

PD IC for Optical Pickups for DVD Players

Monolithic IC MM1779

Outline

This IC is an I/V converting amplifier IC that incorporates light-receiving elements supporting 2 wave length laser for DVDs and audio compact discs. It is optimized for DVD players.

Features

1. Provides 10-divided light-receiving sections optimized for 2 wave length laser
2. High speed
3. High sensitivity
4. Wide operating temperature range: -20 to +80°C
5. High-performance small transparent mold package

MM1779AB

	CD mode	DVD mode	Unit
Output voltage	51.0	39.5	mV/μW
Frequency response	40	55	MHz

MM1779BB

	CD mode	DVD mode	Unit
Output voltage	34.0	27.0	mV/μW
Frequency response	45	70	MHz

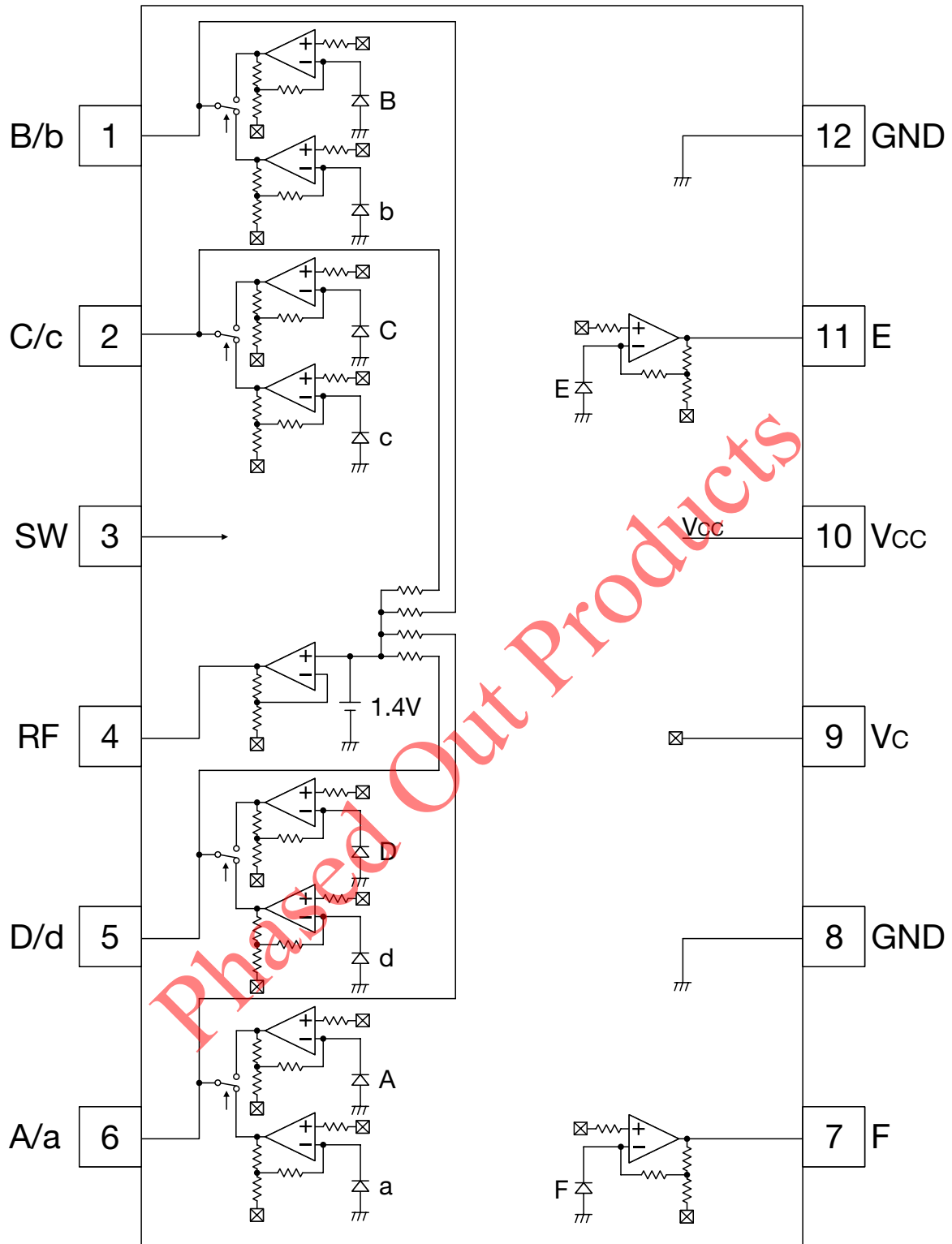
Package

CMP-12C 3.0×4.0 mm, small transparent mold package

Applications

1. DVD players

Pin Configuration



Note: Relation between switch voltage and output mode

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

Pin Description

Pin No.	Pin name	I/O	Functions	Internal equivalent circuit diagram
1 2 5 6	B/b C/c D/d A/a	Output	Output of electrical signal converted from optical signals.	
4	RF	Output	Output is additional value of A to D/a to d.	
3	SW	Input	Input terminal which switches CD and DVD mode. DVD mode is 0 to 0.8V or open, CD mode is 2.0 to Vcc.	
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~+80	°C
Supply voltage	V _{CCmax}	6	V
Allowable loss	P _d	130	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}	1.85~2.75	V
Operating temperature	T _{OPR}	-20~+80	°C

Electrical And Optical Characteristics 1 (CD Mode) $V_{CC}=5V, V_C=2.1V, V_{SWH}=5V$ (Except where noted otherwise $T_a=25^\circ C$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Current consumption	I_{cc}	In dark condition		14	20	mA
Output offset voltage1	V_{off1}	A~F note1-1 In dark condition	-22	0	22	mV
Output offset voltage2	V_{off2}	RF note1-2 In dark condition	1.25	1.40	1.55	V
Output offset voltage difference	ΔV_{off}	(A+B) - (C+D) In dark condition	-27	0	27	mV
		(A+C) - (B+D) In dark condition	-27	0	27	mV
		(A+D) - (B+C) In dark condition	-27	0	27	mV
		E - F In dark condition	-20	0	20	mV
