UMW FOD3120

2.5 Amp Output Current IGBT Gate Drive Optocouple

1.Description

The FOD3120 is a gate driven optocoupler with an output current of 2.5A, 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.

2.Applications

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

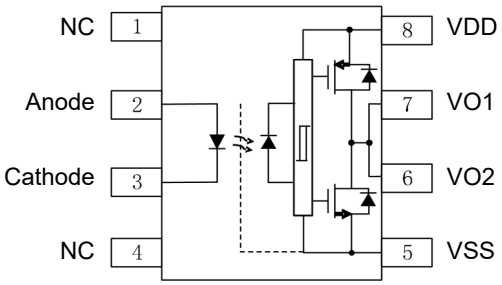
3.Features

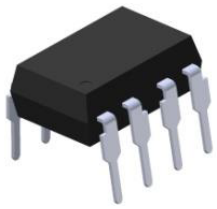
- 30kV/μs minimum Common Mode Rejection
- 2.5A peak output current
- Wide operating V_{CC} Range: 15V~30V
- 400ns maximum propagation delay
- 100ns of pulse width distortion
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Operating temperature range: -40°C~ +110°C

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





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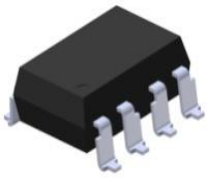


SOP- 8

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°C

Parameter		Symbol	Value	Units
Input	Forward Input Current	I_{FM}	25	mA
	Reverse Voltage	V_R	5	V
Output	Peak Output Current (1)	$I_{O(PEAK)}$	2.5	A
	Supply Voltage	V_{DD} - V_{SS}	0 to 35	V
	Output Voltage	V_O	0 to 30	V
Isolation Voltage		V_{ISO}	5000	V_{rms}
Input Power Dissipation (2) (4)		PD_I	45	mW
Output Power Dissipation (3) (4)		PD_O	250	mW
Operating Temperature		T_{opr}	-40 to 110	°C
Storage Temperature		T_{stg}	-55 to 125	°C
Soldering Temperature		T_{sol}	260	°C

Notes:

1. Maximum pulse width = 10 μs, maximum duty cycle = 1.1%
2. Derate linearly above 87°C, free air temperature at a rate of 0.77 mW/°C
3. No derating required across temperature range.
4. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

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	°C

9.Electro-optical Characteristics (T_A=25°C)

All minimum and maximum specifications are at recommended operating conditions, unless otherwise noted
All typical values are at T_A=25°C, V_{DD}=30V, and V_{SS}=GND.

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Forward Voltage	V_F	I_F=10mA		1.2	1.5	1.8	V
Reverse Current	I_R	V_R=5V				10	μA
High Level Output Current (5)	I_{OH}	V_O=V_{DD}-3V		-1	-2	-2.5	A
		V_O=V_{DD}-6V		-2		-2.5	A
Low Level Output Current (5)	I_{OL}	V_O=V_{SS}+3V		1	2	2.5	A
		V_O=V_{SS}+6V		2		2.5	A
High Level Output Voltage	V_{OH}	I_F=10mA	I_O=-2.5A	V_{DD}-6.25V	V_{DD}-2.5V		V
			I_O=-100mA	V_{DD}-0.3V	V_{DD}-0.1V		V
Low Level Output Voltage	V_{OL}	I_F=0mA	I_O=2.5A		V_{SS}+2.5V	V_{SS}+6.25V	V
			I_O=100mA		V_{SS}+0.1V	V_{SS}+0.3V	V
High Level Power Supply Current	I_{ccH}	V_O=Open, I_F=7 to 16mA			1.8	3.8	mA
Low Level Power Supply Current	I_{ccL}	V_O=Open, I_F=0 to 0.8V			2.1	3.8	mA
Input The Tum On Current	I_{FLH}	I_O=0mA, V_O>5V			2.8	5	mA
Input The Turn Off Voltage	V_{FHL}	I_O=0mA, V_O<5V		0.8			V
UVLO Threshold	V_{UVLO+}	I_F=10mA, V_O>5V		11.5	12.7	13.5	V
	V_{UVLO-}	I_F=10mA, V_O<5V		10	11.2	12	V
UVLO Hysteresis	$UVLO_{HYS}$				1.5		V
Isolation Resistance	R_{ISO}	V_{I-O}=500V, 40~60%R.H.			10^{11}		Ω
Isolation Capacitance	C_{ISO}	V_{I-O}=0V, Freq=1MHZ			1		pF
Propagation Delay Time to Low Output Level	T_{PHL}	I_F=7mA to 16mA Rg=10Ω Cg=10nF F=10KHZ Duty Cycle=50%			100	300	ns
Propagation Delay Time to High Output Level	T_{PLH}				100	300	ns
Pulse Width Distortion	PWD				3	100	ns
Propagation Delay Difference Between Any Two Parts	P_{DD}			-250		250	ns

