1.Description

The FOD3184 is a 3A Output Current, High Speed MOSFET/IGBT Gate Drive Optocoupler. It consists of a aluminium gallium arsenide (AlGaAs) light emitting diode optically coupled to a CMOS detector with PMOS and NMOS output power transistors integrated circuit power stage. It is ideally suited for high frequency driving of power MOSFETS/IGBT used in Plasma Display Panels (PDPs), motor control inverter applications and high performance DC/DC converters.

2.Applications

- Plasma Display Panel
- High performance DC/DC convertor
- High performance switch mode power supply
- High performance uninterruptible power supply
- Isolated Power MOSFET/IGBT gate drive

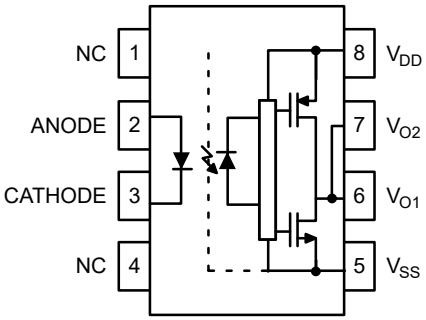
3.Features

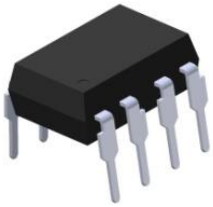
- High noise immunity characterized by 50kV/μs (Typ.) common mode rejection @ V_{CM}=2,000V
- Guaranteed operating temperature range of -40°C to +100°C
- 3A peak output current for medium power MOSFET/IGBT
- Fast switching speed
  – 210ns max. propagation delay
  – 65ns max pulse width distortion
- Fast output rise/fall time
- – Offers lower dynamic power dissipation
- 250kHz maximum switching speed
- Wide V_{DD} operating range from 15V to 30V
- Use of P-Channel MOSFETs at output stage enables output voltage swing close to the supply rail (rail-to-rail output)
- Under voltage lockout protection (UVLO) with hysteresis – optimized for driving IGBTs

4.Truth Table

LED	V_{DD}-V_{SS} " POSITIVE GOING" (TURN-ON)	V_{DD}-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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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)	$I_{O(PEAK)}$	3	A
	Supply Voltage	V_{DD} - V_{SS}	-0.5~35	V
	Output Voltage	V_O	0~V_{DD}	V
Isolation Voltage		V_{ISO}	5000	V_{rms}
Total Power Dissipation		P_{tot}	250	mW
Operating Temperature		T_{opr}	-40 to 100	°C
Storage Temperature		T_{stg}	-40 to 125	°C
Soldering Temperature		T_{sol}	260	°C

8.Recommended Operating Conditions

Parameter	Symbol	Min	Max	Units
Power Supply Voltage	V_{DD} - V_{SS}	15	30	V
Input Current (ON)	$I_{F(ON)}$	10	16	mA
Input Voltage (OFF)	$V_{F(OFF)}$	-3	0.8	V
Operating Temperature	T_A	-40	100	°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}=0V.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
High Level Output Current	I_{OH}	V_{OH}=(V_{DD}-V_{SS}-1V)		-0.9	-0.5	A
		V_{OH}=(V_{DD}-V_{SS}-6V)			-2.5	A
Low Level Output Current	I_{OL}	V_{OL}=(V_{DD}-V_{SS}+1V)	0.5	1		A
		V_{OL}=(V_{DD}-V_{SS}+6V)	2.5			A
High Level Output Voltage (4)(5)	V_{OH}	I_O=-100mA, I_F=10mA	V_{DD}-0.5			V
		I_O=-2.5A, I_F=10mA	V_{DD}-7			V
Low Level Output Voltage (4)(5)	V_{OL}	I_O=100mA, I_F=0mA			V_{SS}+0.5	V
		I_O=2.5A, I_F=0mA			V_{SS}+7	V
High Level Supply Current	I_{DDH}	Output Open, I_F=10 to 16mA		2.6	3.5	mA
Low Level Supply Current	I_{DDL}	Output Open, V_F=-3 to 0.8V		2.5	3.5	mA
Threshold Input Current Low to High	I_{FLH}	I_O=0mA, V_O>5V		3	7.5	mA
Threshold Input Voltage High to Low	V_{FHL}	I_O=0mA, V_O<5V	0.8			V
Input Forward Voltage	V_F	I_F=10mA	1.1	1.43	1.8	V
Temperature Coefficient of Forward Voltage	$\Delta V_F/T_A$	I_F=10mA		-1.5		mV/°C
UVLO Threshold	V_{UVLO+}	V_O>5V, I_F=10mA	11.5	13	13.5	V
	V_{UVLO-}	V_O<5V, I_F=10mA	10	11.5	12	V
UVLO Hysteresis	$UVLO_{HYST}$			1.5		V
Input Reverse Breakdown Voltage	BV_R	I_R=10μA	5			V
Input Capacitance	C_{IN}	f=1MHz, V_F=0V		25		pF

