

# APPLICATION MANUAL

## 3.3V Operation – Video Amplifier (12dB) TK15467S

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## 3.3V Operation – Video Amplifier (12dB) TK15467S

### 1 DESCRIPTION

The TK15467S is 75Ω series Video amplifier to drive at the low voltage with the clamp circuit.

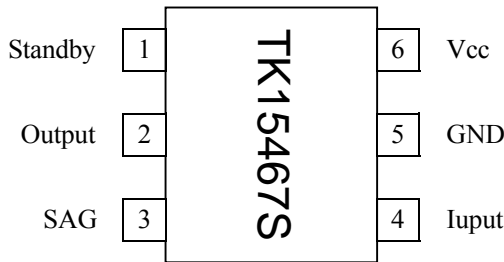
### 2 FEATURES

- Embedded clamp circuit.
- Enable ON/OFF control.
- Very small package.
- Very small output capacitor using SAG function pin.

### 3 APPLICATIONS

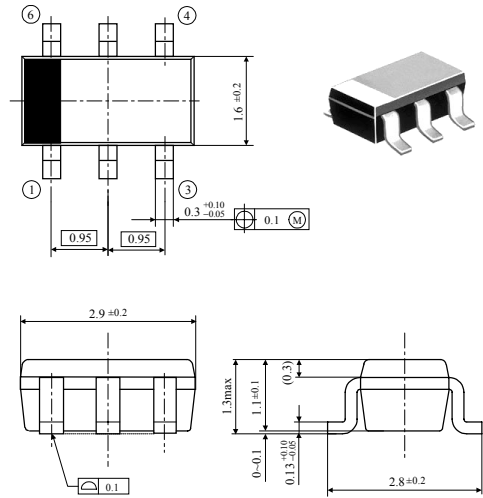
- DSC
- DVC, etc...

### 4 PIN CONFIGURATION



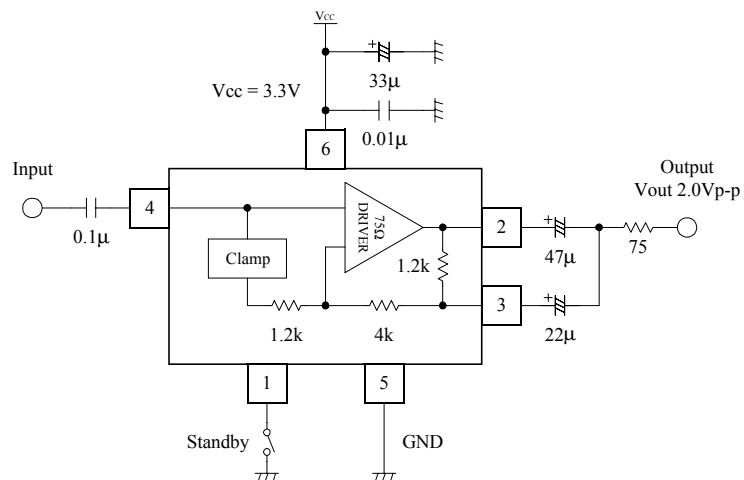
### 5 PACKAGE OUTLINE

■ SOT23-6



Unit : mm

### 6 BLOCK DIAGRAM



**7 ABSOLUTE MAXIMUM RATINGS**

$T_a=25^\circ\text{C}$				
Parameter	Symbol	Rating	Units	Conditions
Supply Voltage	$V_{CC}$	12.0	V	
Power Dissipation	$P_D$	500	mW	At a time mounting on the board*
Storage Temperature Range	$T_{stg}$	-55 ~ +150	$^\circ\text{C}$	
Operating Temperature Range	$T_{OP}$	-40 ~ +85	$^\circ\text{C}$	
Input Frequency	$f_{MAX}$	~ 100	MHz	
Operating Voltage Range	$V_{OP}$	2.8 ~ 10.0	V	

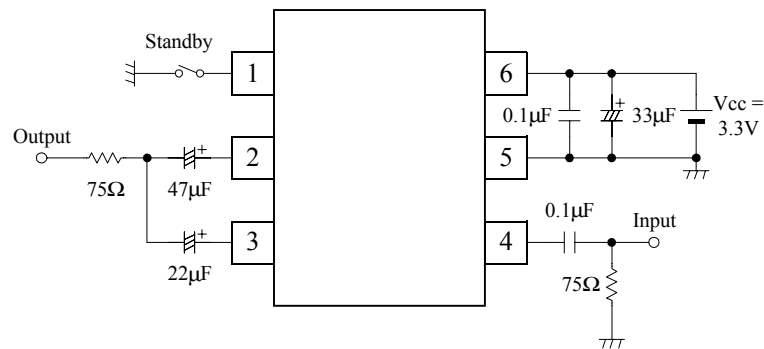
\*  $P_D$  must be decreased at the rate of 4.0mW/ $^\circ\text{C}$  for operation above 25 $^\circ\text{C}$ .