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

Notes:

5. Exponential Waveform, $I_{O(PEAK)}$ ≤ | 2.5 A | (≤ 0.3 μs)

10.1 Typical Characteristic

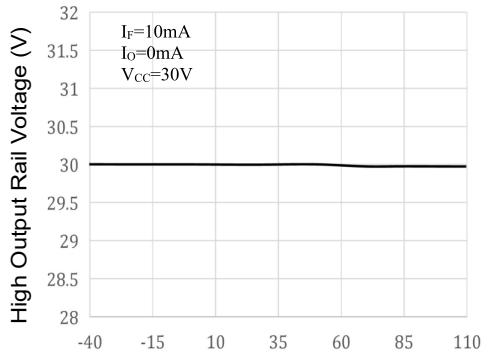


Figure 1: High Output Rail Voltage vs Ambient Temperature

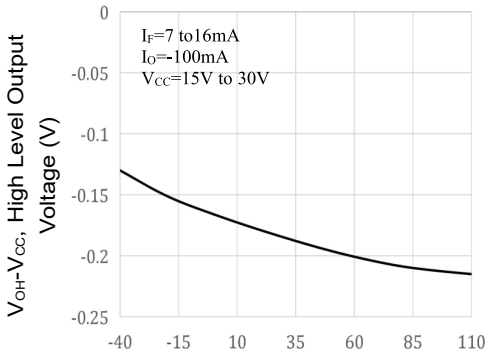


Figure 2: High Level Output Voltage vs Ambient Temperature

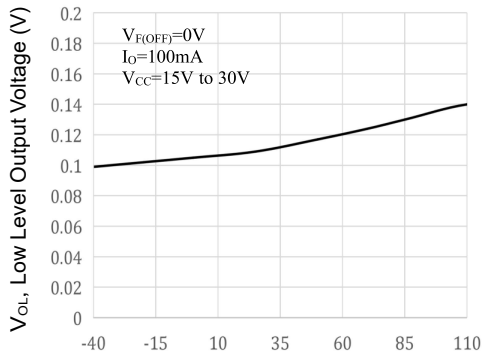


Figure 3: Low Level Output Voltage vs Ambient Temperature

