\text{KHZ, Duty Cycle}=50\%$		80		ns
Output Drop Time(90%~10%)	T_F			80		ns
UVLO Turn On Delay	$T_{UVLO\ ON}$	$I_F=10\text{mA}, V_O>5\text{V}$		1.6		μs
UVLO Turn Off Delay	$T_{UVLO\ OFF}$	$I_F=10\text{mA}, V_O<5\text{V}$		0.4		μs
Output High Level Common Mode Transient Immunity m,n	$ CM_H $	$T_A=25^\circ\text{C}, V_{DD}=30\text{V}$ $V_{CM}=2000\text{V}, I_F=7\sim16\text{mA}, V_F=0\text{V}$	35	50		KV/ μs
Output Low Level Common Mode Transient Immunity m,o	$ CM_L $	$T_A=25^\circ\text{C}, V_{DD}=30\text{V}$ $V_{CM}=2000\text{V}, I_F=7\sim16\text{mA}, V_F=0\text{V}$	35	50		KV/ μs

- a. All typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} - V_{EE} = 30\text{V}$, unless otherwise noted.
- b. Maximum pulse width = 10 μs , maximum duty cycle = 0.2%. This value is intended to allow for component tolerances for designs with I_O peak minimum = 0.5 A. See Applications section for additional details on limiting I_{OH} peak.
- c. Maximum pulse width = 50 μs , maximum duty cycle = 0.5%.
- d. 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.
- e. Maximum pulse width = 1 ms, maximum duty cycle = 20%.
- f. Each channel.
- g. This load condition approximates the gate load of a 1200 V/25 A IGBT.
- h. Pulse Width Distortion (PWD) is defined as $|t_{PHL} - t_{PLH}|$ for any given device.
- k. The difference between t_{PHL} and t_{PLH} between any two parts or channels under the same test condition.
- m. Pins 1 and 4 (HCPL-3150) and pins 3 and 4 (HCPL-315J) need to be connected to LED common.
- n. 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 (that is, $V_O > 15.0\text{V}$).
- o. Common mode transient immunity in a 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 (that is, $V_O < 1.0\text{V}$).