**8 ELECTRICAL CHARACTERISTICS**

$V_{CC}=3.3\text{V}$ ,  $T_a=25^\circ\text{C}$ ,  $V_{in}=0.5\text{V}_{P-P}$ ,  $R_L=150$

Parameter	Symbol	Specification			Units	Conditions
		MIN	TYP	MAX		
Supply Current	$I_{CC}$	-	16.4	25.0	mA	No input
Standby Supply Current	$I_{CCS}$	-	43.0	80.0	$\mu\text{A}$	1pin GND
Standby Terminal Force Current	$I_{fos}$	-	10.0	40.0	$\mu\text{A}$	1pin GND
Threshold Voltage (H=>L)	$V_{THL}$	-	-	0.5	V	1pin Operate => Standby
Threshold Voltage (L=>H)	$V_{TLH}$	1.8	-	-	V	1pin Standby => Operate
Clamp Voltage	$V_{CMP}$	1.08	1.28	1.48	V	4pin
Voltage Gain	$G_V$	10.7	11.2	11.7	dB	$f_{in}=1\text{MHz}$
Differential Gain	DG	-	-1.6	$\pm 5.0$	%	10StepStairs
Differential Phase	DP	-	-2.0	$\pm 5.0$	deg	10StepStairs
Frequency Response	fr	-	0.1	-	dB	$f_{in}=1\text{MHz}/5\text{MHz}$

