

6427525 N E C ELECTRONICS INC 05E 22561 D  
**BIPOLAR ANALOG INTEGRATED CIRCUITS**  
*T-74-07-01*  
 **$\mu$ PC1663,  $\mu$ PC1664**

**ULTRA-WIDEBAND DIFFERENTIAL VIDEO AMPLIFIERS**

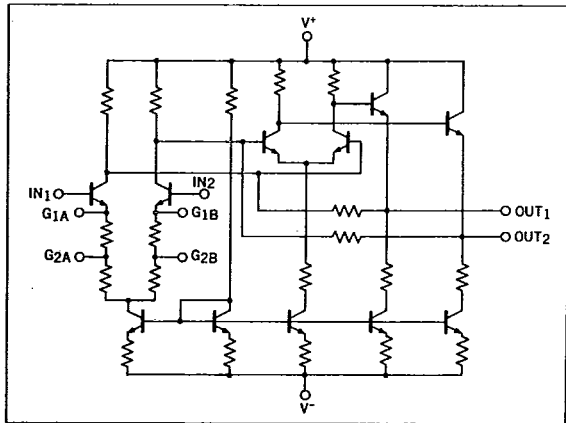
**DESCRIPTION**

The  $\mu$ PC1663 and  $\mu$ PC1664 are video amplifiers with differential input and output stages. An ultrahigh-frequency process ( $f_T = 6$  GHz) improves AC performance compared with industry-standard type 733 video amplifiers. The  $\mu$ PC1663 and  $\mu$ PC1664 are excellent as sense amplifiers for high-density CCDs, as video or pulse amplifiers in high-resolution displays, and in communications equipment.

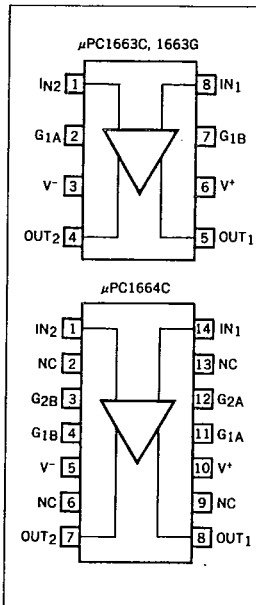
**FEATURES**

- Bandwidth and typical gain  
 120 MHz at  $A_{VOL} = 300$   
 170 MHz at  $A_{VOL} = 100$   
 700 MHz at  $A_{VOL} = 10$
- Very small phase delay
- Gain adjustable from 10 to 300
- No frequency compensation required

**EQUIVALENT CIRCUIT**



**CONNECTION DIAGRAM (Top View)**



**ORDERING INFORMATION**

Part Number	Package
$\mu$ PC1663C	8 PIN PLASTIC DIP (300 mil)
$\mu$ PC1663G	8 PIN PLASTIC SOP (225 mil)
$\mu$ PC1664C	14 PIN PLASTIC DIP (300 mil)

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$\mu$ PC1163,  $\mu$ PC1164  
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ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

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PARAMETER	SYMBOL	$\mu$ PC1663C	$\mu$ PC1663G	$\mu$ PC1664C	UNIT
Voltage between $V^+$ and $V^-$	$V^{\pm}$	$\pm 8$	$\pm 7$	$\pm 8$	V
Power Dissipation	$P_T$	500	*280 ( $T_a = 75^\circ\text{C}$ )	570	mW
Differential Input Voltage	$V_{ID}$	$\pm 5$	$\pm 5$	$\pm 5$	V
Input Voltage	$V_{ICM}$	$\pm 6$	$\pm 6$	$\pm 6$	V
Output Current	$I_O$	35	35	35	mA
Operating Temperature Range	$T_{opt}$	-45 to +85	-45 to +75	-45 to +85	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +150	-55 to +150	-55 to +150	$^\circ\text{C}$

