

I/V Conversion Amplifier for DVD/CD

Monolithic IC MM1730XB

Outline

This IC is an I/V conversion amplifier including photodiode elements which correspond to 2-wavelength laser of DVDs and audio CDs.
It is optimized for DVD players.

Features

1. Equipped with a 10-divided light-receiving unit optimized for 2-wavelength laser
2. High speed (frequency response $f_c=40\text{MHz}$ typ. : DVD)
3. High sensitivity ($32\text{mV}/\mu\text{W}$ typ. : DVD)
4. Wide operating temperature range ($-20\sim+75^\circ\text{C}$)
5. High-performance small transparent molded package

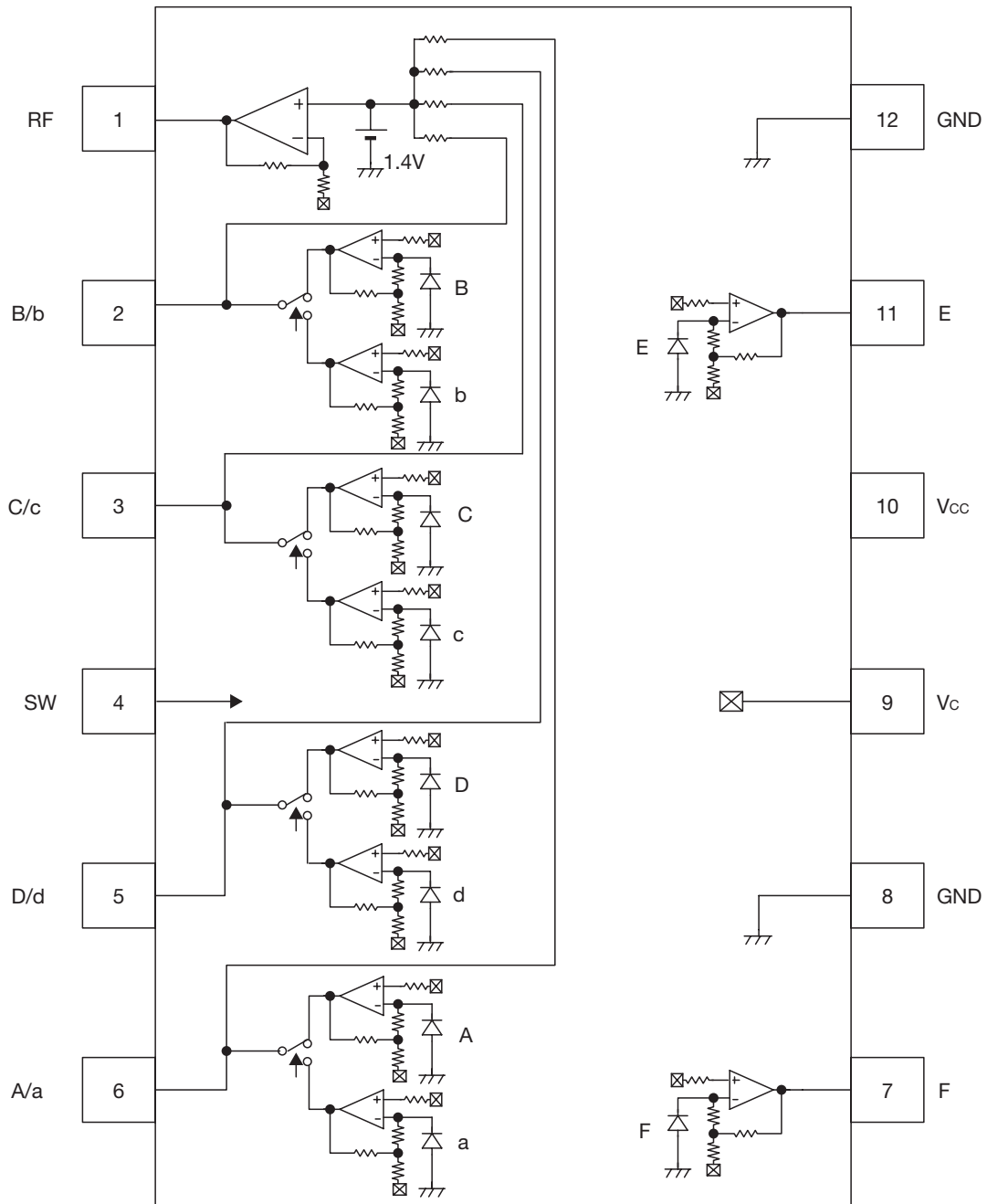
Package

CMP-12A 4.0×5.0mm Small transparent molded package

Application

1. Ideal for DVD players
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Pin Configuration



note : Relation between switch voltage and output mode

	SW		OUTPUT
CD mode	High	$V_{SWH}=2.0V \sim V_{CC}$ or open	A to D
DVD mode	Low	$V_{SWL}=0V \sim 0.8V$	a to d

Pin Description

Pin No.	Pin name	I/O	Functions	Internal equivalent circuit diagram
2 3 5 6	B/b C/c D/d A/a	Output	Output of electrical signal converted from optical signals.	
1	RF	Output	Output is additional value of A to D/a to d.	
4	SW	Input	Input terminal which switches CD and DVD mode. DVD mode is 0 to 0.8V, CD mode is 2.0 to Vcc or open.	
7 11	F E	Output	Output of electrical signal converted from optical signals.	

Pin No.	Pin name	I/O	Functions	Internal equivalent circuit diagram
8, 12	GND		GND Pin	
9	V _c	Input	Center voltage input pin.	
10	V _{cc}	Input	Power voltage supply pin.	

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T _{STG}	-40~+90	°C
Storage temperature / humidity	T/H _{STG}	85/90	°C/% RH
Operating temperature	T _{OPR}	-20~+75	°C
Supply voltage	V _{CC max}	6	V
Allowable loss	P _d	200	mW

Recommended Operating Conditions

