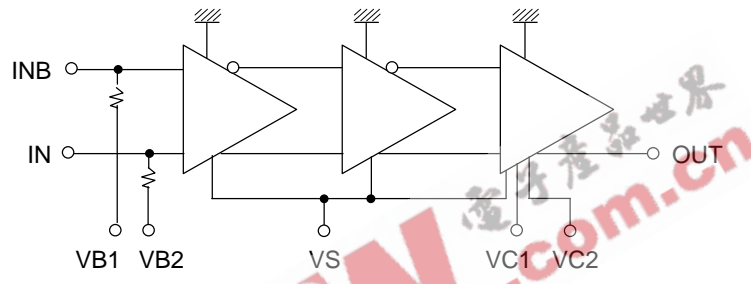# OKI®

Electronic Components

KGL4115HW-R

11.1 Gbps Modulator Driver IC

FEATURES

- 11.1Gbps Operation
- Differential Input
- High Output Voltage: Maximum Amplitude > 2.7 Vpp
- X-Point Control Function
- Output Amplitude Control Function
- Output Bias Control Function

FUNCTION DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	Note
Supply Voltage	VS	-6.5	0.3	V	
X-Point Control Voltage	VB1	VS-4.5 (Min. -6.5)	VS+2.4 (Max. 0.3)	V	
Output Amplitude Control Voltage	VC1	-6.5	VS+1.2 (Max. 0.3)	V	
Output Bias Control Voltage	VC2	-6.5	VS+2.4 (Max. 0.3)	V	
Operating Temperature at Package Base	Ts	-10	100	°C	
Storage Temperature	Tst	-40	125	°C	

1

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VS	-5.5		-5.0	V
X-Point Control Voltage	VB1	VS+0.8		VS+2.2	V
Output Amplitude Control Voltage	VC1	VS		VS+1.0	V
Output Bias Control Voltage	VC2	VS		VS+2.2	V
Operating Temperature at Package Base	Ts	0		70	°C
Input Interface	AC coupled (External blocking capacitor is required)				
Output Interface	DC coupled				

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Data Rate		NRZ	11.1			Gbps
Supply Current	Iss	including bias current = 20 mA			285	mA
Voltage Offset	Vo (ofs)	50 Ω load, bias current = 20 mA	-1		0	V
Input Amplitude	Vin	Differential (AC Coupled)	0.25		1	Vpp
		Single-Ended (AC Coupled)	0.5		1	
Output Amplitude (Max)	Vo (Max)	50 Ω load, @Data Rate 10.7Gbps	2.7			Vpp
		50 Ω load, @Data Rate 11.1Gbps	2.6			
Output Low Voltage (Min)	V (LO)	50 Ω load			-3	V
Output High Voltage (Min)	V (HI)	50 Ω load			-1	V
X-Point Control	Xp	NRZ, 50 Ω load	20		80	%
X-Point Stability	Del (Xp)	0–70°C 50 Ω load			10	%
Output Rise/Fall Time	Tr/Tf	50 Ω load 20%/80%			40	ps
Input Return Loss	S11	100kHz–10 GHz		13		dB

PACKAGE DIMENSIONS

(Top View)
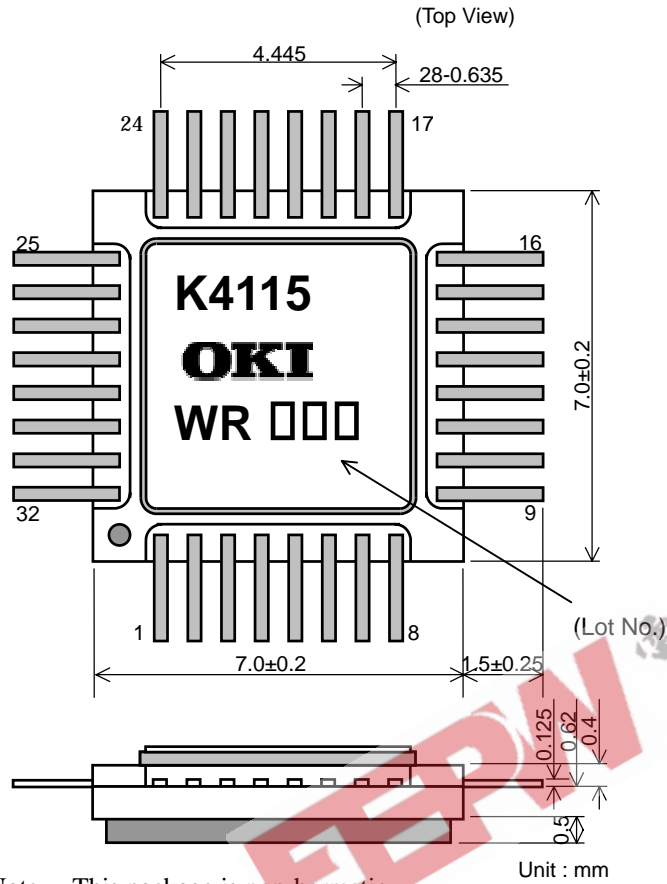
Note.   This package is non-hermetic.

