CEL

DC to VHF DIFFERENTIAL VIDEO AMPLIFIER

UPC1663GV

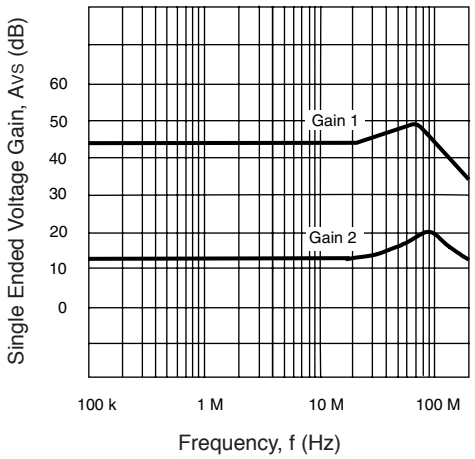
FEATURES

- **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**

DESCRIPTION

NEC's UPC1663GV is a video amplifier with differential input and output stages. A high frequency process (f_T = 6 GHz) improves AC performance compared with industry-standard video amplifiers. This device is excellent as a sense amplifier for high-density CCDs, as a video or pulse amplifier in high-resolution displays, and in communications equipment.

SINGLE ENDED VOLTAGE GAIN vs. FREQUENCY



ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = ±6 V, R_S = 50 Ω, f = 10 MHz)

PART NUMBER / PACKAGE OUTLINE			UPC1663GV S08		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
I_{CC}	Power Supply Current	mA		13	20
A_{Vd}	Differential Voltage Gain: Gain[1] Gain[2]		200 8	320 10	500 12
BW	Bandwidth (Gain is 3 dB down from the gain at 100 KHz) Gain[1] Gain[2]	MHz MHz		120 700	
t_R	Rise Time, V_{OUT} = 1V_{p-p}: Gain[1] Gain[2]	ns ns		2.9 2.7	
t_{pd}	Propagation Delay, V_{OUT} = 1 Vp-p: Gain[1] Gain[2]	ns ns		2 1.2	
R_{IN}	Input Impedance: Gain[1] Gain[2]	kΩ kΩ	 50	4.0 180	
C_{IN}	Input Capacitance	pF		2	
I_{IO}	Input Offset Current	μA		0.4	5.0
I_B	Input Bias Current	μA		20	40
V_N	Input Noise Voltage, 10 k to 10 MHz	$\mu V_{r.m.s.}$		3	
V_I	Input Voltage Range	V	±1.0		
CMRR	Common Mode Rejection Ratio, Vcm = ±1 V, f ≤100 kHz Vcm = ±1 V, f = 5 MHz	dB dB	55 53	94 60	
SVRR	Supply Voltage Rejection Ratio, ΔV = ±0.5 V	dB	50	70	
$V_{O(off)}$	Output Offset Voltage, $V_{O(off)}$ = IOUT1 - OUT2I Gain[1] Gain[2]	 V V		 0.3 0.1	 1.5 1.0
$V_{O\ (CM)}$	Output Common Mode Voltage	V	2.4	2.9	3.4
V_{Op-p}	Max. Output Voltage Swing, Single-ended	Vp-p	3.0	4.0	
I_{sink}	Output Sink Current	mA	2.5	3.6	

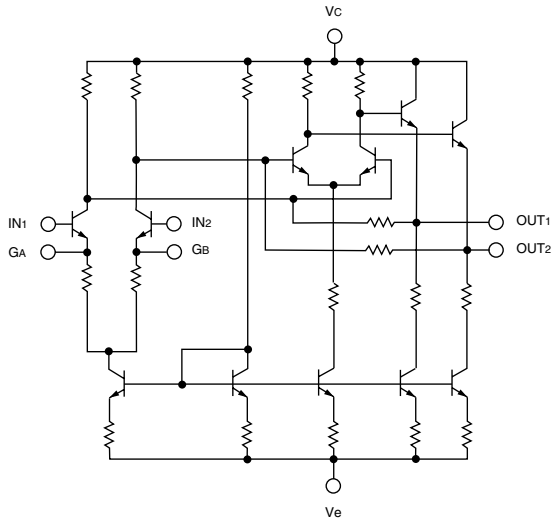
Notes:
1. Gain select pins GA and GB are connected together.
2. All gain select pins are open.
3. Insert adjustment resistor (0 to 10 kΩ) between GA and GB when variable gain is necessary.

