SONY

CXB1456R

VGA/SVGA/XGA 24-bit Receiver

Description

CXB1456R is the 1 chip deserializer for VGA/SVGA/XGA 24-bit color digital RGB, and meet to the Gigabit Video Interface specification.

Features

- 1 chip receiver for serial transmission of 24-bit color VGA/SVGA/XGA picture
- On chip PLL circuit for data and clock recovery
- On chip panel mode automatically selectable circuit
- TTL compatible I/O
- Support 1 pixel/shiftclock mode with 1 chip and 2 pixel/shiftclock mode with 2 chip
- +3.3V single power supply
- Low power consumption
- 64pin plastic LQFP package with body size 10mm × 10mm

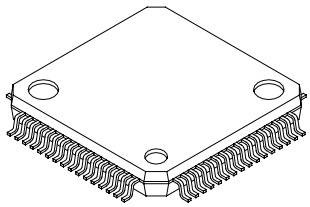
Application

Gigabit video interface

Structure

Bi-CMOS IC

64 pin LQFP (Plastic)



Absolute Maximum Ratings

• Supply voltage	Vcc	4.2	V
• Storage temperature	Tstg	–65 to +150	°C
• Allowable power dissipation	P_D	650	mW

Recommended Operating Condition

• Supply voltage		3.3 ± 0.3	V
• Operating temperature	Topr	0 to +80	°C

Block Digagram & Pin out

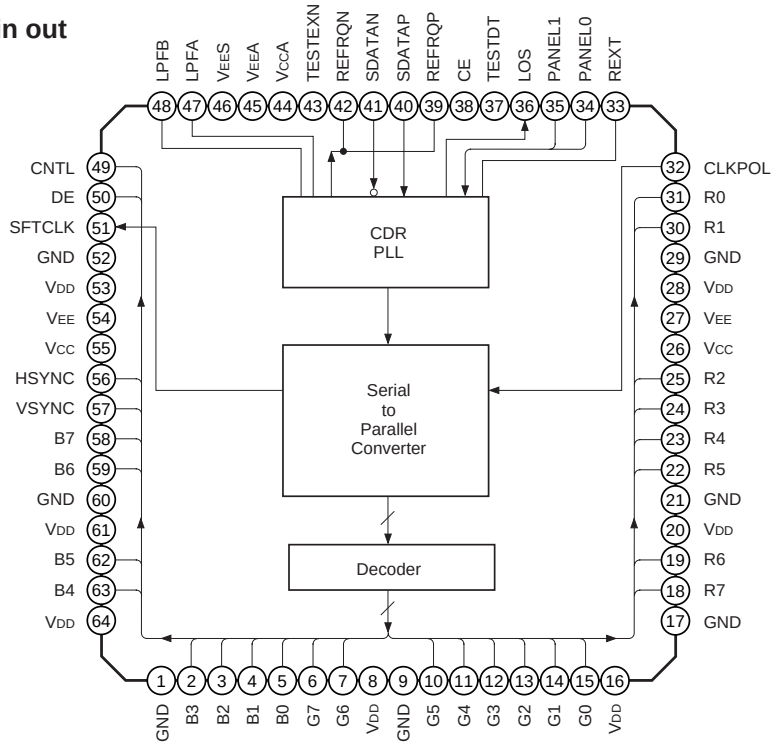


Fig. 1. Block Diagram & Pin out

E98Y04C9X-PS

Pin List

Table 1. Power/Ground

Pin name	Pin number	Descriptions
V_{DD}	8, 16, 20, 28, 53, 61, 64	MOS power supply, should be connected to 3.3V ± 0.3V
GND	1, 9, 17, 21, 29, 52, 60	MOS ground, connected to 0V
V_{CC}	26, 55	ECL power supply, connected to 3.3V ± 0.3V
V_{EE}	27, 54	ECL ground, connected to 0V
$V_{CC}A$	44	Analog power supply, connected to 3.3V ± 0.3V
$V_{EE}A$	45	Analog ground, connected to 0V
$V_{EE}S$	46	Substrate GND, connected to 0V

Table 2. Digital Signals

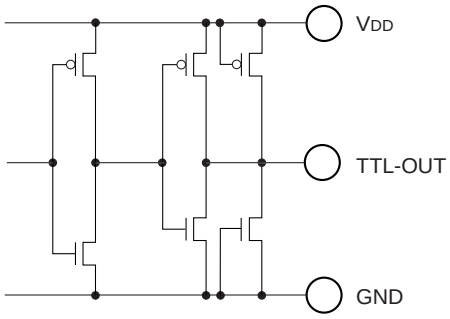
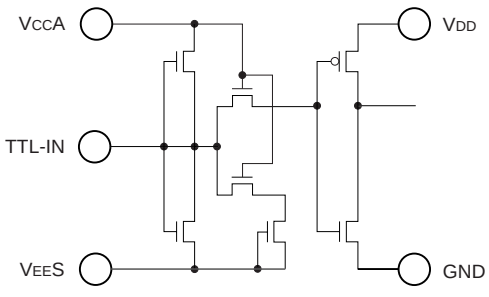
Pin name	Pin number	Type	Descriptions	Equivalent circuit
SFTCLK	51	TTL out	Shift clock, for the data fetch at falling or rising edge	
RED (7 to 0) GRN (7 to 0) BLU (7 to 0)	18, 19, 22, 23, 24, 25, 30, 31 6, 7, 10, 11, 12, 13, 14, 15 58, 59, 62, 63, 2, 3, 4, 5	TTL out	Pixel data	
HSYNC	56	TTL out	Hsync data	
VSYNC	57	TTL out	Vsync data	
CNTL	49	TTL out	Control data	
DE	50	TTL out	Display enable data	
LOS	36	TTL out	Los of signal	
PANEL (1, 0)	35, 34	TTL in	Panel mode select switch	
CLKPOL	32	TTL in	Trigger edge select switch	
CE	38	TTL in	Chip enable	
TESTEXN TESTDT	43, 37	TTL in	Reversed for TEST under fabrication	

Table 2. Digital Signals (Cont.)