Unit : mm

PIN ASSIGNMENT

No.	Symbol	Note
1	GND	Ground
2	GND	Ground
3	GND	Ground
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	OUT	Signal Output Port
11	GND	Ground
12	GND	Ground
13	N.C.	No Connection
14	GND	Ground
15	GND	Ground
16	GND	Ground
17	GND	Ground
18	VC2	Output Bias Control Port
19	VC1	Output Amplitude Control Port
20	VS	Supply Voltage Port
21	VS	Supply Voltage Port
22	VB2	Input Termination Port
23	VB1	X-Point Control Port and Inverted Input Termination Port
24	GND	Ground
25	GND	Ground
26	GND	Ground
27	GND	Ground
28	INB	Inverted Input Port
29	GND	Ground
30	GND	Ground
31	IN	Signal Input Port
32	GND	Ground

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TYPICAL CHARACTERISTICS (10.7Gbps WAVEFORM)

Measured Condition

Display Factor   V : 600 mV/div,   H : 20 ps/div,   Offset : -2.2V
Input Signal   10.7 Gbps,   NRZ,   PN31,   Differential 0.25 Vpp
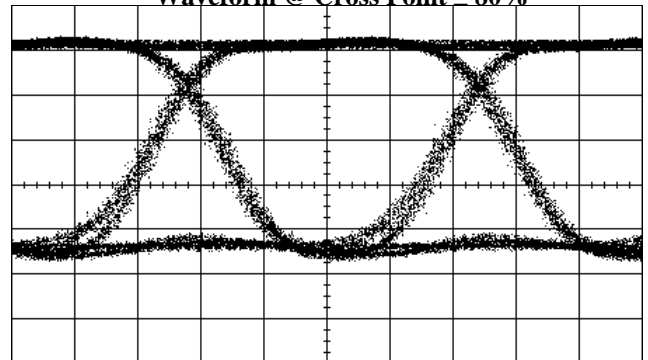
Waveform @ Maximum Amplitude
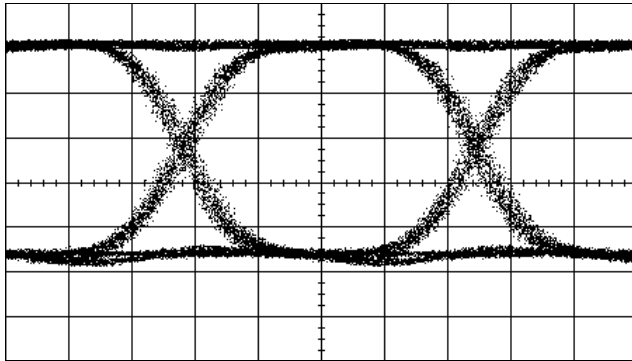
Operating Condition
  VB1 = -3.80 V   (@Xp = 51.3%)
  VC1 = -4.62 V
  VC2 = -5.0 V   (@Output Offset : Off)
  VS= -5.0 V   (Iss = 194.8 mA)
Output Amplitude   : 2.800Vpp
Rise Time (20-80%) : 23.1 ps
Fall Time (20-80%) : 21.8 ps
Jitter (p-p)   : 12.2 ps