Output offset voltage sum	Σv_{off}	A+B+C+D	-60	0	60	mV
Output voltage note1-3, 5	V_{oF}	A~D $P_o=10\mu W, \lambda =780nm$	25.5	34.0	42.5	mV/ μW
	V_{oT}	E, F $P_o=10\mu W, \lambda =780nm$	67.0	89.0	111.0	mV/ μW
	V_{oRF}	RF $P_o=10\mu W, \lambda =780nm$	45.0	59.5	74.0	mV/ μW
Output voltage ratio	V_{oT}/V_{oF}	E~F/A~D	2.3	2.6	2.9	
Maximum output voltage note1-4, 5	V_{omax}	A~D, RF $P_o=100\mu W, \lambda =780nm$	3.9	4.1		V
		E, F $P_o=100\mu W, \lambda =780nm$	4.5	4.9		V
Frequency characteristics note1-5	f_c	A~D, RF $P_o=10\mu W, \lambda =780nm$ 100kHz reference, -3dB	28	45		MHz
		E, F $P_o=10\mu W, \lambda =780nm$ 100kHz reference, -3dB	0.5	2.0		MHz
Group delay deviation note1-5	t_{gd}	A~D, RF $f=1MHz\sim 12MHz$		1	5	ns
Output noise level note1-5	V_n	A~D In dark condition $f=12MHz, BW=30kHz$		-82	-75	dBm
		RF In dark condition $f=12MHz, BW=30kHz$		-73	-65	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) $V_{CC}=5V, V_C=2.1V, V_{SWH}=0V$ (Except where noted otherwise $T_a=25^\circ C$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Current consumption	I_{CC}	In dark condition		14	20	mA
Output offset voltage1	V_{off1}	a~d note2-1 In dark condition	-22	0	22	mV
Output offset voltage2	V_{off2}	RF note2-2 In dark condition	1.25	1.40	1.55	V
Output offset voltage difference	ΔV_{off}	(a+b) - (c+d) In dark condition	-27	0	27	mV
		(a+c) - (b+d) In dark condition	-27	0	27	mV
		(a+d) - (b+c) In dark condition	-27	0	27	mV
Output offset voltage sum	Σv_{off}	a+b+c+d	-60	0	60	mV
Output voltage note2-3, 5	V_o	a~d $P_o=10\mu W, \lambda =650nm$	20.5	27.0	33.5	mV/ μW
		RF $P_o=10\mu W, \lambda =650nm$	35.5	47.0	58.8	mV/ μW
Maximum output voltage note2-4, 5	V_{omax}	a~d, RF $P_o=100\mu W, \lambda =650nm$	3.9	4.1		V
Frequency Characteristics note2-5	f_c	a~d, RF $P_o=10\mu W, \lambda =650nm$ 100kHz reference, -3dB	45	70		MHz
Group delay deviation note2-5	t_{gd}	a~d, RF $f=1MHz\sim 27MHz$		1	5	ns
Output noise level note2-5	V_n	a~d In dark condition $f=27MHz, BW=30kHz$		-82	-75	dBm
		RF In dark condition $f=27MHz, BW=30kHz$		-73	-65	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.