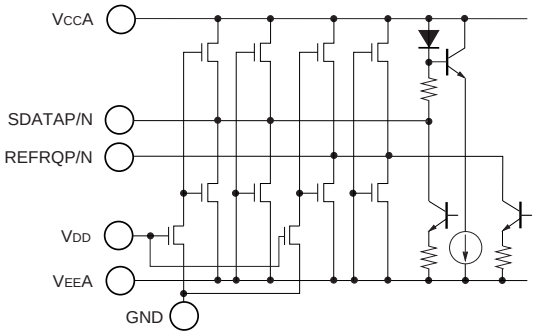
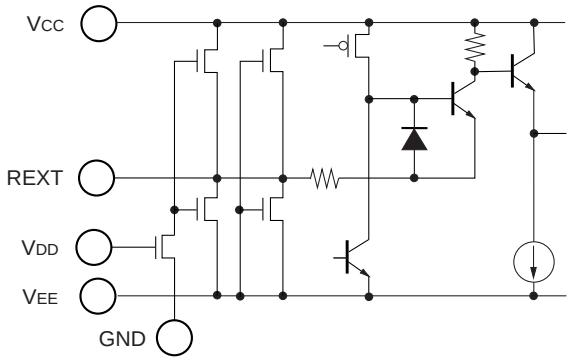
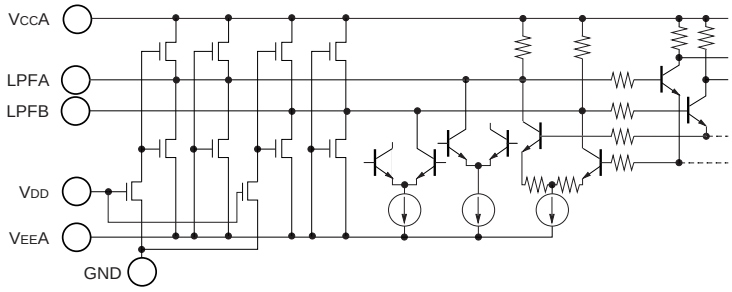
Pin name	Pin number	Type	Descriptions	Equivalent circuit
SDATAP/N	40, 41	Rx	Serial input	
REFRQP/N	39, 42	Rx	Refclk request	

Table 3. Special

Pin name	Pin number	Descriptions	Equivalent circuit
REXT	33	External Register	
LPFA/B	47, 48	External loop filter	

Electrical characteristics

Table 4. Absolute Maximum Rating

Description	Symbol	Min.	Typ.	Max.	Unit	Comments
Power supply voltage	V_{CC}	–0.3		4.2	V	
TTL DC input voltage	V_{I}_T	–0.5		4.6	V	
TTL output current (High)	I_{OH}_T	–10		0	mA	
TTL output current (Low)	I_{OL}_T	0		10	mA	
Serial input pin voltage	Vsdin	–0.5		V_{CC} + 0.5	V	
REFREQ output pin voltage	V_{RQ}out	0.5		V_{CC} + 0.5	V	
Storage temperature	Tstg	–65		150	°C	

Table 5. Recommended Operating Conditions

Description	Symbol	Min.	Typ.	Max.	Unit	Comments
Power supply voltage	V_{CC}	3.0	3.3	3.6	V	
Ambient temperature	Ta	0		80	°C	

Table 6. DC Characteristics (Under the recommended conditons. See Tab. 5)

Description		Symbol	Min.	Typ.	Max.	Unit	Conditions
Input HIGH voltage (TTL)		V_{IH}_T	2		V_{CC}	V	
Input LOW voltage (TTL)		V_{IL}_T	0		0.8	V	
Input HIGH current (TTL)		I_{IH}_T			10	µA	$V_{IN} = V_{CC}$
Input LOW current (TTL)		I_{IL}_T	–10			µA	$V_{IN} = 0$
Output HIGH voltage (TTL)		V_{OH}_T	2.4			V	I_{OH} = –3mA
Output LOW voltage (TTL)		V_{OL}_T			0.4	V	I_{OL} = 3mA
Output HIGH current (REFREQ)		I_{OH}_RQ	–0.1	0	+0.1	mA	See Fig. 3, 4 REXT = 5.6kΩ
Output LOW current (REFREQ)		I_{OL}_RQ	7.8		11	mA	
Input dynamic range (SDATA)		V_{IM}_SD	V_{CC} – 0.4		V_{CC} + 0.2	V	Common mode voltage
Input dynamic range (SDATA)		V_{ID}_SD	–0.5		+0.5	V	Differential voltage
Supply current	Worst Case	I_{CC}		138	173	mA	C_L = 8pF, f = 65MHz See Fig. 9, 10
	16 Grayscale			77	104	mA	

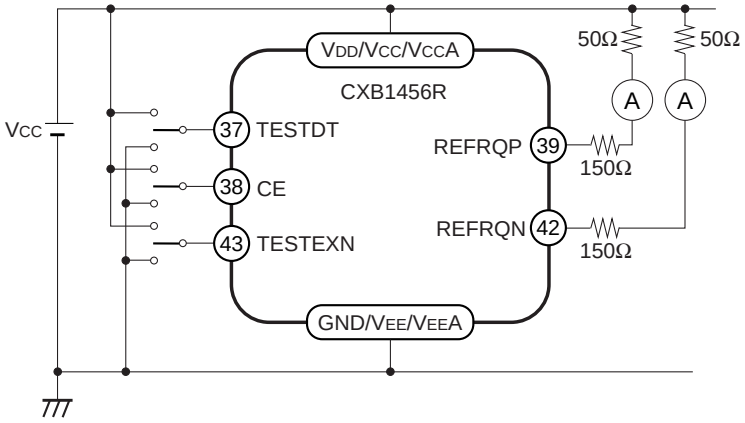


Fig. 3. I_{OH}_RQ and I_{OL}_RQ DC measurement

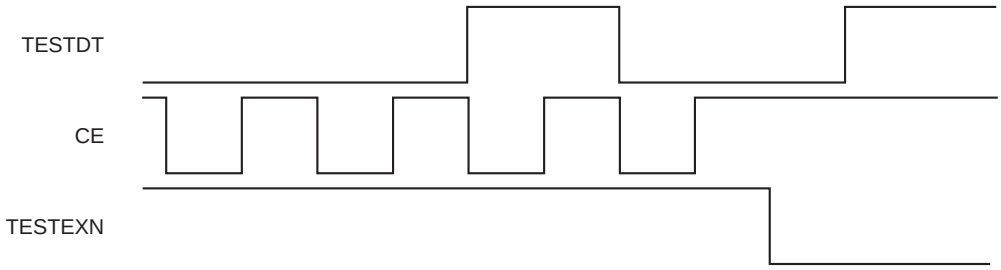


Fig. 4. I_{OH}_RQ and I_{OL}_RQ DC measurement setting

Table 7. AC Characteristics (Under the recommended conditons. See Tab. 5)