10.Switching Characteristics

Apply over all recommended conditions, typical value is measured at V_{DD}=30V, V_{SS}=0V, T_A=25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Propagation Delay Time to High Output Level (6)	t_{PLH}	I_F=10mA, R_g=10Ω, f=250kHz Duty Cycle=50%, C_g=10nF	50	120	210	ns
Propagation Delay Time to Low Output Level (6)	t_{PHL}		50	145	210	ns
Pulse Width Distortion (7)	P_{WD}			35	65	ns
Propagation Delay Difference Between Any Two Parts (8)	P_{DD} (t_{PHL}-t_{PLH})		-90		90	ns
Rise Time	t_r	C_L=10nF, R_g=10Ω		38		ns
Fall Time	t_f			24		ns
UVLO Turn On Delay	$t_{UVLO\ ON}$			2		μs
UVLO Turn Off Delay	$t_{UVLO\ OFF}$			0.3		μs
Output High Level Common Mode Transient Immunity (9) (10)	| CM_H |	T_A=+25°C, I_F=10mA to 16mA, V_{CM}=2kV, V_{DD}=30V	35	50		kV/μs
Output Low Level Common Mode Transient Immunity (9) (11)	| CM_L |	T_A=+25°C, V_F=0V V_{CM}=2kV, V_{DD}=30V	35	50		kV/μs

11.Isolation Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Withstand Isolation Voltage (12) (13)	V_{ISO}	T_A=25°C, R.H.<50%, t=1min. I_{I-O}≤10μA	5000			V_{rms}
Resistance (input to output) (13)	R_{I-O}	V_{I-O}=500V		10^{11}		Ω
Capacitance (input to output)	C_{I-O}	Freq.=1MHz		1		pF

