NEL

(PRELIMINARY)
Revised on August 5, 1994

NLG4219
1 : 4 DEMUX WITH RESET

The NLG4219 is an ultra-fast 1:4 demultiplexer. It divides serial input signal operating at up to 10 Gb/s into 4 parallel output signals at up to 2.5 Gb/s [Tc = 25 ℃, MIN.].
Designed with LSCFL (Low-power Source Coupled FET Logic), it uses SCFL I/O levels (V_H : 0.0 V, V_L : - 0.9 V).
Owing to built-in 50-ohm termination resistors between signal input pins and ground (GND), external termination resistors are unnecessary for impedance matching.
The NLG4219 is fabricated using the 0.15-μm gate length A-SAINT (Advanced Self-Aligned Implantation for N^+ layer Technology) process.

FEATURES

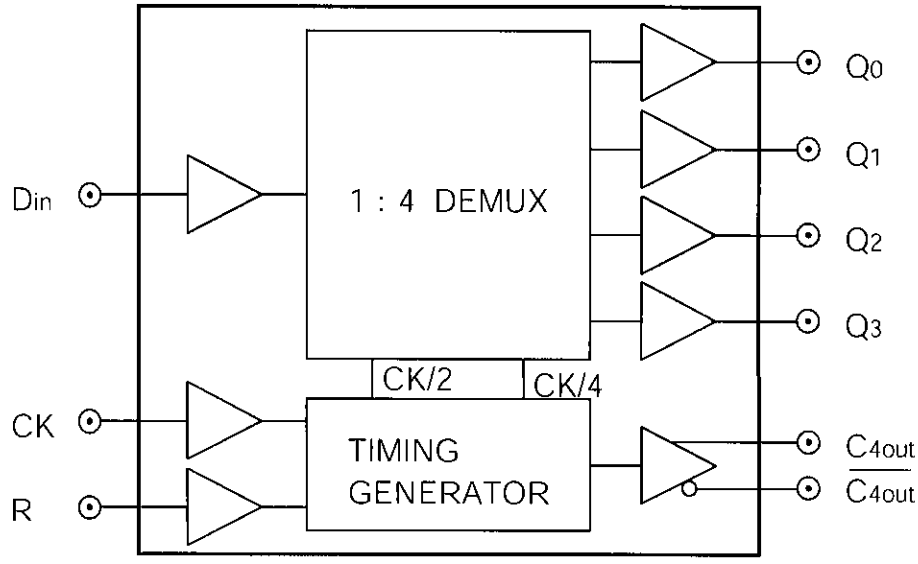
Ultra-high speed :	maximum clock frequency	f_{MAX} = 10.0 GHz	[Tc = 25 ℃, MIN.]
	output rise time	tr = 60 ps (20-80%)	[Tc = 25 ℃, TYP.]
	output fall time	tf = 60 ps (20-80%)	[Tc = 25 ℃, TYP.]

High Reliability : hermetically-sealed package

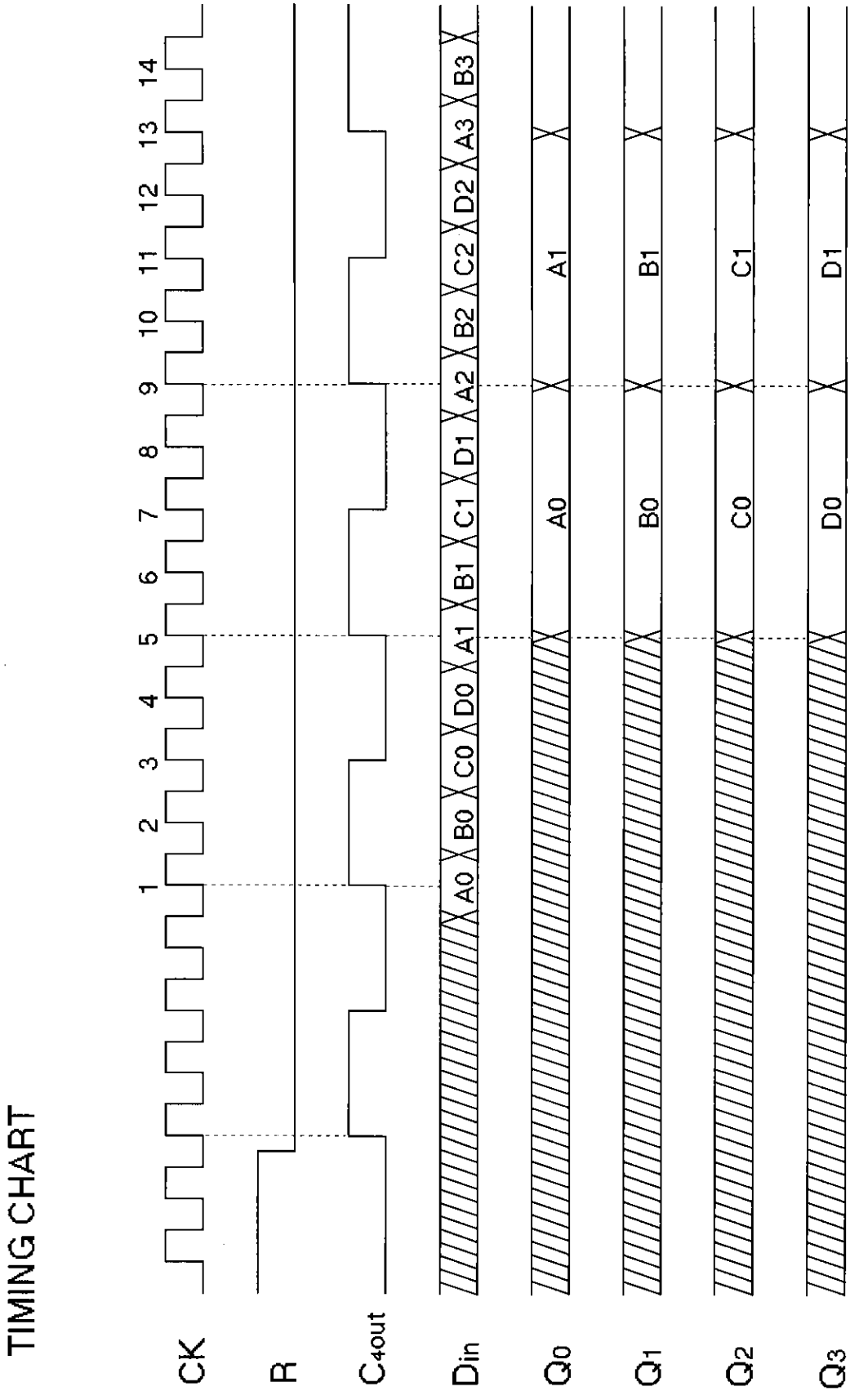
APPLICATIONS

- Serial-to-parallel converters
- High speed testers
- Board links
- Digital transmission system receivers
- Computer links