\*Mounted on 5 cm x 5 cm x 0.16 mm glass epoxy PWB

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	$V^{\pm}$ (1663C, 1664C)	$\pm 2$	$\pm 6$	$\pm 7$	V
Supply Voltage	$V^{\pm}$ (1663G)	$\pm 2$	$\pm 6$	$\pm 6.5$	V
Source Current	$I_{O \text{ source}}$			20	mA
Sink Current	$I_{O \text{ sink}}$			2.5	mA
Frequency Range		DC		200	MHz

ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ ,  $V^{\pm} = \pm 6\text{V}$ )

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Differential Voltage Gain	Gain 1	200	320	500		(Note 1)
	Gain 2	80	100	120		(Note 2)
	Gain 3	8	10	12		(Note 3)
Bandwidth	Gain 1		120		MHz	$R_S = 50 \Omega$ (3 dB down point)
	Gain 2		170			
	Gain 3		700			
Rise Time	Gain 1		2.9		ns	$R_S = 50 \Omega$ , $V_{out} = 1 V_{p-p}$
	Gain 2		2.7			
	Gain 3		2.7			
Propagation Delay	Gain 1		2		ns	$R_S = 50 \Omega$ , $V_{out} = 1 V_{p-p}$
	Gain 2		1.6			
	Gain 3		1.2			
Input Impedance	Gain 1		4.0		k $\Omega$	
	Gain 2	6.7	13			
	Gain 3	50	180			
Input Capacitance	$C_{in}$		2		pF	
Input Offset Current	$I_{IO}$		0.4	5.0	$\mu\text{A}$	
Input Bias Current	$I_B$		20	40	$\mu\text{A}$	
Input Noise Voltage	$V_n$		3		$\mu\text{V}_{r.m.s.}$	$R_S = 50 \Omega$ , 10 k to 10 MHz
Input Voltage Range	$V_I$	$\pm 1.0$			V	
Common Mode Rejection Ratio	CMR	55	70		dB	$V_{cm} = \pm 1 \text{ V}$ , $f \leq 100 \text{ kHz}$
		53	60			$V_{cm} = \pm 1 \text{ V}$ , $f = 5 \text{ MHz}$
Supply Voltage Rejection Ratio	SVR	50	70		dB	$\Delta V = \pm 0.5 \text{ V}$
Output Offset Voltage	Gain 1		0.3	1.5	V	$V_{O(off)} =  I_{OUT1} - I_{OUT2} $
	Gain 2, 3		0.1	1.0		
Output Common Mode Voltage	$V_{O(CM)}$	2.4	2.9	3.4	V	
Output Voltage Swing	$V_{O(p-p)}$	3.0	4.0		$V_{p-p}$	
Output Sink Current	$I_{sink}$	2.5	3.6		mA	
Power Supply Current	$I_{CC}$		13	20	mA	

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- Notes:
1. Gain select pins G1A and G1B are connected.
  2. Gain select pins G2A and G2B are connected.
  3. All gain select pins are open.
  4. Insert adjustment resistor (0 to 10 k $\Omega$ ) between G1A and G1B when variable gain is necessary.