*Typical values at T_A=25°C

12.1 Typical Characteristic

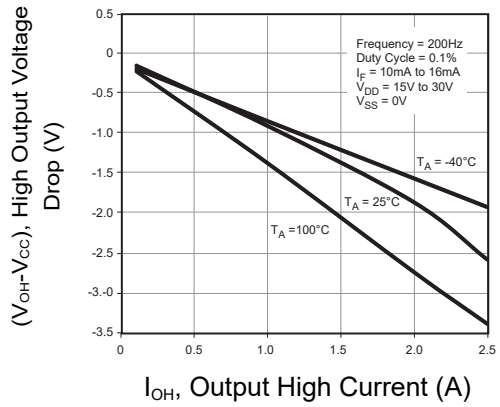


Figure 1: Output High Voltage Drop vs. Output High Current

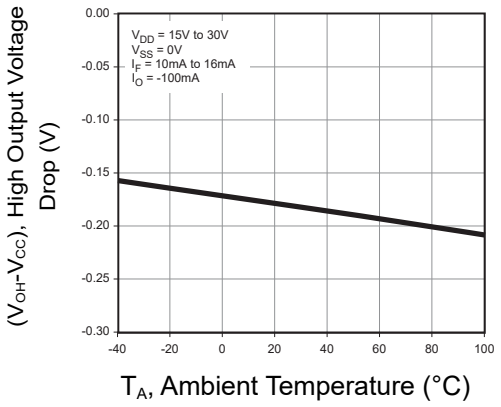


Figure 2: Output High Voltage Drop vs. Ambient Temperature

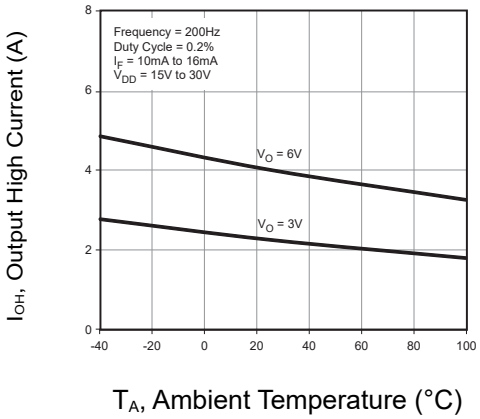


Figure 3: Output High Current vs. Ambient Temperature

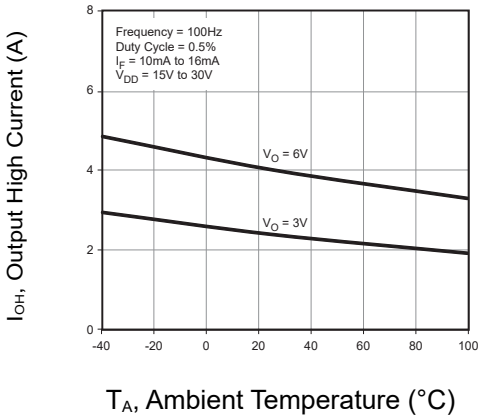


Figure 4: Output High Current vs. Ambient Temperature

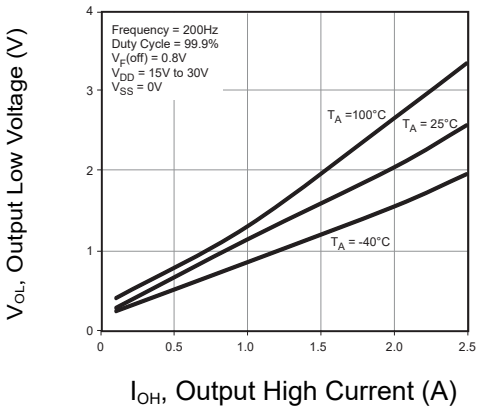