FUNCTIONAL DIAGRAM



TIMING CHART



PIN CONNECTION TABLE

PIN No.	NAME	FUNCTION	PIN No.	NAME	FUNCTION
1	GND	Ground (0.0V)	17	GND	Ground (0.0V)
2	GND	Ground (0.0V)	18	GND	Ground (0.0V)
3	Din	Data Input	19	Q3	Data Output 3
4	GND	Ground (0.0V)	20	Q2	Data Output 2
5	CK	Clock Input	21	Q1	Data Output 1
6	GND	Ground (0.0V)	22	Q0	Data Output 0
7	R	Reset Input (1)	23	N.C.	No Internal Connection
8	GND	Ground (0.0V)	24	GND	Ground (0.0V)
9	Vss	Power Supply (-3.5V)	25	Vss	Power Supply (-3.5V)
10	N.C.	No Internal Connection	26	$\overline{C4out}$	1/4 Clock Output (Comp.)
11	N.C.	No Internal Connection	27	GND	Ground (0.0V)
12	Vref	Signal Input Ref. (2)	28	C4out	1/4 Clock Output (True)
13	N.C.	No Internal Connection	29	GND	Ground (0.0V)
14	Vcsout	Output Swing Adjust (3)	30	N.C.	No Internal Connection
15	N.C.	No Internal Connection	31	N.C.	No Internal Connection
16	Vss	Power Supply (-3.5V)	32	Vss	Power Supply (-3.5V)

Notes

(1) R : For demultiplexing operation, apply the low level ($\simeq$ -0.9V).

(2) Vref : Internally generated reference voltage that determines the signal input threshold level. By applying - 0.75 V to - 0.20 V externally to this pin, an arbitrary signal input threshold voltage can be established.

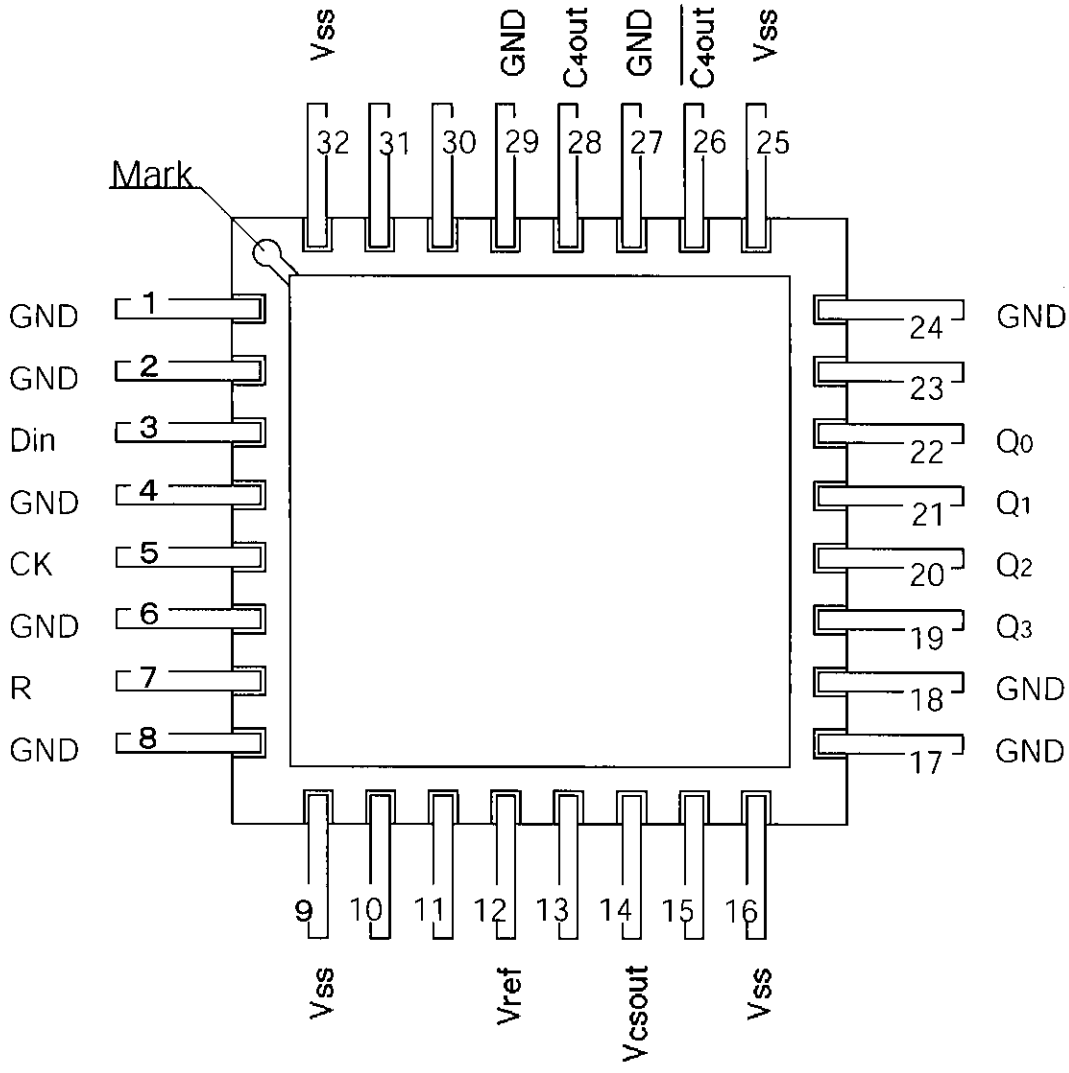
(3) Vcsout : Output swing adjustment pin. Generally left unconnected.
To decrease the output swing, connect a resistor between Vcsout pin and Vss pin as shown in sample implementation (see page 12) .
Output swing can not be increased.

ATTENTION

Please pay attention not to touch the Vcsout pin to the GND or the other pins while applying the Vss voltage, otherwise the IC would be damaged.

(4) Terminate unused output pins in 50-ohms.

CONNECTION DIAGRAM (TOP VIEW)



ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING
V_{SS}	Power Supply Voltage	0.0 V ~ - 4.0 V
V_{IN}	Applied Voltage at Signal Inputs (Din, CK, R)	+ 0.3 V ~ - 1.6 V
Vout	Applied Voltage at Signal Outputs (Q_0, Q_1, Q_2, Q_3, C_{4out}, $\overline{C_{4out}}$)	+ 0.2 V ~ - 1.75 V
Vcsout	Applied Voltage at V_{csout} pin	Open Circuit Voltage ~ V_{SS}
Vref	Applied Voltage at Vref pin	+ 0.3 V ~ - 1.6 V
Tstor	Storage Temperature	- 60 ℃ ~ + 150 ℃
Tc (1)	Case Temperature under Bias	- 60 ℃ ~ + 125 ℃

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS
V_{SS}	Power Supply	- 3.4	- 3.5	- 3.75	V
Vref	Signal Input Reference	- 0.2	- 0.5	- 0.75	V
Vcsout	Output Swing Adjust	Normally Open			V

DC CHARACTERISTICS

(V_{SS}=- 3.4 V ~ - 3.75 V. GND = 0.0 V. T_c = 0 ~ 85 ℃ (1))

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS	
V_{OH}	Output Voltage, High	- 0.1	0.0		V	
V_{OL}	Output Voltage, Low		- 0.9	- 0.85	V	
V_{IH}	Input Voltage, High	- 0.2	0.0		V	
V_{IL}	Input Voltage, Low		- 0.9	- 0.75	V	
I_{SS}	Power Supply Current		750	1050	mA	(2)
Pd	Power Dissipation		2.6	3.9	W	(2)

Notes

(1) Tc : Temperature at package base.