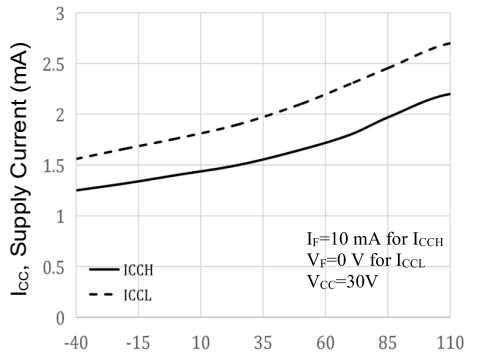


Figure 4: Supply Current vs Ambient Temperature

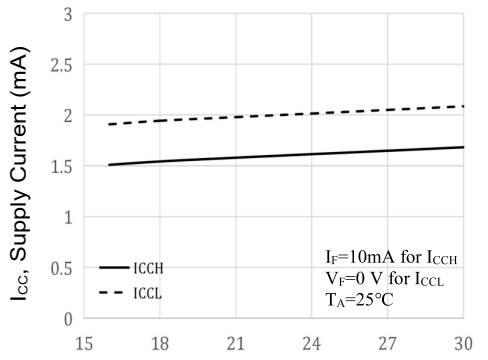


Figure 5: Supply Current vs supply Voltage

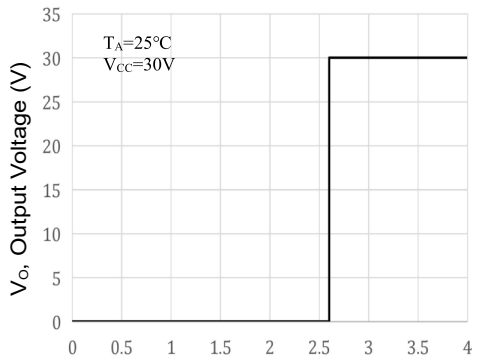


Figure 6: Output Voltage vs Threshold input Current Low to High

10.2 Typical Characteristic

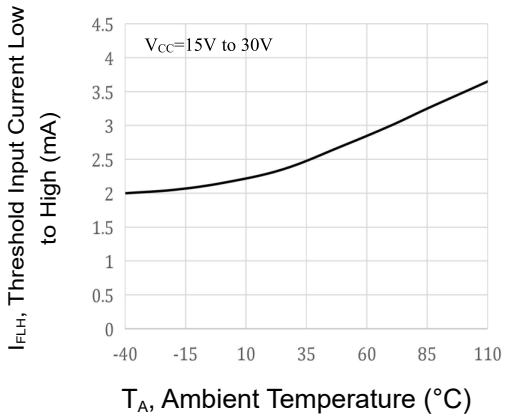


Figure 7: Threshold Input Current Low to High vs Ambient Temperature

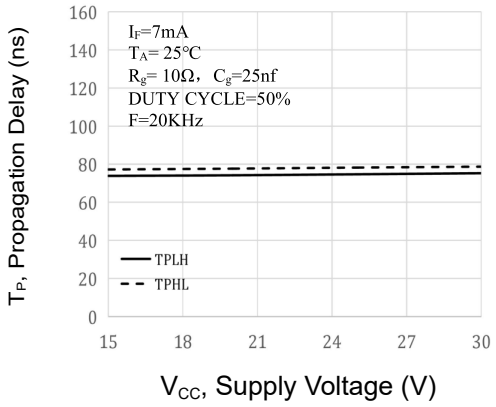


Figure 8: Propagation Delay vs Supply Voltage

