Application Manual

75Ω Video Line Driver with internal Clamp Circuit
TK15405BM, TK15417BM

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MEETING YOUR NEEDS
TOKO, Inc.

75Ω Video Line Driver with internal Clamp Circuit
TK15405BM, TK15417BM

1. DESCRIPTION

The TK15405BM and the TK15417BM are a single-channel 75Ω video line driver IC that has internal clamp circuit. The standard video input signal is internally clamped at 1.22V. The TK15405BM amplified G_V =6dB and the TK15417BM amplified G_V =12dB which can select by input video signal peak to peak.
The SAG terminal can reduce the output coupling capacitor size.
The standby circuit can reduce the supply current when Pin 1 connects to ground.

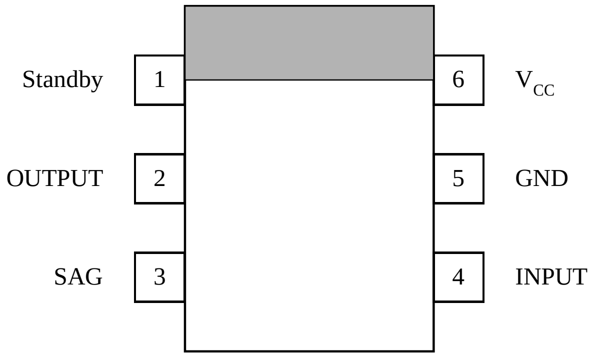
2. FEATURES

- Internal Clamp circuit
- Active high ON/OFF Control with Pull-up
- Very Small Output Capacitor Using SAG Function Pin
- Very Small Application by Small Package and SAG Function

3. APPLICATIONS

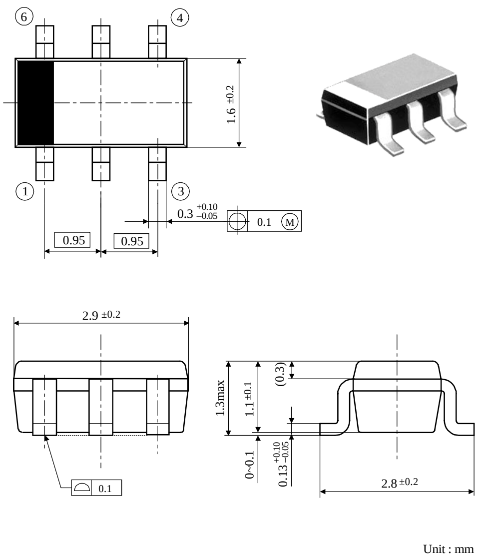
- Digital Still Camera
- Camcorder
- Portable Video Equipment

4. PIN CONFIGURATION



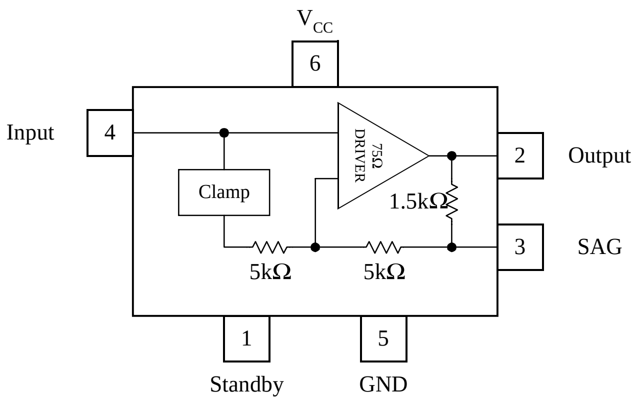
5. PACKAGE OUTLINE

- SOT23-6

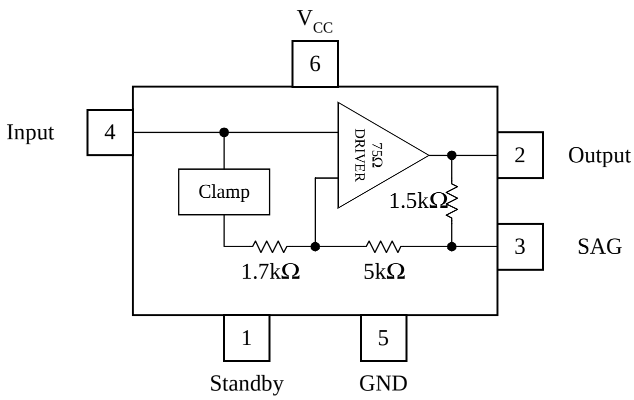


6. BLOCK DIAGRAM

6-1. TK15405BM



6-2. TK15417BM



7. ABSOLUTE MAXIMUM RATINGS

T_A =25°C

PARAMETER	SYMBOL	RATING	UNIT	CONDITIONS
Supply Voltage	V_{CC}	12.0	V	
Power Dissipation	P_D	350	mW	Note
Storage Temperature Range	T_{STG}	-55 to +150	°C	
Operating Temperature Range	T_{OP}	-40 to +85	°C	
Maximum Operating Frequency	f_{MAX}	Up to 20	MHz	
Operating Voltage Range	V_{OP}	4.5 to 10.0	V	

Note: Power dissipation is 350mW. Derate at 2.8mW/°C for operation above T_A =25°C.

8. ELECTRICAL CHARACTERISTICS

8-1. TK15405BM

V_{CC} =5.0V, V_{IN} =1.0Vp-p, R_L =150Ω, T_A =25°C

PARAMETER	SYMBOL	VALUE			UNIT	TEST CONDITION
		MIN	TYP	MAX		
Operating Voltage	V_{OP}	4.5	–	10.0	V	
Supply Current	I_{CC}	–	7.5	10.0	mA	No Input
Standby Supply Current	I_{CCS}	–	22.0	50.0	μA	Pin 1 Grounded
Standby Terminal Current	I_{FOS}	–	12.0	50.0	μA	Pin 1 in Standby mode
Standby Threshold Voltage (High to Low)	V_{THL}	–	–	0.6	V	Pin 1 Operating to Standby mode
Standby Threshold Voltage (Low to High)	V_{TLH}	1.8	–	–	V	Pin 1 Standby to Operating mode
Clamp Voltage	V_{CMP}	1.05	1.22	1.45	V	Pin 4 Input terminal
Voltage Gain	GV	5.5	6.0	6.5	dB	f_{IN} = 1MHz
Differential Gain	DG	-3.0	-1.1	+3.0	%	Staircase signal input
Differential Phase	DP	-3.0	0.2	+3.0	deg	Staircase signal input
Frequency Response	f_r	–	-0.1	–	dB	f_{IN} = 1MHz / 5MHz

Note: This IC is operating mode when Pin 1 is connected high level or open.

8-2. TK15417BM

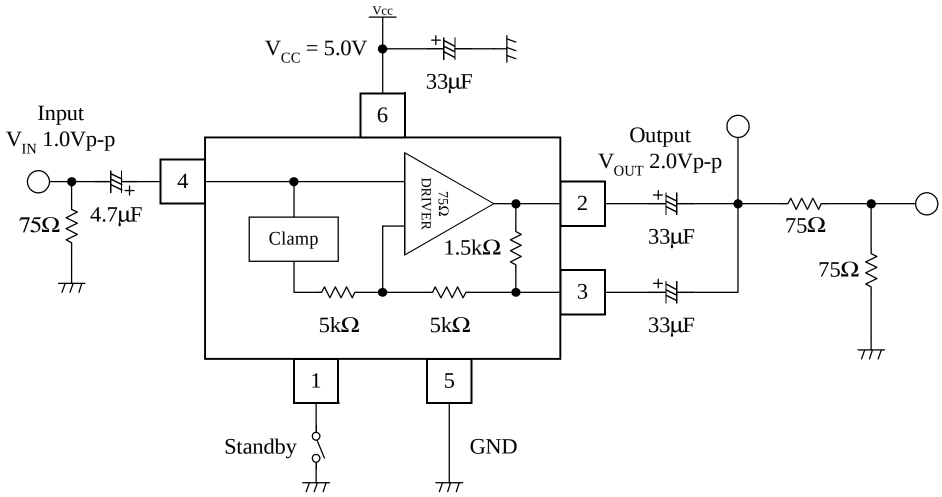
V_{CC} =5.0V, V_{IN} =0.5Vp-p, R_L =150Ω, T_A =25°C

PARAMETER	SYMBOL	VALUE			UNIT	TEST CONDITION
		MIN	TYP	MAX		
Operating Voltage	V_{OP}	4.5	–	10.0	V	
Supply Current	I_{CC}	–	7.5	10.0	mA	No Input
Standby Supply Current	I_{CCS}	–	22.0	50.0	μA	Pin 1 Grounded
Standby Terminal Current	I_{FOS}	–	12.0	50.0	μA	Pin 1 in Standby mode
Standby Threshold Voltage (High to Low)	V_{THL}	–	–	0.6	V	Pin 1 Operating to Standby mode
Standby Threshold Voltage (Low to High)	V_{TLH}	1.8	–	–	V	Pin 1 Standby to Operating mode
Clamp Voltage	V_{CMP}	1.05	1.22	1.45	V	Pin 4 Input terminal
Voltage Gain	GV	11.4	11.9	12.4	dB	f_{IN} = 1MHz
Differential Gain	DG	-3.0	-1.2	+3.0	%	Staircase signal input
Differential Phase	DP	-3.0	0.4	+3.0	deg	Staircase signal input
Frequency Response	f_r	–	0.0	–	dB	f_{IN} = 1MHz / 5MHz

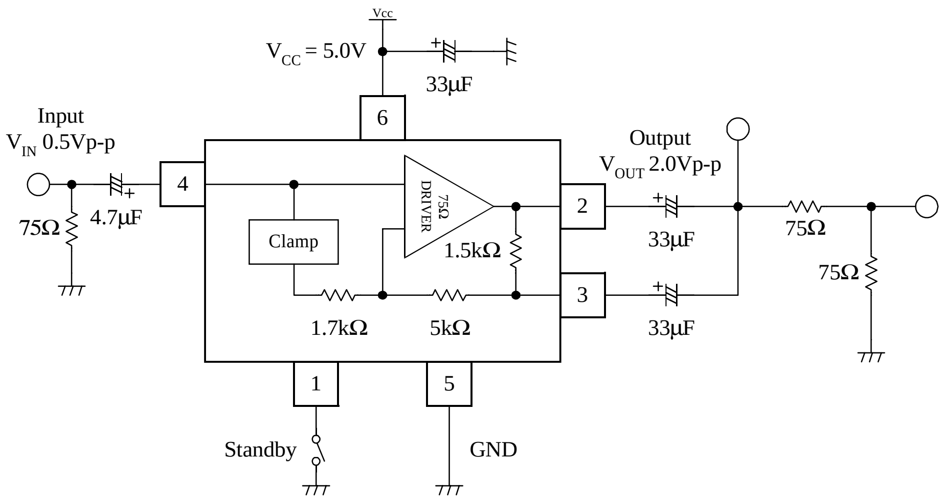
Note: This IC is operating mode when Pin 1 is connected high level or open.