Figure 5: Output Low Voltage vs. Output High Current

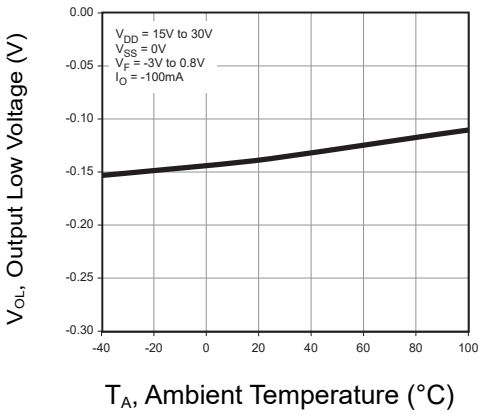


Figure 6: Output Low Voltage vs. Ambient Temperature

12.2 Typical Characteristic

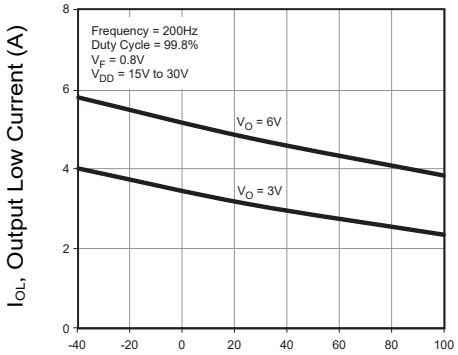


Figure 7: Output Low Current vs. Ambient Temperature

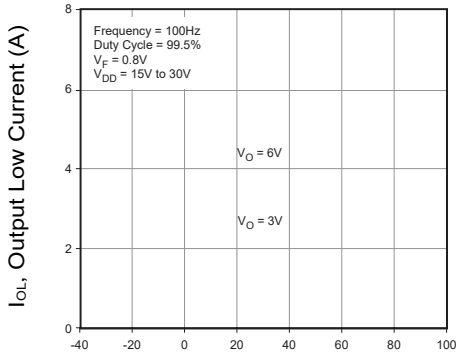


Figure 8: Output Low Current vs. Ambient Temperature

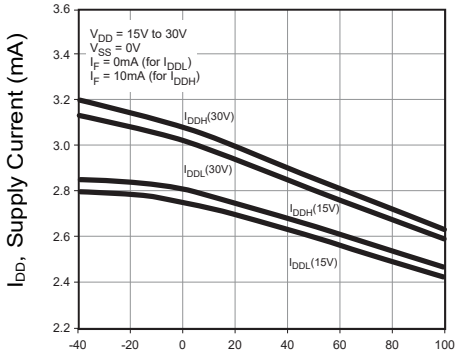


Figure 9: Supply Current vs. Ambient Temperature

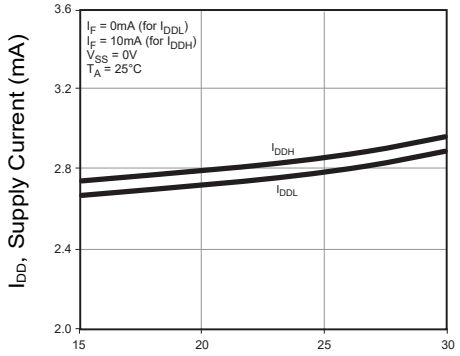


Figure 10: Supply Current vs. Supply Voltage