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_C–V_E	Voltage between V_C and V_E	V	-0.3 to 14
P_T	Total Power Dissipation[2]	mW	200
V_{ID}	Differential Input Voltage	V	±5
V_{IN}	Input Voltage	V	±6
I_O	Output Current	mA	35
T_{OP}	Operating Temperature	°C	-45 to +75
T_{STG}	Storage Temperature	°C	-55 to +150

Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Mounted on 50 cm x 50 cm x 1.6 mm glass epoxy PCB with copper film (T_A = Max T_{OP}).

EQUIVALENT CIRCUIT



RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX
V_C	Positive Supply Voltage	V	+2	+6	+6.5
Ve	Negative Supply Voltage	V	-2	-6	-6.5
$I_{O\ source}$	Source Current	mA			20
$I_{O\ sink}$	Sink Current	mA			2.5
	Frequency Range	MHz	DC		200

Attention:
Due to high 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.

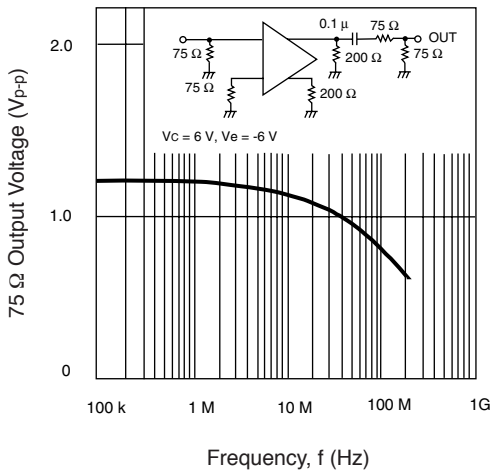
TYPICAL PERFORMANCE UNDER SINGLE SUPPLY +5 V OPERATION*

PARAMETER	CONDITIONS	TYPICAL	UNITS
Differential Gain	15 MHz		
Gain 1		35	dB
Gain 2		11	dB
Bandwidth	Gain is 3 dB down from		
Gain 1	the gain at 100 KHz	106	MHz
Gain 2		115	MHz
Rise Time	R_S = 50 Ω, V_{OUT} = 80 mV_{p-p}		
Gain 1		2.2	ns
Propagation Delay			
Gain 1	RS = 50 Ω, V_{OUT} = 80 mVp-p	2.8	ns
Gain 2	RS = 50 Ω, V_{OUT} = 60 mVp-p	1.8	ns
Phase Shift	100 MHz		
Gain 1		-123	degree
Gain 2		-93	degree
Output Power	Z_L = 50 Ω, 15 MHz		
R_A = 240 Ω		5.0	dBm
R_A = 910 Ω		0	dBm
R_A = 80 Ω		-11.5	dBm