Item	Symbol	Ratings	Units
V _{CC} Operating supply voltage	V _{CCOP}	4.5~5.5	V
V _c Operating supply voltage	V _{COP}	1.8~3.0	V
Operating temperature	T _{OPR}	-20~+75	°C

Electrical And Optical Characteristics 1 (CD Mode) $V_{CC}=5V, V_C=2.5V, V_{SWH}=5V$ (Except where noted otherwise $T_a=25^\circ C$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Current consumption	I_{CC}	In dark condition		20	26	mA
Output offset voltage1	V_{off1}	A~F note 1-1 In dark condition	-20	0	20	mV
Output offset voltage2	V_{off2}	RF note 1-2 In dark condition	1.25	1.4	1.55	V
Output offset voltage	ΔV_{off}	(A+B)-(C+D) In dark condition	-15	0	15	mV
		(A+C)-(B+D) In dark condition	-15	0	15	mV
		(A+D)-(B+C) In dark condition	-15	0	15	mV
		E - F In dark condition	-15	0	15	mV
Output voltage note 1-3, 5	V_o	A~D $P_o=10\mu W, \lambda=780nm$	32.0	40.0	48.0	mV/ μW
		E, F $P_o=10\mu W, \lambda=780nm$	70.4	88.0	105.6	mV/ μW
		RF $P_o=10\mu W, \lambda=780nm$	56.0	70.0	84.0	mV/ μW
Maximum output voltage note 1-4, 5	V_{omax}	A~D, RF $P_o=100\mu W, \lambda=780nm$	4.0	4.2		V
		E, F $P_o=100\mu W, \lambda=780nm$	4.5	4.9		V
Frequency characteristics note 1-5	f_c	A~D, RF $P_o=10\mu W, \lambda=780nm$ 100kHz reference, -3dB	15	30		MHz
		E, F $P_o=10\mu W, \lambda=780nm$ 100kHz reference, -3dB	1	3.5		MHz
Group delay deviation note 1-5	t_{gd}	A~D, RF $f=1\sim 12MHz$		4	9	ns
Output noise level note 1-5	V_n	A~D In dark condition $f=12MHz, BW=30kHz$		-78	-73	dBm
		RF In dark condition $f=12MHz, BW=30kHz$		-67	-62	dBm

note1-1 : Measure output offset voltage A to F with reference to V_C .

note1-2 : Measure output offset voltage RF with reference to GND.

note1-3 : Measure output voltage with reference to output offset voltage.

note1-4 : Measure maximum output voltage with reference to GND.

note1-5 : Parameters are guaranteed by design.