9. TEST CIRCUIT

9-1. TK15405BM



9-2. TK15417BM

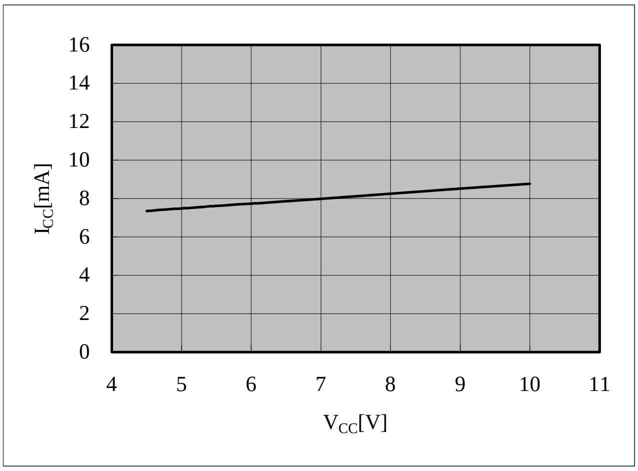


10. TYPICAL CHARACTERISTICS

10-1. TK15405BM

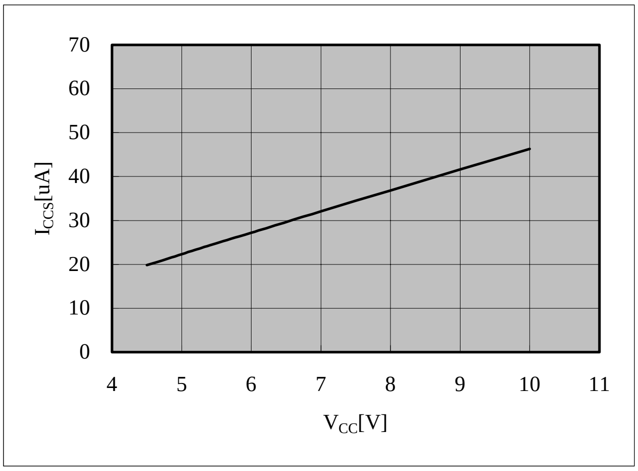
■ Supply Current vs. Supply Voltage

T_A =25°C



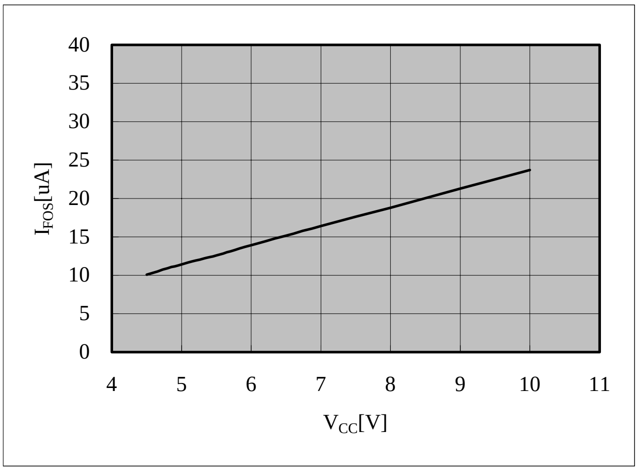
■ Standby Supply Current vs. Supply Voltage

T_A =25°C



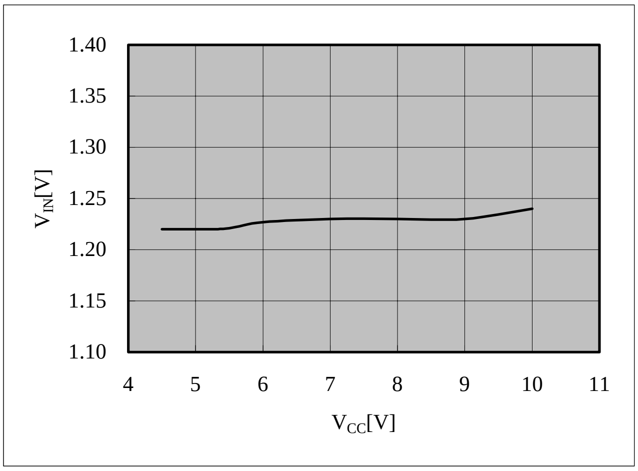
■ Standby Terminal Current vs. Supply Voltage

T_A =25°C



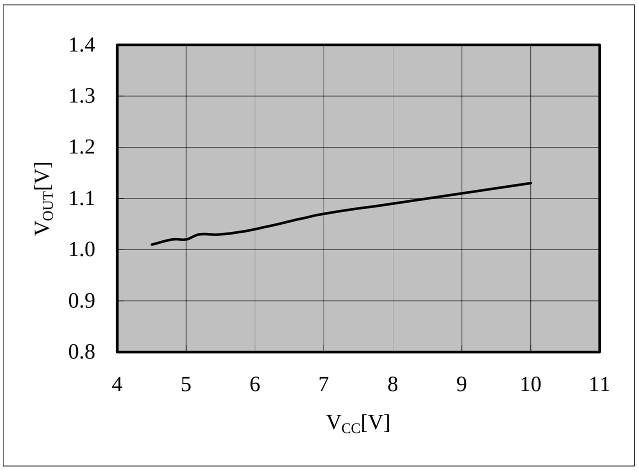
■ Input Terminal Voltage vs. Supply Voltage

T_A =25°C



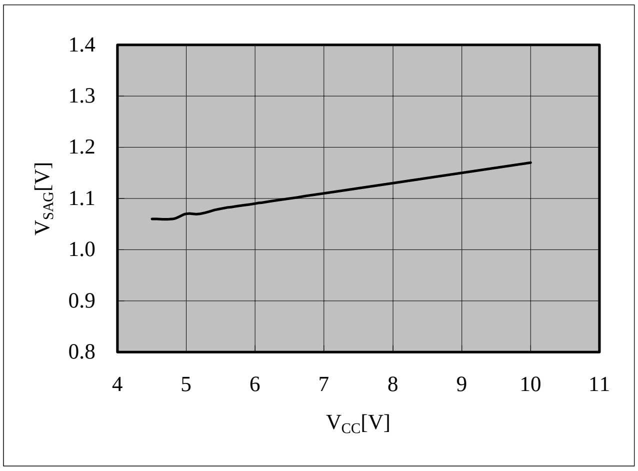
■ Output Terminal Voltage vs. Supply Voltage

T_A =25°C



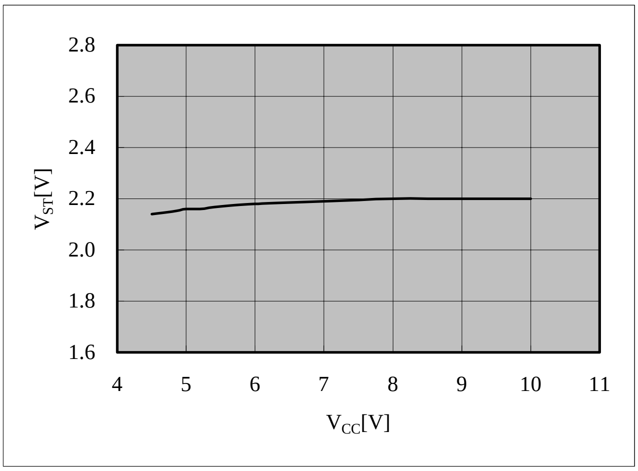
■ SAG Terminal Voltage vs. Supply Voltage

T_A =25°C



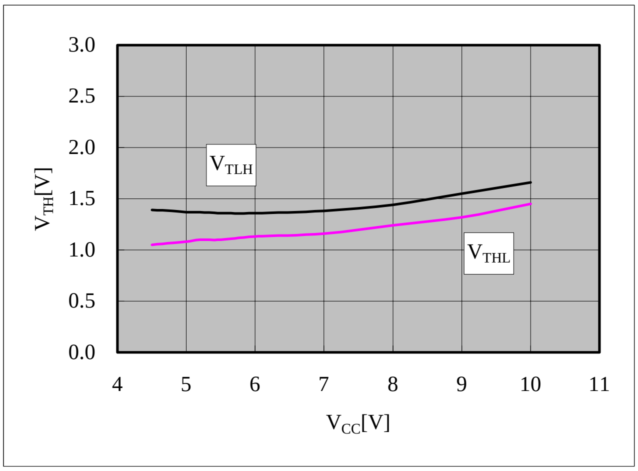
■ Standby Terminal Voltage vs. Supply Voltage