Description	Symbol	Min.	Typ.	Max.	Unit	Conditions
Minimum SFTCLK frequency Maximum SFTCLK frequency	Fsftclk	 65.0		25.0	MHz MHz	
SFTCLK duty factor	Dsftclk	35		65	%	Vth = 1.4V, C_L = 8pF
Pixel/Sync/Cntl/DE setup to SFTCLK	Tsetup	17 9 4.5			ns ns ns	Vth = 1.4V, C_L = 8pF 25MHz 40MHz 65MHz
Pixel/Sync/Cntl/DE hold to SFTCLK	Thold	16 9 4.5			ns ns ns	Vth = 1.4V, C_L = 8pF 25MHz 40MHz 65MHz
SFTCLK rise time	Torc			5	ns	0.8V to 2.0V, C_L = 8pF
SFTCLK fall time	Tofc			3	ns	2.0V to 0.8V, C_L = 8pF
Pixel/Sync/Cntl/DE rise time	Tord			5	ns	0.8V to 2.0V, C_L = 8pF
Pixel/Sync/Cntl/DE fall time	Tord			3	ns	2.0V to 0.8V, C_L = 8pF
CLOCK mode assert time	TAclk		0.5		µs	
CLOCK mode deassert time	TDclk		20		µs	
LOS signal assert time	TAlos		0.5		µs	
LOS signal deassert time	TDlos		0.15		µs	