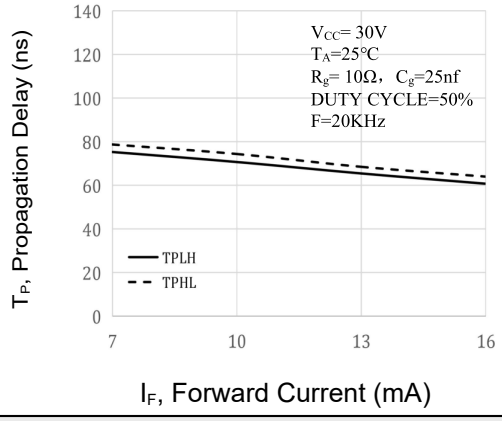


Figure 9: Propagation Delay vs Forward Current

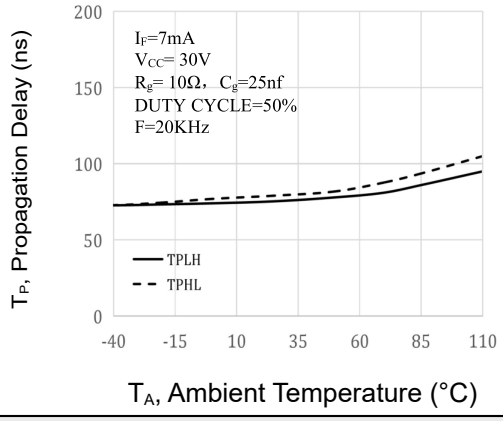


Figure 10: Propagation Delay vs Ambient Temperature

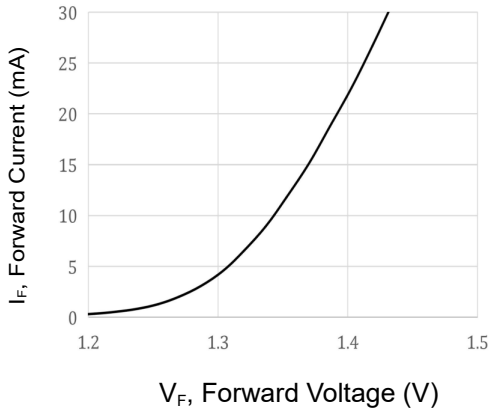


Figure 11: Forward Current vs Forward Voltage

11.Test Circuits Diagrams

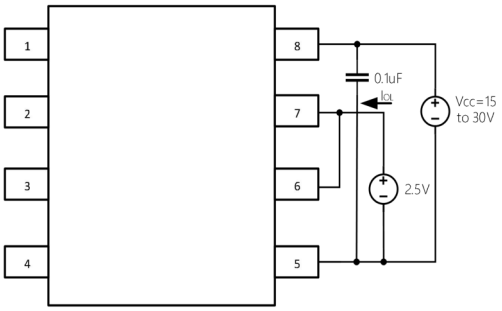


Figure.12 I_{OL} Pulsed Test Circuit

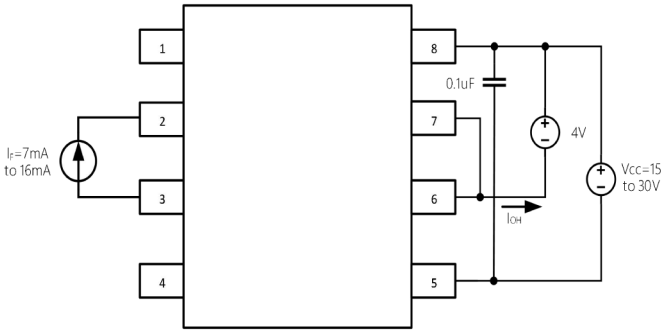


Figure.13 I_{OH} Pulsed Test Circuit