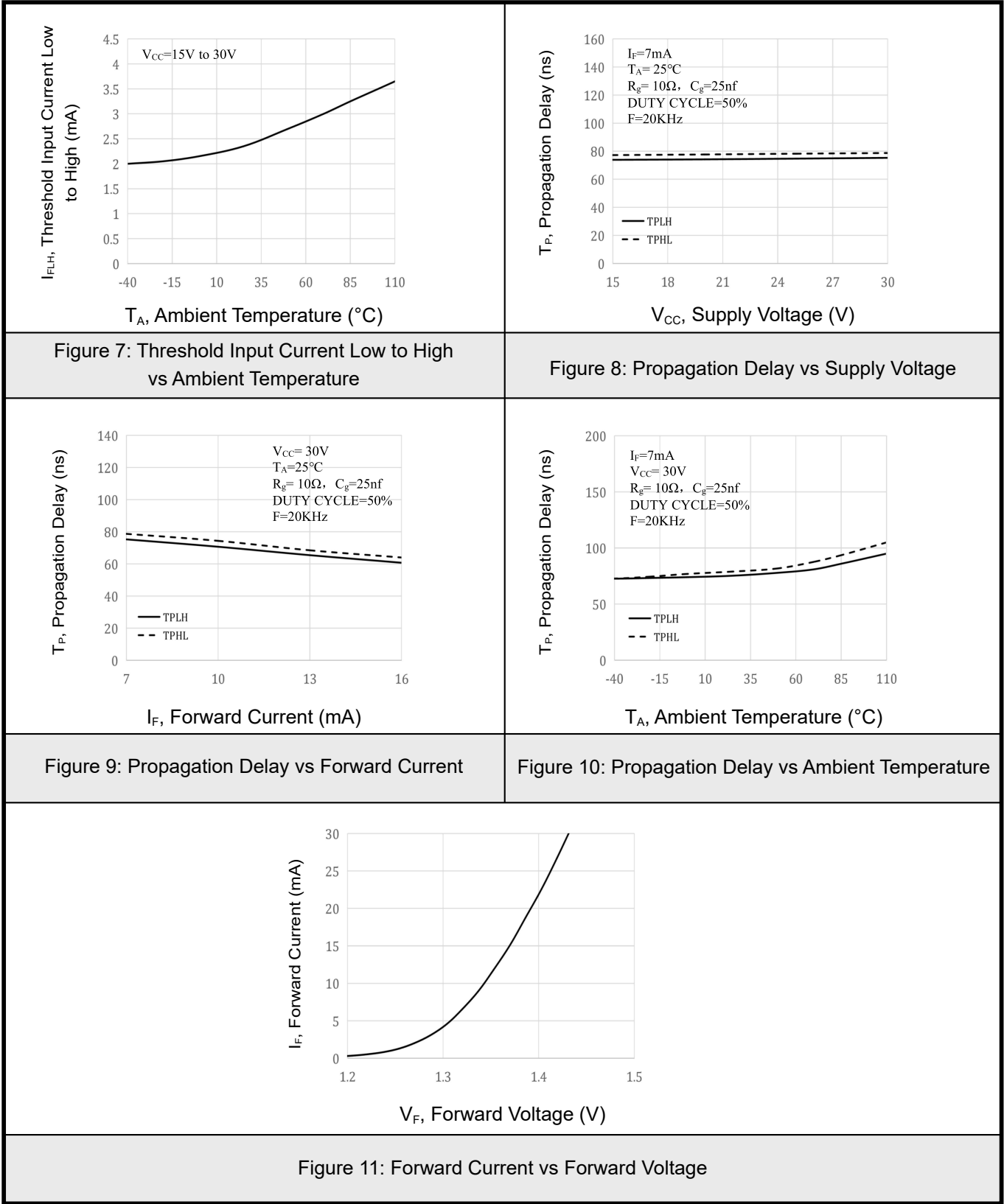


10.1 Typical Characteristic





10.2 Typical Characteristic





11. Test Circuits Diagrams

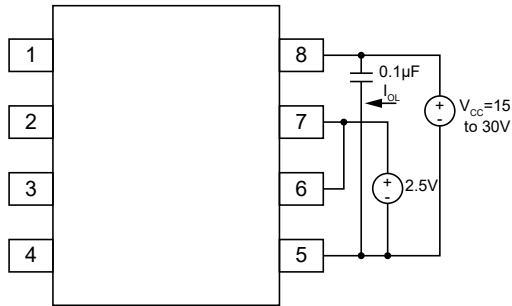
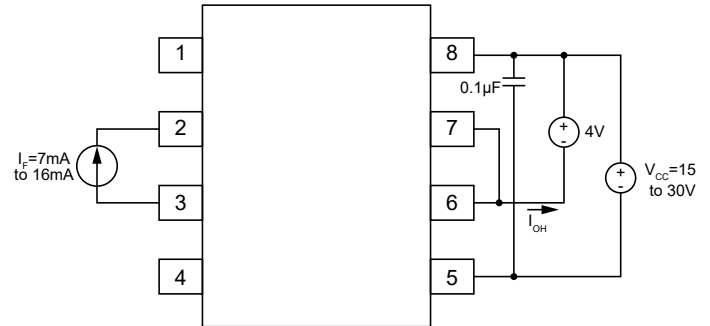
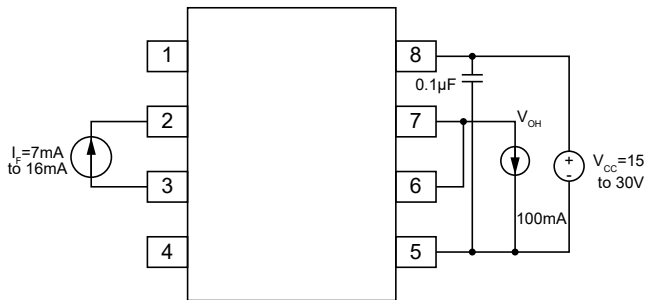