T_A =25°C



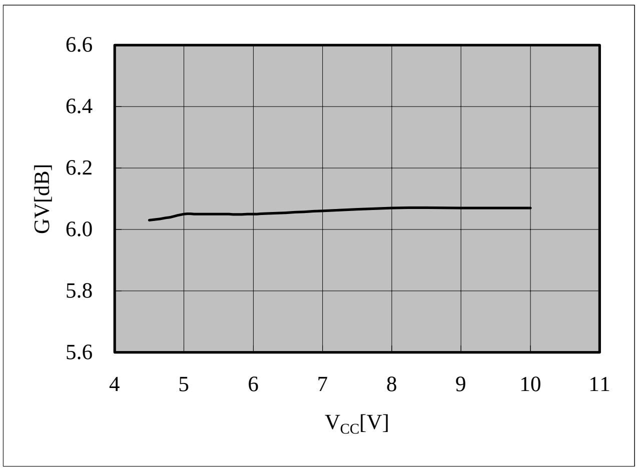
■ Threshold Voltage vs. Supply Voltage

T_A =25°C



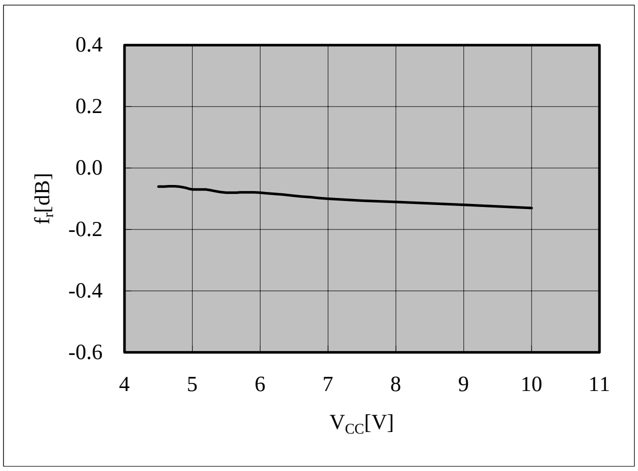
■ Voltage Gain vs. Supply Voltage

f_{IN} =1MHz, V_{IN} =1.0Vp-p, R_L =150Ω, T_A =25°C



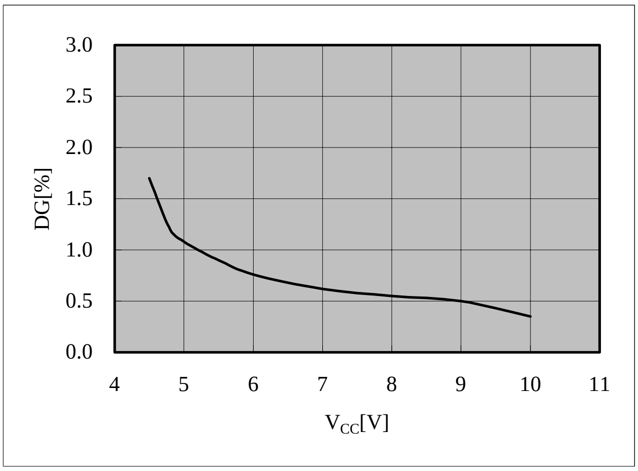
■ Frequency Response vs. Supply Voltage

f_{IN} =1MHz/5MHz, V_{IN} =1.0Vp-p, R_L =150Ω, T_A =25°C



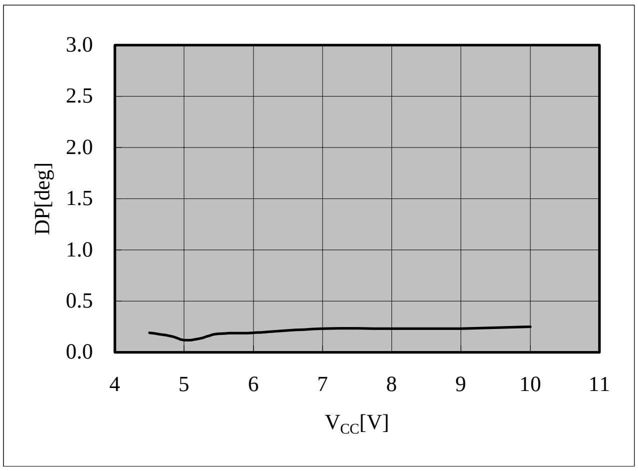
■ Differential Gain vs. Supply Voltage

Staircase Signal Input, R_L =150Ω, T_A =25°C



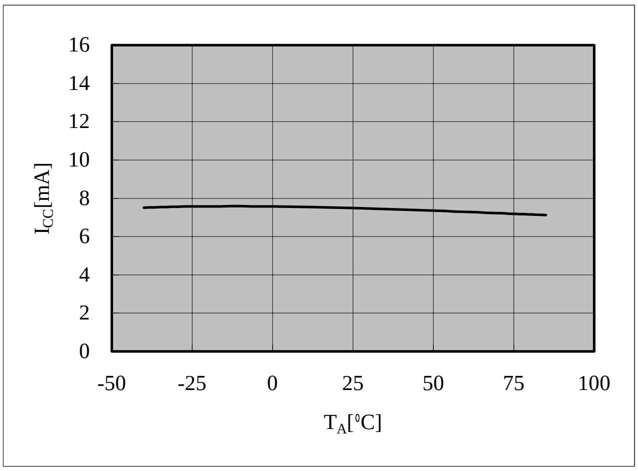
■ Differential Phase vs. Supply Voltage

Staircase Signal Input, R_L =150Ω, T_A =25°C



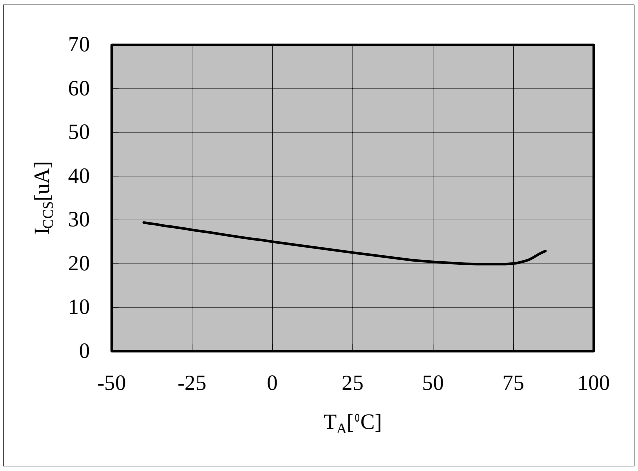
■ Supply Current vs. Temperature

V_{CC} =5.0V



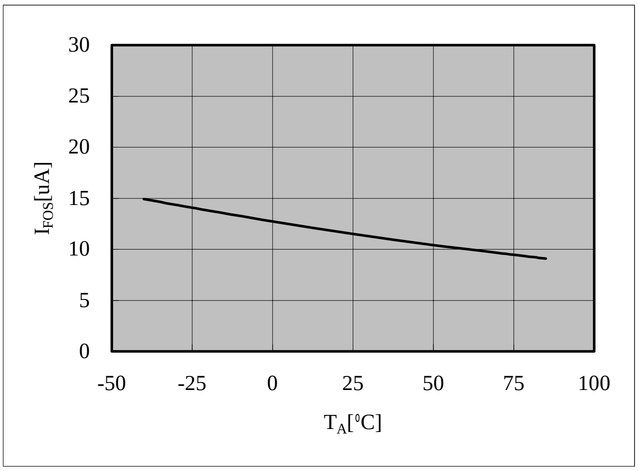
■ Standby Supply Current vs. Temperature

V_{CC} =5.0V



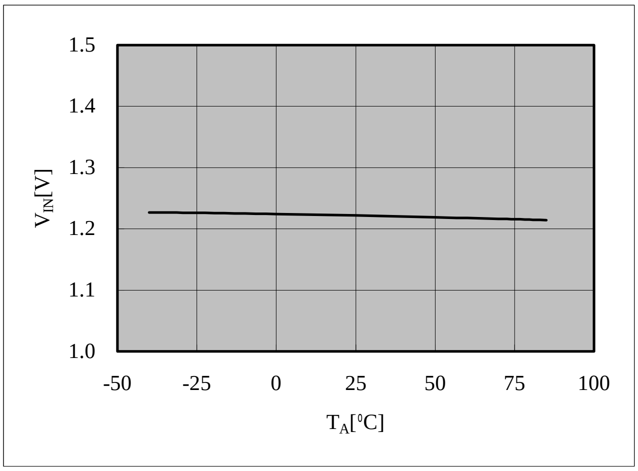
■ Standby Terminal Current vs. Temperature

V_{CC} =5.0V



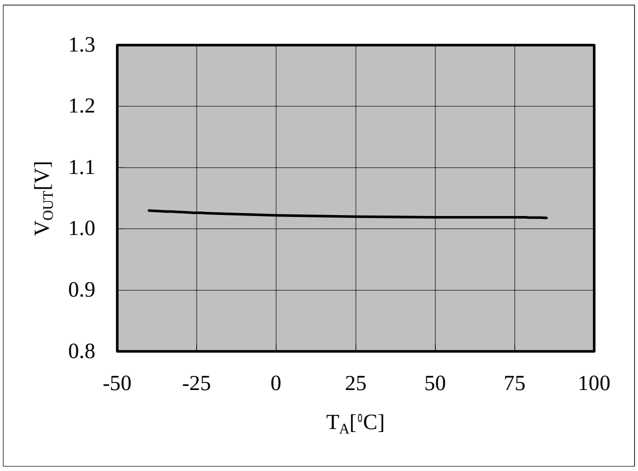
■ Input Terminal Voltage vs. Temperature

V_{CC} =5.0V



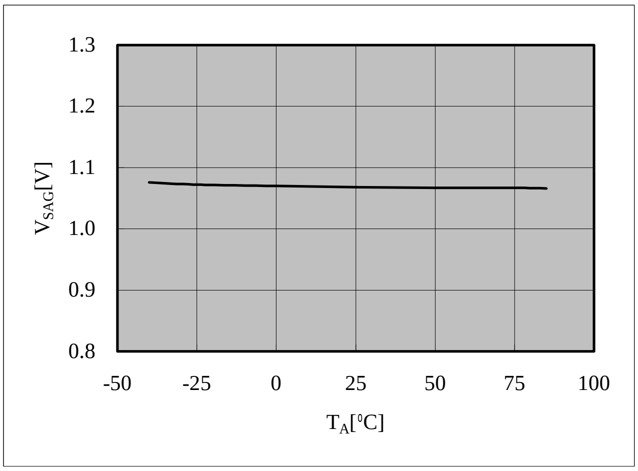
■ Output Terminal Voltage vs. Temperature

V_{CC} =5.0V



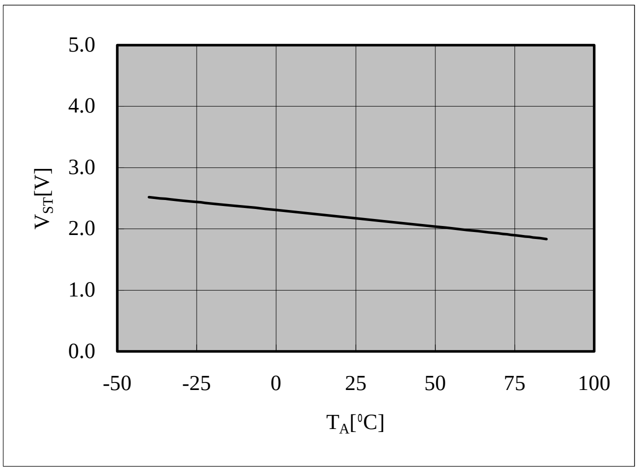
■ SAG Terminal Voltage vs. Temperature

V_{CC} =5.0V



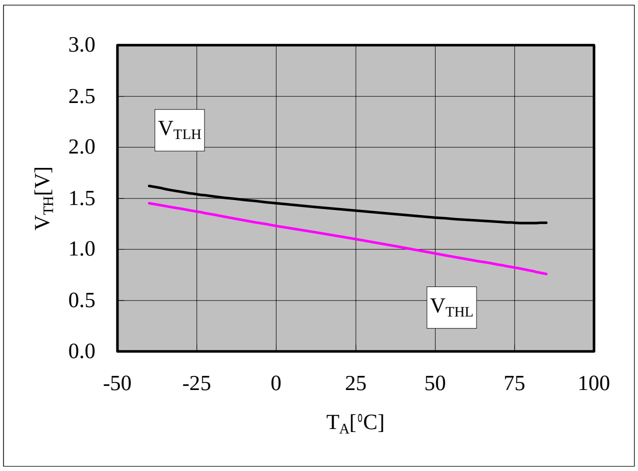
■ Standby Terminal Voltage vs. Temperature