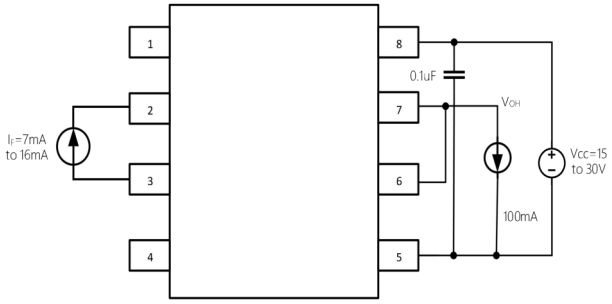


Figure.14 V_{OH} Pulsed Test Circuit

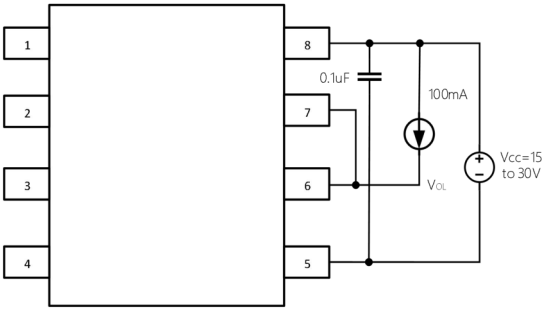


Figure.15 V_{OL} Pulsed Test Circuit

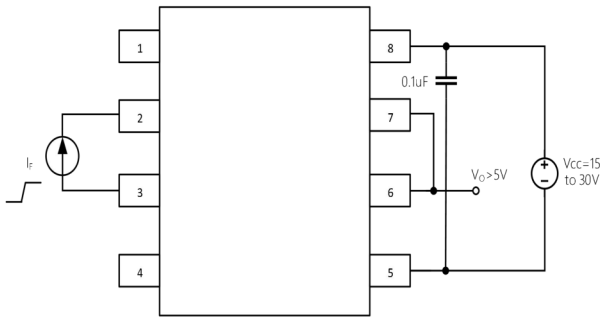


Figure.16 I_{FLH} Test Circuit

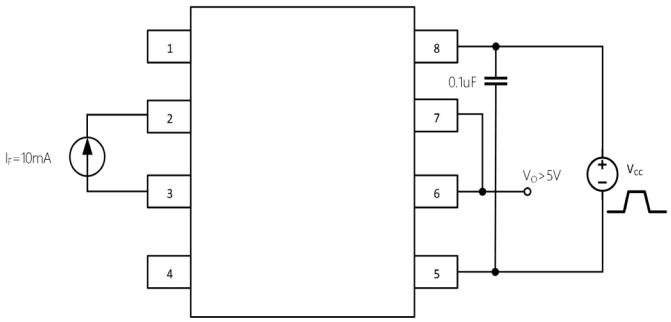


Figure.17 UVLO Test Circuit

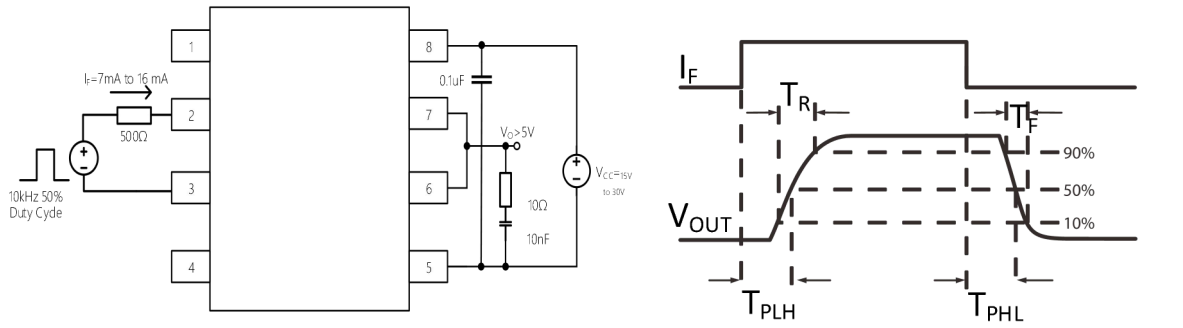


Figure.18 T_{PHL}, T_{PLH}, T_R, T_F Test Circuit

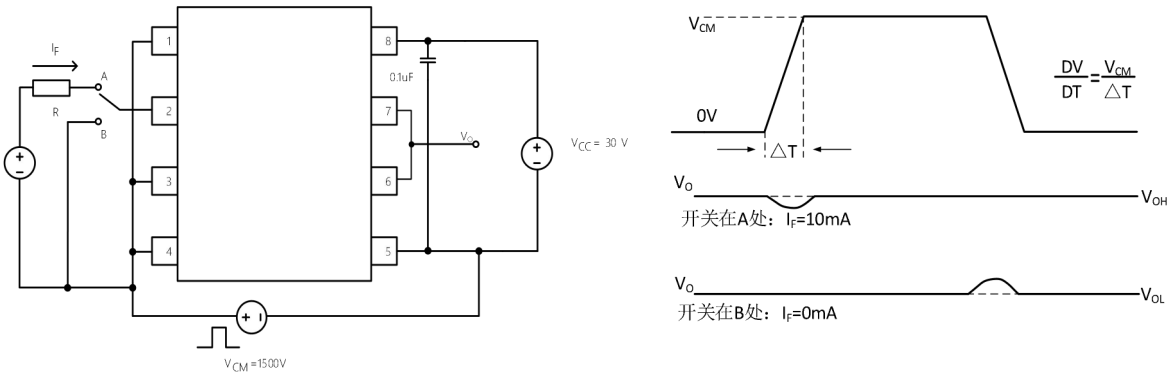
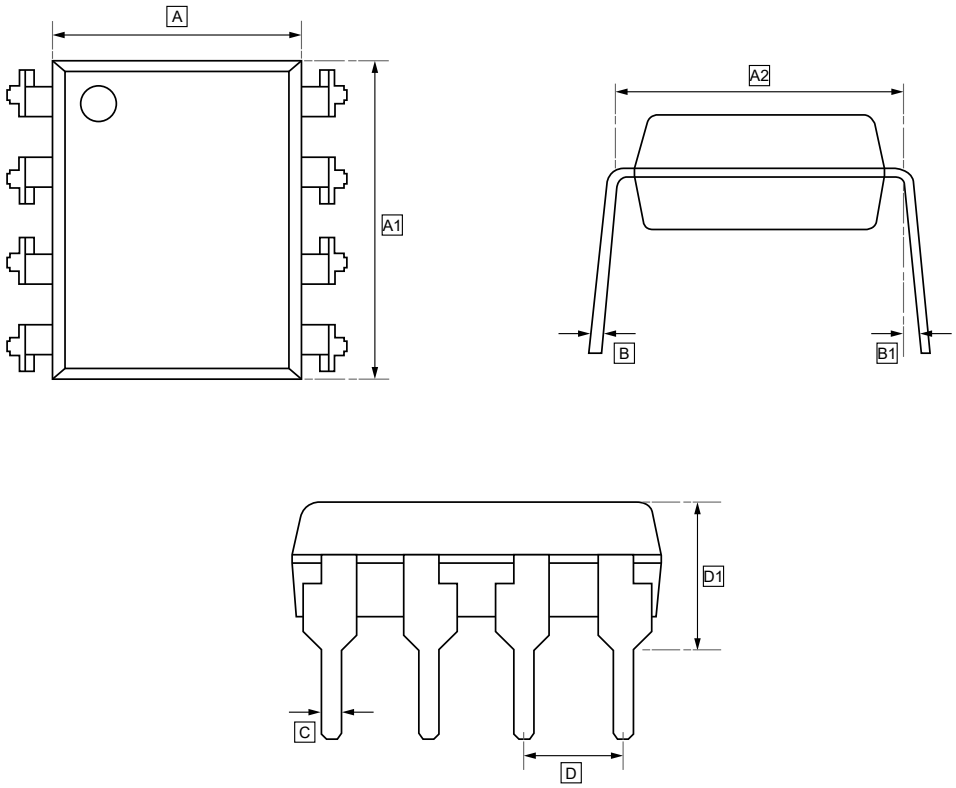