Electrical And Optical Characteristics 2 (DVD Mode) $V_{CC}=5V, V_C=2.5V, V_{SWL}=0V$ (Except where noted otherwise $T_a=25^\circ C$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Current consumption	I_{CC}	In dark condition		20	26	mA
Output offset voltage1	V_{off1}	a~d note 2-1 In dark condition	-20	0	20	mV
Output offset voltage2	V_{off2}	RF note 2-2 In dark condition	1.25	1.4	1.55	V
Output offset voltage	ΔV_{off}	(a+b)-(c+d) In dark condition	-15	0	15	mV
		(a+c)-(b+d) In dark condition	-15	0	15	mV
		(a+d)-(b+c) In dark condition	-15	0	15	mV
Output voltage note 2-3, 5	V_o	a~d $P_o=10\mu W, \lambda=650nm$	25.6	32.0	38.4	mV/ μW
		RF $P_o=10\mu W, \lambda=650nm$	44.8	56.0	67.2	mV/ μW
Maximum output voltage note 2-4, 5	V_{omax}	a~d, RF $P_o=100\mu W, \lambda=650nm$	4.0	4.2		V
Frequency characteristics note 2-5	f_c	a~d, RF $P_o=10\mu W, \lambda=650nm$ 100kHz reference, -3dB	30	40		MHz
Group delay deviation note 2-5	t_{gd}	a~d, RF $f=1\sim 27MHz$		4	9	ns
Output noise level note 2-5	V_n	a~d In dark condition $f=27MHz, BW=30kHz$		-78	-73	dBm
		RF In dark condition $f=27MHz, BW=30kHz$		-67	-62	dBm

note1-1 : Measure output offset voltage a to d with reference to V_C .

note2-2 : Measure output offset voltage RF with reference to GND.

note2-3 : Measure output voltage with reference to output offset voltage.

note2-4 : Measure maximum output voltage with reference to GND.