(2) : Includes load current. Excludes current through input termination resistors, all of which have a value of 50 - ohms.

AC CHARACTERISTICS

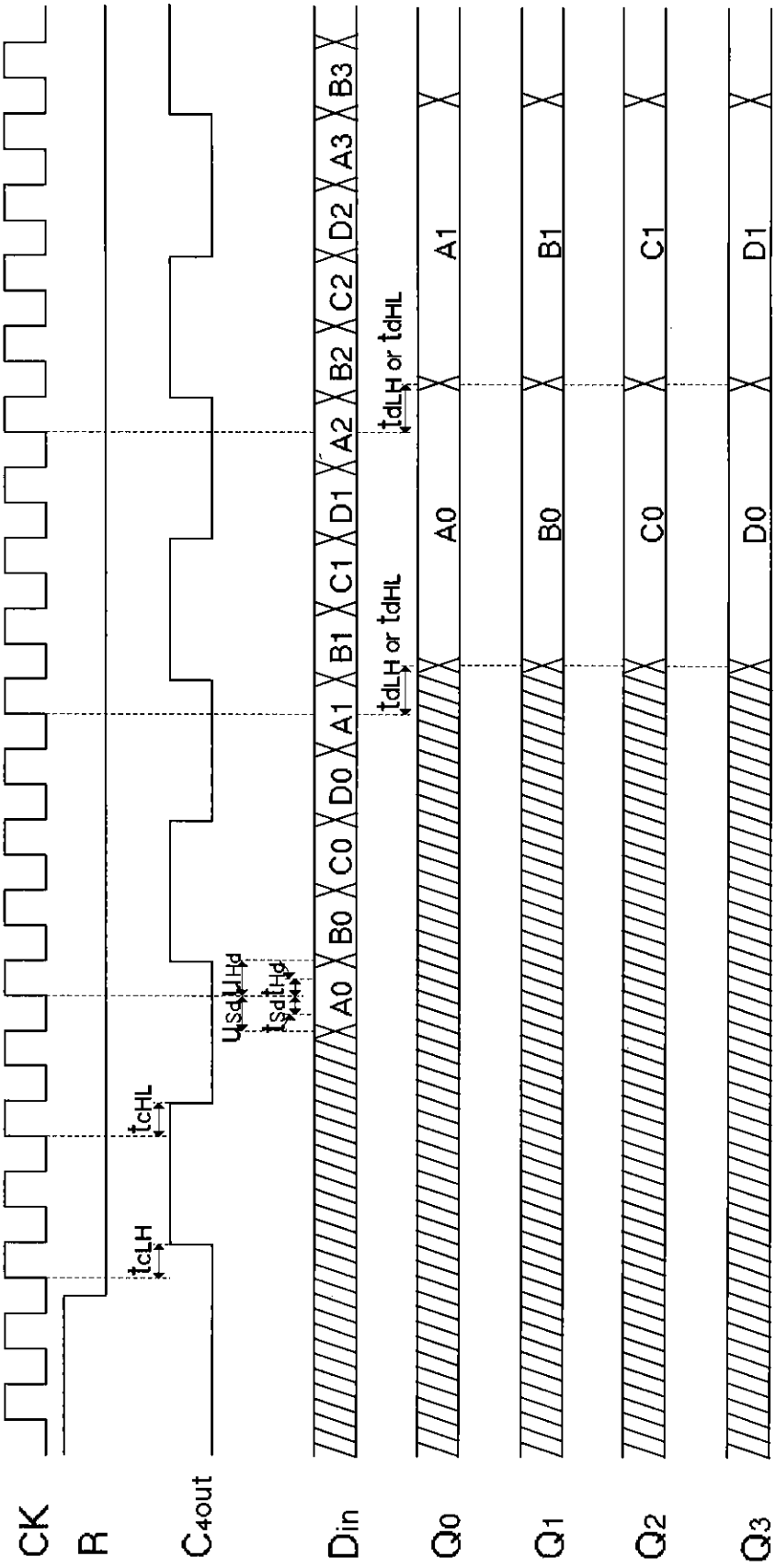
(Vss = - 3.5 V, GND = 0.0 V , Vref = - 0.2 ～ - 0.75 V)

SYMBOL	PARAMETER	Tc=0℃			Tc=25℃			Tc=85℃			UNITS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
f_{MAX}	Maximum Clock Frequency	10.0			10.0			10.0			GHz
t_{rQ}	Output Rise Time (Q_n (1) 20-80%)		55	75		60	80		65	85	ps
t_{fQ}	Output Fall Time (Q_n (1) 20-80%)		55	75		60	80		65	85	ps
t_{rC}	Output Rise Time (C4out,$\overline{C4out}$ 20-80%)		40	55		40	55		45	60	ps
t_{fC}	Output Fall Time (C4out,$\overline{C4out}$ 20-80%)		40	55		40	55		45	60	ps
t_{dLH}	Output Rise Delay (CK-Q_n (1))	410	480	550	415	485	555	430	500	570	ps
t_{dHL}	Output Fall Delay (CK-Q_n (1))	410	480	550	415	485	555	430	500	570	ps
t_{cLH}	Output Rise Delay (CK- C4out,$\overline{C4out}$)	325	395	465	335	405	475	350	420	490	ps
t_{cHL}	Output Fall Delay (CK- C4out,$\overline{C4out}$)	325	395	465	335	405	475	350	420	490	ps
t_{sd}	Minimum Setup Time (Din-CK)		-70	-50		-70	-50		-70	-50	ps
t_{Hd}	Minimum Hold Time (CK-Din)		100	130		100	130		100	130	ps