**9 TEST CIRCUIT**

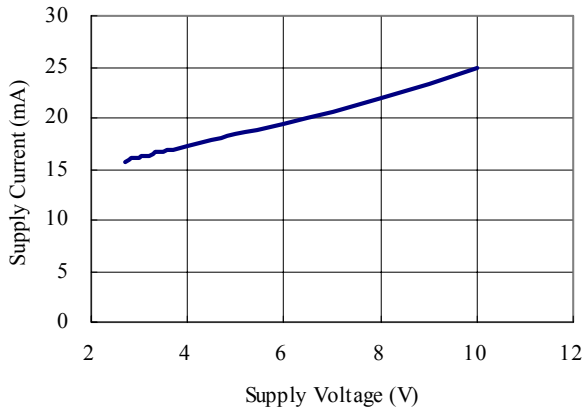


**10 TYPICAL PERFORMANCE CHARACTERISTICS**

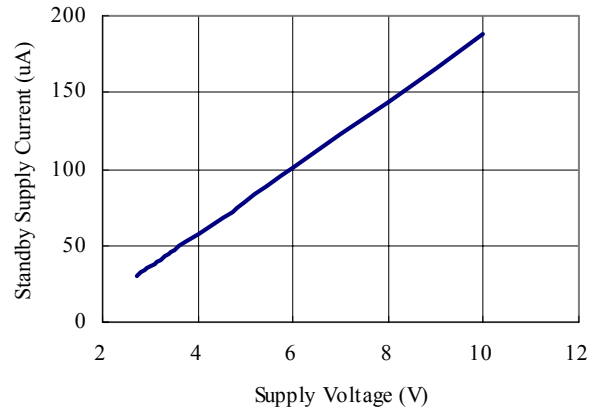
**10-1 Supply voltage variation**

$V_{CC}=2.7 \sim 10.0V, T_a=25^{\circ}C, V_{in}=0.5V_{P-P}, R_L=150\Omega$

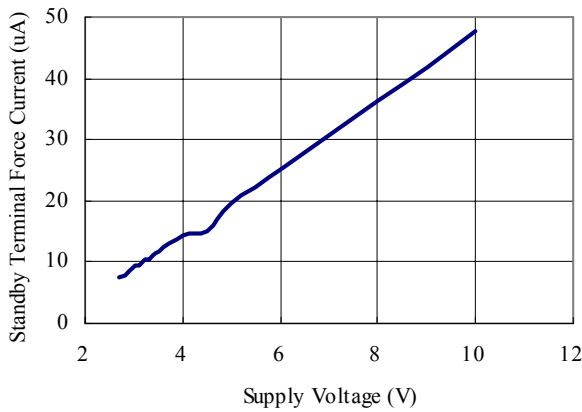
Supply Current



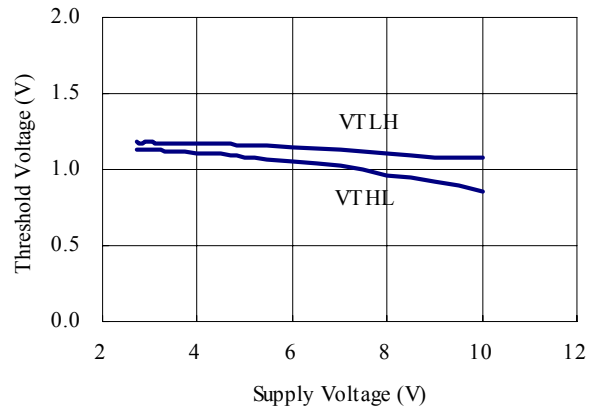
Standby Supply Current



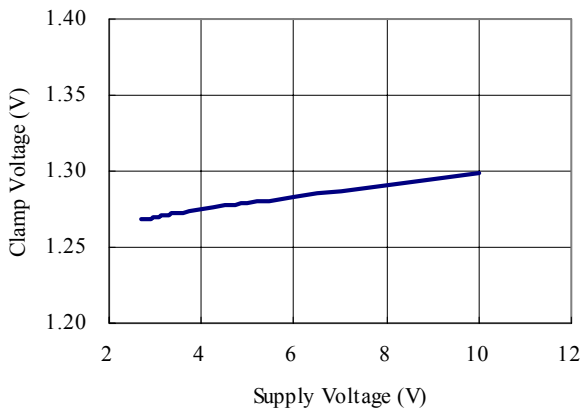
Standby Terminal Force Current



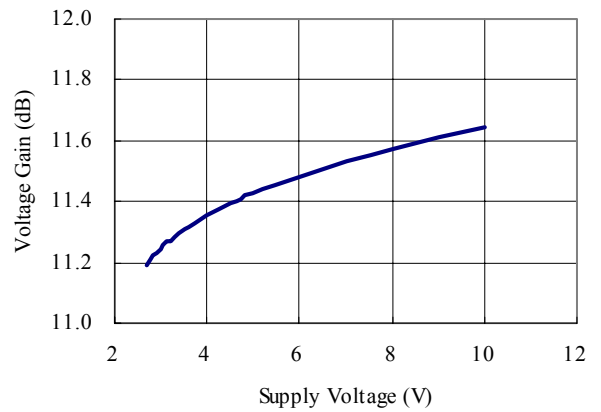
Threshold Voltage



Clamp Voltage

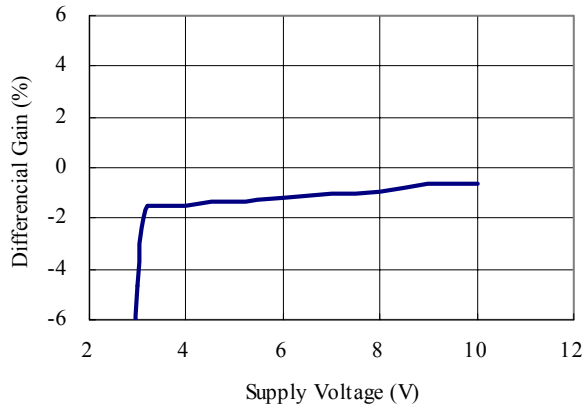


Voltage Gain

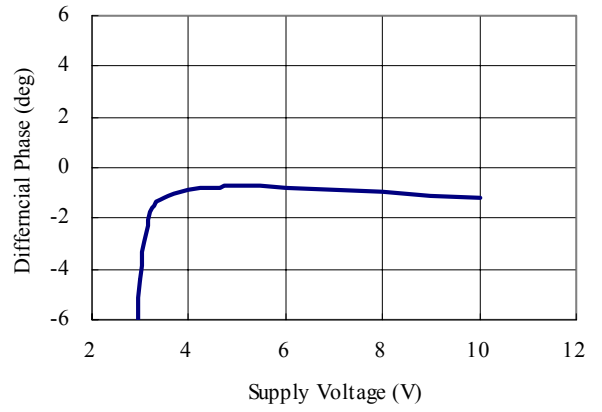


$V_{CC}=2.7 \sim 10.0V$ ,  $T_a=25^\circ C$ ,  $V_{in}=0.5V_{p-p}$ ,  $R_L=150\Omega$