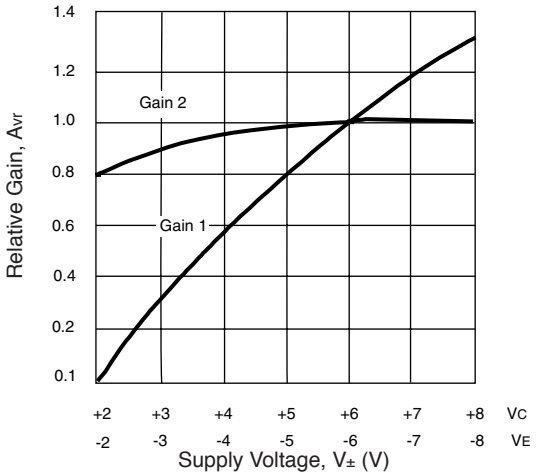
* See Application Circuit

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

VIDEO LINE SINGLE ENDED OUTPUT VOLTAGE SWING vs. FREQUENCY

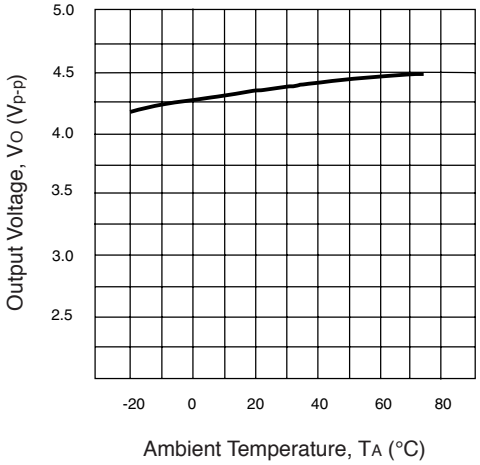


NORMALIZED VOLTAGE GAIN vs. SUPPLY VOLTAGE

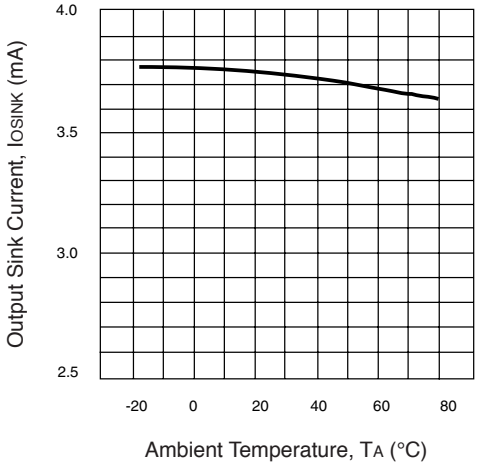


TYPICAL PERFORMANCE CURVES (T_A = 25°C)

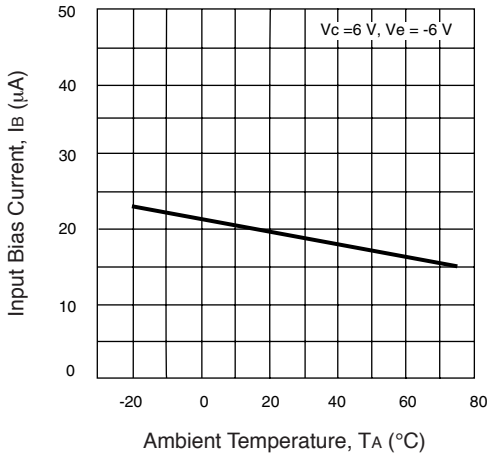
SINGLE ENDED OUTPUT VOLTAGE SWING vs. TEMPERATURE