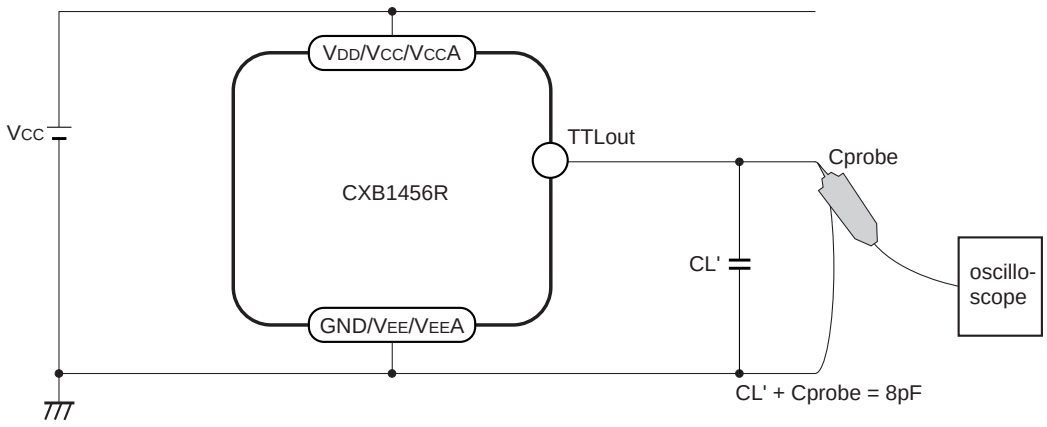


Fig. 5. Pixel/Sync/Cntl/DE waveform measurement

Timing Chart

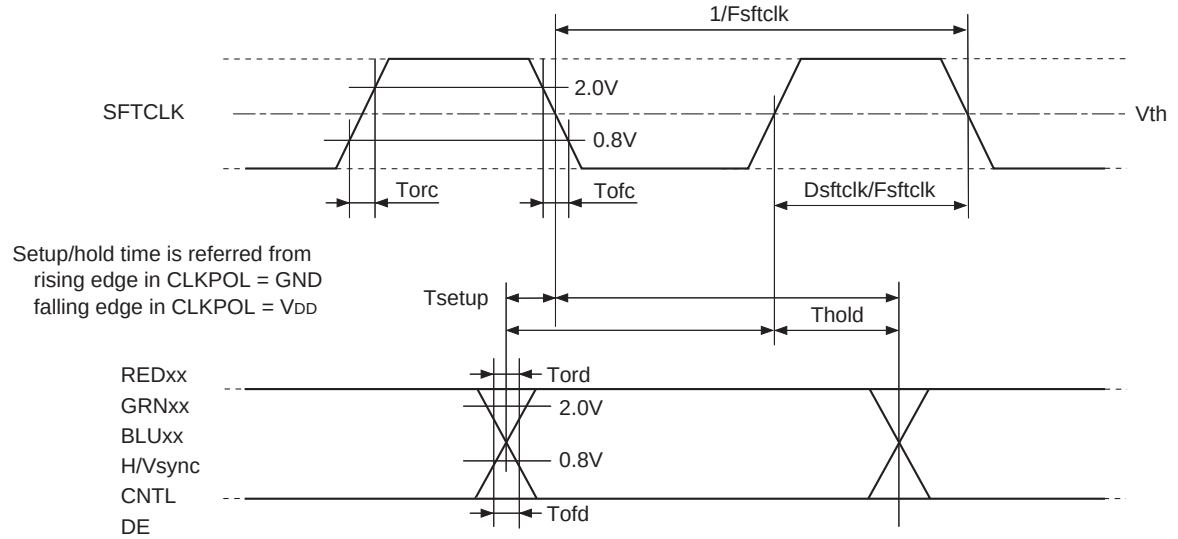


Fig. 6. TTL output timing

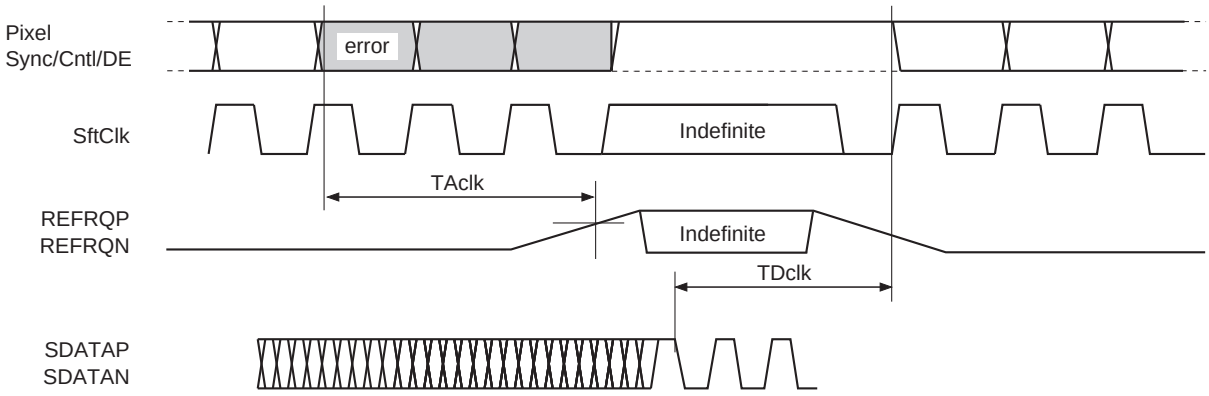


Fig. 7. Refclk request timing

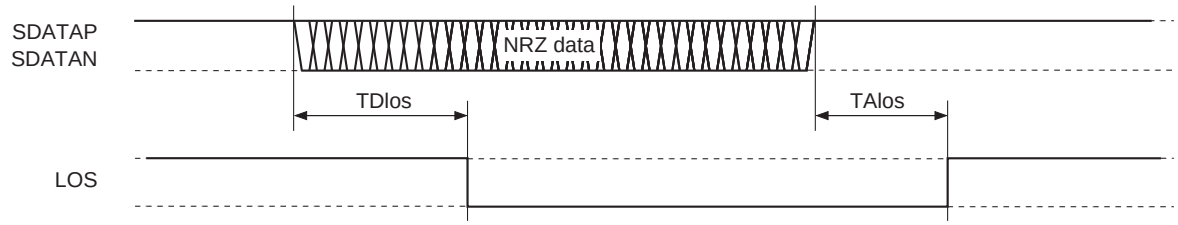


Fig. 8. Idle mode timing

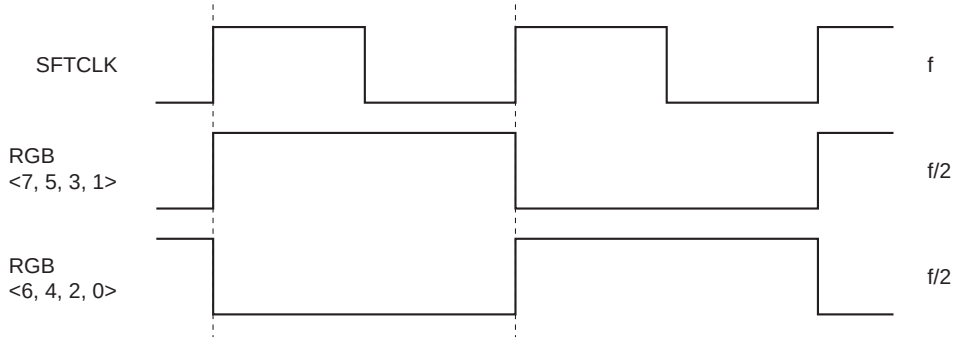


Fig. 9. Worst case test pattern

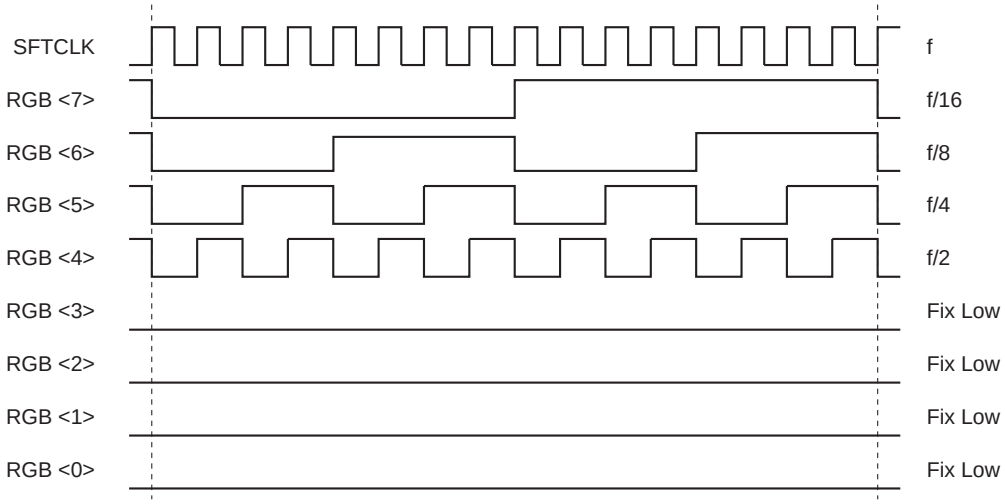


Fig. 10. 16 Grayscale test pattern

CLKPOL Pin Control

The CLKPOL pin is used to select the SFTCLK trigger edge. (See Table 8.)

The CLKPOL pin is open High-impedance TTL input, and this should not be left open for use. (See Fig. 12. Recommended application circuit.)

Table 8. SFTCLK Polarity

CLKPOL	Receiver operation trigger
L	Rising edge
H	Falling edge

PANEL1 and 0 Pin Control

The PANEL1 and 0 pins are used to select the panel mode. (See Table 9.)

For the normal use, the all frequencies of SFTCLK (25MHz to 65MHz) can be covered by fixing both PANEL1 and 0 to High.

The PANEL1 and 0 pins are open High-impedance TTL inputs, and they should not be left open for use. (See Fig. 12. Recommended application circuit.)

Table 9. Panel Mode

PANEL1	PANEL0	Supporting panel size	Shift Clock	Serial rate
L	L	VGA (640 × 480)	25MHz	750Mbps
L	H	SVGA (800 × 600)	40MHz	1200Mbps
H	L	XGA (1024 × 768)	65MHz	1950Mbps
H	H	VGA to XGA	25MHz to 65MHz	750Mbps to 1950Mbps

CE Pin Control

The CE pin is used to select the standby mode. (See Table 10.)

The CE pin is open High-impedance TTL input, and this should not be left open for use. (See Fig. 12. Recommended application circuit.)