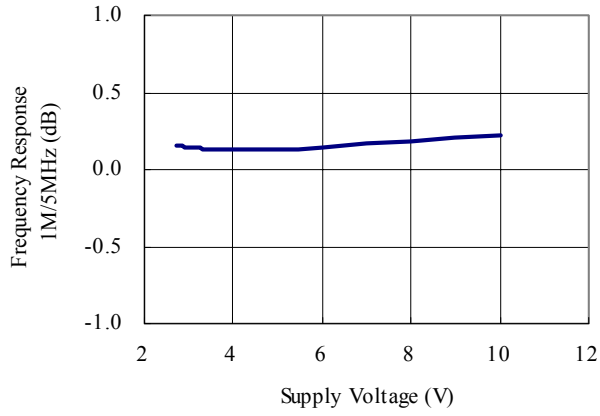
Differential Gain



Differential Phase



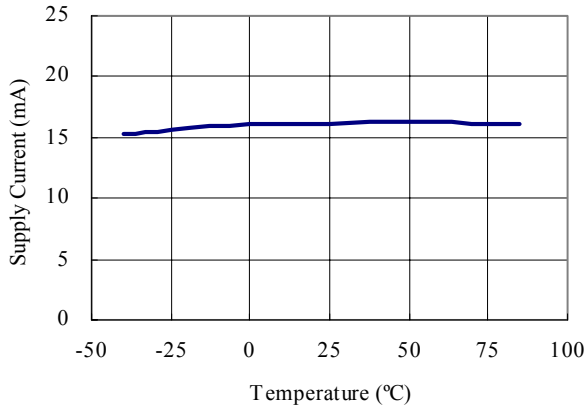
Frequency Response



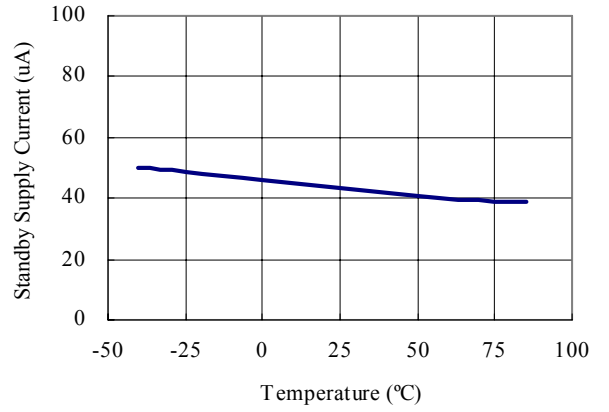
**10-2 Ambient temperature variation**

$V_{CC}=3.3V, T_a=-40 \sim 85^{\circ}C, V_{in}=0.5V_{p-p}, R_L=150\Omega$

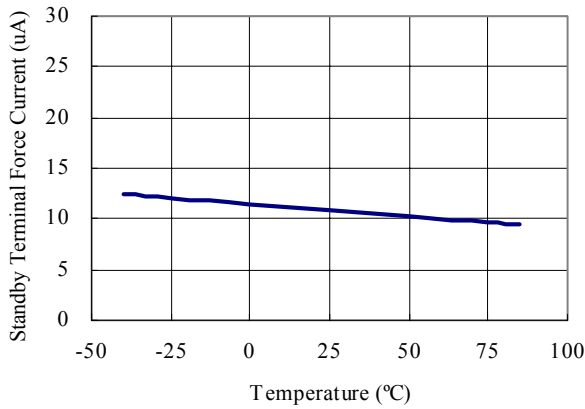
Supply Current



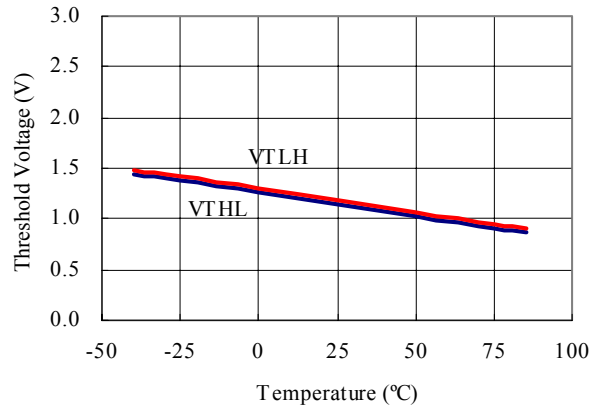
Standby Supply Current



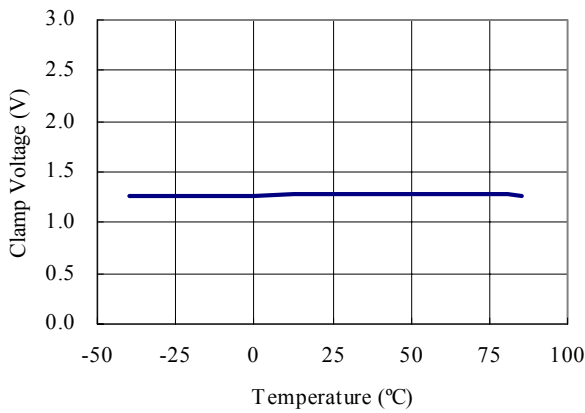
Standby Terminal Force Current



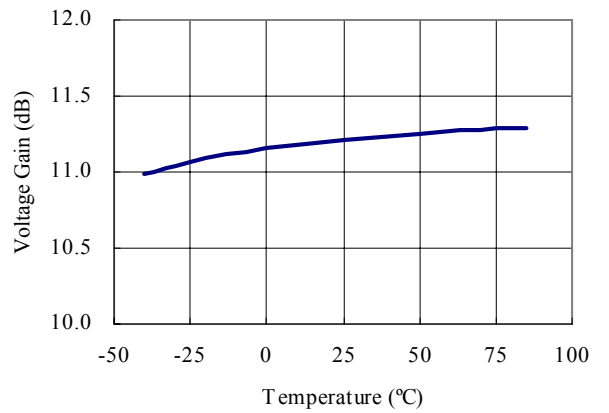
Threshold Voltage



Clamp Voltage