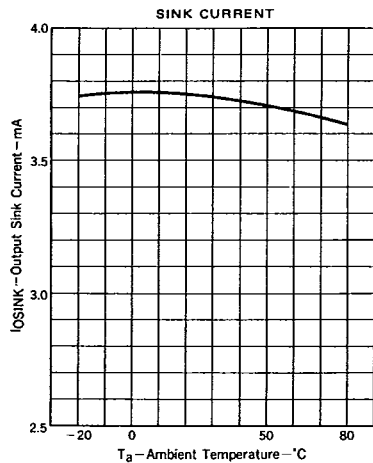
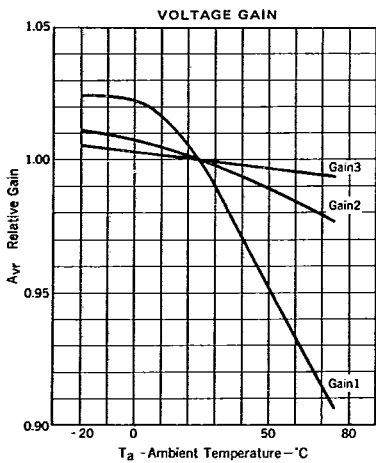
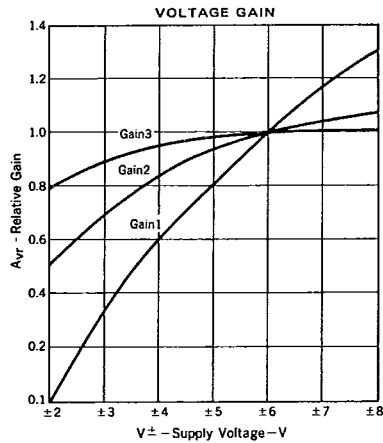
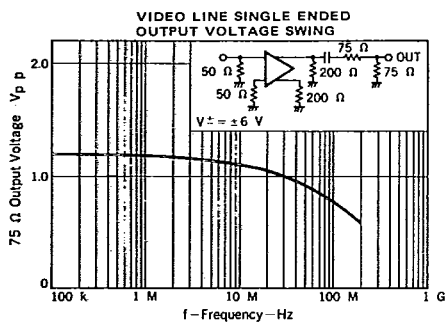
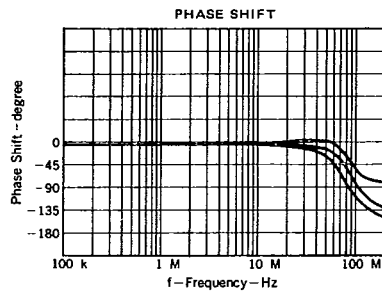
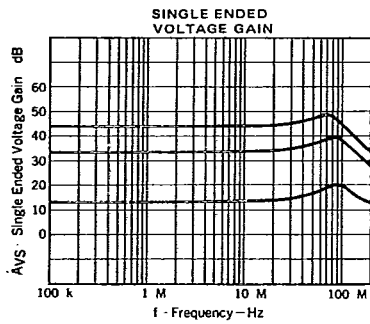
Attention: Due to ultrahigh-frequency characteristics, the physical circuit layout is very critical. Supply voltage line bypass, double-sided printed-circuit board, and wide-area ground line layout are necessary for stable operation. Two signal resistors connected to both inputs and two load resistors connected to both outputs should be balanced for stable operation.

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TYPICAL PERFORMANCE CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

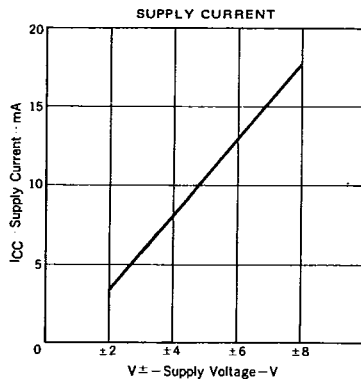
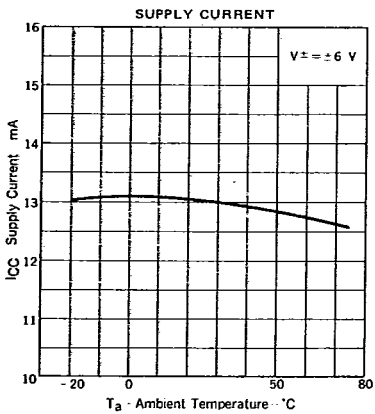
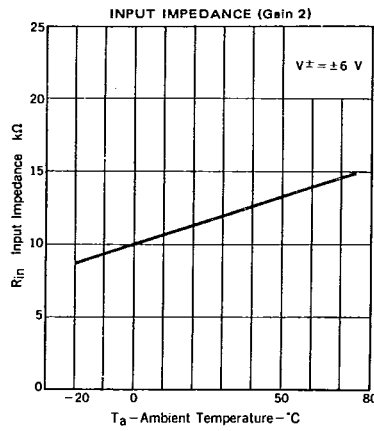
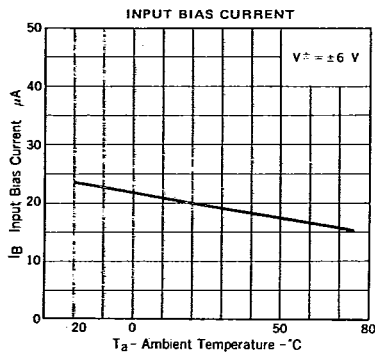
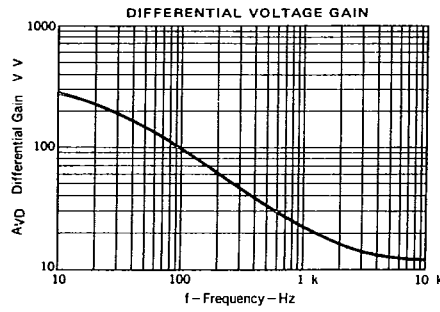
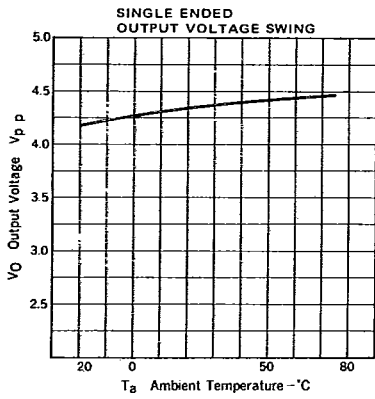