Note

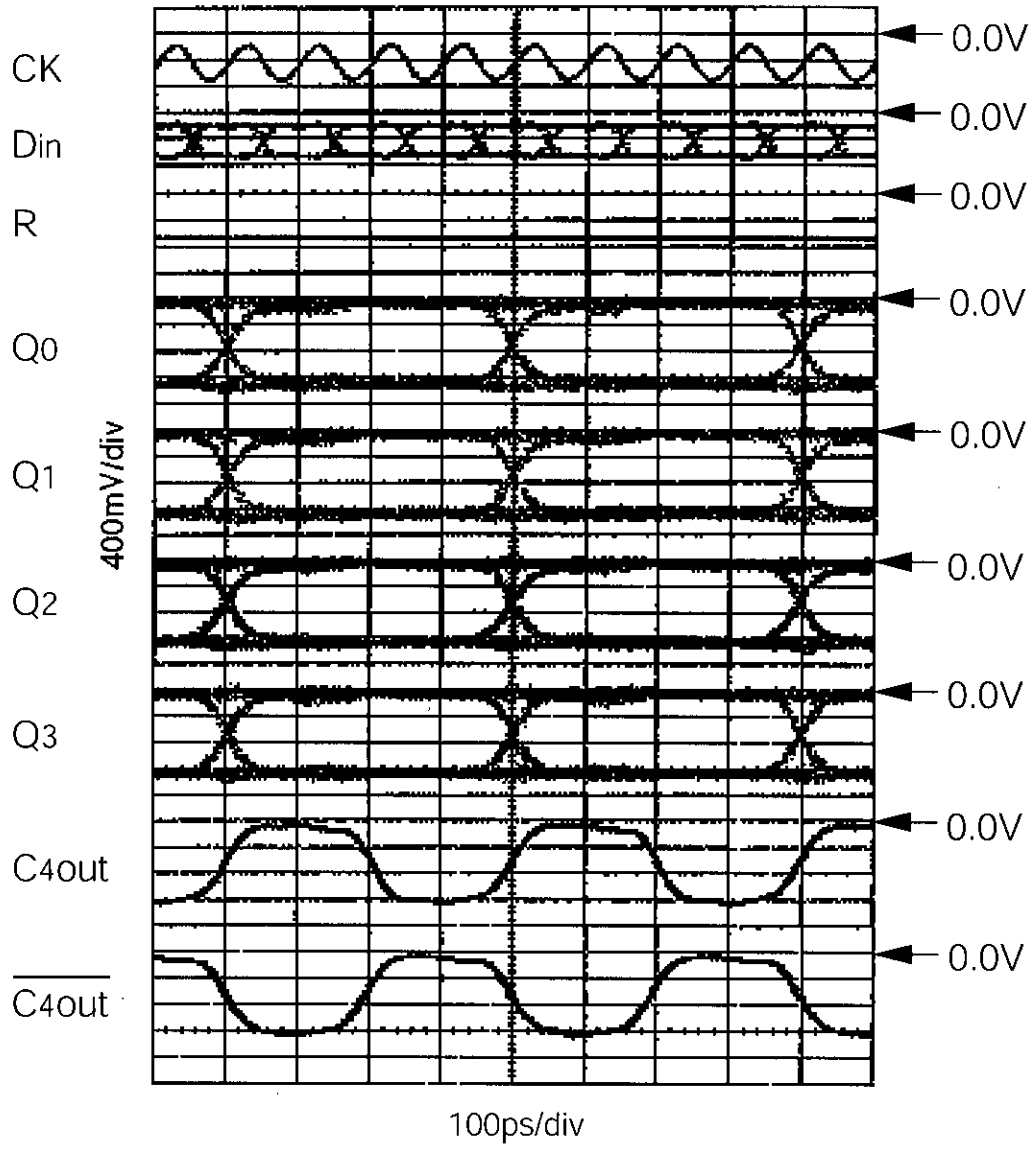
(1) Qn : n = 0,1,2,3

TIMING CHART (INCLUDING DELAY TIMES)



(In the figure above, t_{Sd} , t_{Hd} are the minimum setup and hold times as defined on the previous page ; U_{Sd} , U_{Hd} are the corresponding user setup and hold times.)

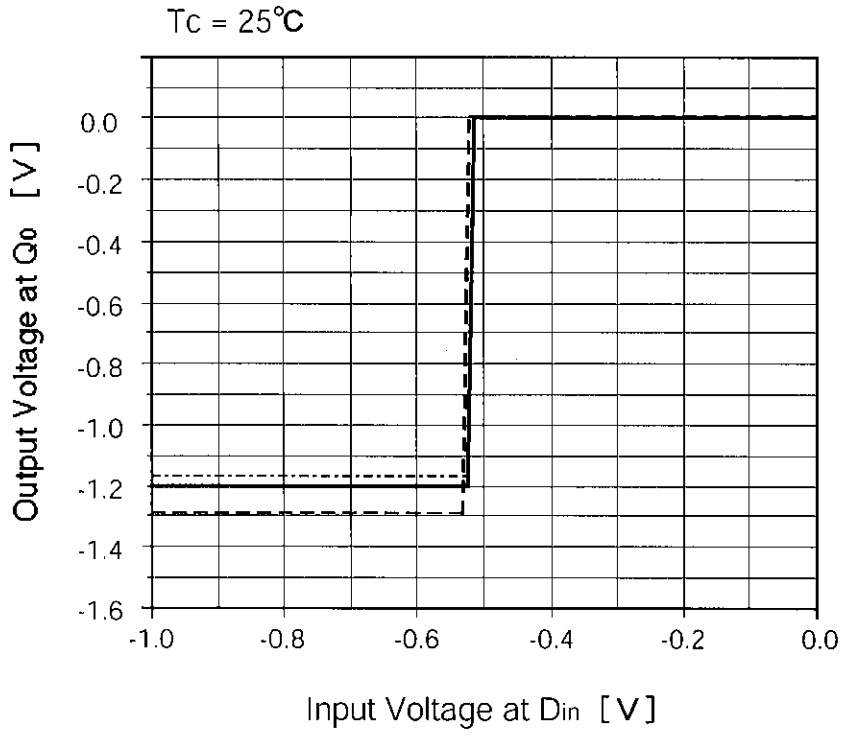
INPUT AND OUTPUT WAVEFORMS AT 10 Gb/s



Measurement Conditions

Vss = - 3.5 V, Vref = - 0.50 V, Vcsout : open .
D_{in} : 10.0 Gb/s pseudo-random pattern having a word length of 2^{31} -1 bits .
CK : 10.0 GHz signal .
R = - 0.75 V.
Signal outputs connected to the 50-ohm impedance pin of a sampling oscilloscope .
Results given here were obtained using the NEL test fixture.