Table 10

CE	Operation mode
L	Standby mode, all TTL outputs fixed to Low (excluding LOS)
H	Normal mode

Test Pin Control

The TESTEXN and TESTDT pins are for test only. Select normal mode. (See Table 11.)

The TESTEXN and TESTDT pins are open High-impedance TTL inputs, and they should not be left open for use.

Table 11. Test mode

TESTEXN	TESTDT	Operation mode
L	X	Test mode
H	X	Normal mode

LOS Pin Output

The LOS pin shows the absence of proper level of SDATA signal. The LOS pin is High when the connector is disconnected or the transmitter is idle.

The LOS pin is TTL output.

Applications

CXB1456R GVIF receiver is applied to the digital RGB signal transmission for

P/C with LCD monitor
Video on demand system
Monitoring system
Graphical controller
Projector
Digital TV monitor
Car navigation system

with GVIF transmitter, CXB1455R.

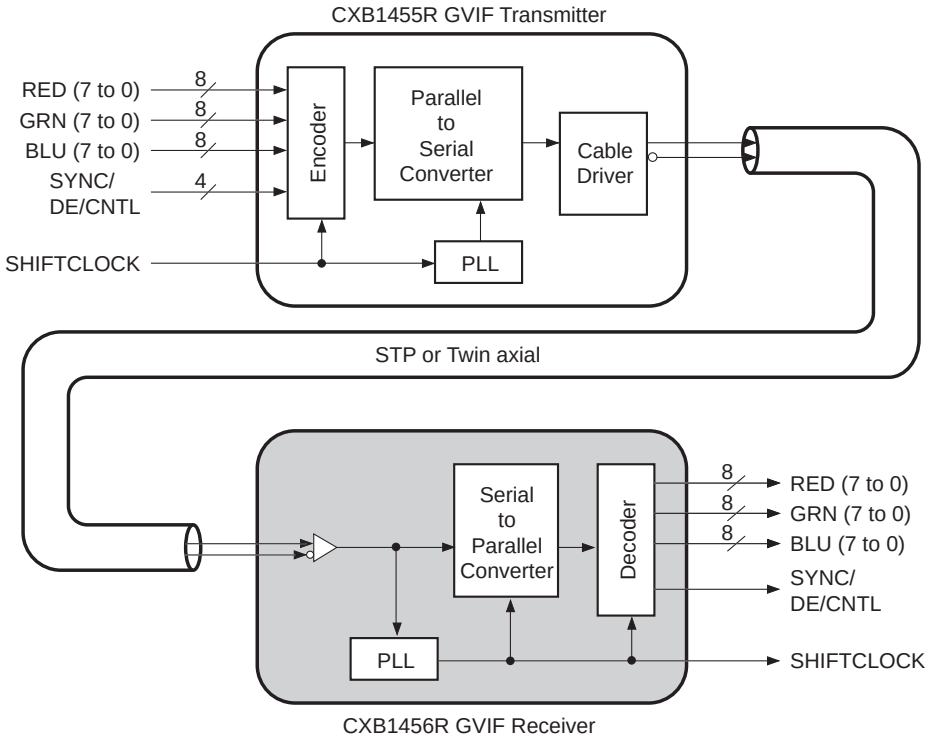
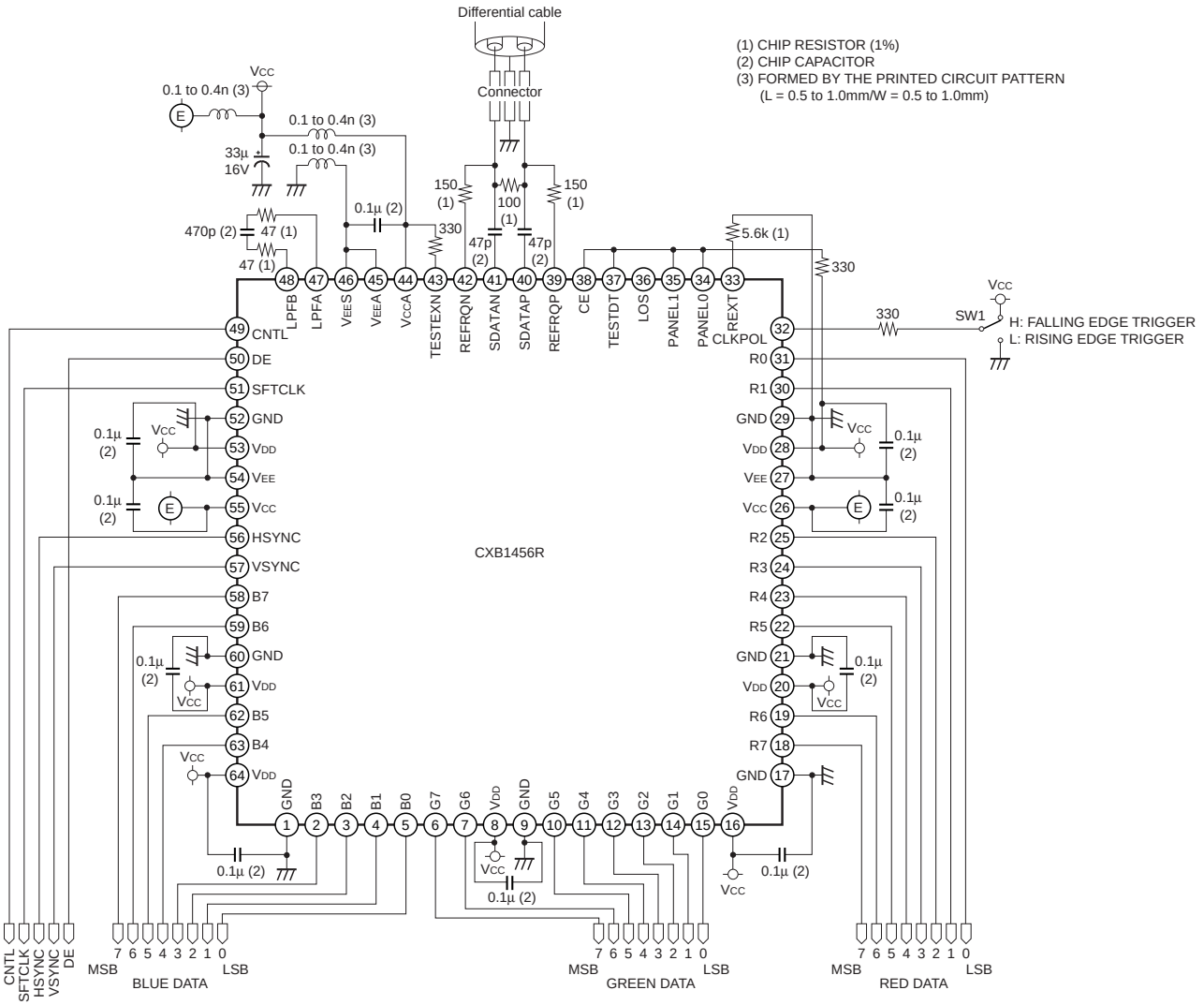