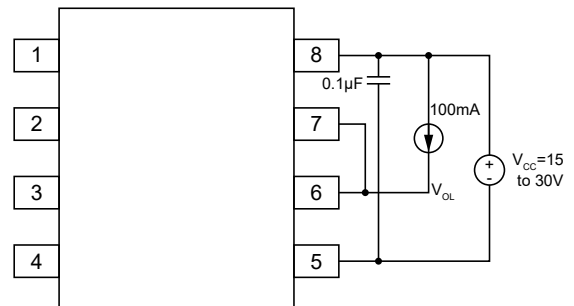
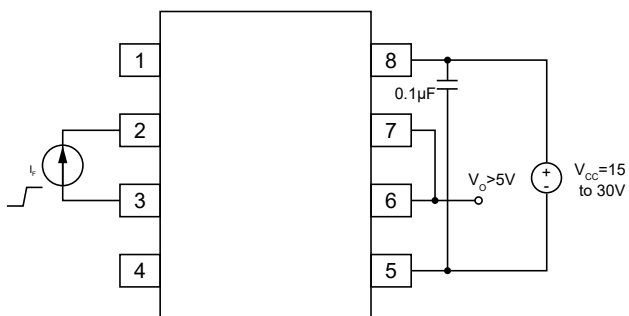
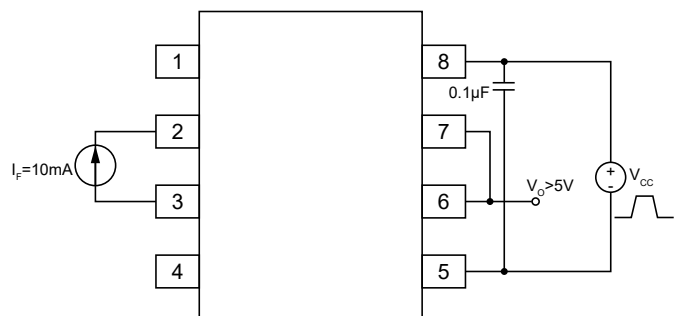
Figure.12 I_{OL} Pulsed Test CircuitFigure.13 I_{OH} Pulsed Test CircuitFigure.14 V_{OH} Pulsed Test CircuitFigure.15 V_{OL} Pulsed Test CircuitFigure.16 I_{FLH} Test Circuit