SAMPLE DC TRANSFER CHARACTERISTICS

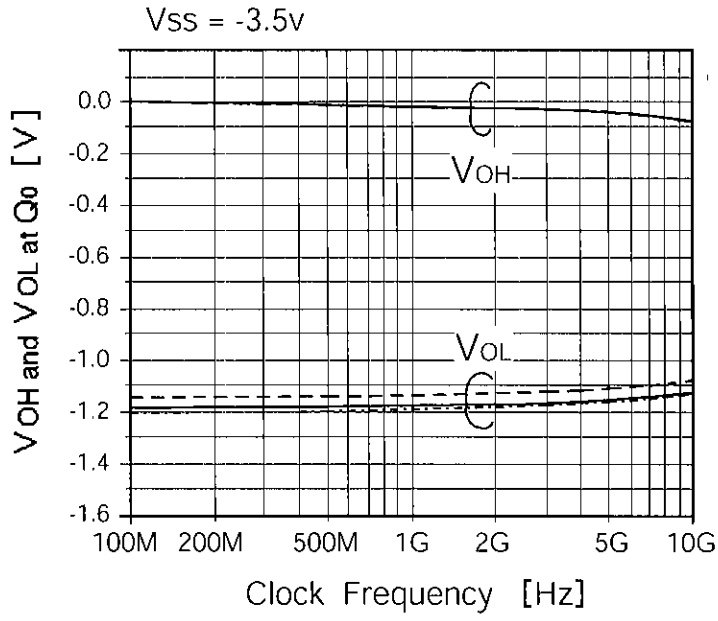


- - - - - - - - -	:	Vss = - 3.4 V
———————	:	Vss = - 3.5 V
- - - - - - -	:	Vss = - 3.75 V

Measurement Conditions

CK : 100 MHz signal
R : -0.75 V
Vref : -0.50V
Vcsout : Open

SAMPLE AC CHARACTERISTICS

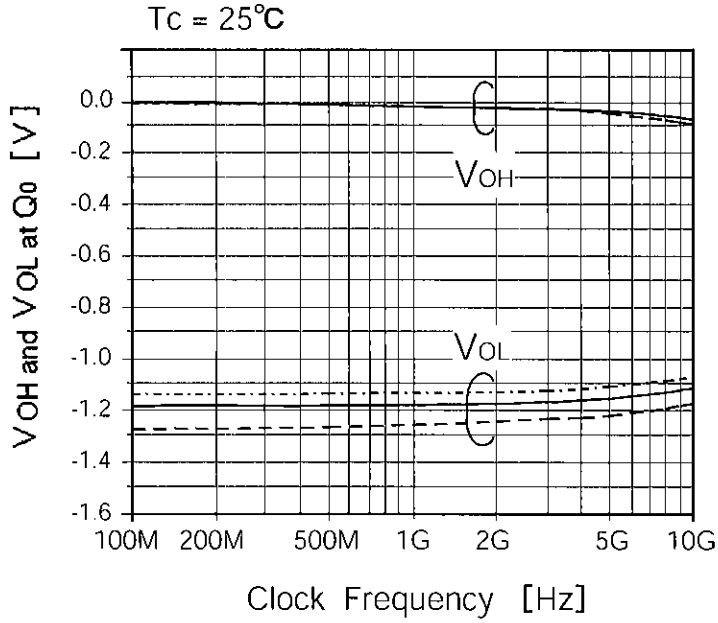


---------- : Tc = 0 ℃
———— : Tc = 25 ℃
- - - - - - : Tc = 85 ℃

Measurement Conditions

Vss = - 3.5 V
Vref = - 0.50 V
Vcsout : Open
Din : VIH = - 0.2 V ,
VIL = - 0.75 V
CK : VIH = - 0.2 V ,
VIL = - 0.75 V

Results given here were obtained using the NEL test fixture.



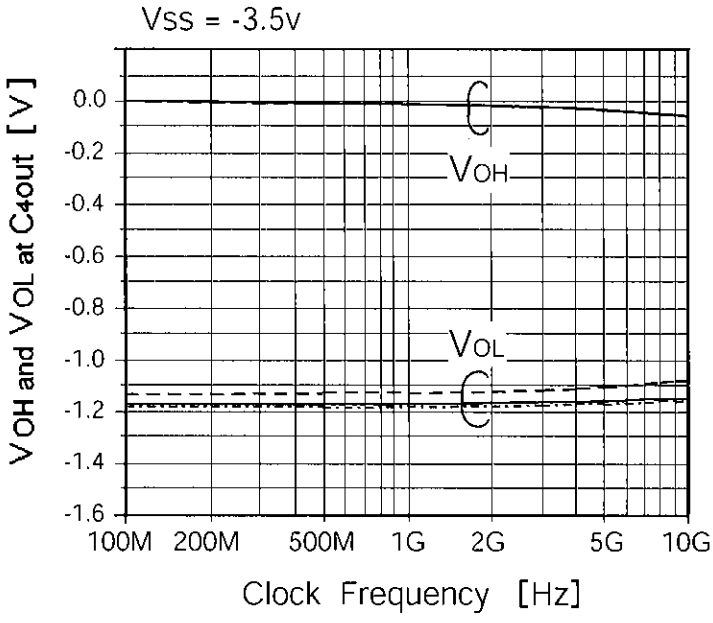
---------- : Vss = - 3.4 V
———— : Vss = - 3.5 V
- - - - - - : Vss = - 3.75 V

Measurement Conditions

Vref = - 0.50 V
Vcsout : Open
Din : VIH = - 0.2 V ,
VIL = - 0.75 V
CK : VIH = - 0.2 V ,
VIL = - 0.75 V
Tc = 25℃

Results given here were obtained using the NEL test fixture.

SAMPLE AC CHARACTERISTICS

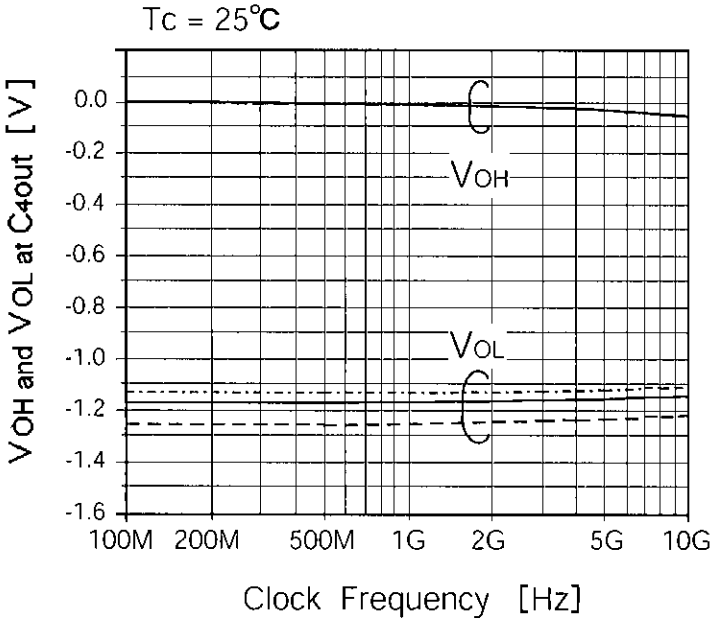


---------- : Tc = 0 ℃
———— : Tc = 25 ℃
- - - - - - : Tc = 85 ℃

Measurement Conditions

Vss = - 3.5 V
Vref = - 0.50 V
Vcsout : Open
CK : VIH = - 0.2 V ,
VIL = - 0.75 V

Results given here were obtained using the NEL test fixture.