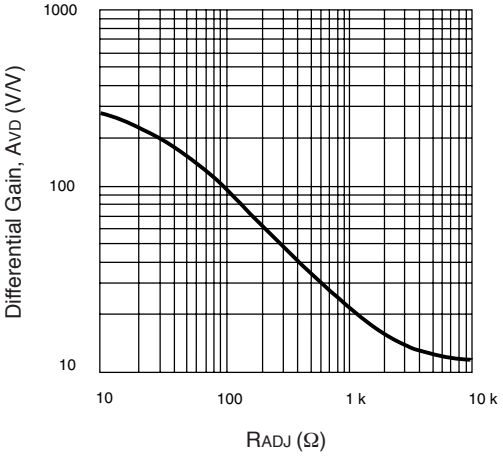
SINK CURRENT vs. TEMPERATURE



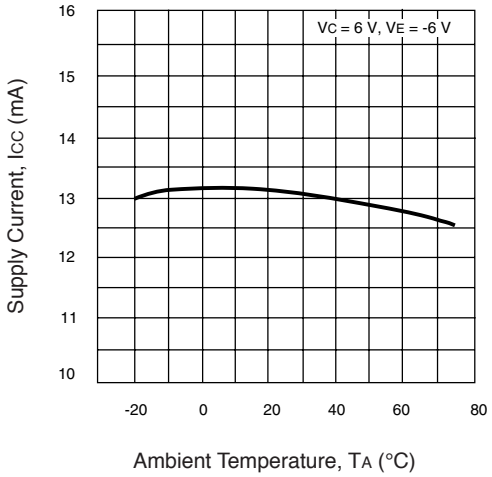
INPUT BIAS CURRENT vs. TEMPERATURE



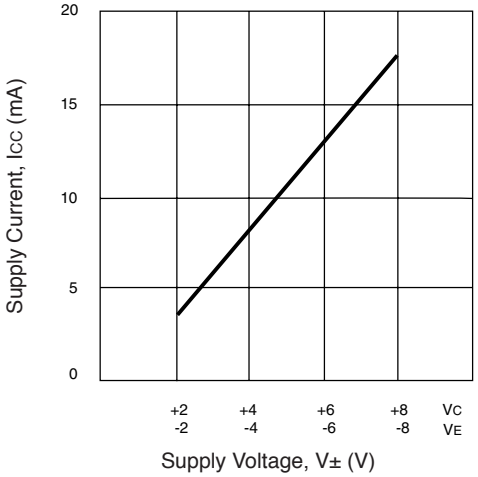
DIFFERENTIAL VOLTAGE GAIN vs. RESISTANCE BETWEEN GA AND GB



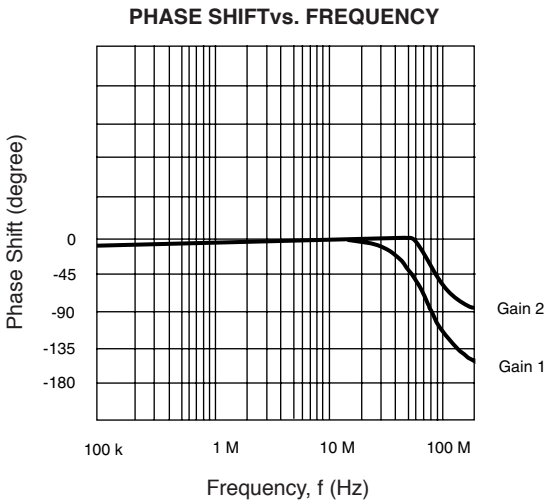
SUPPLY CURRENT vs. TEMPERATURE



SUPPLY CURRENT vs. SUPPLY VOLTAGE

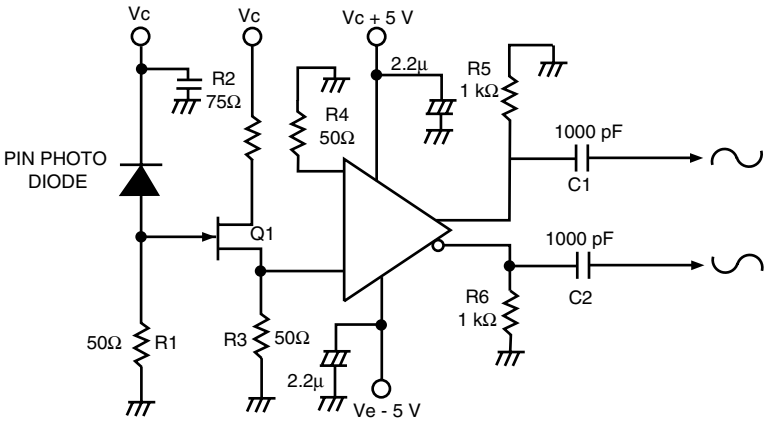


TYPICAL PERFORMANCE CURVES (T_A = 25°C)



