

FEATURES

The EA driver IC ML015A15 is designed for a 10Gb/s optical communication system. Output Swing, Output Offset and Output X-point are adjustable. Differential outputs are provided to drive an external modulator or laser diode. The hermetically sealed metal-ceramic package guarantees high reliability.

DESCRIPTION

- Operation DC to 10Gb/s, NRZ
- Built-in D-FF
- Internal Input / Output 50 Ω Termination
- Output Voltage Swing :
Vo-pp(Max.)=2.7 Vp-p min. @RL=50 Ω
- Single -5.2V Power Supply
- Output Reflection Coefficient: S22<-10dB @DC to 10GHz
- Output Swing Control Adjustment
- Output Offset Control Adjustment
- Output X-Point Control Adjustment
- 20-pin Hermetic Package

APPLICATION

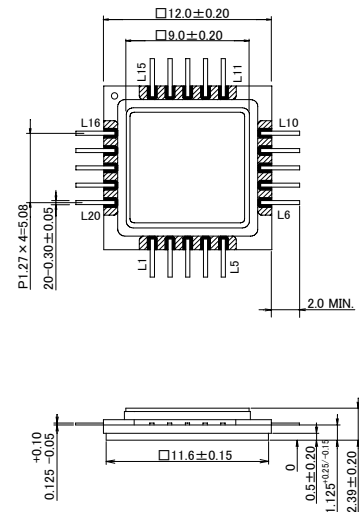
10Gb/s High-speed Optical Transmitter

ABSOLUTE MAXIMUM RATINGS (Ta = 25 $\pm$ 3 $^{\circ}$ C)

Symbol	Parameter	Ratings		Unit
		Min.	Max.	
Vss	Supply Voltage	-6.0	0	V
Voff	Output Offset Voltage Control Voltage	Vss	Vss+1.4	V
Vcrs	X-point Control Voltage	Vss	Vss+1.4	V
Vin , VinB	Input Voltage	-4.0	0	V
Vout , VoutB	Output Voltage	-4.1	+0.5	V
Iout	Output Current	—	100	mA
Ig2	Prebuffer Output Swing Control Current	—	4.5	mA
IM	Output Swing Control Current	—	4.5	mA
Tc	Operating Case Temperature	—	+100	$^{\circ}$ C
Tstg	Storage Temperature	-40	+125	$^{\circ}$ C

OUTLINE

Unit:mm



< Keep safety first in your circuit designs! >

Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of Substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

RECOMMENDED OPERATING CONDITIONS

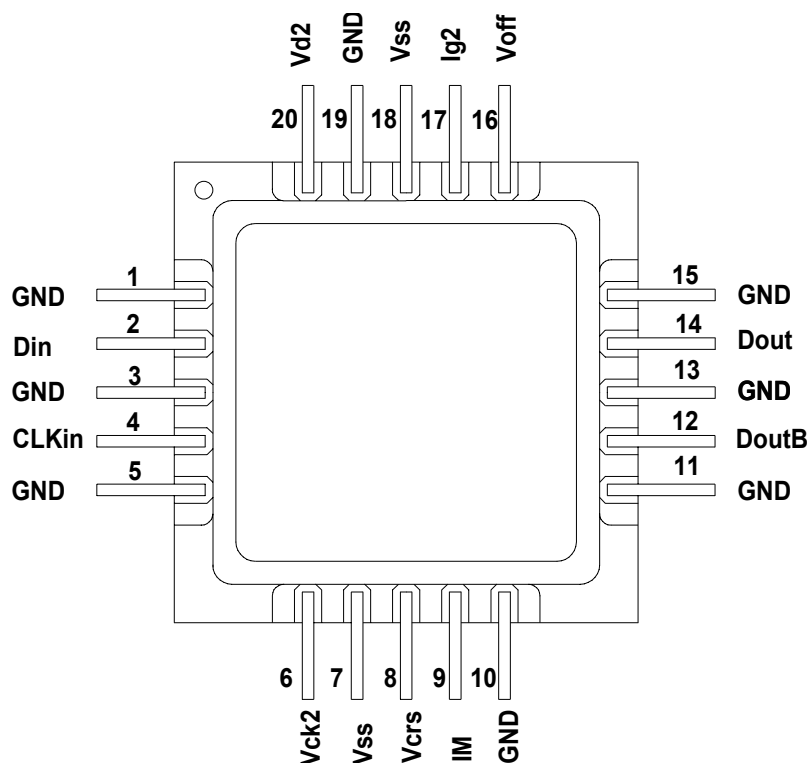
Symbol	Parameter	Test Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Vss	Supply Voltage	—	-5.72	-5.2	-4.68	V
Vd2	Data Input Threshold Voltage	—	-0.7	-0.5	-0.4	V
Vck2	CLK Input Threshold Voltage	—	-0.7	-0.5	-0.4	V
Voff	Output Offset Voltage Control Voltage	—	Vss	—	Vss+1.2	V
Vcrs	X-point Control Voltage	—	Vss	—	Vss+1.2	V
VinH	Input Level High	—	-0.35	-0.25	-0.0	V
VinL	Input Level Low	—	-1.2	-0.75	-0.65	V
Ig2	Prebuffer Output Swing Control Current	—	2.5	3.5	4.0	mA
IM	Output Swing Control Current	—	0.7	2.0	3.5	mA