Figure.17 UVLO Test Circuit

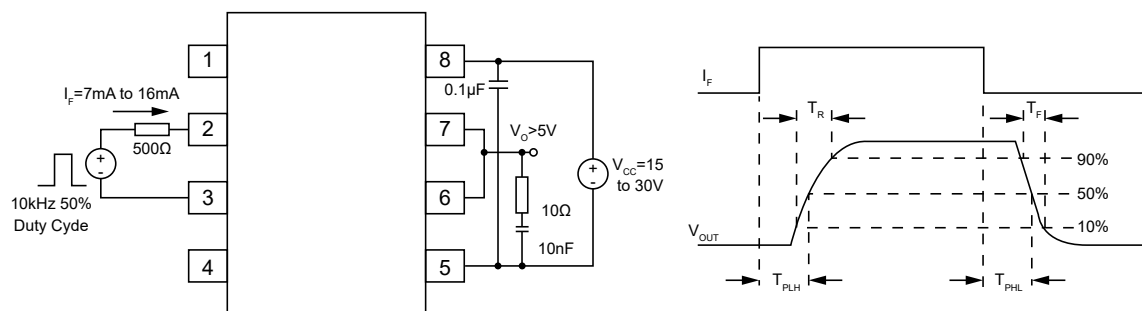


Figure.18 T_{PHL} , T_{PLH} , T_R , T_F Test Circuit

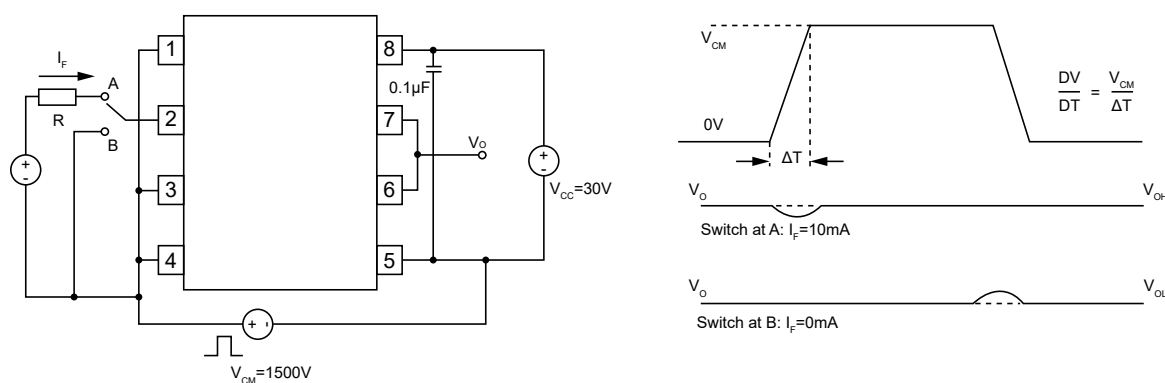
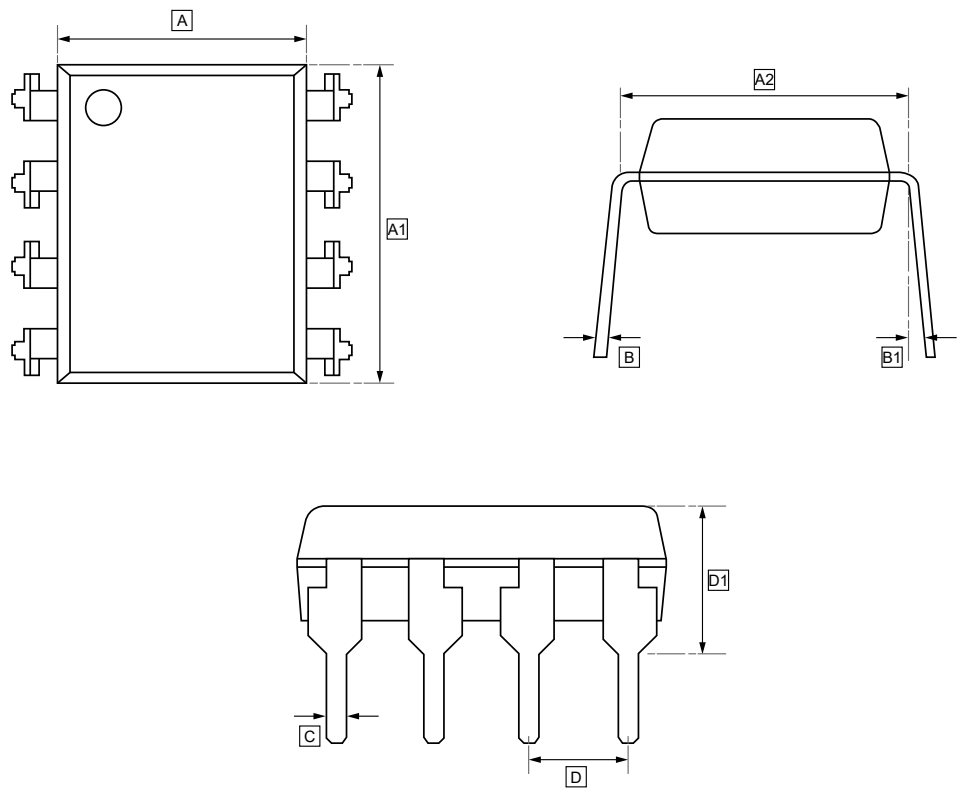