V_{CC} =5.0V



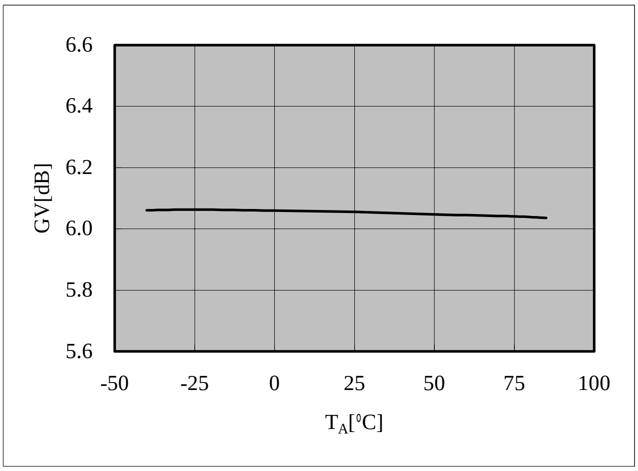
■ Threshold Voltage vs. Temperature

V_{CC} =5.0V



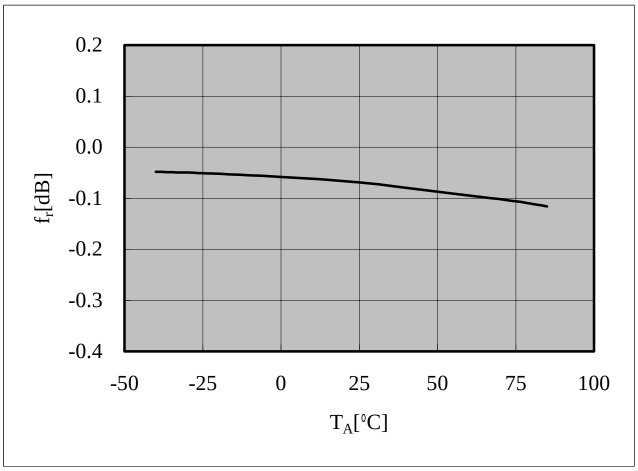
■ Voltage Gain vs. Temperature

f_{IN} =1MHz, V_{IN} =1.0Vp-p, R_L =150Ω, V_{CC} =5.0V



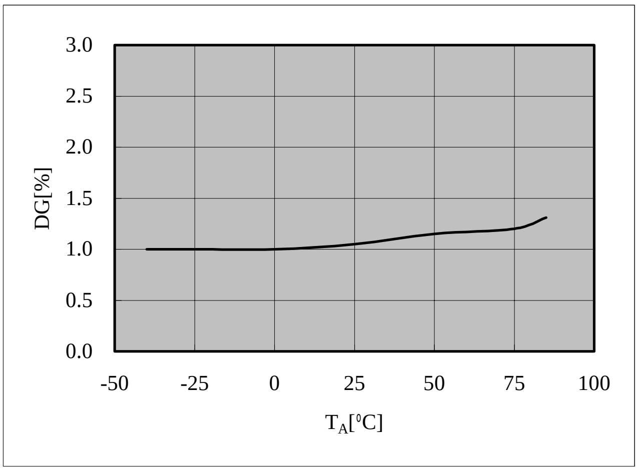
■ Frequency Response vs. Temperature

f_{IN} =1MHz/5MHz, V_{IN} =1.0Vp-p, R_L =150Ω, V_{CC} =5.0V



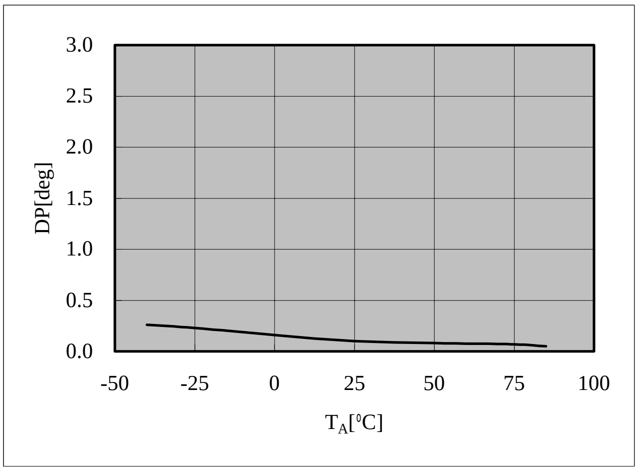
■ Differential Gain vs. Temperature

Staircase Signal Input, R_L =150Ω, V_{CC} =5.0V

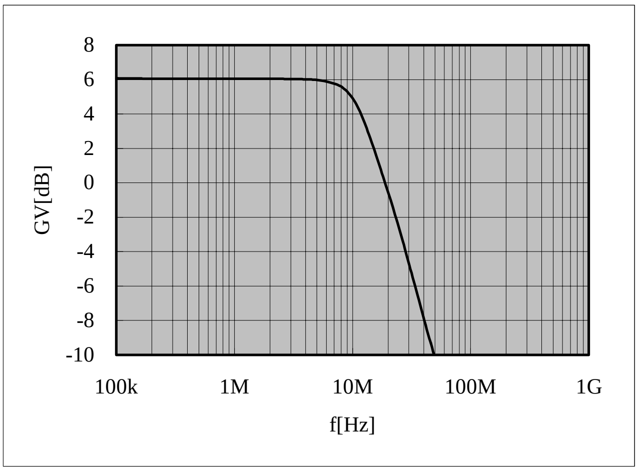


■ Differential Phase vs. Temperature

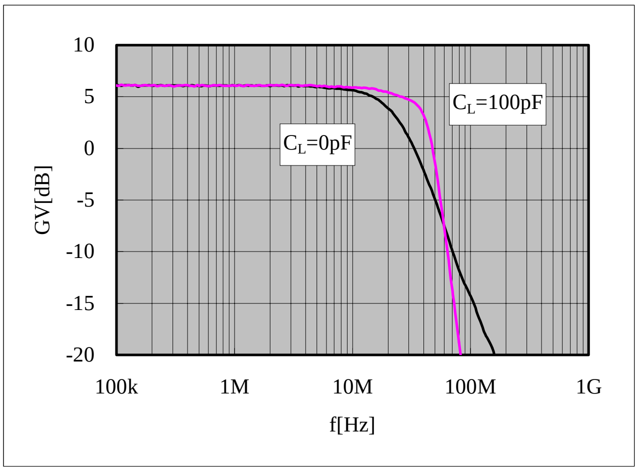
Staircase Signal Input, R_L =150Ω, V_{CC} =5.0V



■ Voltage Gain vs. Frequency (V_{IN} =1.0Vp-p)
V_{CC} =5.0V, R_L =150Ω, T_A =25°C

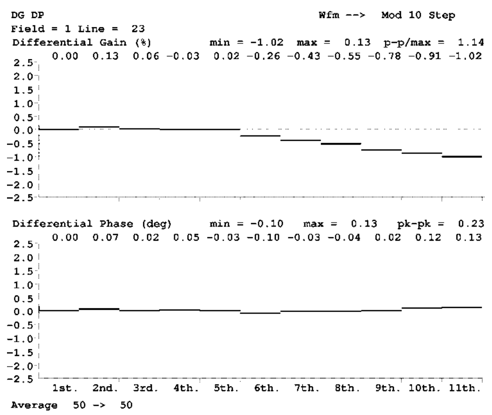


■ Voltage Gain vs. Frequency (Small Input Signal)
V_{CC} =5.0V, R_L =150Ω, T_A =25°C



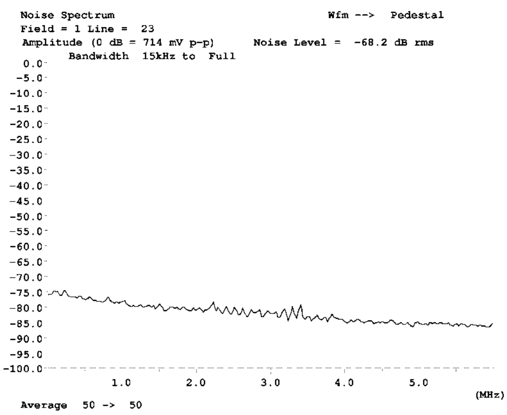
■ DG and DP Characteristics
V_{CC} =5.0V, R_L =150Ω, T_A =25°C

VM700A Video Measurement Set



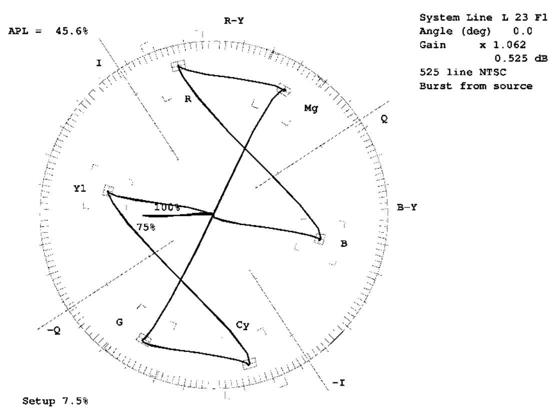
■ Signal to Noise Ratio
V_{CC} =5.0V, R_L =150Ω, T_A =25°C

VM700A Video Measurement Set



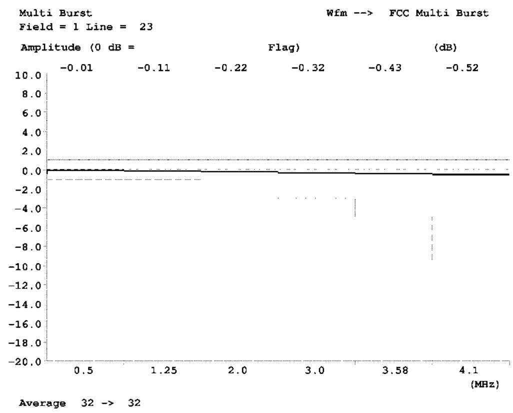
■ Color Bar Characteristic
V_{CC} =5.0V, R_L =150Ω, T_A =25°C

VM700A Video Measurement Set



■ Multi Burst Characteristic
V_{CC} =5.0V, R_L =150Ω, T_A =25°C

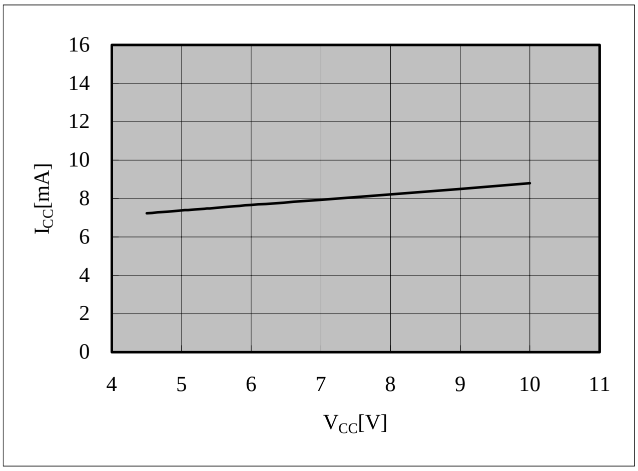
VM700A Video Measurement Set



10-2. TK15417BM

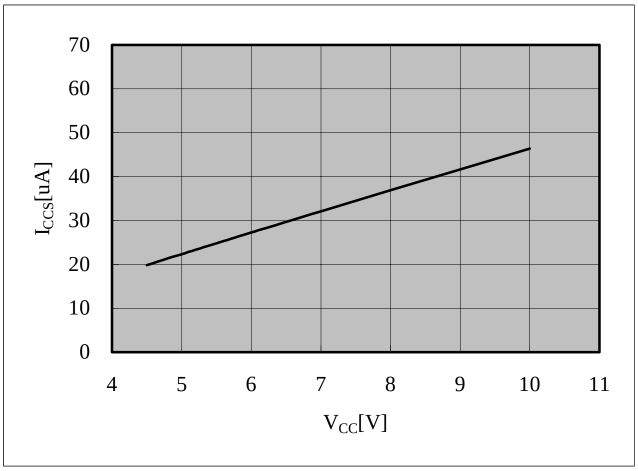
■ Supply Current vs. Supply Voltage

T_A =25°C



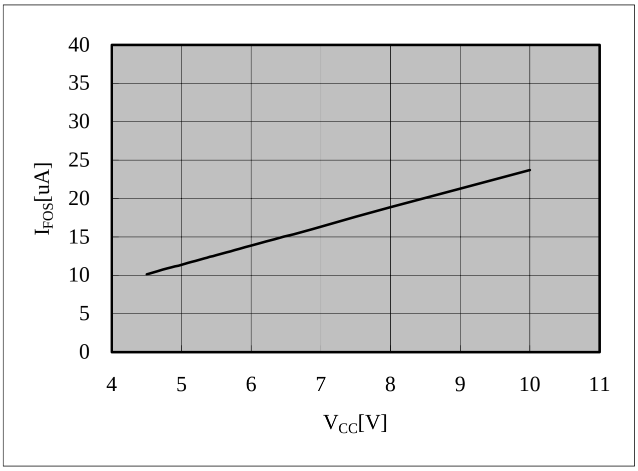
■ Standby Supply Current vs. Supply Voltage

T_A =25°C



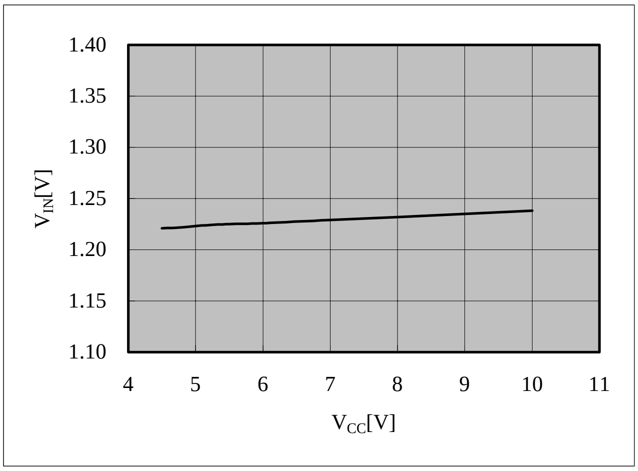
■ Standby Terminal Voltage vs. Supply Voltage