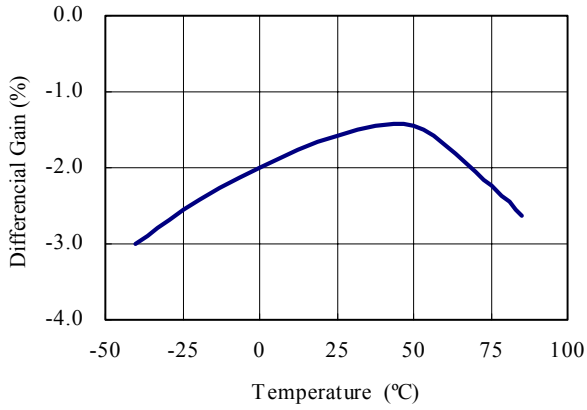


Voltage Gain

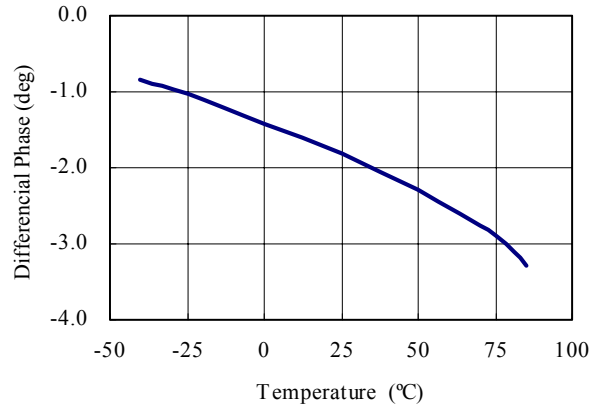


$V_{CC}=3.3V, T_a=-40 \sim 85^{\circ}C, V_{in}=0.5V_{p-p}, R_L=150\Omega$

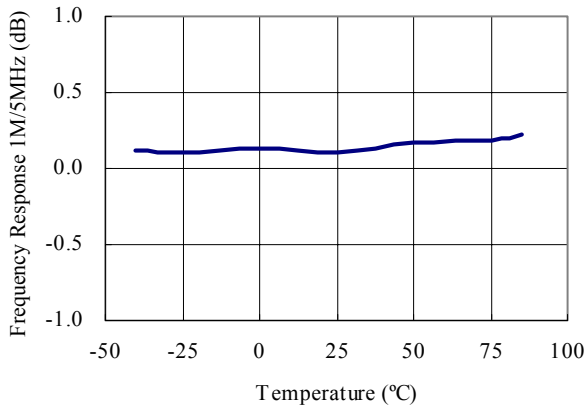
Differential Gain



Differential Phase



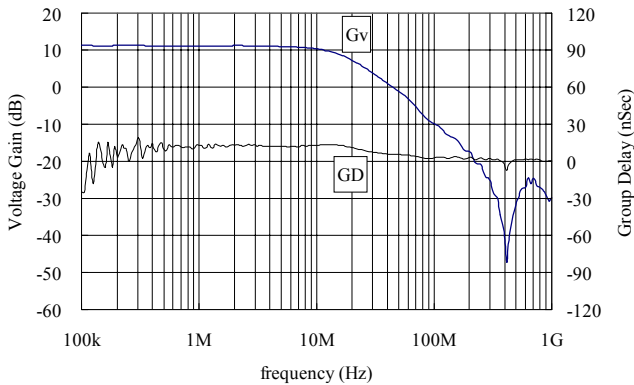
Frequency Response



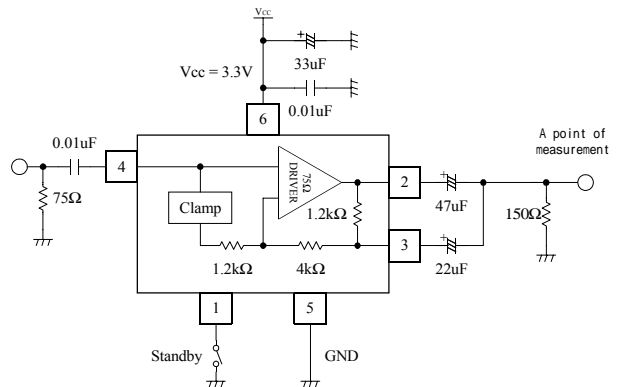
**10-3 Frequency characteristics**

$V_{CC}=3.3V, T_a=25^{\circ}C, V_{in}=0.5V_{p-p}, R_L=150\Omega$

Voltage Gain, Group Delay



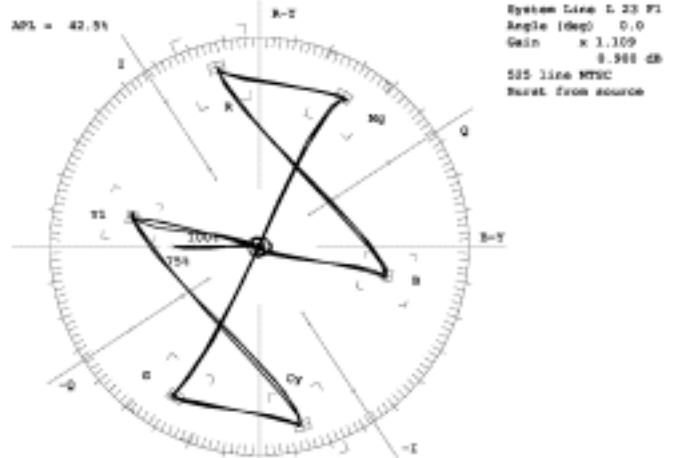
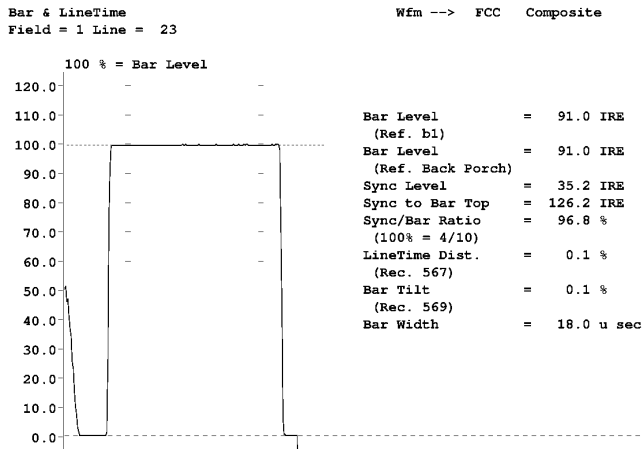
Test Circuit