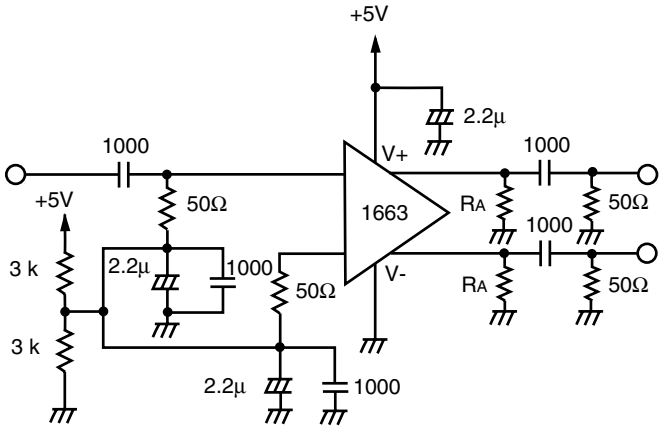
TYPICAL APPLICATIONS

• Photo Signal Detector



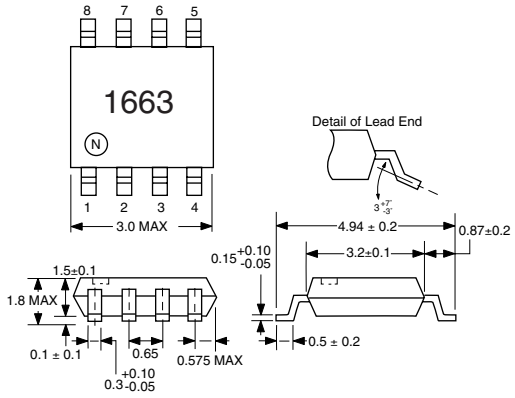
Since the input impedance of the IC falls when the gain rises, stable operation can be achieved by inserting a FET buffer when necessary as illustrated above.

• Application for +5 V Single Supply



OUTLINE DIMENSIONS (Units in mm)

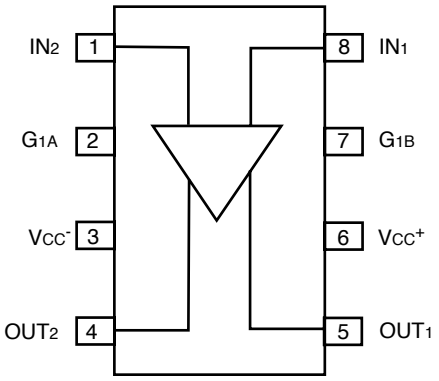
UPC1663GV
PACKAGE OUTLINE S08



Notes:
1. Each lead centerline is located within 0.12 mm (0.005 inch) of its true position at maximum material condition.
2. All dimensions are typical unless otherwise specified.

CONNECTION DIAGRAM (TOP VIEW)

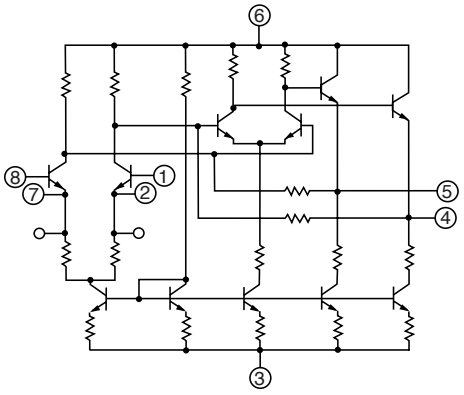
UPC1663GV



ORDERING INFORMATION

PART NUMBER	QUANTITY
UPC1663GV-E1-A	1000/Reel

PIN DESCRIPTION

Pin No.	Pin Name	In single Bias (V)	In single bias (V)	Functions and Applications	Internal Equivalent Circuit
8 1	IN_1 IN_2	Pin voltage	Apply voltage	Input pin	
5 4	OUT_1 OUT_2	0 Pin voltage 0	$V_{CC}/2$ Apply voltage $V_{CC}/2$	Output pin	
6	V_{CC}^+	±2 to ±6.5	-0.3 to +14	Plus voltage supply pin. This pin should be connected with bypass capacitor to minimize AC impedance.	
3	V_{CC}^-		GND	Minus voltage supply pin. This pin should be connected with bypass capacitor to minimize AC impedance.	
7 2	G_{1A} G_{1B}	—	—	Gain adjustment pin. External resistor from 0 to 10 kW can be inserted between pin 2 and 7 to determine gain value.	Internal circuit constants should be refered to application note.

Life Support Applications
These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.