---------- : Vss = - 3.4 V
———— : Vss = - 3.5 V
- - - - - - : Vss = - 3.75 V

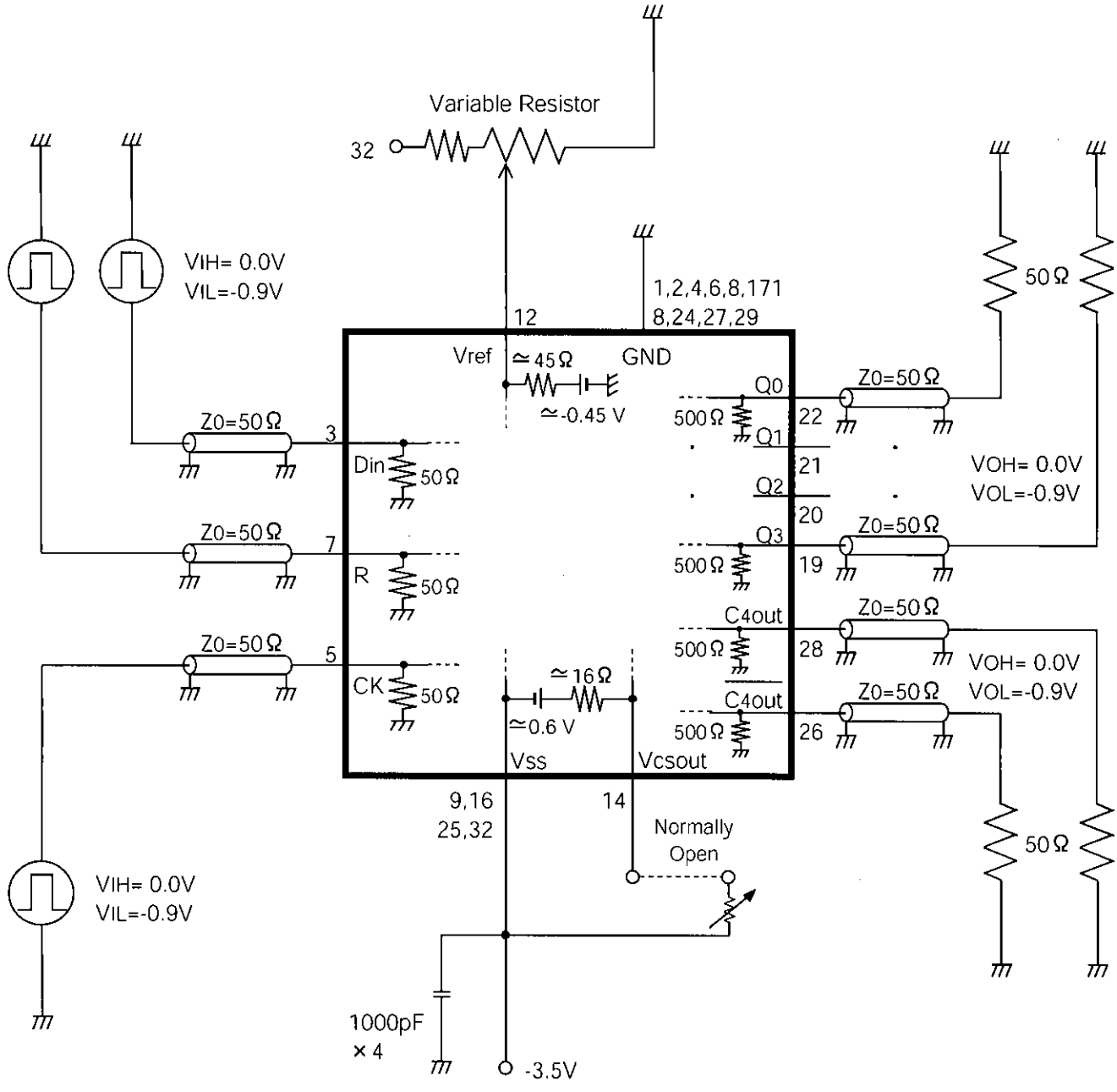
Measurement Conditions

Vref = - 0.50 V
Vcsout : Open
CK : VIH = - 0.2 V ,
VIL = - 0.75 V
Tc = 25℃

Results given here were obtained using the NEL test fixture.