T_A =25°C



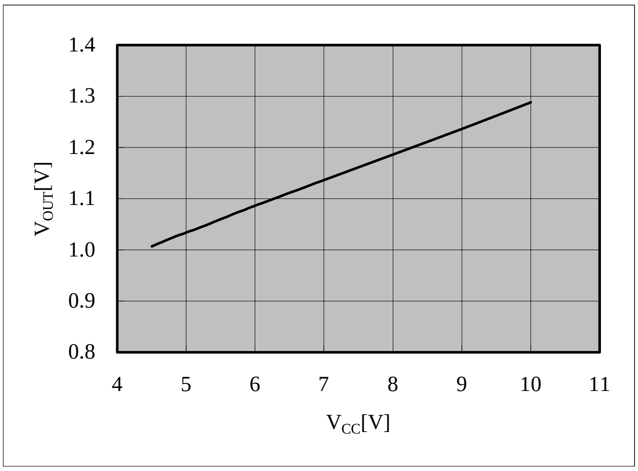
■ Input Terminal Voltage vs. Supply Voltage

T_A =25°C



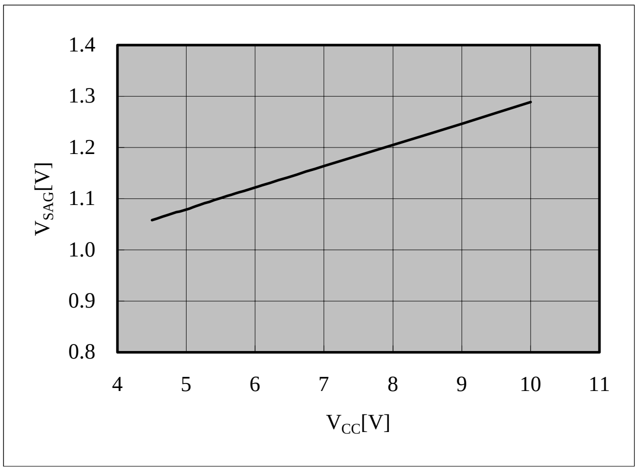
■ Output Terminal Voltage vs. Supply Voltage

T_A =25°C



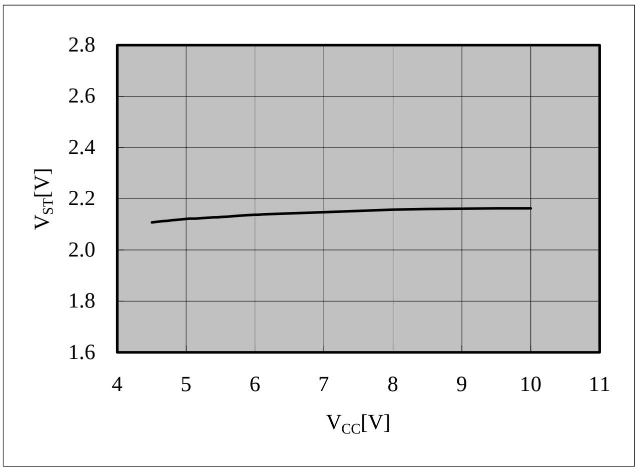
■ SAG Terminal Voltage vs. Supply Voltage

T_A =25°C



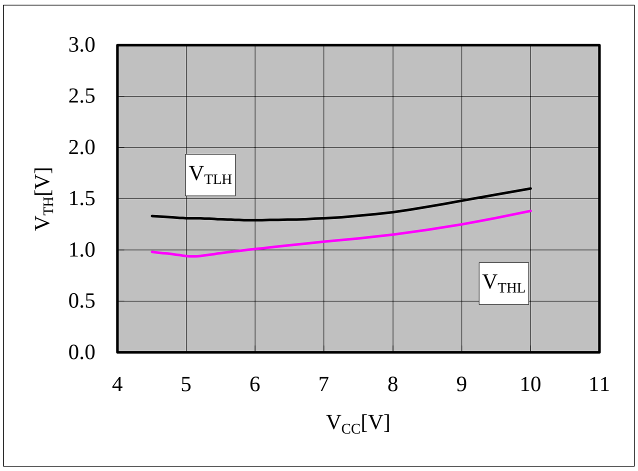
■ Standby Terminal Voltage vs. Supply Voltage

T_A =25°C



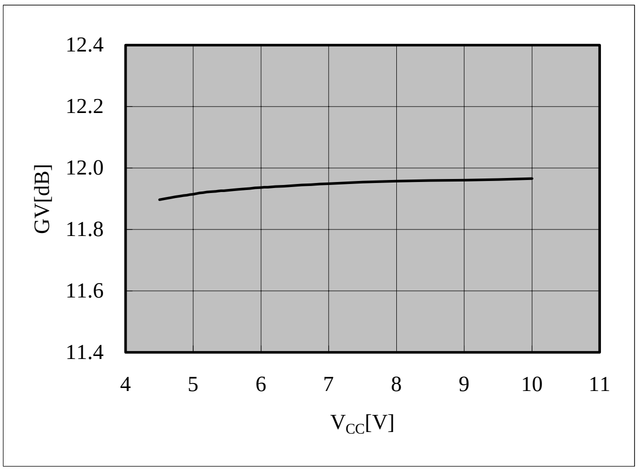
■ Threshold Voltage vs. Supply Voltage

T_A =25°C



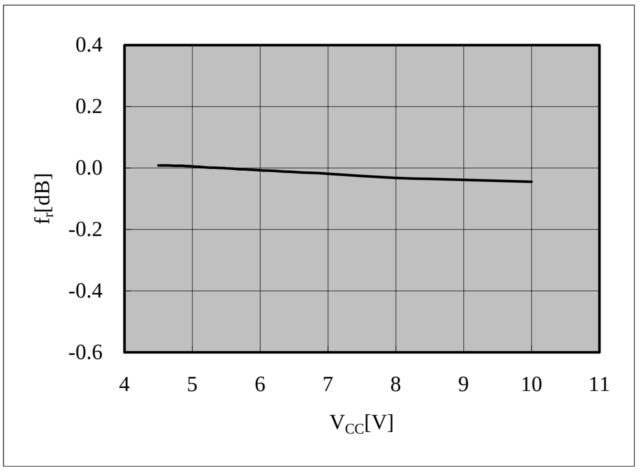
■ Voltage Gain vs. Supply Voltage

f_{IN} =1MHz, V_{IN} =0.5Vp-p, R_L =150Ω, T_A =25°C



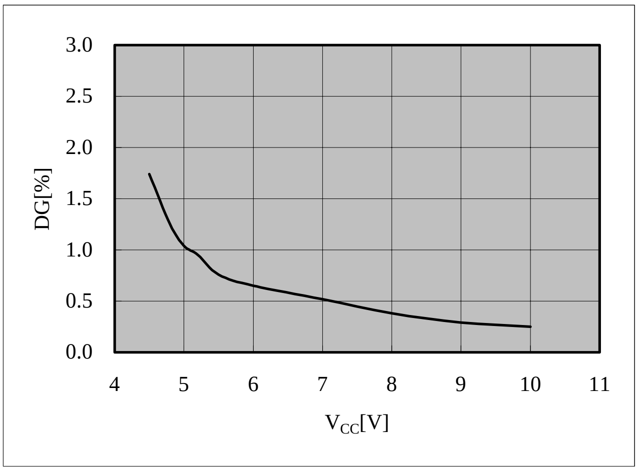
■ Frequency Response vs. Supply Voltage

f_{IN} =1MHz/5MHz, V_{IN} =0.5Vp-p, R_L =150Ω, T_A =25°C



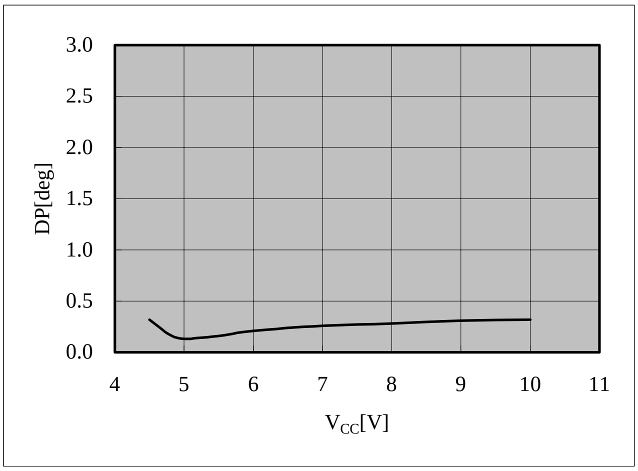
■ Differential Gain vs. Supply Voltage

Staircase Signal Input, R_L =150Ω, T_A =25°C



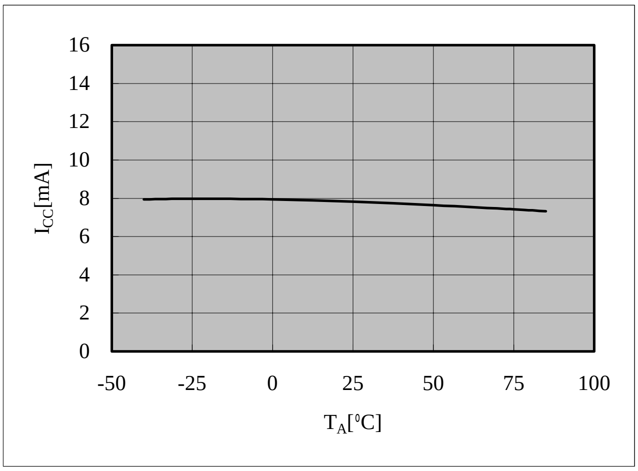
■ Differential Phase vs. Supply Voltage

Staircase Signal Input, R_L =150Ω, T_A =25°C



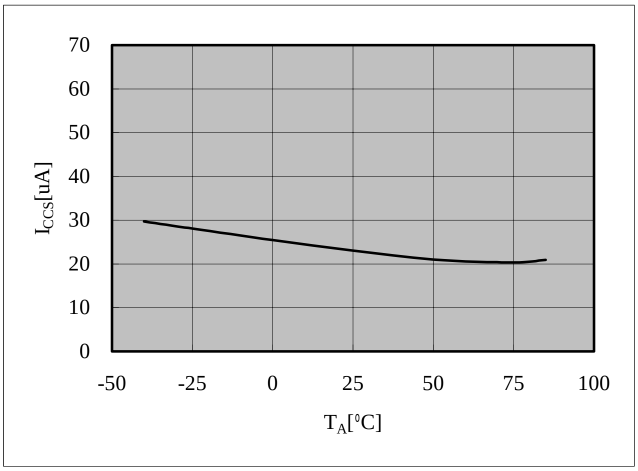
■ Supply Current vs. Temperature

V_{CC} =5.0V



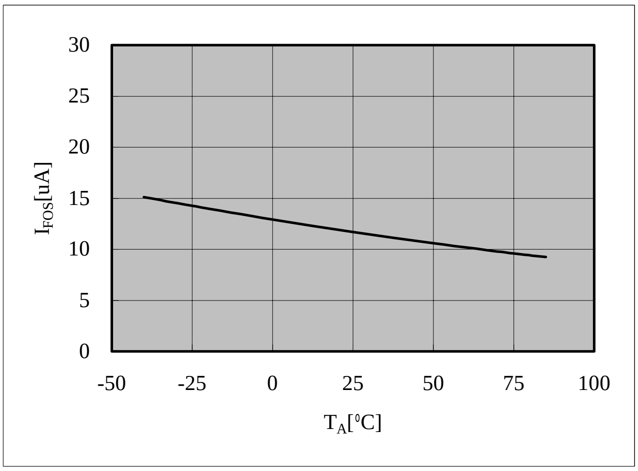
■ Standby Supply Current vs. Temperature