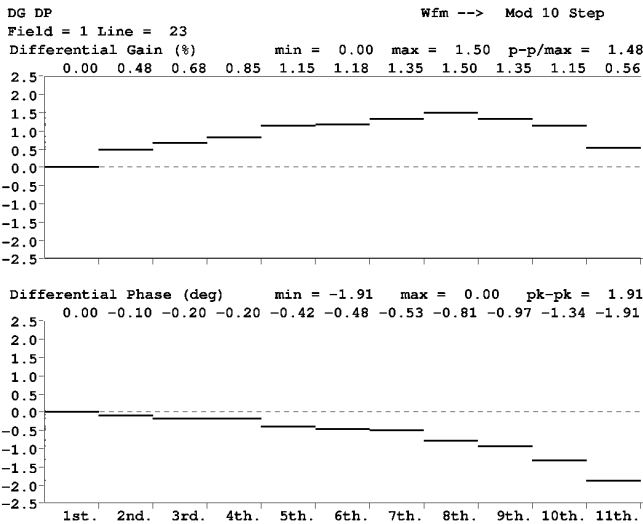
**10-4 Video signal characteristics**

$V_{CC}=3.3V, T_a=25^{\circ}C, V_{in}=0.5_{p-p}, R_L=150\Omega$   
Color Bar

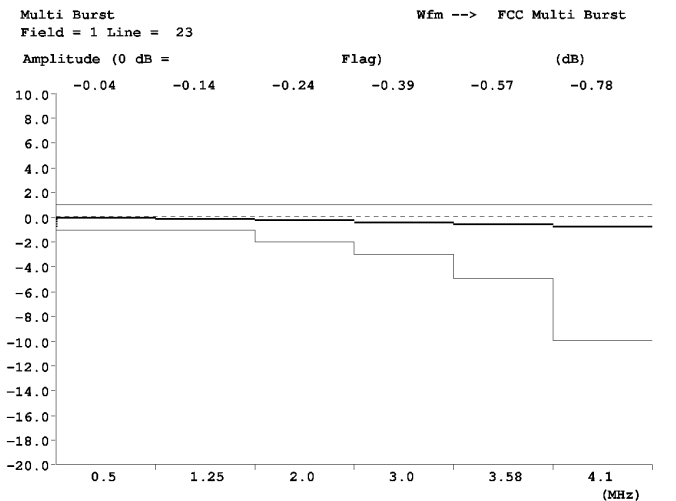
**Bar and Line Time**



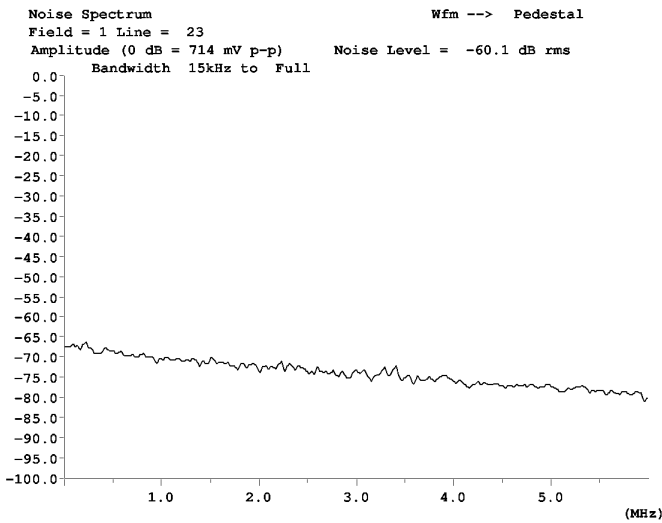
**DG, DP**



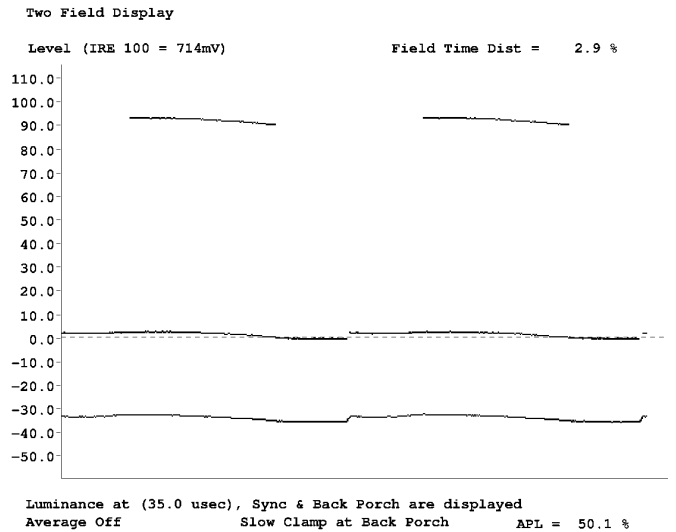
**Multi Burst**



**Noise Spectrum**



**Two Field**



**11 PIN DESCRIPTION**

Pin No.	Pin Description	Internal Equivalent Circuit	Description
1	Standby		Standby logic terminal. Low → Standby. Open, or High → Operate.
2 3	Output SAG		Output terminal. It is impossible to drive 150Ω(75Ω+75Ω). SAG terminal.
4	Input		Input terminal. The Sink-tip-bottom is clamped at input.
5	GND		GND terminal.
6	V <sub>CC</sub>		V <sub>CC</sub> terminal.