*1 : No AC inputs

ELECTRICAL CHARACTERISTICS (Ta = 25 $\pm$ 3 $^{\circ}$ C , Vss=-5.2V, Ig2=3.0mA, f=9.95328Gbps, PRBS 2³¹-1, RL=50 Ω)

Symbol	Parameter	Test Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Iss	Power Supply Current	Voff=Vcrs=-5.2V , Vo-pp=2.7Vp-p	—	570	720	mA
Vo-pp (Max.)	Output Voltage Swing(Max.)	Voff=Vcrs=-5.2V , IM=3.0mA	2.7	—	—	Vp-p
Vo-pp (Min.)	Output Voltage Swing(Min.)	Voff=Vcrs=-5.2V , IM=0.5mA	—	—	1.8	Vp-p
Iout	Modulation Current Output	Voff=Vcrs=-5.2V,	35	—	60	mA
VOH	Output Voltage High	Vcrs=-5.2V , Voff=Vss to Vss+1.2V , Vo-pp=2.7Vp-p	-1.0	—	-0.2	V
VOL	Output Voltage Low	Vcrs=-5.2V , Voff=Vss to Vss+1.2V , Vo-pp=2.7Vp-p	-3.0	—	—	V
CP	X-point Control Range	Voff=-5.2V , Vcrs=Vss to Vss+1.2V , Vo-pp=2.7Vp-p	50	—	80	%
tr	Rise Time	Voff=Vcrs=-5.2V , Vo-pp=2.7Vp-p , 20-80%	—	25	30	ps
tf	Fall Time	Voff=Vcrs=-5.2V , Vo-pp=2.7Vp-p , 20-80%	—	25	30	ps
JITp-p	Jitter P-P	Voff=Vcrs=-5.2V , Vo-pp=2.7Vp-p	—	—	10	ps
S22	Output Reflection Coefficient	Voff=Vcrs=-5.2V , Vo-pp=2.7Vp-p , DC to 10GHz	—	—	-10	dB
PM	CLK/DATA phase margin	Voff=Vcrs=-5.2V , Vo-pp=2.7Vp-p	200	—	—	deg.

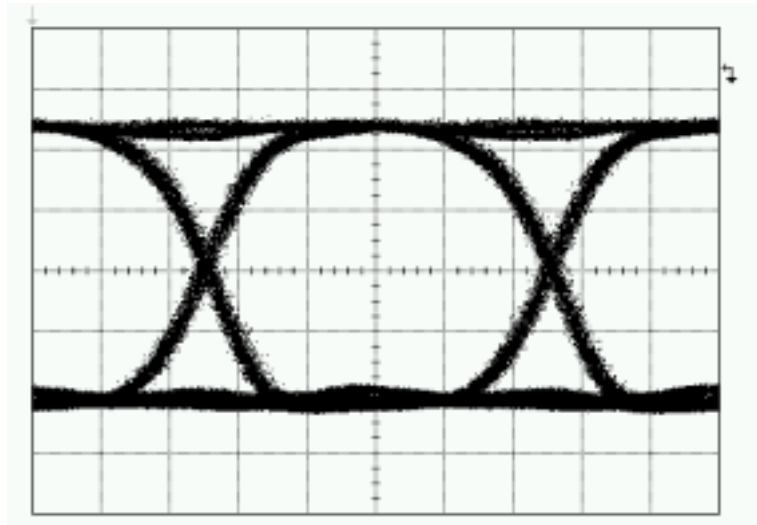
Pin Assignment



Pin Description

Pin No.	Pin name	Description	Pin No.	Pin name	Description
1	GND	Ground	11	GND	Ground
2	Din	Data Input	12	DoutB	Data Output Complementary to Dout (for Laser Diode)
3	GND	Ground	13	GND	Ground
4	CLKin	Clock Input	14	Dout	Data Output (for EA Modulator)
5	GND	Ground	15	GND	Ground
6	Vck2	CLK Input Threshold Voltage	16	Voff	Output Offset Voltage Control Voltage
7	Vss	Supply Voltage	17	Ig2	Prebuffer Output Swing Control Current
8	Vcrs	X-point Control Voltage	18	Vss	Supply Voltage
9	IM	Output Swing Control Current	19	GND	Ground
10	GND	Ground	20	Vd2	Data Input Threshold Voltage