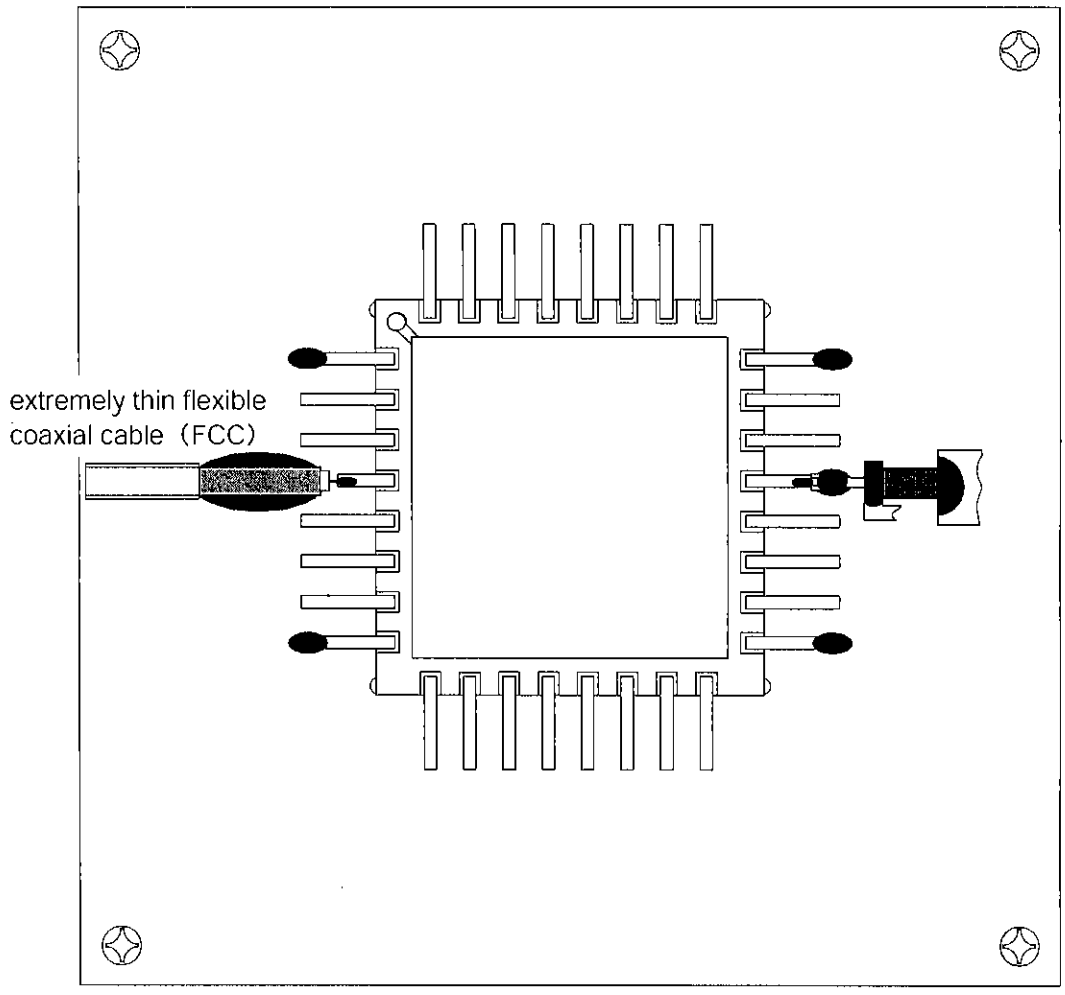
SAMPLE IMPLEMENTATION

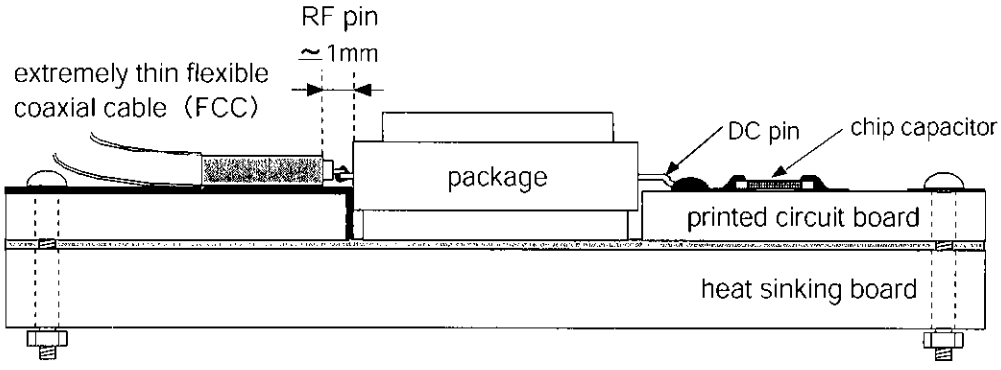
Note : Numbers represent pin numbers



Although not shown here, in place of the above variable resistor, the Vref pin can be connected directly to an external power supply. In this case, apply approximately - 0.5 V.

SAMPLE MOUNTING





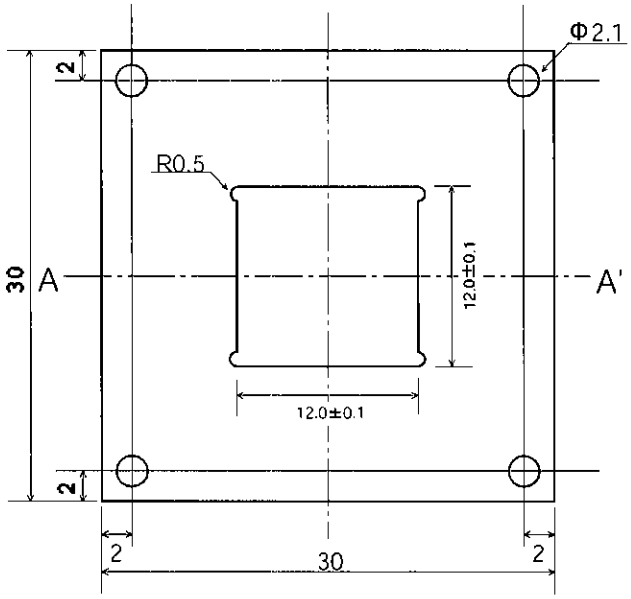
: conducting epoxy adhesive

: solder

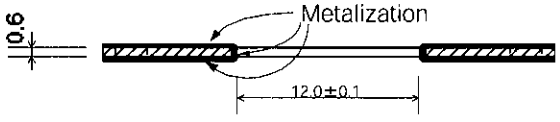
MOUNTING PARTS (unit : mm)

Printed Circuited Board

top view



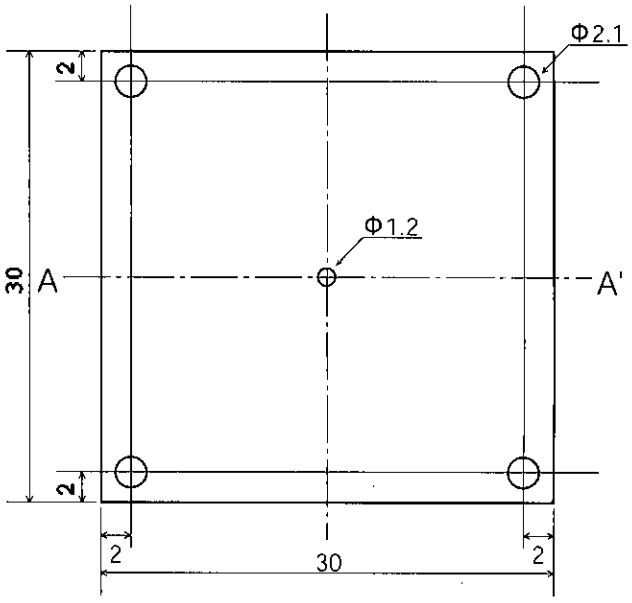
A-A' cross-sectional view



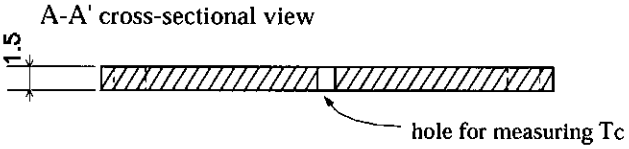
material : glass epoxy base coated
on both sides with a layer of metal and solder
(copper foil thickness : 18 μ m
solder thickness : 40～70 μ m)

Heat Sinking Board

top view



A-A' cross-sectional view



material : aluminum board

Solder

Sn : 60%, Φ0.6mm
(melting point : 190℃)

Conducting epoxy adhesive

Sumitomo bakelite CRM-1061

Screws for attaching the printed circuit board to the heat sinking board

4 M2×8, cross-type small screws

Nuts

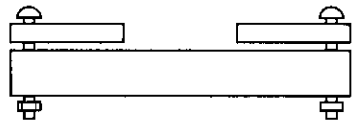
4 M2 hex nuts

Spring washers

4 M2 spring washers

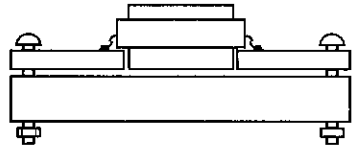
MOUNTING PROCEDURE

①



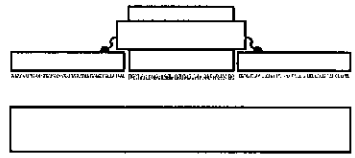
Temporarily fasten the printed circuit board to the heat sinking board with the screws.

②



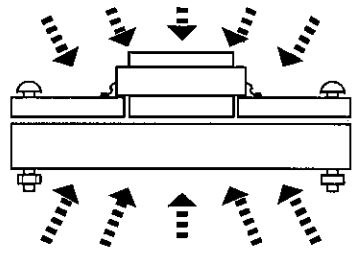
Insert the IC package into the center part of the printed circuit board. Solder the GND pins to the printed circuit board.