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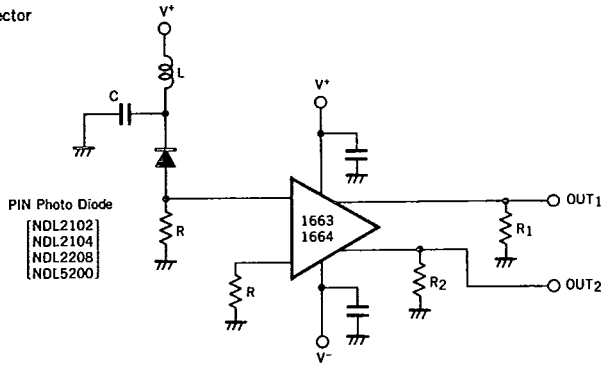
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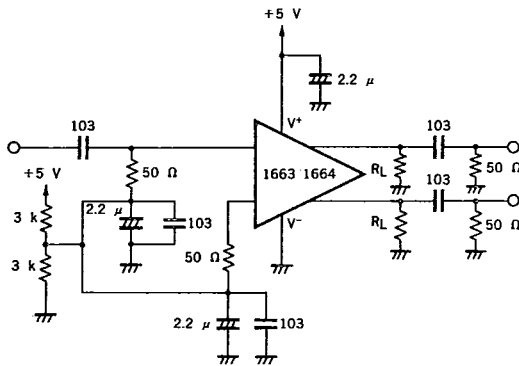
TYPICAL APPLICATIONS

● Photo Signal Detector



FET source follower buffer is necessary, when input impedance of  $\mu$ PC1663/1664 is critical.

● Application for +5 V Single Supply



PERFORMANCE UNDER +5 V OPERATION

PARAMETER	CONDITIONS	PERFORMANCE	UNIT
Differential Gain	Gain 1	35	dB
	Gain 3	11	
Bandwidth	Gain 1	106	MHz
	Gain 3	115	
Rise Time	Gain 1, $R_S = 50 \Omega$ , $V_{OUT} = 80 \text{ mV}_{p-p}$	2.2	ns
Propagation Delay	Gain 1, $R_S = 50 \Omega$ , $V_{OUT} = 80 \text{ mV}_{p-p}$	2.8	ns
	Gain 3, $R_S = 50 \Omega$ , $V_{OUT} = 60 \text{ mV}_{p-p}$	1.8	
Phase Shift	Gain 1	-123	degree
	Gain 3	-93	
Output Power	$R_L = 240 \Omega$	5.0	dBm
	$R_L = 910 \Omega$	0	
	$R_L = 80 \Omega$	-11.5	