TYPICAL CHARACTERISTICS



■ Operating Condition:
Vss=Voff=Vcrs -5.2V
Vd2=-0.5V
Vck2=-0.55V
Ig2 = 3.0mA
Im= 2.0mA

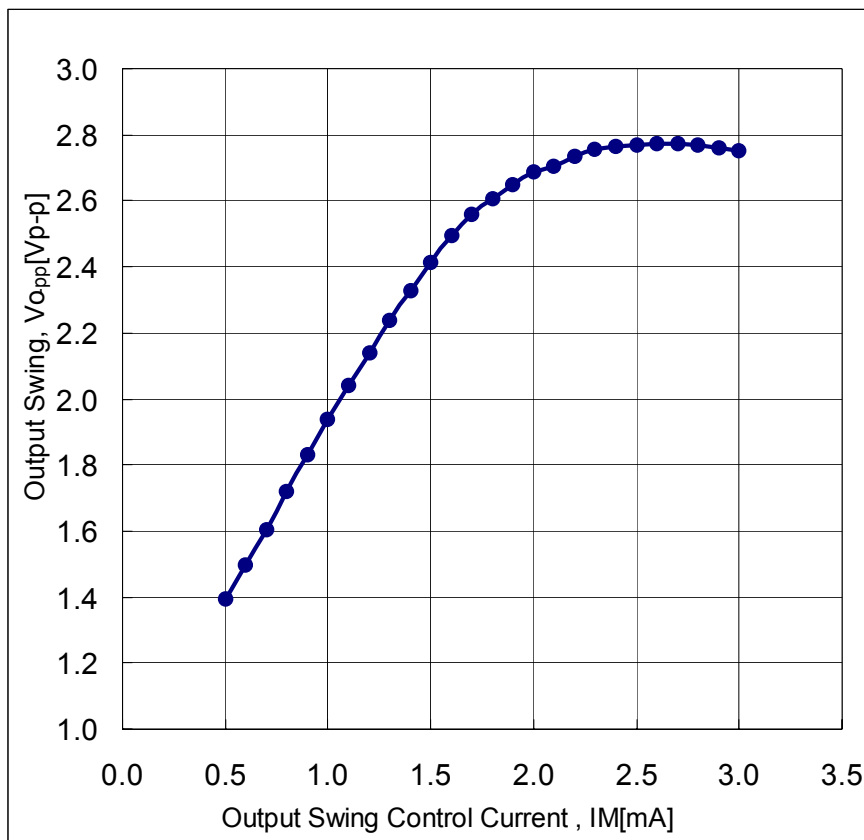
■ Input signal:
10Gb/s ,PRBS 2³¹-1
Din =-0.5V±0.125V ,
CLKin=-0.5V±0.125V