Fig. 11. Block Diagram of GVIF transceiver chip set

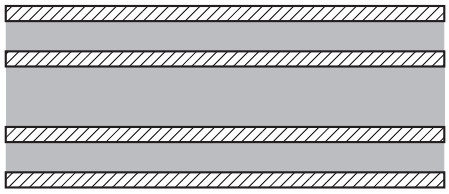
Application Cicuit



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Fig. 12. Recommended application circuit

Recommended Printed Circuit Board Structure



L1 : Cu plate (18µm) + solder coat
l1 : Fiber-glass epoxy core (0.3mm)
L2 : Cu plate (36µm)
l2 : Fiber-glass epoxy core (0.8mm)
L3 : Cu plate (36µm)
l3 : Fiber-glass epoxy core (0.3mm)
L4 : Cu plate (18µm) + solder coat

Fig. 13. Recommended Printed Circuit Board Structure

Recommended Printed Circuit Board Pattern

POWER and special signal routing example

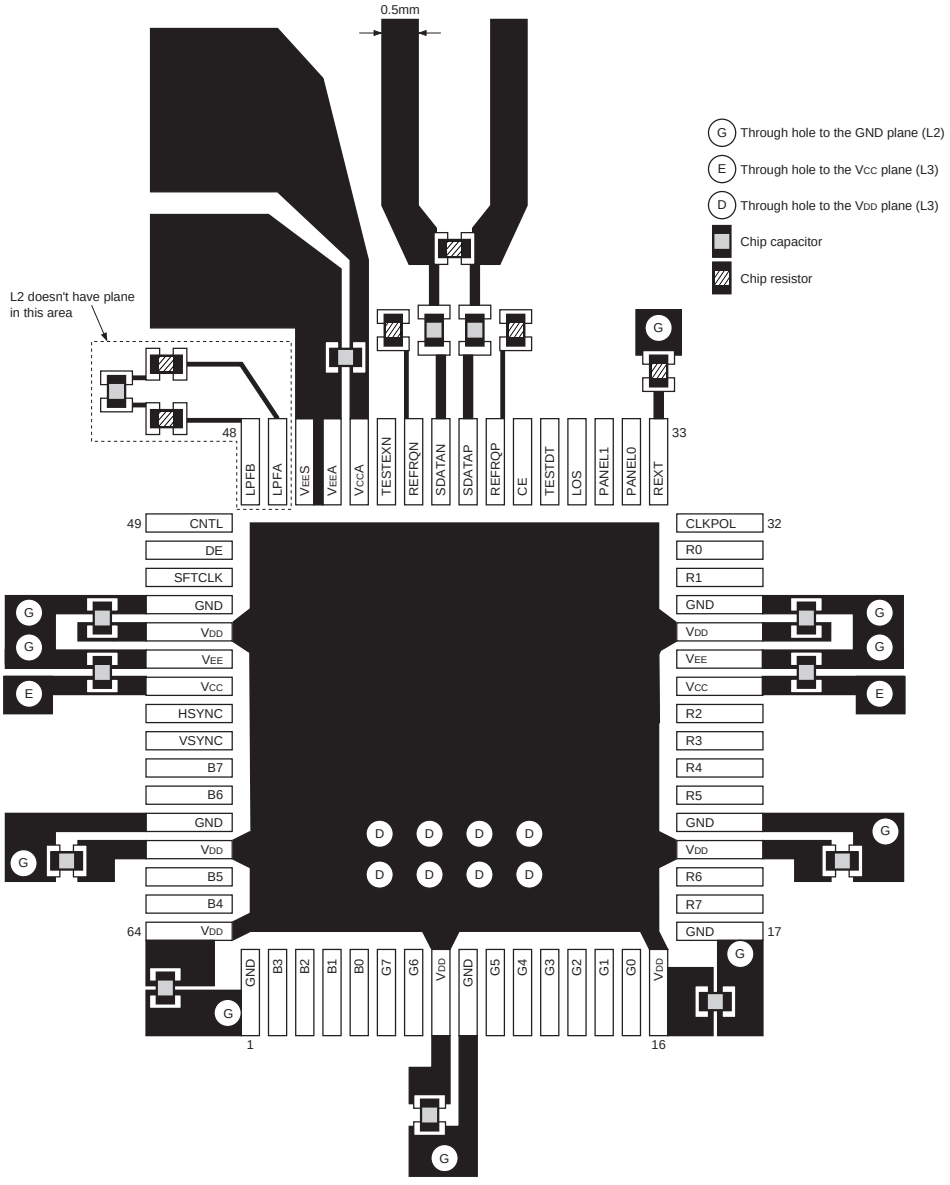


Fig. 14. Recommended Printed Circuit Board Pattern

Micro Strip Line

For maximum performance, the impedance between the pins SDDATAP/N of the LSI and the footprint of the connector should be 50Ω using a micro strip line. 50Ω impedance can be reached when using 0.5mm width pattern lines on L1 using this circuit board structure. The length of the lines should be identical and through-hole should not be used. L2 is recommended as the large ground plane.

Terminators

Terminators (100Ω resistor) should be located as close to the LSI as possible.