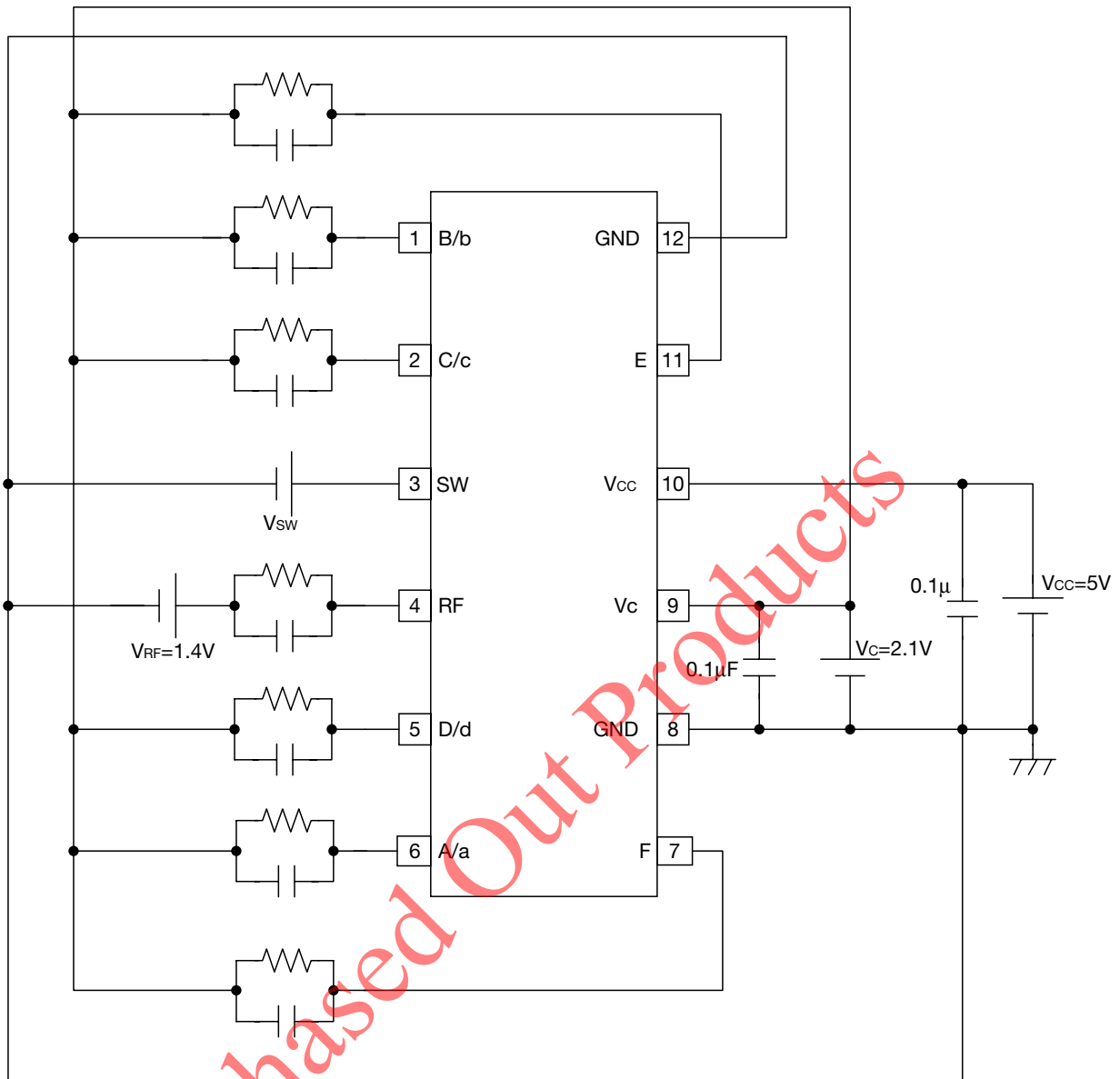
note2-5: Parameters are guaranteed by design.