■ Output Voltage Swing:
2.72Vp-p

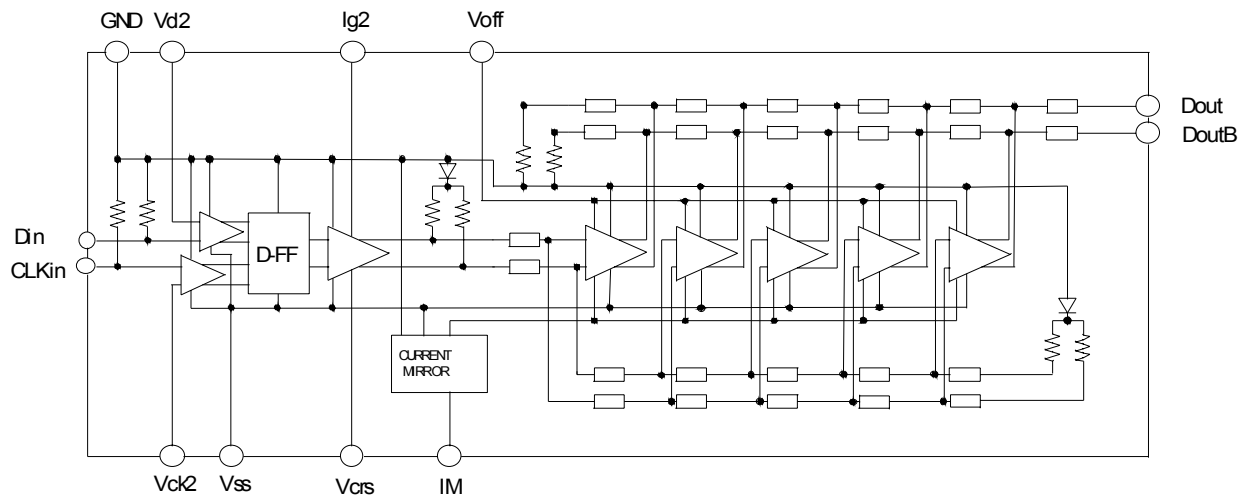
■ Rise Time(20-80%) :22.2ps

■ Fall Time (20-80%) :20.4ps

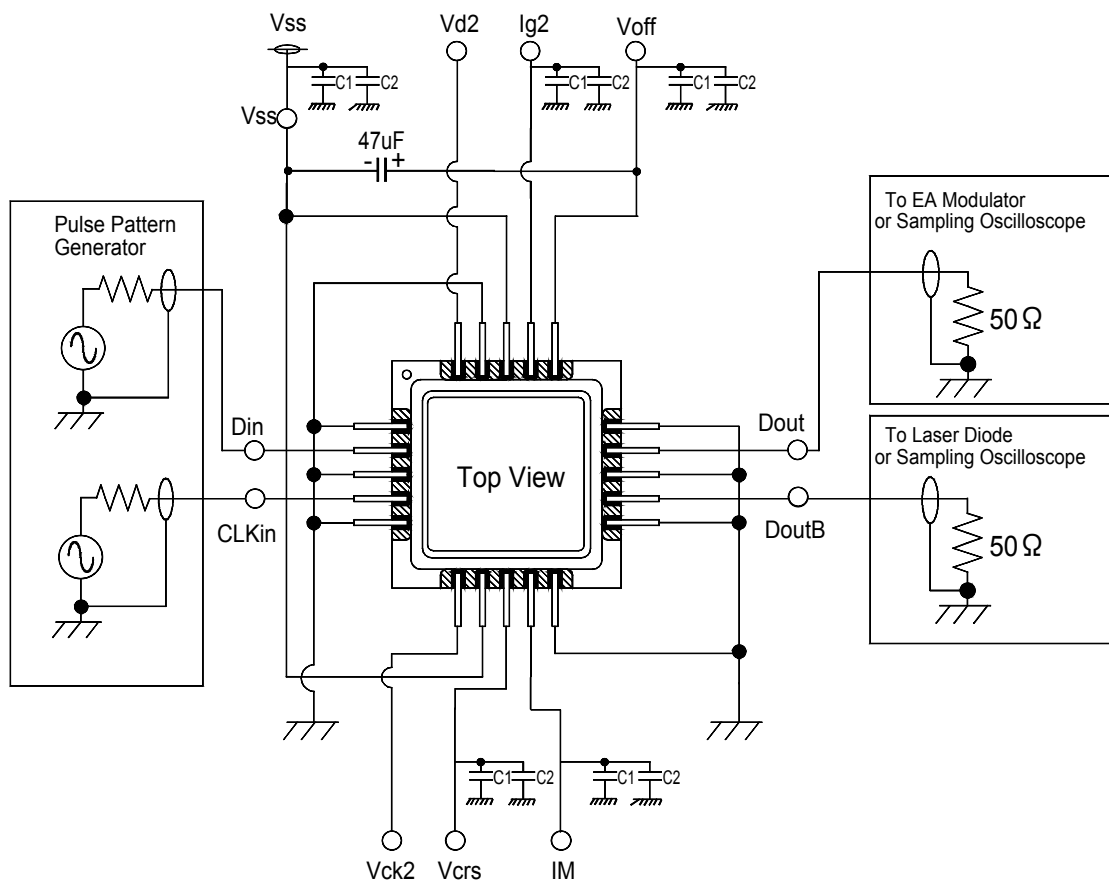
TYPICAL Vo-pp vs. IM (@Ta=25°C , 50 Ω Load with Modulation)



Block Diagram



Test Circuit



Note : C1=40pF, C2=10000pF

BIAS PROCEDURE AND CONDITIONS

The following procedure is recommended to bias the device.

<Power up sequence>

GND $\Rightarrow$ Voff $\Rightarrow$ Vcrs $\Rightarrow$ Vss $\Rightarrow$ Ig2 $\Rightarrow$ IM $\Rightarrow$ Vd2 $\Rightarrow$ Vck2

- (1) Adjust Voff, Vcrs from zero to desired value.
- (2) Supply Vss from zero to specified value.
- (3) Tune Ig2 from zero to around 3.0mA. By tuning Ig2, tr/ta can be adjusted. If Ig2<3.0mA, enough Vout swing may not be observed.
- (4) By tuning IM, Vout swing can be adjusted.

<Power off sequence>

Vd2 $\Rightarrow$ Vck2 $\Rightarrow$ IM $\Rightarrow$ Ig2 $\Rightarrow$ Vss $\Rightarrow$ Vcrs $\Rightarrow$ Voff $\Rightarrow$ GND

The reverse procedure is recommended to bias off.

Take care that devices are not operated under conditions exceeding absolute maximum ratings.