Filter Devices and Reference Registors

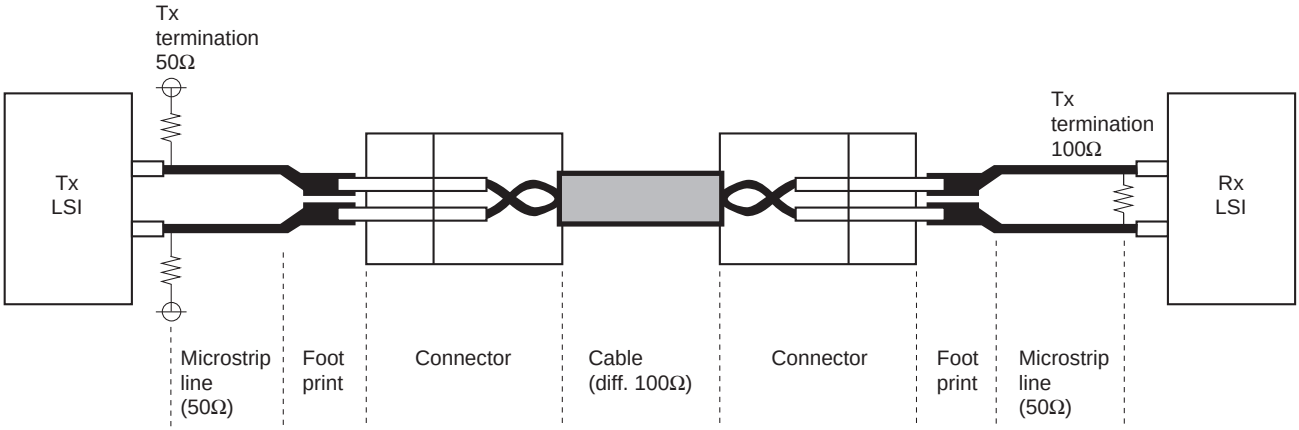
Capacitors and resistors which are connected to LPFA/B and REXT are filters and reference resistors. The region of Layer 2 (L2) is under the device and conductive patterns. The ground plane should be taken off in order to reduce parasitic capacitors.

Bypass Capacitors

Bypass capacitors (0.1µF SMD type) should be located as close to the pins as possible. Refer to the recommendation.

Recommendation for Cable and Connector Characteristics

The GVIF system uses terminators at both ends (transmitter and receiver), a cable equalizer and a small amplitude differential signal. In order to solve the problems of high speed data transmission such as signal reflection, reduce the signal level and EMI. In order to achieve the best solution, note the following:



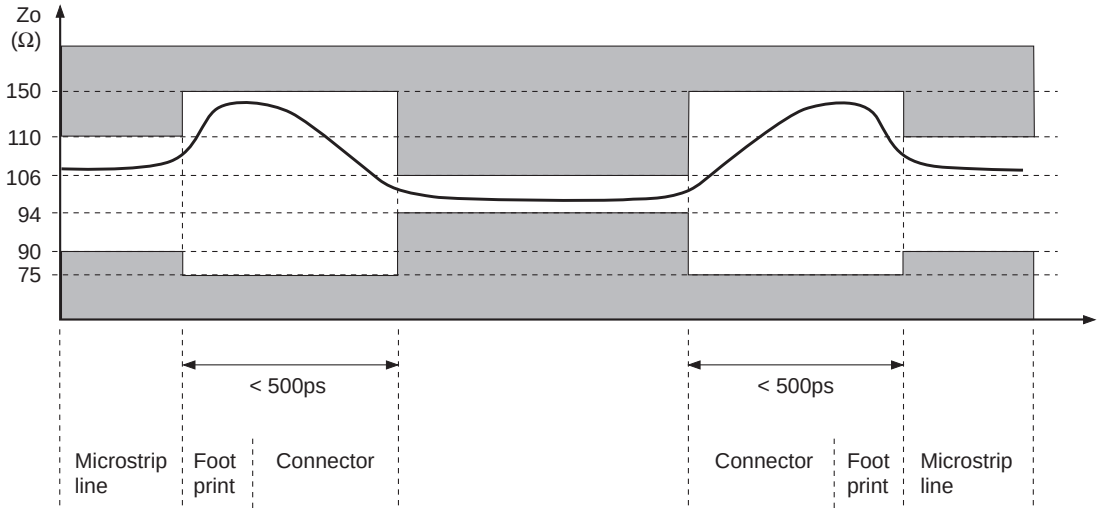
It is important to note the following issues for a good data transmission system:

- Good impedance matching
  Differential impedance should be fit to the recommended template on the next page.
- Cable loss should be small and the loss curve should be smooth.
  Maximum loss should be less than 6dB at 1GHz.
  See the next page.
- Skew of POS/NEG (differential signal) should be small
  Less than 12% of 1-bit time or 160ps@VGA, 100ps@SVGA, 60ps@XGA.
- Good EMI performance cable and connectors.

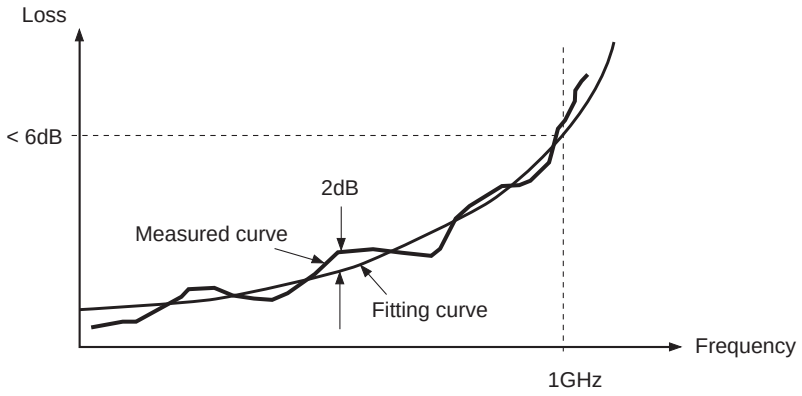
In order to satisfy these issues, the recommendations are as follows:

- Use the differential cable which provides good controlled impedance, low loss and good skew matching.
  A shielded twisted pair (STP) cable is recommended.
- Use a low reflectance connector.
- To minimize interference from other signals, high speed signal lengths should be identical.
- Use double shielded cable.