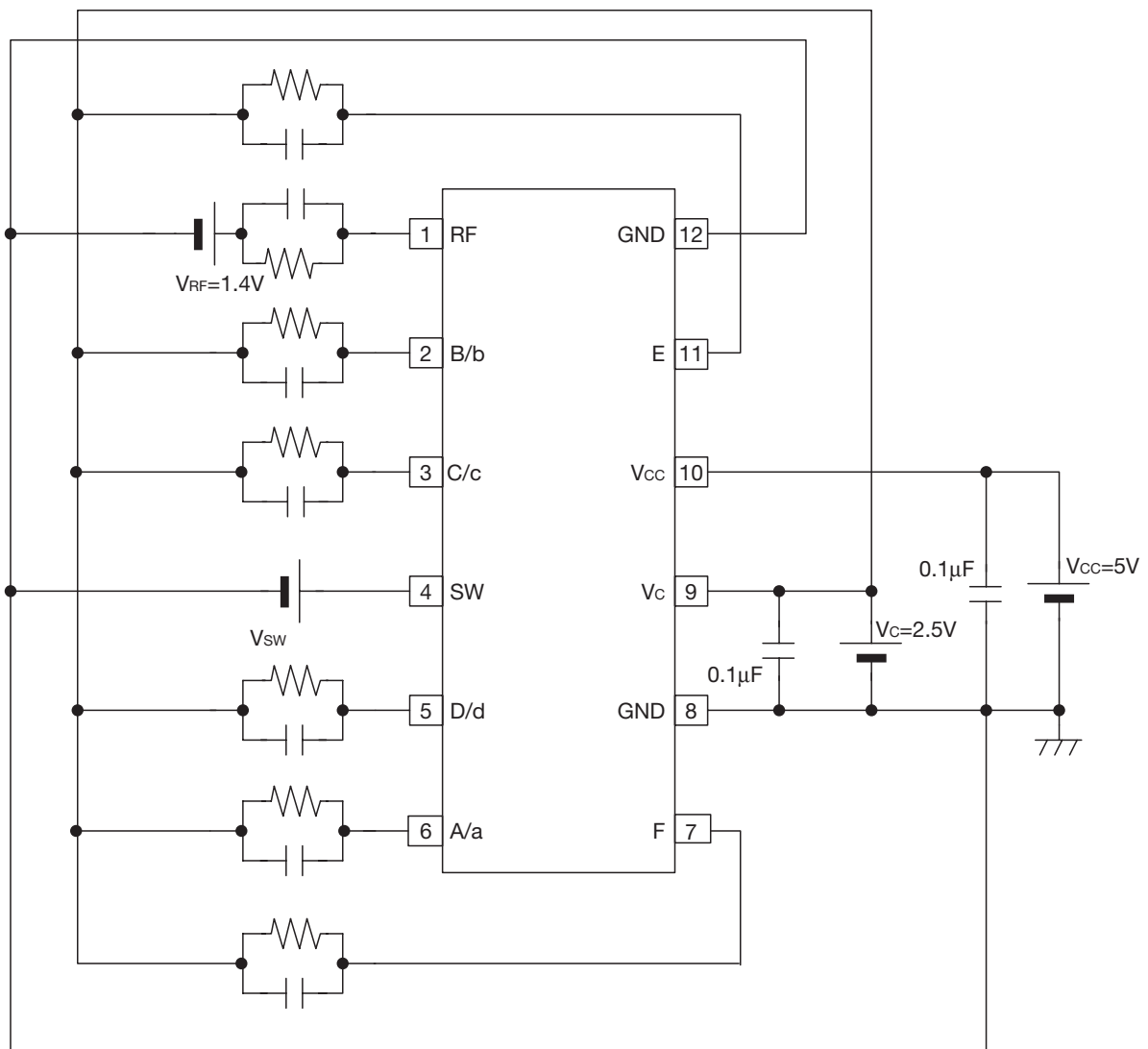
note2-5 : Parameters are guaranteed by design.

Electrical Characteristics 3 $V_{CC}=5V, V_C=2.5V$ (Except where noted otherwise $T_a=25^\circ C$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Switch terminal high level input voltage DVD→CD	V_{SWH}	SW Terminal : Variable from 0 to 5V	2.0		V_{CC}	V
Switch terminal low level input voltage CD→DVD	V_{SWL}	SW Terminal : Variable from 5 to 0V	0		0.8	V