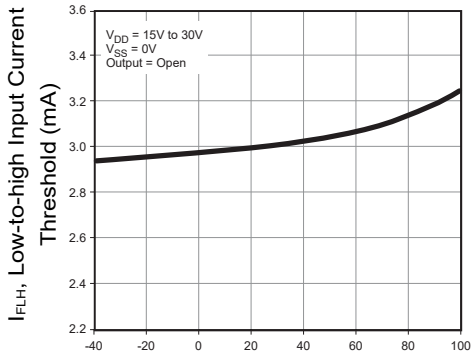


Figure 11: Low-to-High Input Current Threshold vs. Ambient Temperature

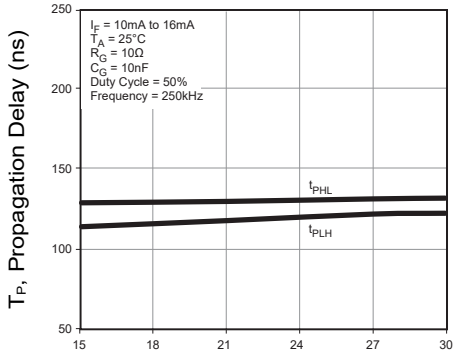


Figure 12: Propagation Delay vs. Supply Voltage

12.3 Typical Characteristic

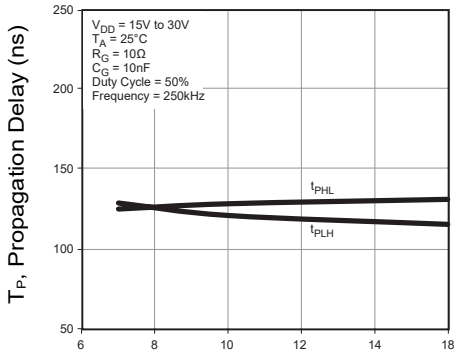


Figure 13: Propagation Delay vs. LED Forward Current

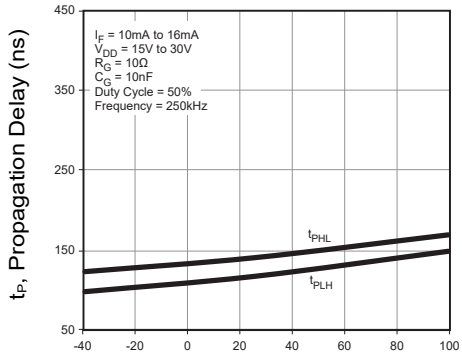


Figure 14: Propagation Delay vs. Ambient Temperature

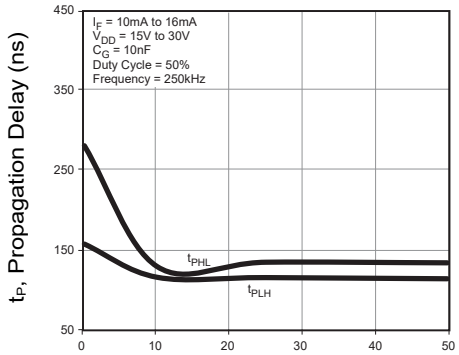