③



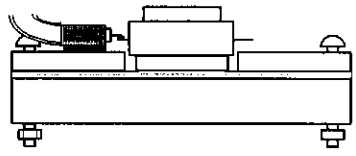
Unfasten the printed circuit board from the heat sinking board. Thinly paint the entire bottom surfaces of the printed circuit board and the IC with the conducting epoxy adhesive. Make sure that silver paste is not applied to the region between the printed circuited board and the IC.

④



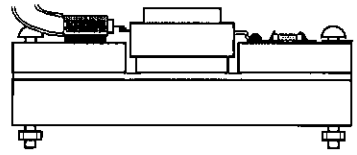
Again fasten the printed circuit board to the heat sinking board with the screws. Bake the fixture in an oven for 60 minutes at 150℃ (120℃～170℃) .

⑤



Take the fixture out of the oven. After the IC has cooled, solder the FCC to the input/output pins.

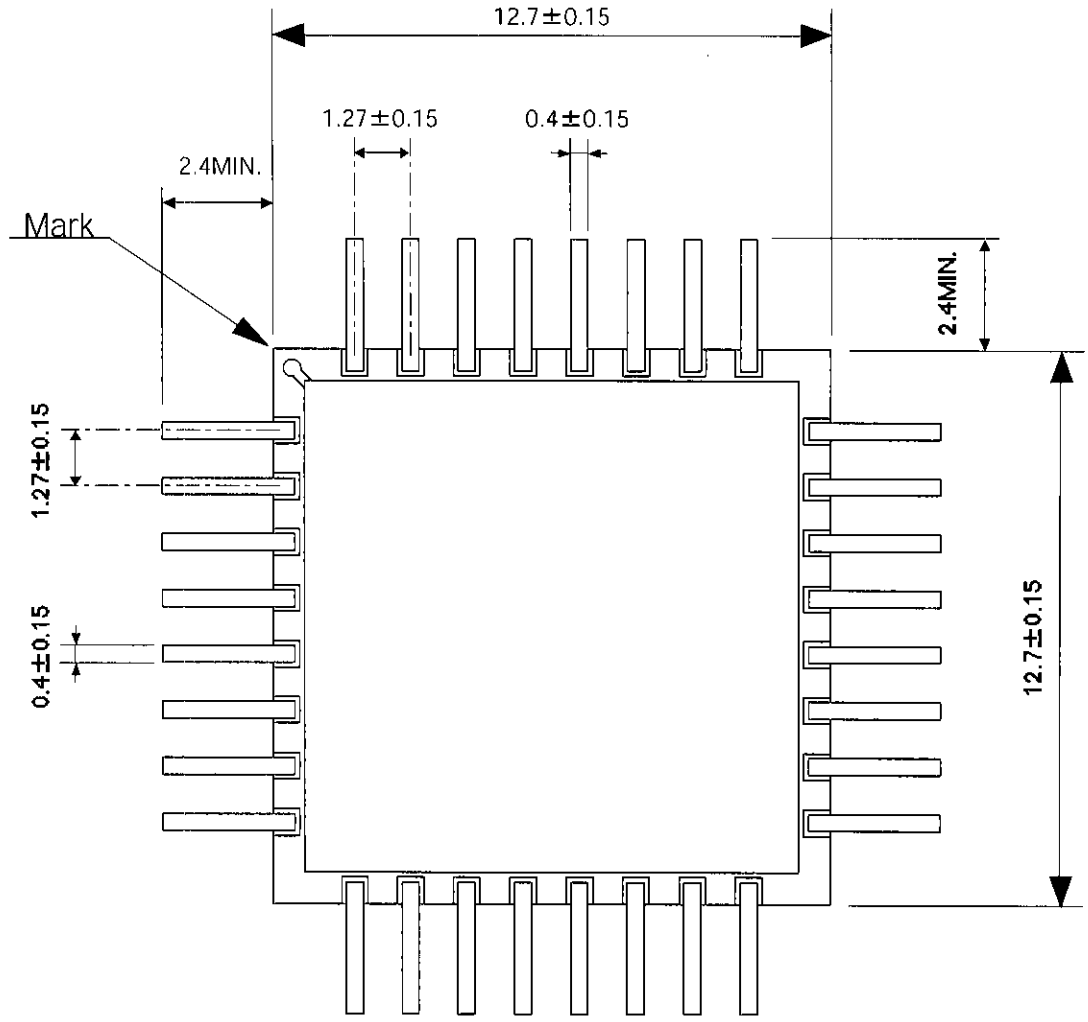
⑥



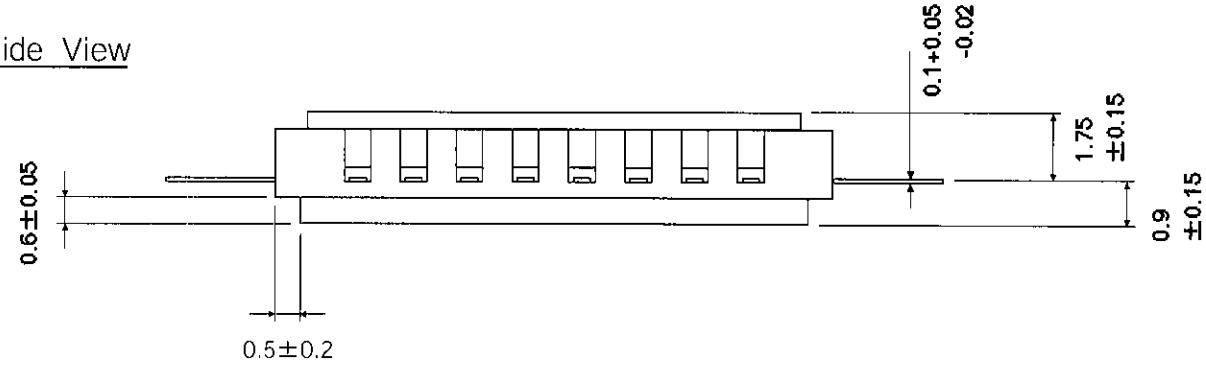
As the final step, solder the chip capacitors, chip resistors, etc., to the DC pins.

32 PIN PACKAGE DIMENSION (mm)

Top View



Side View



OPERATING AND HANDLING INSTRUCTIONS

Since the NEL ICs are fabricated with GaAs MESFET ' s (MEtal Semiconductor Field Effect Transistors) , users are recommended to follow the instructions below to prevent damage to the chip from electro-static discharge.

(1) Power Supply Sequence

The following power supply sequence is recommended.

1) Set supply voltage Vss, Vref and GND to 0 V.
2) Apply Vref .
3) Apply Vss.

RF signals are recommended to be applied while power supplying and biasing.

(2) Handling precautions

1) Use a conductive working desk connected to ground (or, a conductive table top connected to ground) .
2) Require all handling personnel to wear a conductive bracelet or wrist-strap connected to ground though a 1 M-ohm resistor.
3) Ground all test equipment.
4) Ground all soldering iron tips.
5) Store IC' s and other devices such as chip capacitors in their conductive carriers until they are soldered.