Waveform @ Maximum Offset
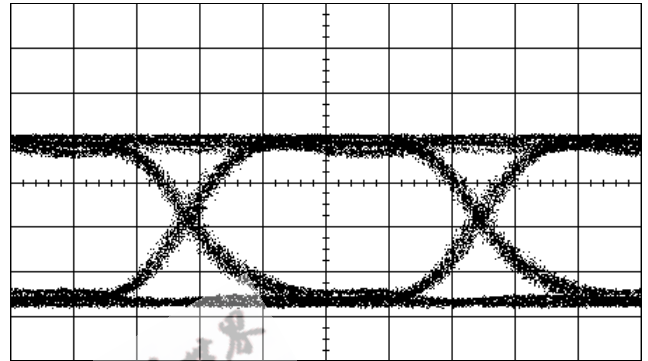
Operating Condition
  VB1 = -3.81 V   (@Xp = 52.2%)
  VC1 = -4.62 V
  VC2 = -2.8 V   (@Output Offset : Max)
  VS= -5.0 V   (Iss = 249.4 mA)
Voltage Offset   : -1.312 Vpp
Rise Time (20-80%) : 21.3 ps
Fall Time (20-80%) : 25.8 ps
Jitter (p-p)   : 11.7 ps
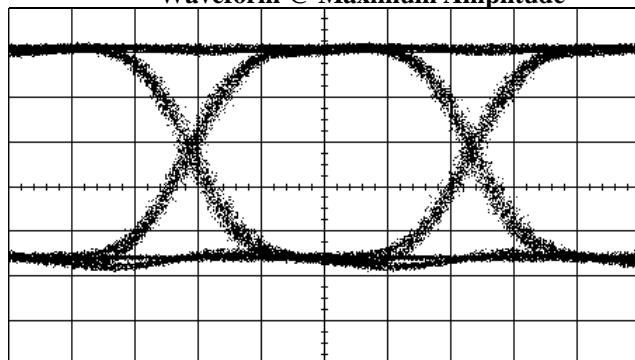
Waveform @ Cross Point ≅ 20%
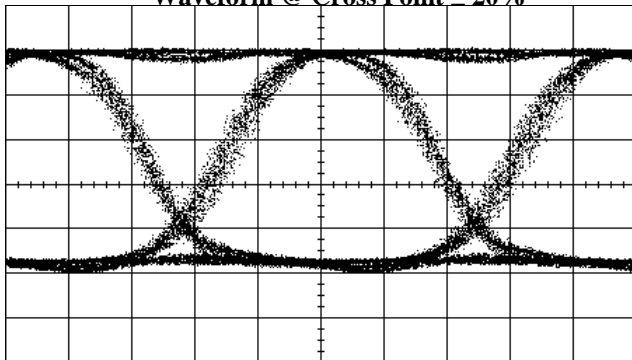
Operating Condition
  VB1= -3.67 V   (@Xp = 19.6%)
  VC1= -4.62 V
  VC2= -5.0 V   (@Output Offset : Off)
  VS= -5.0 V   (Iss = 194.7 mA)
Output Amplitude   : 2.787 Vpp
Rise Time (20-80%) : 24.4 ps
Fall Time (20-80%) : 22.7 ps
Jitter (p-p)   : 13.2 ps

Waveform @ Cross Point ≅ 80%

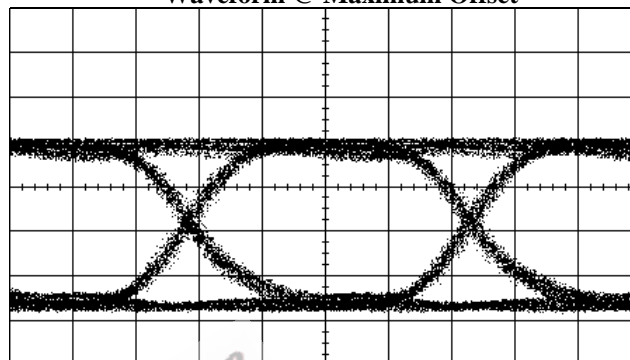

Operating Condition
  VB1= -3.91 V   (@Xp = 80.0%)
  VC1= -4.62 V
  VC2= -5.0 V   (@Output Offset : Off)
  VS= -5.0 V   (Iss = 194.4 mA)
Output Amplitude   : 2.716 Vpp
Rise Time (20-80%) : 23.1 ps
Fall Time (20-80%) : 21.8 ps
Jitter (p-p)   : 11.6 ps