Figure 15: Propagation Delay vs. Series Load Resistance

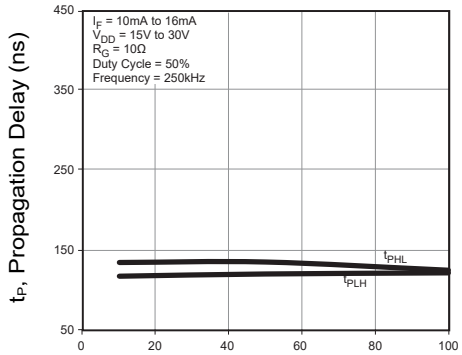


Figure 16: Propagation Delay vs. Series Load Capacitance

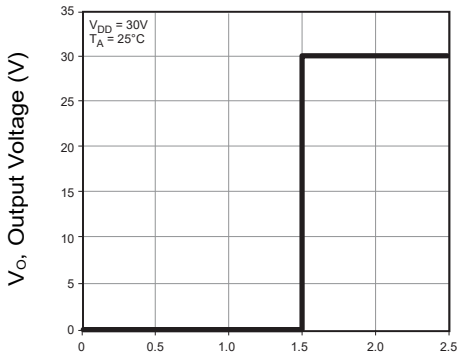


Figure 17: Transfer Characteristics

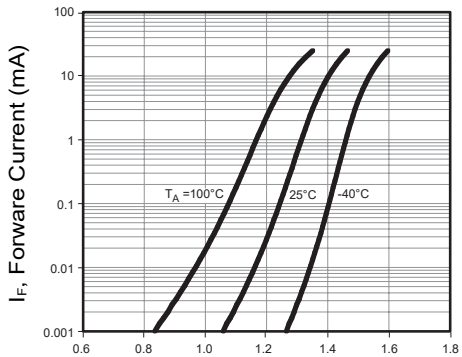


Figure 18: Input Forward Current vs. Forward Voltage

13.Test Circuits Diagrams

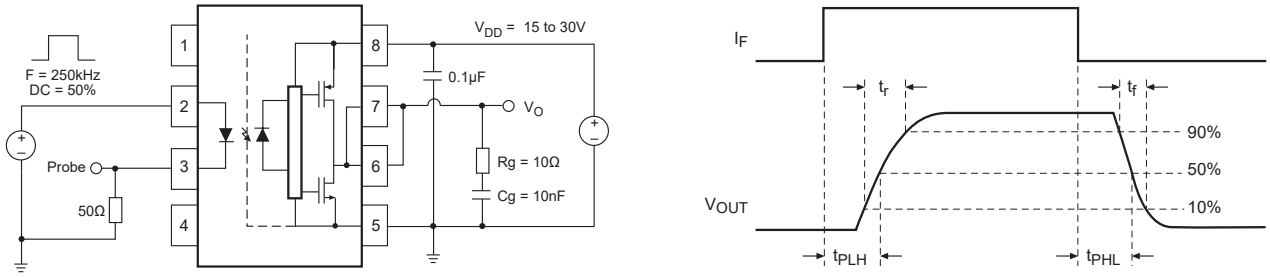


Figure 19: Propagation Delay Test Circuit and Waveforms

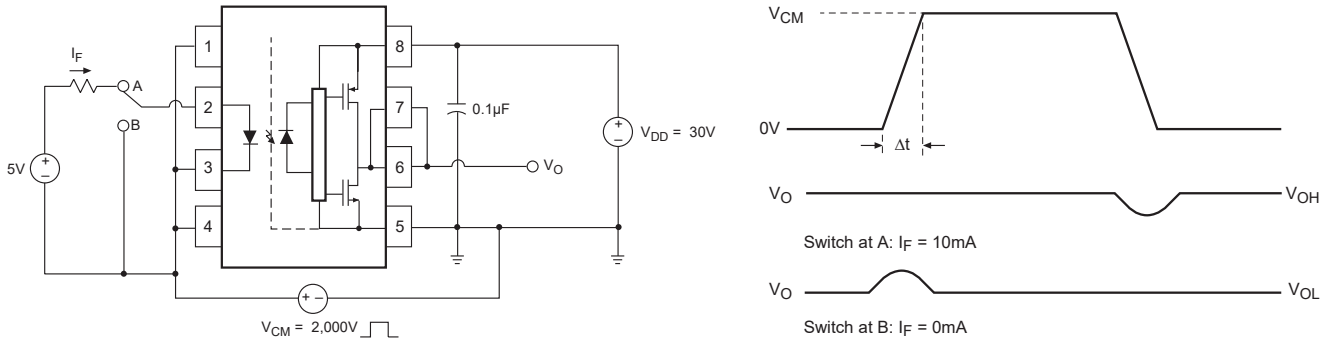
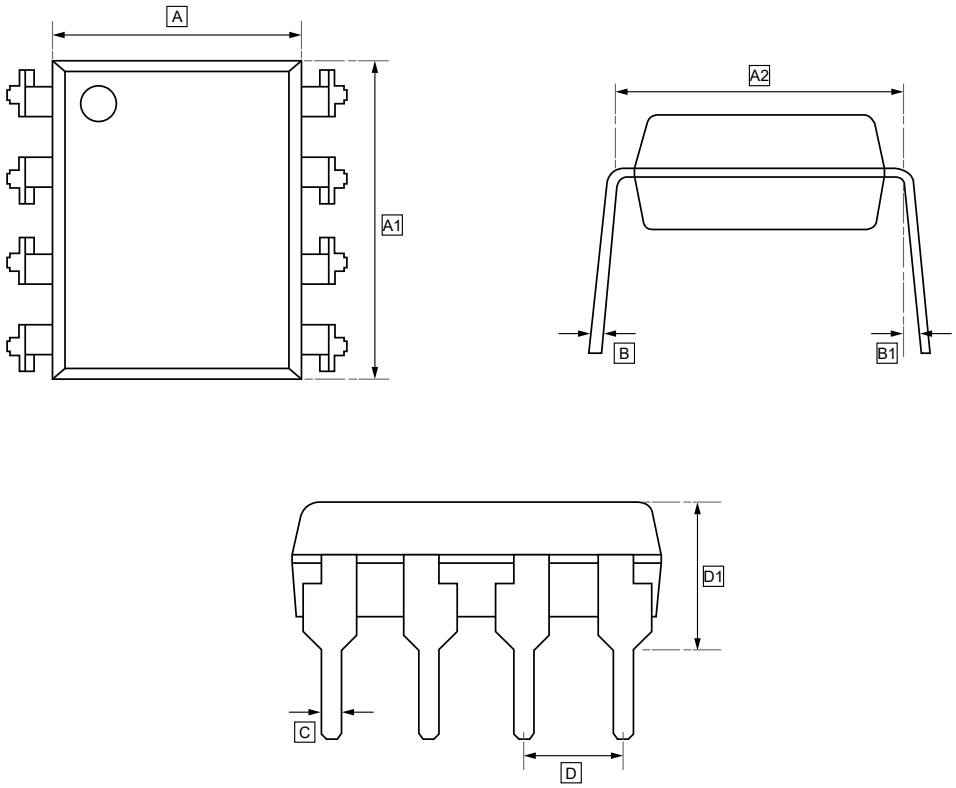