note3-1 : Time until mode changes after changing SW input voltage : 2 μ s Max

Measuring Circuit

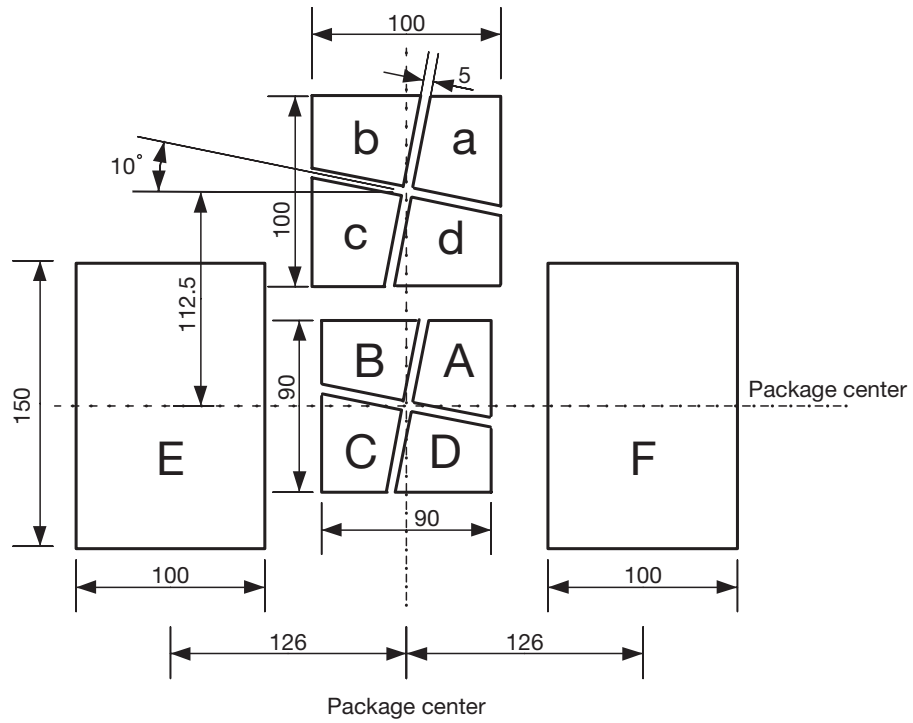


*1 : Conditions of load are all 10k Ω /10pF

*2 : Each mode is selected by making V_{SW} following voltage.

CD mode :	$V_{SWH}=2.0V \sim V_{CC}$ or open
DVD mode :	$V_{SWL}=0V \sim 0.8V$

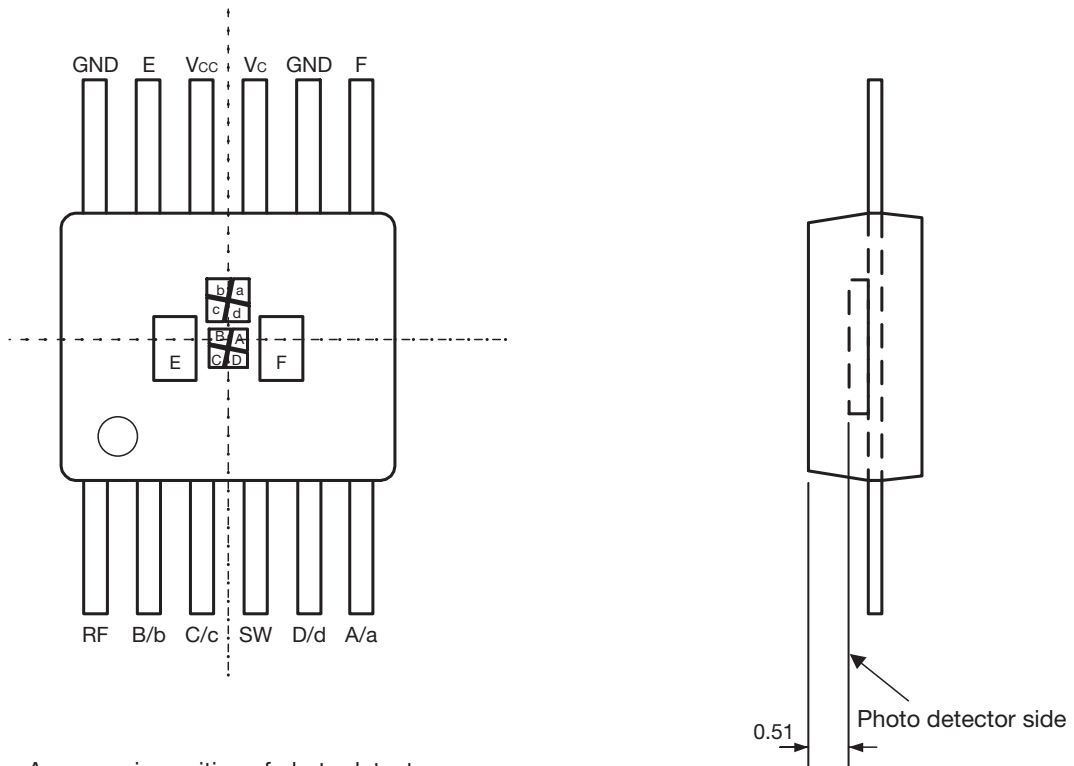
Photo Detector Pattern Dimensions



note : Photo detector A to D : CD mode
 Photo detector a to d : DVD mode

unit : μm

Photo Detector Position



Accuracy in position of photo detector
 $\Delta X, Y, Z = \pm 0.2\text{mm}$
 $\Delta \theta = \pm 2^\circ$

unit : mm