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 μs max.

Measuring Circuit

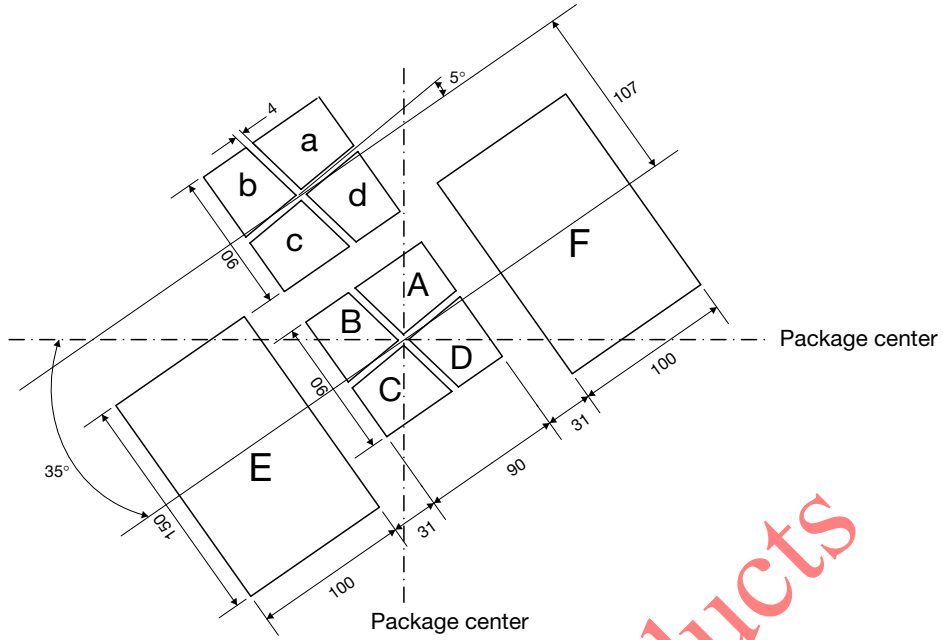


*1: Conditions of load are all 10kΩ//10pF

*2: Each mode is selected by making Vsw following voltage.

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

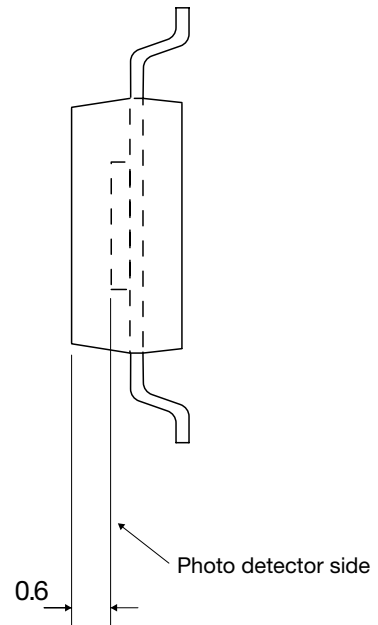
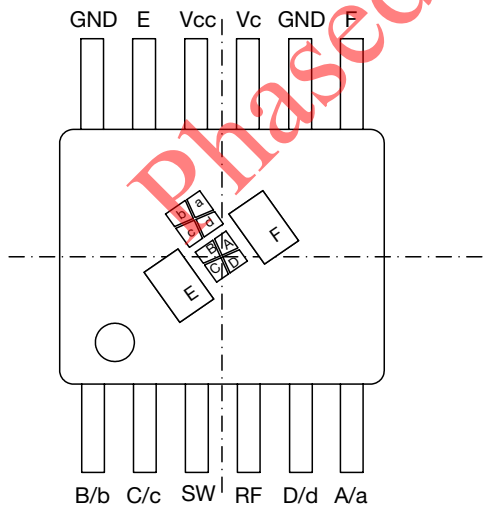
Photo Detector Pattern Dimensions



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

unit: mm

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