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TYPICAL CHARACTERISTICS (11.1Gbps WAVEFORM)

### Measured Condition

Display Factor   V : 600 mV/div,   H : 20 ps/div,   Offset : -2.2V

Input Signal   11.1 Gbps,   NRZ,   PN31,   Differential 0.25 Vpp

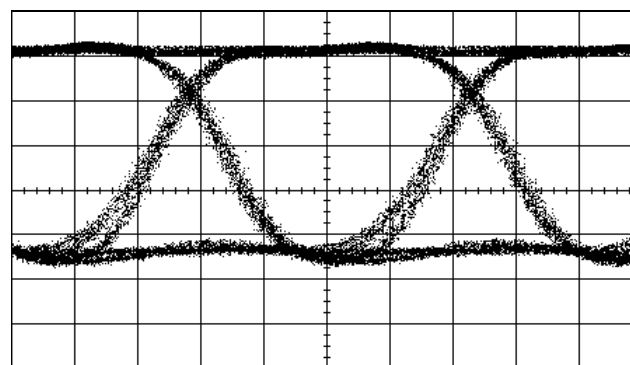### Waveform @ Maximum Amplitude

Operating Condition
  VB1 = -3.80 V   (@Xp = 51.9%)
  VC1 = -4.62 V
  VC2 = -5.0 V   (@Output Offset : Off)
  VS= -5.0 V   (Iss = 194.9 mA)
Output Amplitude   : 2.799Vpp
Rise Time (20-80%) : 22.7 ps
Fall Time (20-80%) : 21.8 ps
Jitter (p-p)   : 10.2 ps

Waveform @ Maximum Offset

Operating Condition
  VB1 = -3.81 V   (@Xp = 52.5%)
  VC1 = -4.62 V
  VC2 = -2.8 V   (@Output Offset : Max)
  VS= -5.0 V   (Iss = 249.5 mA)
Voltage Offset   : -1.311 Vpp
Rise Time (20-80%) : 21.3 ps
Fall Time (20-80%) : 25.3 ps
Jitter (p-p)   : 10.6 ps

Waveform @ Cross Point ≅ 20%
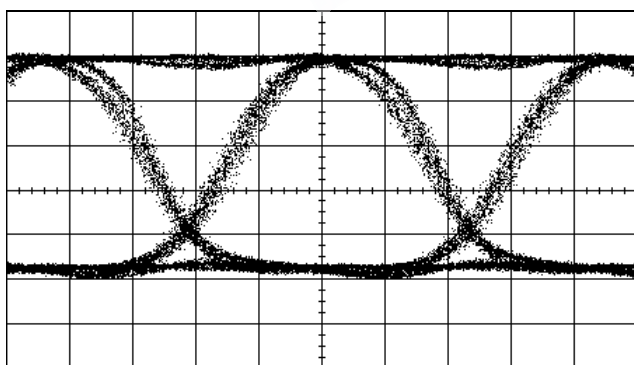
Operating Condition
  VB1= -3.67 V   (@Xp = 19.6%)
  VC1= -4.62 V
  VC2= -5.0 V   (@Output Offset : Off)
  VS= -5.0 V   (Iss = 194.7 mA)
Output Amplitude   : 2.786 Vpp
Rise Time (20-80%) : 24.4 ps
Fall Time (20-80%) : 22.7 ps
Jitter (p-p)   : 11.5 ps

Waveform @ Cross Point ≅ 80%

Operating Condition
  VB1= -3.91 V   (@Xp = 80.0%)
  VC1= -4.62 V
  VC2= -5.0 V   (@Output Offset : Off)
  VS= -5.0 V   (Iss = 194.5 mA)
Output Amplitude   : 2.716 Vpp
Rise Time (20-80%) : 22.2 ps
Fall Time (20-80%) : 21.3 ps
Jitter (p-p)   : 11.0 ps