12 APPLICATIONS INFORMATION

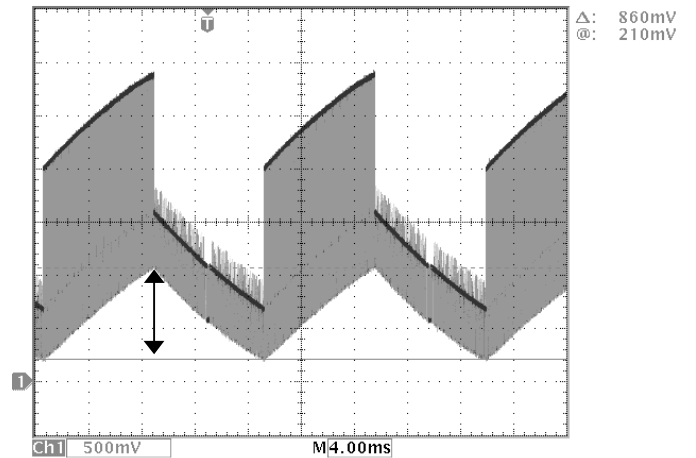
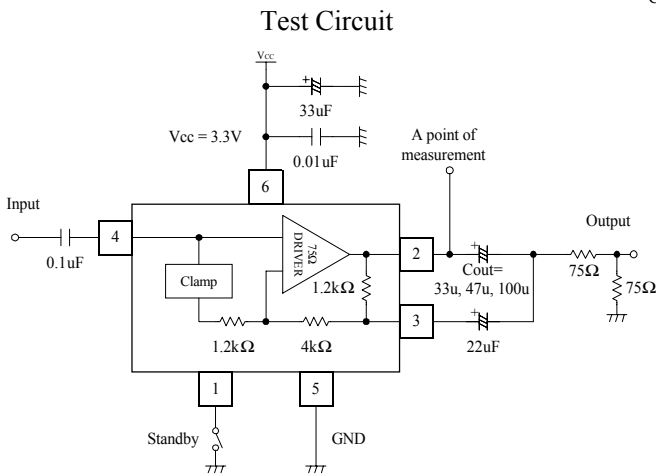
The low voltage operation is achieved with TK15467S. Therefore, please pay attention to the output capacitor. In case of changing  $V_{CC}$  by changing the video driver, refer this data sheet and reconsider the external components.

12-1 Output coupling capacity

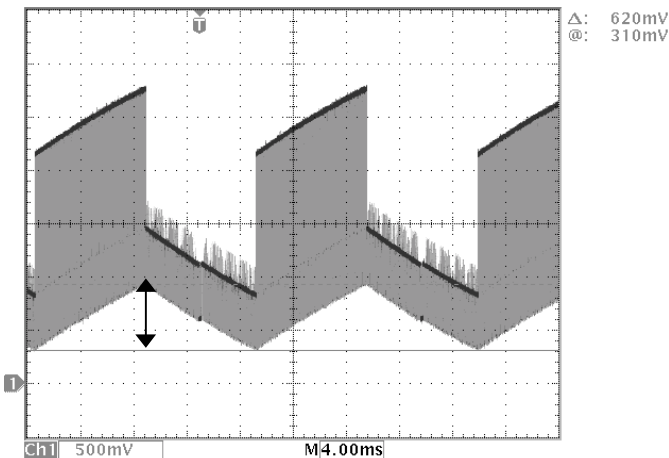
$C_{out}=47\mu F$ , and  $C_{sag}=22\mu F$  are recommended as a standard value. In case of changing capacity value, please refer to the characteristics shown below.

Following waveforms are measured by with different  $C_{out}$ . "Field Square Wave" is used as input signal for measurement whose output alternately black and white color in same screen as stripe, with the  $C_{sag}$  capacity no change.

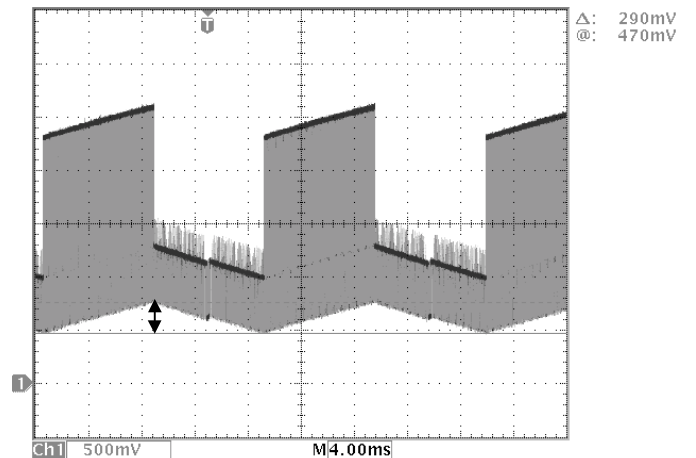
$V_{CC}=3.3V$ ,  $T_a=25^\circ C$ ,  $V_{in}=0.5V_{P-P}$ (Field Square Wave),  $R_L=150\Omega$   
 $C_{OUT}=33\mu F$ ,  $C_{SAG}=22\mu F$



$C_{OUT}=47\mu F$ ,  $C_{SAG}=22\mu F$



$C_{OUT}=100\mu F$ ,  $C_{SAG}=22\mu F$



Different SAG waveforms can be seen at the output when the  $C_{out}$  value was changed.

The SAG waveform will be smaller with larger  $C_{out}$ . The SAG voltage is 290mV with  $C_{out} 100\mu F$ , and 860mV with  $33\mu F$ .