V_{CC} =5.0V



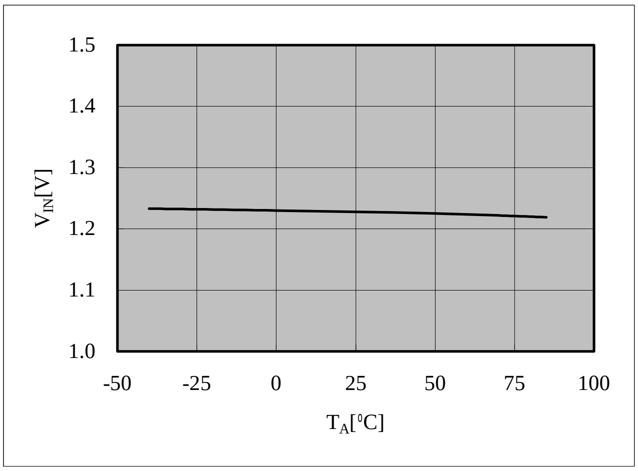
■ Standby Terminal Current vs. Temperature

V_{CC} =5.0V



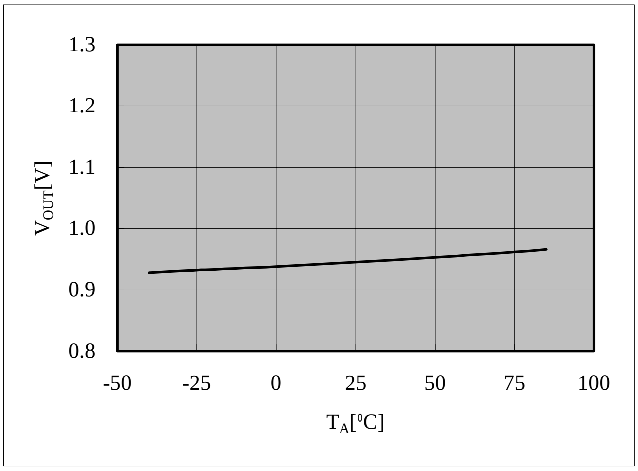
■ Input Terminal Voltage vs. Temperature

V_{CC} =5.0V



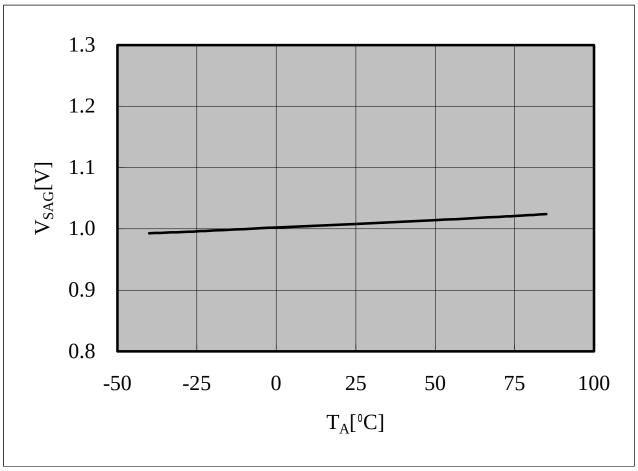
■ Output Terminal Voltage vs. Temperature

V_{CC} =5.0V



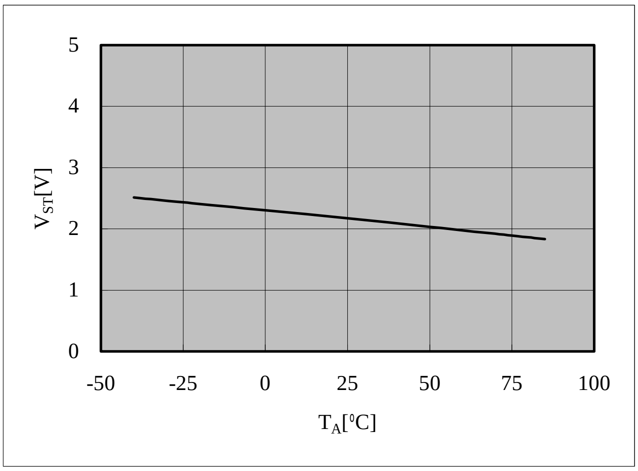
■ SAG Terminal Voltage vs. Temperature

V_{CC} =5.0V



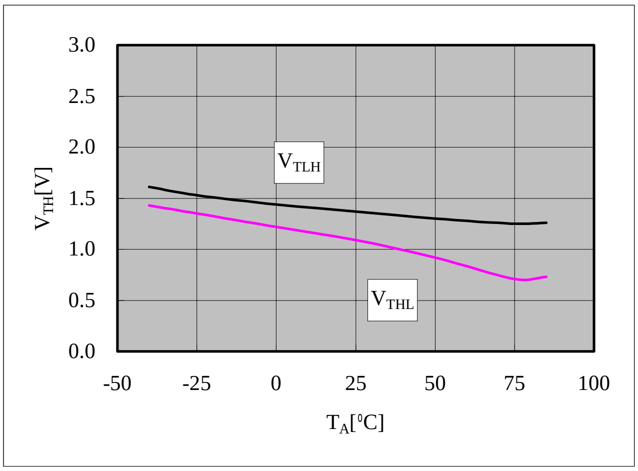
■ Standby Terminal Voltage vs. Temperature

V_{CC} =5.0V



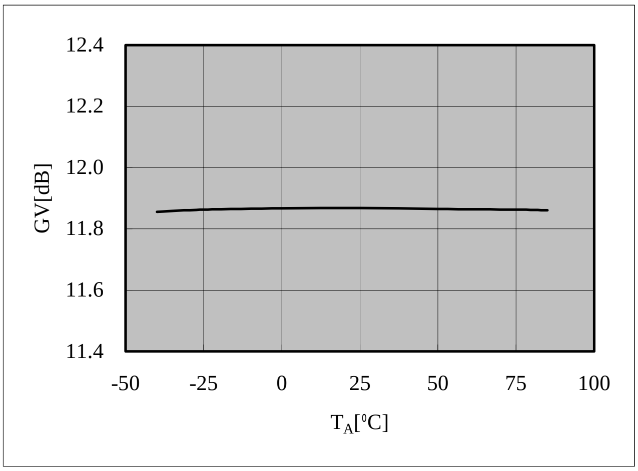
■ Threshold Voltage vs. Temperature

V_{CC} =5.0V



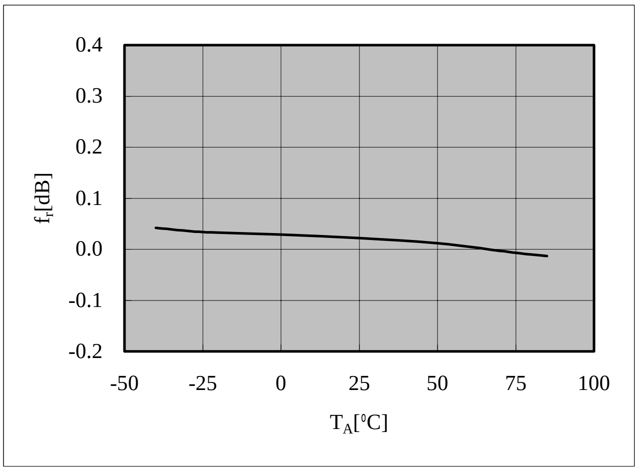
■ Voltage Gain vs. Temperature

f_{IN} =1MHz, V_{IN} =0.5Vp-p, R_L =150Ω, V_{CC} =5.0V



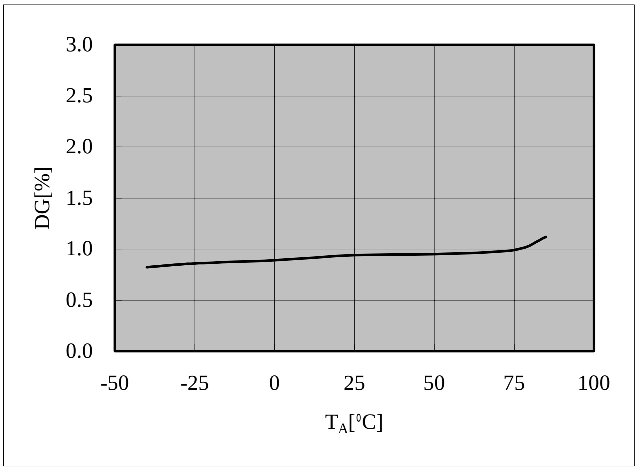
■ Frequency Response vs. Temperature

f_{IN} =1MHz/5MHz, V_{IN} =0.5Vp-p, R_L =150Ω, V_{CC} =5.0V



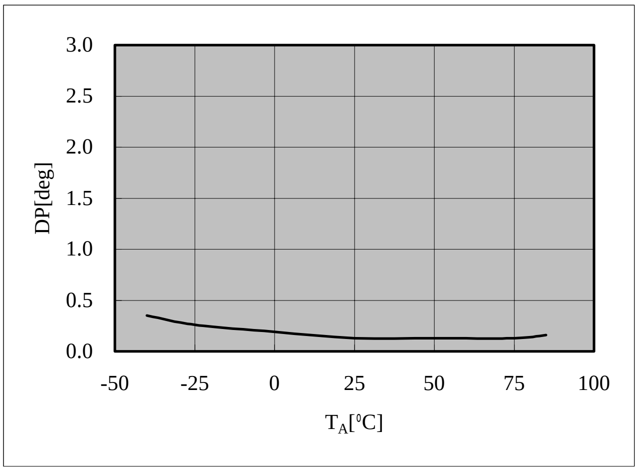
■ Differential Gain vs. Temperature

Staircase Signal Input, R_L =150Ω, V_{CC} =5.0V

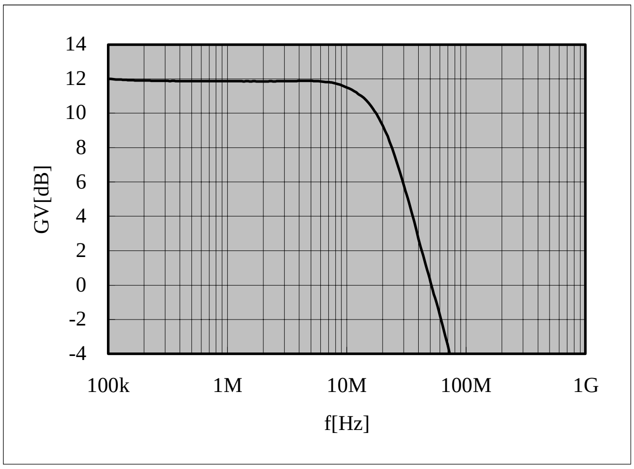


■ Differential Phase vs. Temperature

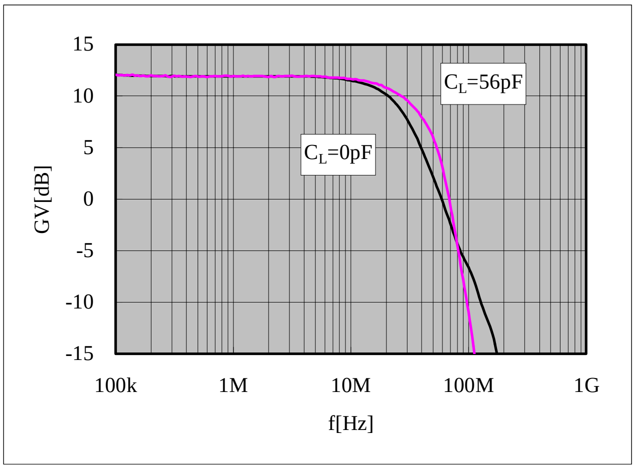
Staircase Signal Input, R_L =150Ω, V_{CC} =5.0V