TYPICAL APPLICATION
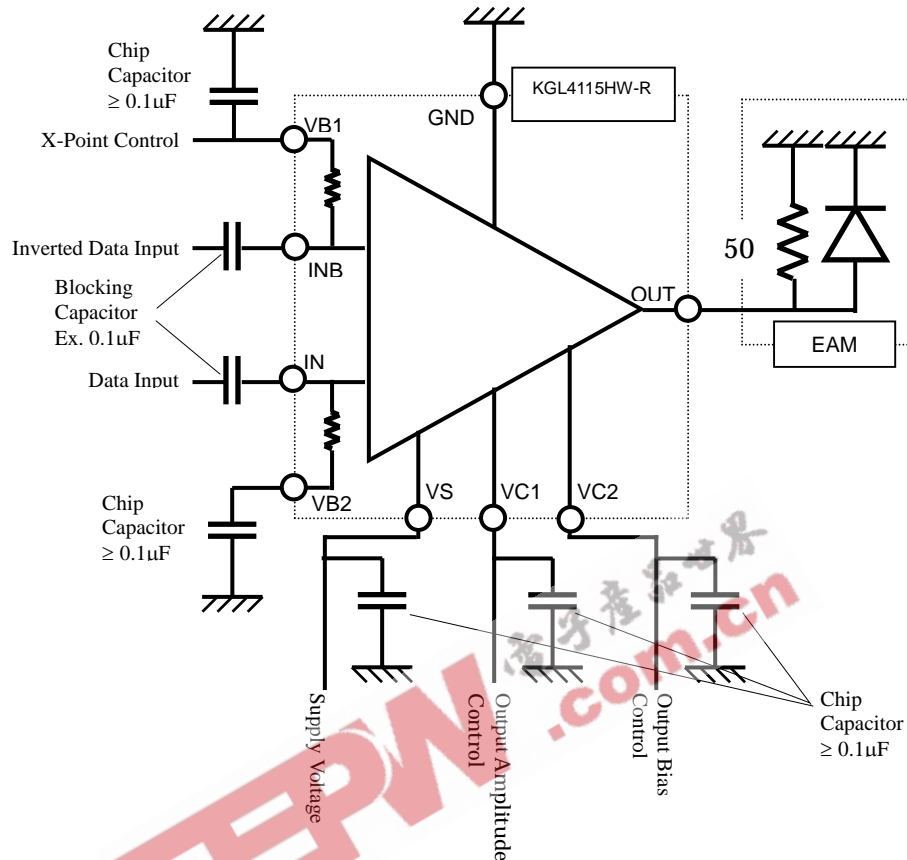
APPLICATION NOTE

1. For stable operation;
    1-1. To prevent a dependence of "X-Point" on the supply voltage VS,
        (1) Use an external voltage source of –3.8V for "VB2", or
        (2) Control the voltage of "VB1", so that the voltage difference "VB1–VB2" is constant.

    1-2. To prevent a dependence of "Output amplitude" on the supply voltage VS,
        Control the voltage of "VC1", so that the voltage difference "VC1–VS" is constant.

    1-3. To prevent a dependence of "Output bias control voltage" on supply voltage VS,
        Control the voltage of "VC2", so that the voltage difference "VC2–VS" is constant.

2. Power-up/shut-down sequence;
    For power-up, supply control voltages (VB1, (VB2), VC1, VC2) at first, then Vs.   For shut-down,
    Vs at first, then control voltages.
    Customer does not need to care about the sequence for the control voltages (VB1,(VB2),VC1,VC2).

3. Under "no signal input" condition, the operation may not be stable.

SAFETY AND HANDRING INFORMATION ON GAAS DEVICES

Arsenic Compound (GaAs Devices)
The product contains arsenic (As) as a compound.
This material is stable for normal use, however, its dust or vapor may be potentially hazardous to the human body.
Avoid ingestion, fracture, burning or chemical treatment to the product.
　　　• Do not put the product in your mouth.
　　　• Do not burn or destroy the product.
　　　• Do not perform chemical treatment for the product.
Keep laws and ordinances related to the disposal of the products.

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