Figure.19 CMR Test Circuit



12.1 DIP-8 Package Outline Dimensions

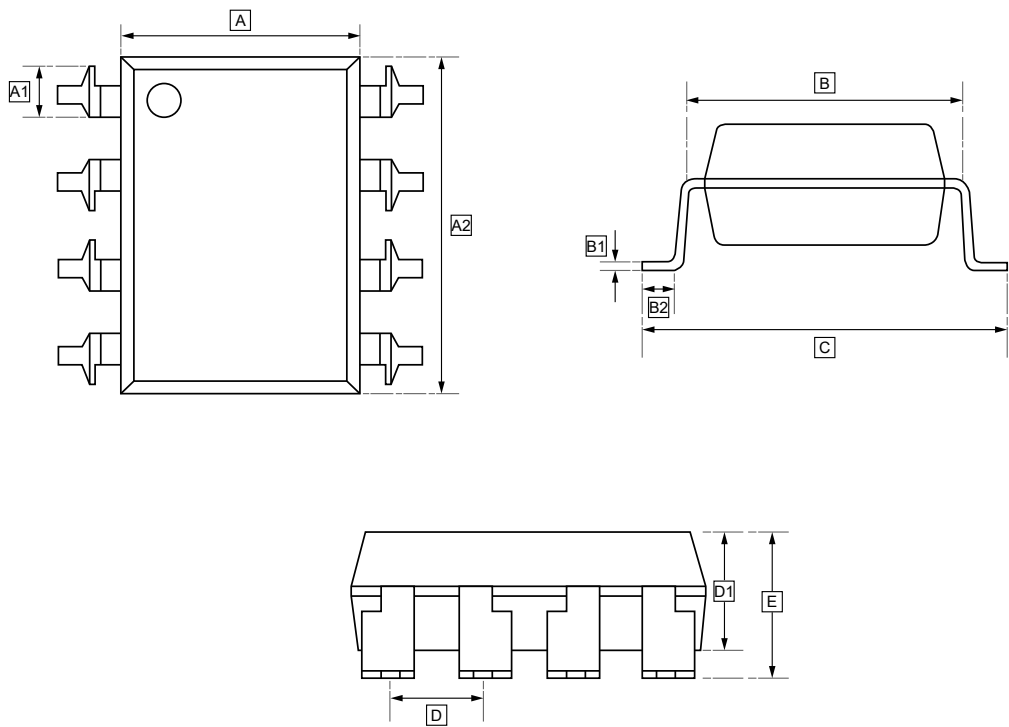


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	C	D	D1
Min	6.30	9.46	7.62	0.25	5°	0.40	2.54	4.20
Max	6.90	10.06	TYP.		15°	0.60	TYP.	4.80



12.2 SOP-8 Package Outline Dimensions

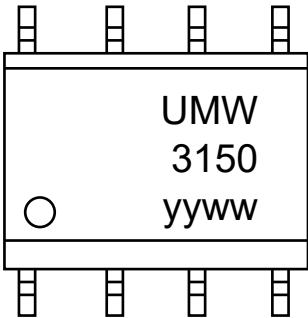


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	B	B1	B2	C	D	D1	E
Min	6.30	1.45	9.46	7.62	0.25	0.6	-	2.54	3.20	4.00
Max	6.90		10.06	TYP		-	10.3	TYP	3.80	4.60



13.Ordering Information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW HCPL-3150-500E	3150	SOP-8	1000	Tape and reel
UMW HCPL-3150-000E	3150	DIP-8	2250	Tube and box
UMW HCPL-3150-560E	3150	SOP-8	1000	Tape and reel



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