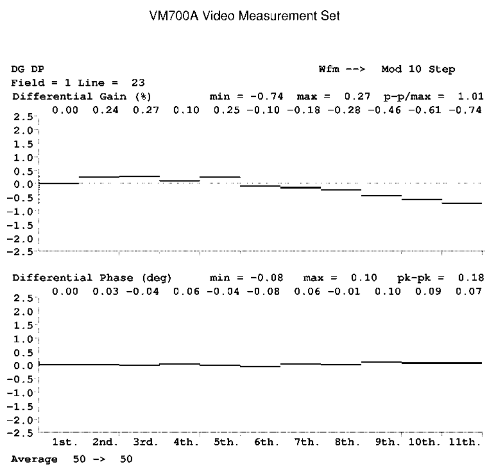
■ Voltage Gain vs. Frequency (V_{IN} =0.5Vp-p)
V_{CC} =5.0V, R_L =150Ω, T_A =25°C



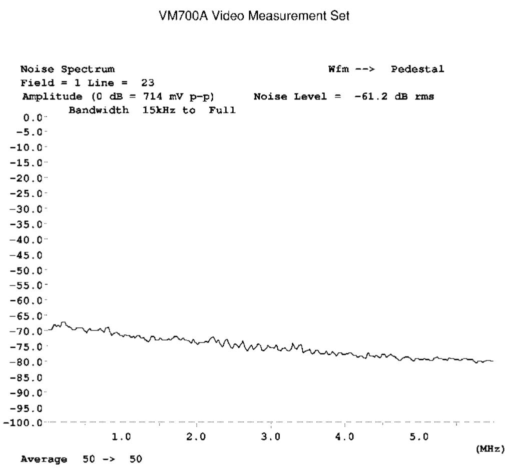
■ Voltage Gain vs. Frequency (Small signal Input)
V_{CC} =5.0V, R_L =150Ω, T_A =25°C



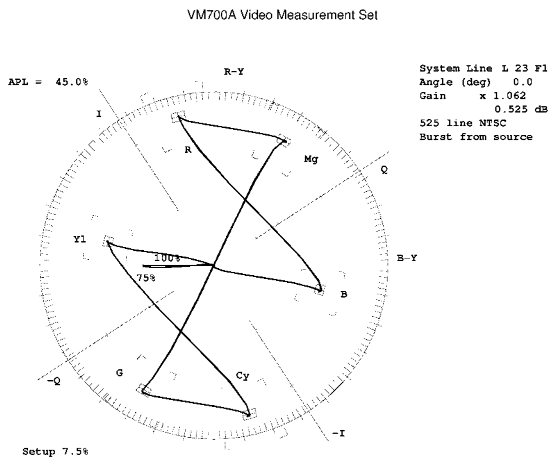
■ DG and DP Characteristics
V_{CC} =5.0V, R_L =150Ω, T_A =25°C



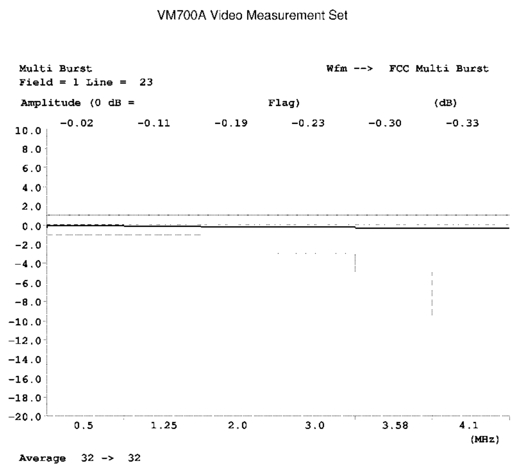
■ Signal to Noise Ratio
V_{CC} =5.0V, R_L =150Ω, T_A =25°C



■ Color Bar Characteristic
V_{CC} =5.0V, R_L =150Ω, T_A =25°C

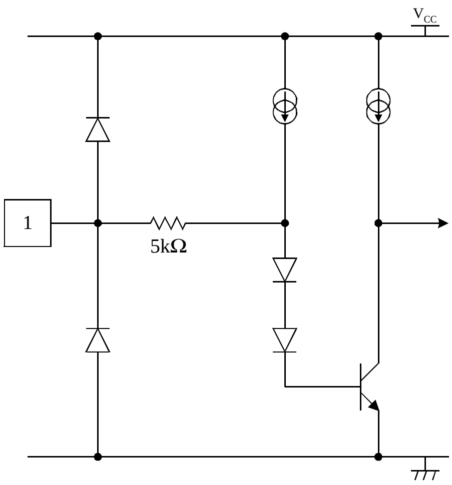
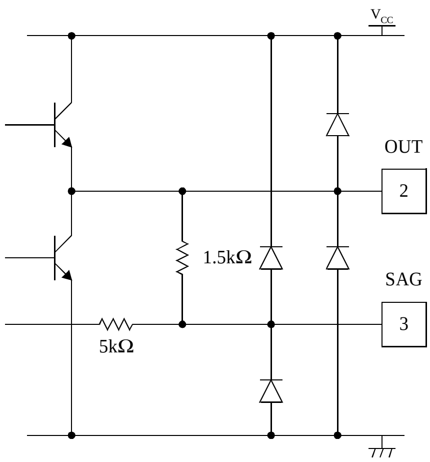
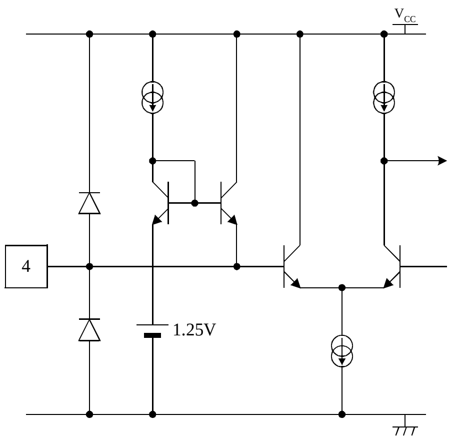


■ Multi Burst Characteristic
V_{CC} =5.0V, R_L =150Ω, T_A =25°C



11. PIN DESCRIPTION

The following contents become common to TK15405BM and TK15417BM.

PIN NO.	SYMBOL	INTERNAL EQUIVALENT CIRCUIT	DESCRIPTION
1	Standby		Standby Logic Terminal. The device is in the standby mode when Pin 1 is connected to Low level. The device is in the operating mode when Pin 1 is connected to High level or Open.
2 3	Output SAG		Pin 2: Output Terminal. Pin 2 is available to drive 75Ω+75Ω load. Pin 3: SAG Terminal.
4	Input		Input Signal Terminal. The sink chip bottom is clamped by the clamp circuit.
5	GND	—	Ground Terminal.
6	V_{CC}	—	Power Supply Terminal.

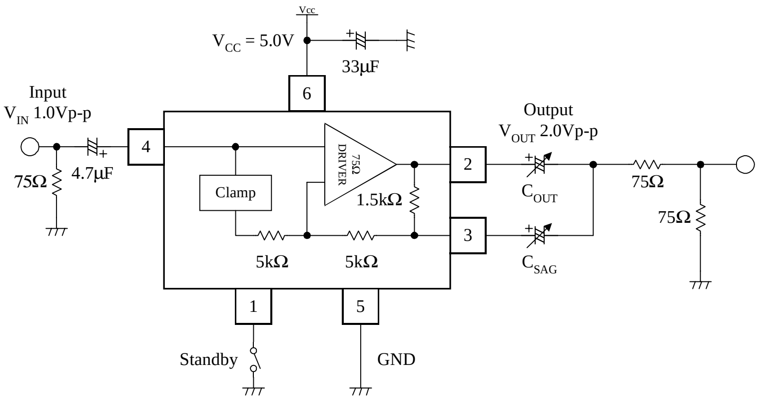
12. APPLICATIONS INFORMATION

12-1. Output Coupling Capacitance and SAG Characteristics

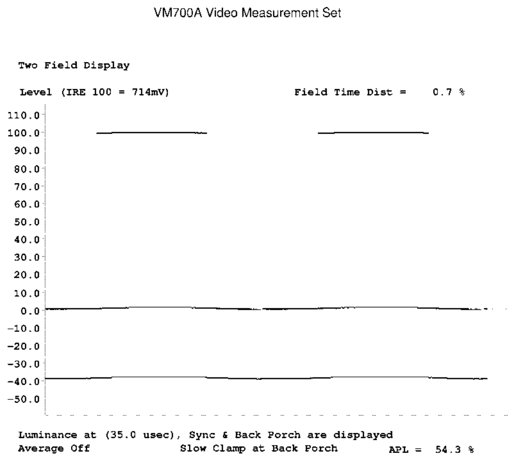
SAG characteristics of the output are changed with the combination of the output terminal coupling capacitance and the SAG terminal coupling capacitance.

Since the SAG characteristics when changing the output terminal coupling capacitor value (C_{OUT}) and the SAG terminal coupling capacitor value (C_{SAG}) is shown below, please choose the output terminal coupling capacitor value and the SAG terminal coupling capacitor value according to the allowable value of SAG.

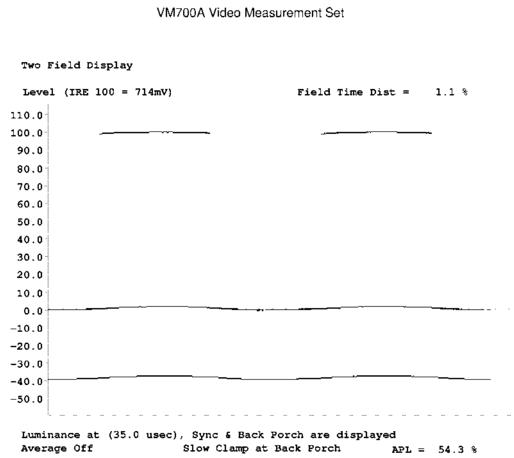
Measurement is represented and is performed using TK15405BM.