Figure 20: CMR Test Circuit and Waveforms

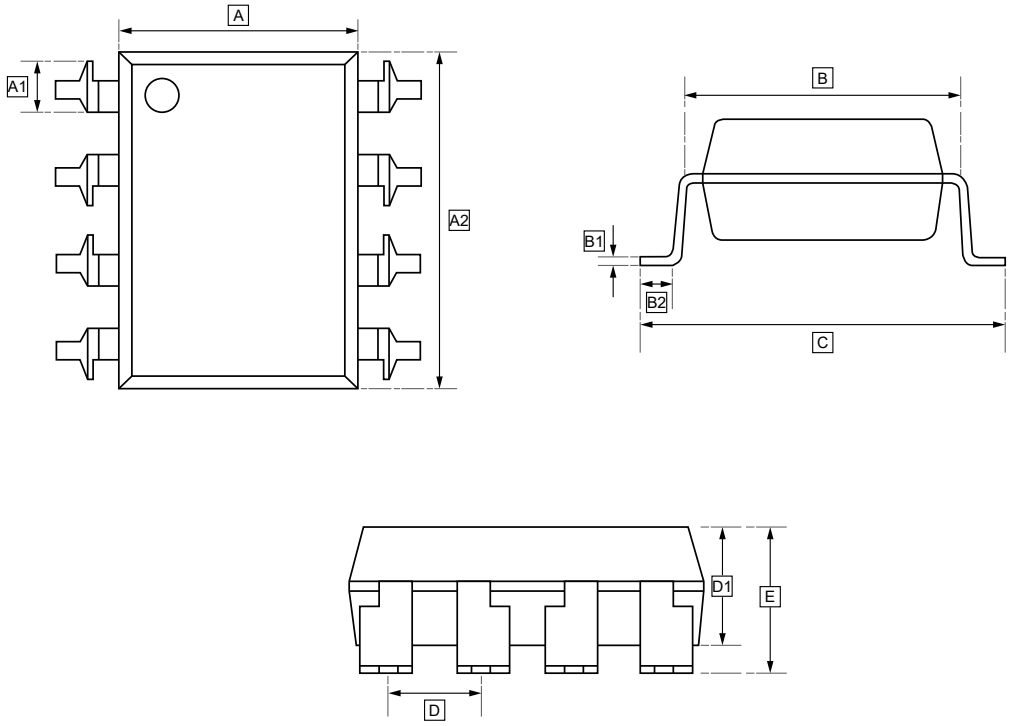
14.1 DIP-8 Package Outline Dimensions



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

14.2 SOP-8 Package Outline Dimensions

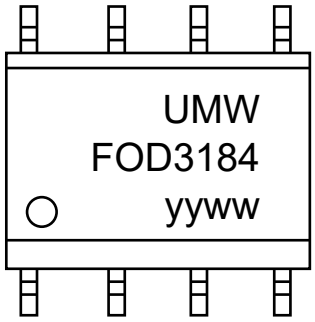


DIMENSIONS (mm are the original dimensions)

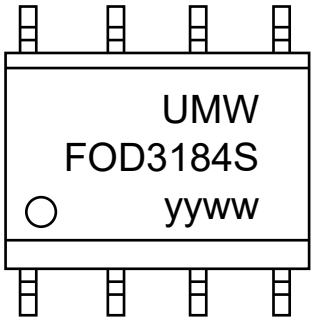
Symbol	A	A1	A2	B	B1	B2	C	D	D1	E
Min	6.30	1.45	9.46	7.62	0.25	0.6	-	2.54	3.20	4.00
Max	6.90		10.06	TYP		-	10.3	TYP	3.80	4.60

15.Ordering Information

DIP-8



SOP-8



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW FOD3184	FOD3184	DIP-8	2250	Tube and box
UMW FOD3184S	FOD3184S	SOP-8	1000	Tape and reel

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