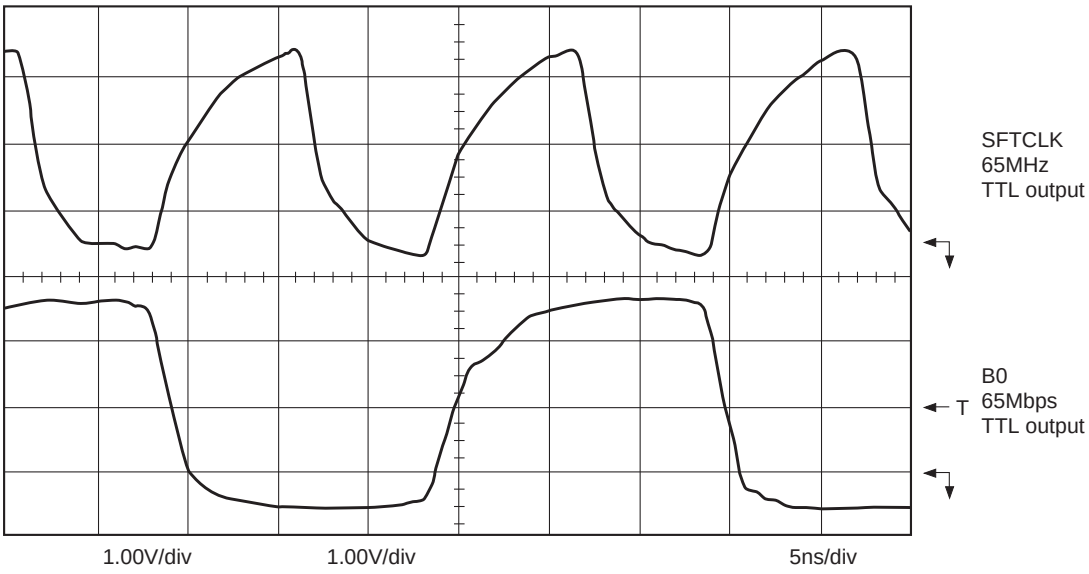
Recommended Transmission Path : Differential impedance template



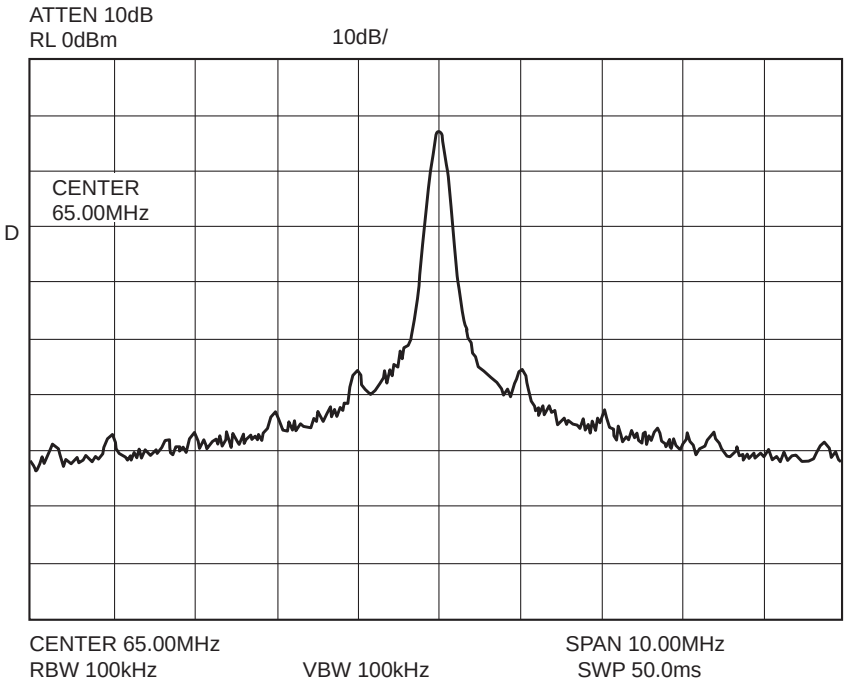
Recommended Transmission Path : Attennation Characteristics



TTL output waveform with C_L = 8pF

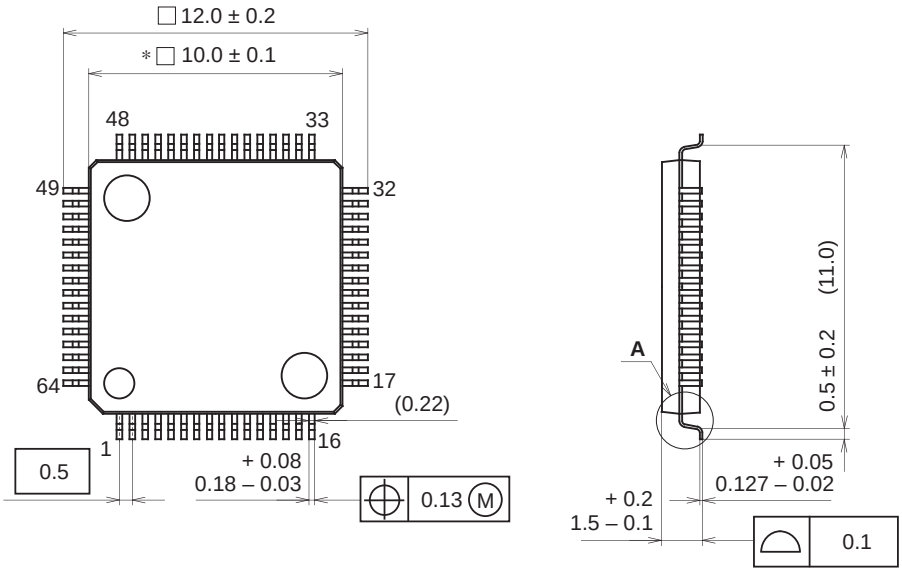


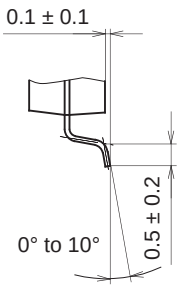
SFTCLK Power spectrum



Package Outline Unit: mm

64PIN LQFP (PLASTIC)





DETAIL **A**

NOTE: Dimension "∗" does not include mold protrusion.

SONY CODE	LQFP-64P-L01
EIAJ CODE	LQFP064-P-1010
JEDEC CODE	————

PACKAGE STRUCTURE

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER/PALLADIUM PLATING
LEAD MATERIAL	42/COPPER ALLOY
PACKAGE MASS	0.3g

NOTE : PALLADIUM PLATING
This product uses S-PdPPF (Sony Spec.-Palladium Pre-Plated Lead Frame).