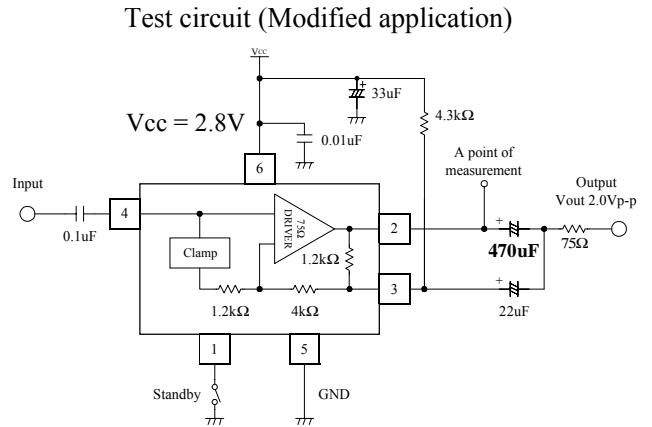
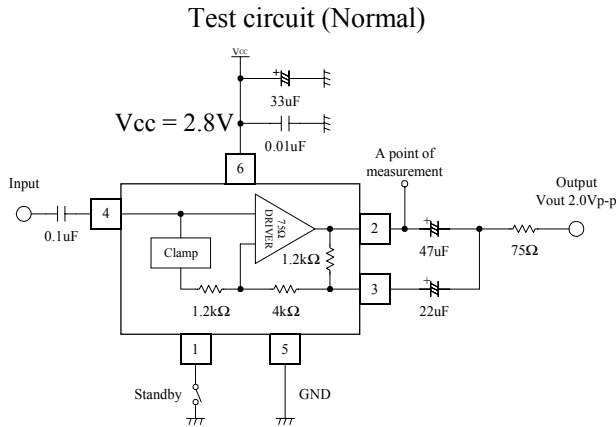
Actually, the waveforms appeared at the IC terminal are the mixed signal of the SAG voltage and Video signal. For example, output amplitude is 2.86V with  $C_{out} 33\mu F$  (SAG voltage 0.86V and video signal amplitude 2.0V). When  $47\mu F$  or larger value was used, SAG is compensated. Therefore we recommend to use larger than  $47\mu F$ .

### 12-2 Low voltage operation

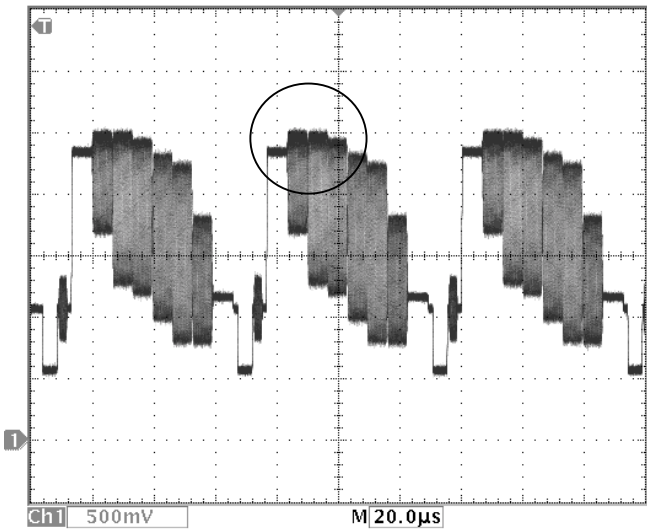
The internal bias voltage of the TK15467S is independent of  $V_{CC}$ . If this IC is used with lower  $V_{CC}$  than standard application, and output dynamic range is not enough, please reduce the bias voltage of the output terminal.

By reducing the value of  $V_{CC}$ , difference between necessary maximum amplitude of the video signal and the available maximum amplitude voltage will be small. It is necessary to reduce SAG voltage to enlarge the dynamic range at the output. For example, increase  $C_{out}$  value, and connect resistance between SAG terminal (3Pin) and  $V_{CC}$  terminal (6Pin) to reduce output terminal voltage.

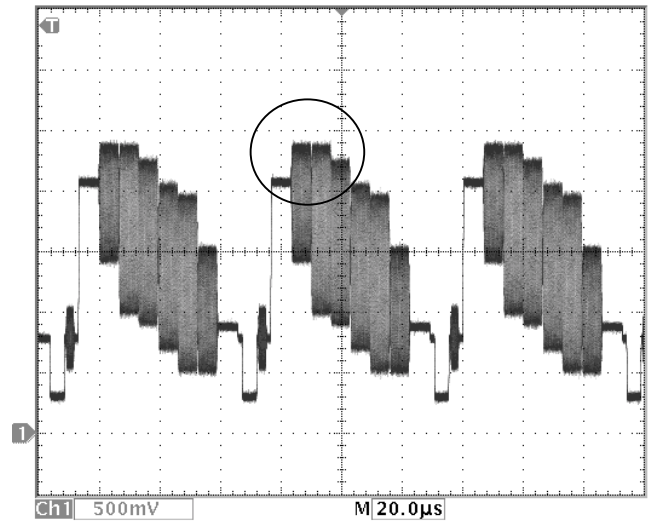
Below shows the output waveforms at  $V_{CC}=2.8V$  by changing the application. “100% Color Bar” signal was used for measurement.



Waveforms of the standard application



Waveforms of the modified application



The waveform of the standard application shows supply-side signal is saturated. On the other hand, the waveform shows no problem with the modified application. In this case, we set  $V_{CC}$  at extremely low voltage ( $V_{CC}=2.8V$ ), but it is available to use in low voltage with different value of external components. Please check and select the most suitable value for your application.

**13. NOTES**

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- Power drive products for automobile, ship or aircraft transport systems; steering and navigation systems, emergency signal communications systems, and any system other than those mentioned above which include electronic sensors, measuring, or display devices, and which could cause major damage to life, limb or property if misused or failure to function.

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■ None of the ozone depleting substances(ODS) under the Montreal Protocol are used in our manufacturing process.

**14. OFFICES**

If you need more information on this product and other TOKO products, please contact us.

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 1-17, Higashi-yukigaya 2-chome, Ohta-ku, Tokyo,  
 145-8585, Japan  
 TEL: +81.3.3727.1161  
 FAX: +81.3.3727.1176 or +81.3.3727.1169  
 Web site: <http://www.toko.co.jp/>

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