Figure.19 CMR Test Circuit

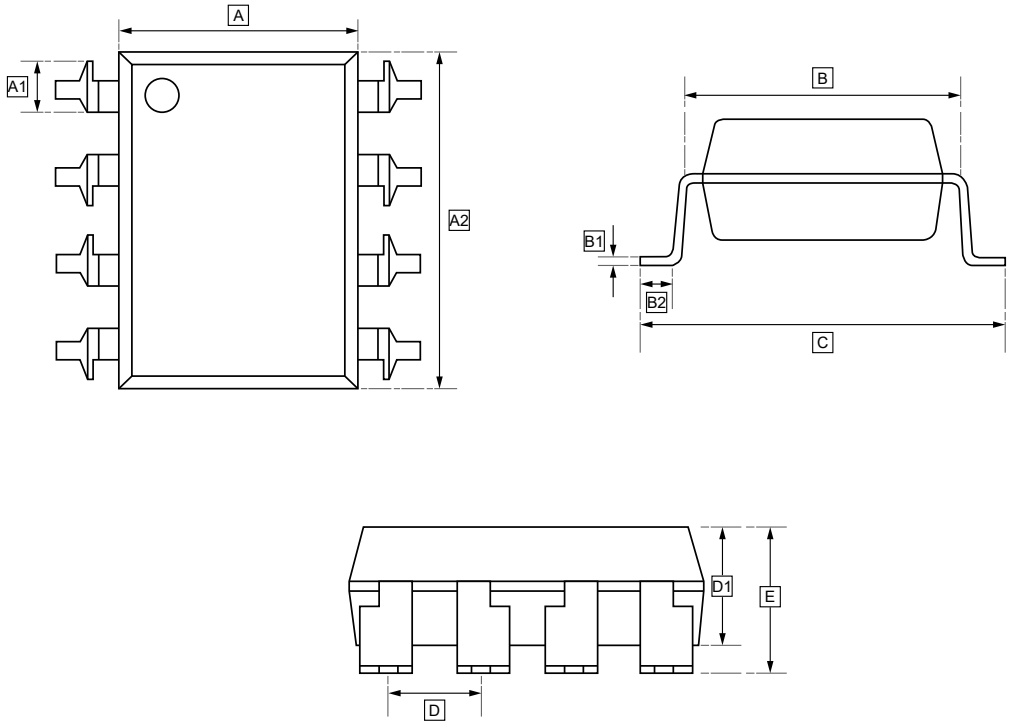
12.1 DIP-8 Package Outline Dimensions



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

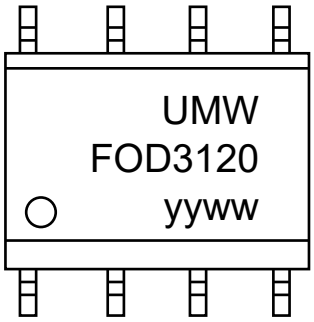
12.2 SOP-8 Package Outline Dimensions



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 FOD3120	FOD3120	DIP-8	2250	Tube and box
UMW FOD3120S	FOD3120S	SOP-8	1000	Tape and reel

14.Disclaimer

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