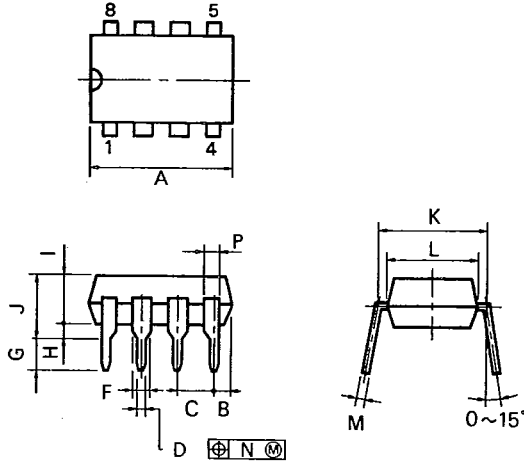
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8 PIN PLASTIC DIP (300 mil)



P8C-100-300B,C

NOTES

- 1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.
- 2) Item "K" to center of leads when formed parallel.

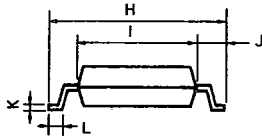
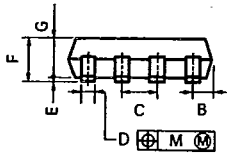
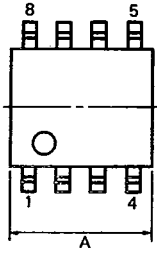
ITEM	MILLIMETERS	INCHES
A	10.16 MAX.	0.400 MAX.
B	1.27 MAX.	0.050 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	0.50 <sup>+0.10</sup>	0.020 <sup>+0.004</sup>
F	1.4 MIN.	0.055 MIN.
G	3.2 <sup>+0.3</sup>	0.126 <sup>+0.012</sup>
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.4	0.252
M	0.25 <sup>+0.08</sup>	0.010 <sup>+0.003</sup>
N	0.25	0.01
P	0.9 MIN.	0.035 MIN.

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8 PIN PLASTIC SOP (225 mil)



S8GM-50-2258

**NOTE**

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	5.70 MAX.	0.225 MAX.
B	0.94 MAX.	0.037 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	0.40 $\pm 0.08$	0.016 $\pm 0.003$
E	0.1 $\pm 0.1$	0.004 $\pm 0.004$
F	1.8 MAX.	0.071 MAX.
G	1.49	0.059
H	6.5 $\pm 0.3$	0.256 $\pm 0.012$
I	4.4	0.173
J	1.1	0.043
K	0.15 $\pm 0.10$	0.006 $\pm 0.004$
L	0.6 $\pm 0.2$	0.024 $\pm 0.008$
M	0.12	0.005

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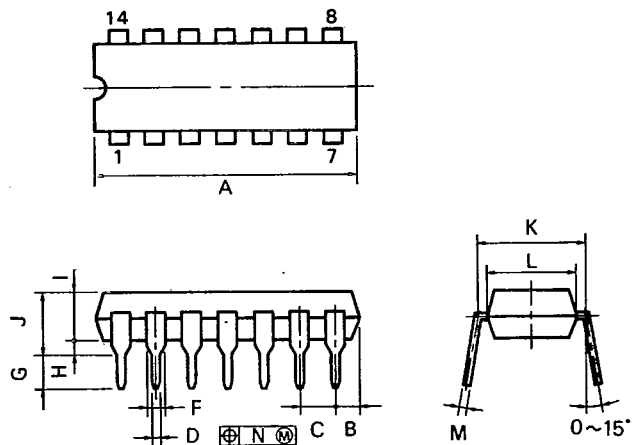


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14 Pin Plastic DIP (300 mil)



P14C-100-300B1

**NOTES**

- 1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.
- 2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	20.32 MAX.	0.800 MAX.
B	2.54 MAX.	0.100 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	0.50 <sup>+0.10</sup>	0.020 <sup>+0.004</sup>
F	1.2 MIN.	0.047 MIN.
G	3.6 <sup>+0.2</sup>	0.142 <sup>+0.012</sup>
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.82 (T.P.)	0.300 (T.P.)
L	6.4	0.252
M	0.25 <sup>+0.08</sup>	0.010 <sup>+0.003</sup>
N	0.25	0.01