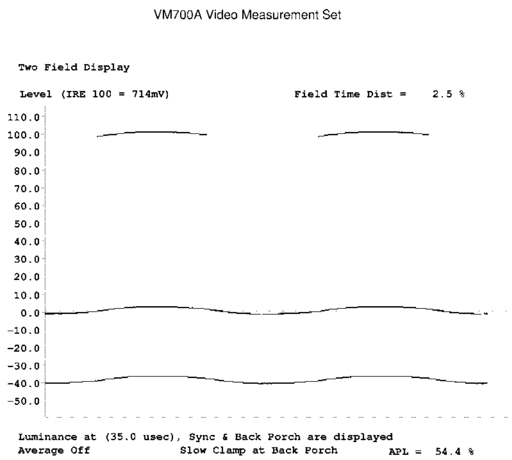
■ C_{OUT}=100µF, C_{SAG}=33µF



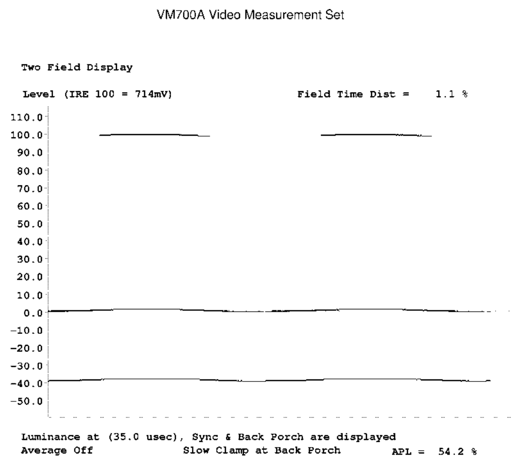
■ C_{OUT} =100µF, C_{SAG} =22µF



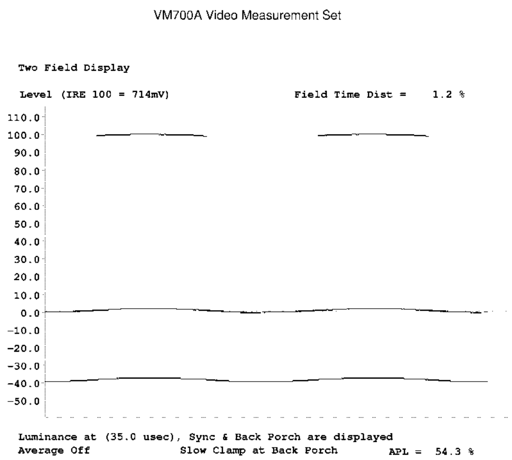
■ C_{OUT} =100µF, C_{SAG} =10µF



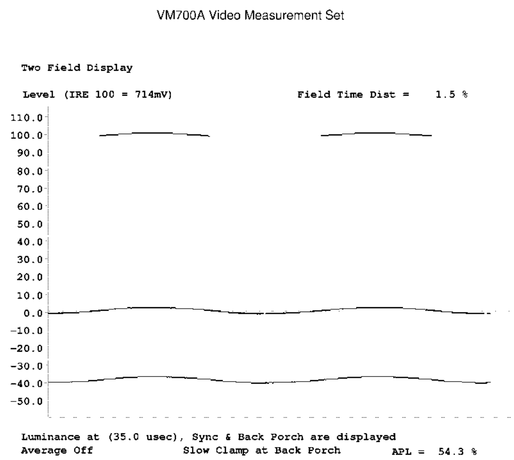
■ C_{OUT} =47µF, C_{SAG} =47µF



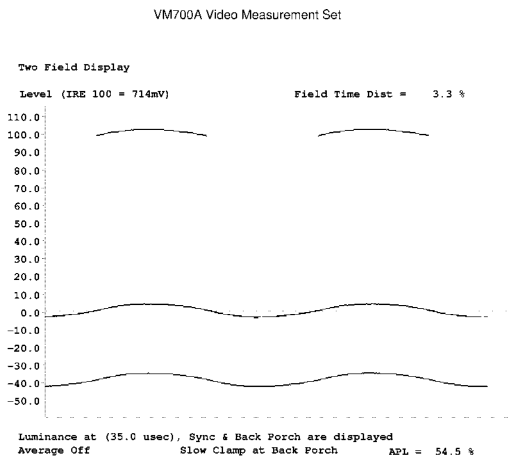
■ C_{OUT} =47µF, C_{SAG} =33µF



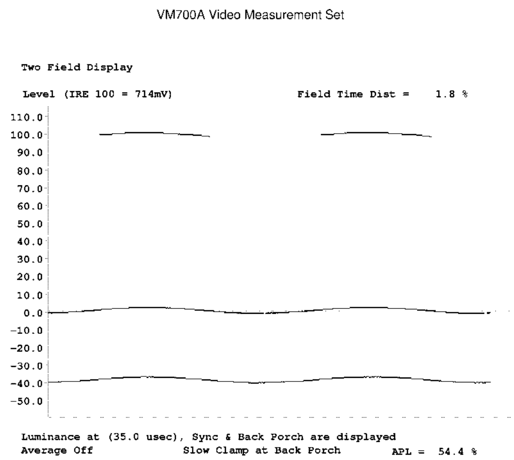
■ C_{OUT} =47µF, C_{SAG} =22µF



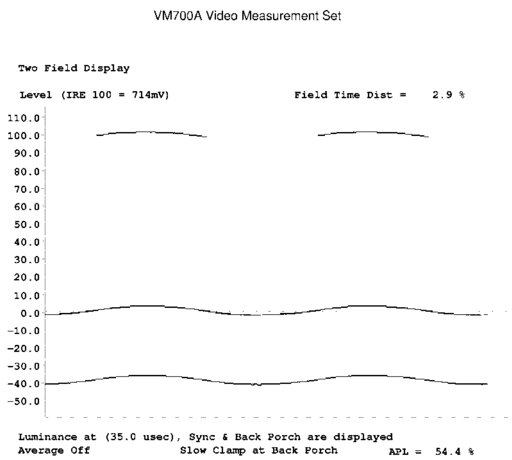
■ C_{OUT} =47µF, C_{SAG} =10µF



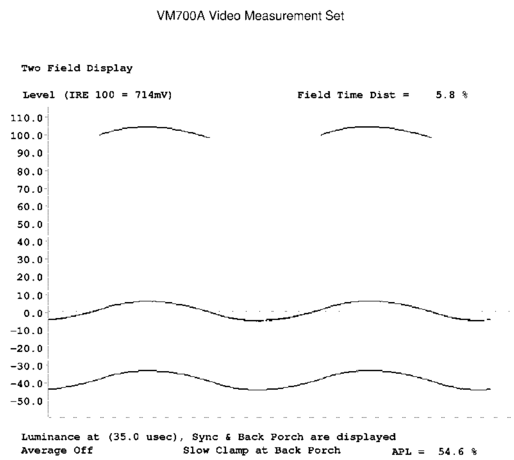
■ C_{OUT} =33µF, C_{SAG} =33µF



■ C_{OUT} =33µF, C_{SAG} =22µF

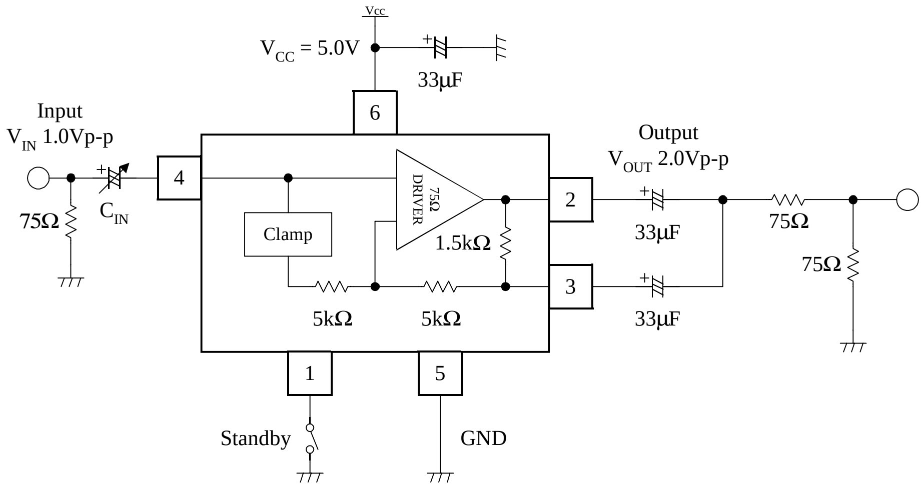


■ C_{OUT} =33µF, C_{SAG} =10µF

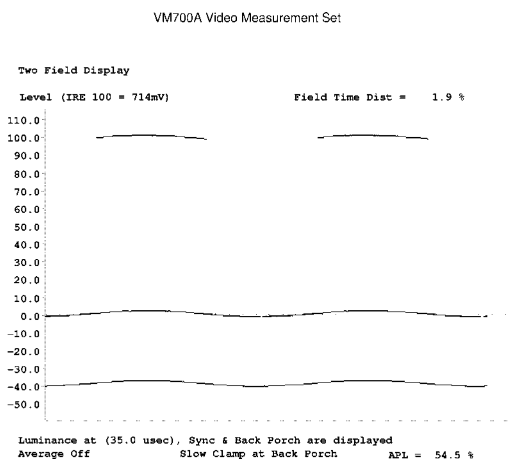


12-2. Input Coupling Capacitance and SAG Characteristics

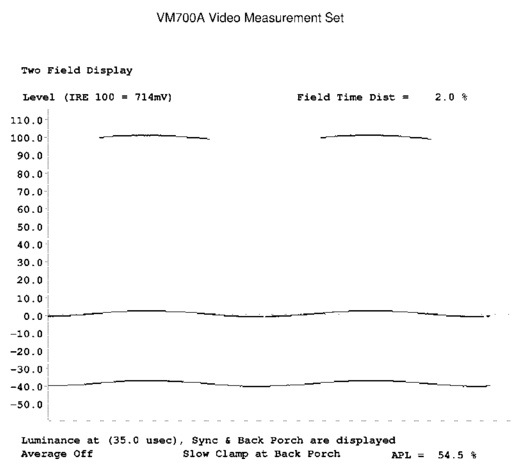
SAG characteristics are changed with the input terminal coupling capacitance.
Since the SAG characteristics when changing the input terminal coupling capacitor value (C_{IN}) is shown below, please choose the input terminal coupling capacitor value according to the allowable value of SAG.
Measurement is represented and is performed using TK15405BM.



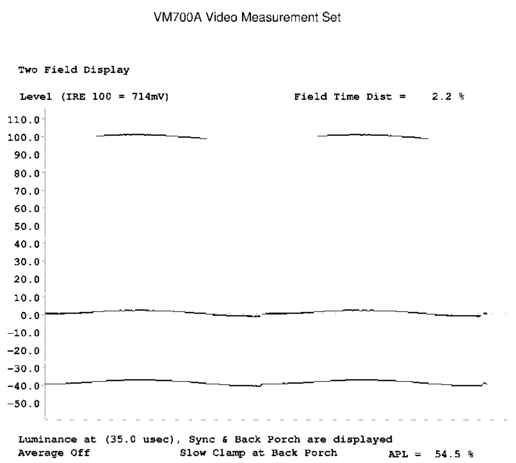
■ C_{IN}=10µF



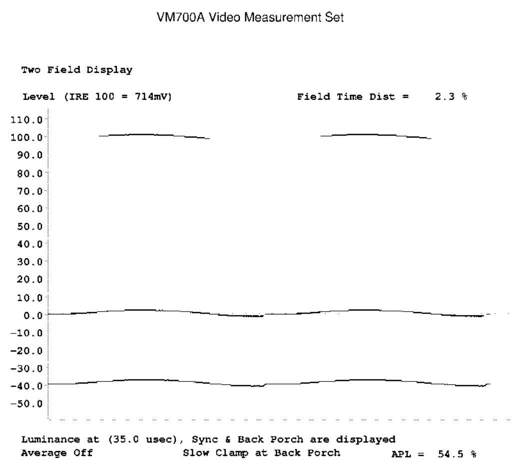
■ C_{IN} =4.7µF



■ C_{IN} =1.0µF



■ C_{IN} =0.68µF



13. NOTES

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

14. OFFICES

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