

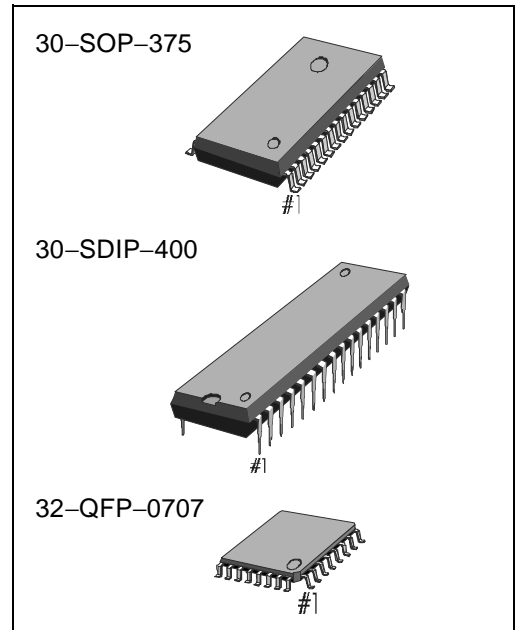
INTRODUCTION

The KA9201, which is an RF amplifier, is a monolithic integrated circuit designed for three-spot type optical pick-up of the compact disc player.

It consists of an RF signal processing circuit, a Focus Error AMP, a Tracking Error AMP, a Focus OK Detector, a Mirror Detector, a Defect Detector, an EFM Comparator and an automatic power controller for laser diode.

FEATURES

- Functions: RF AMP
 - Focus error AMP
 - Tracking error AMP
 - Focus OK detector
 - Mirror detector
 - Defect detector
 - EFM (Eight to Fourteen Modulation) Comparator
 - Automatic asymmetry control AMP
 - Center voltage buffer
 - APC (Automatic Power Control) AMP for photo-diode and laser-diode drive
- Single power supply operation (+ 5V)
- Split power supply operation ($\pm 5V$)
- Low power consumption: (100mW at $\pm 5V$, 50mW at + 5V)
- Built-in automatic power controller use for P-sub and N-sub of the laser diode
- Minimum number of external components required
- Built-in disc defect detection circuit for improvement of playability
- Recommended operation supply voltage range:
 - $V_{CC} \sim V_{EE}$: 3.4 to 11 V
 - $V_{CC} \sim D_{GND}$: 3.4 to 5.5 V
- Power Supply Condition:

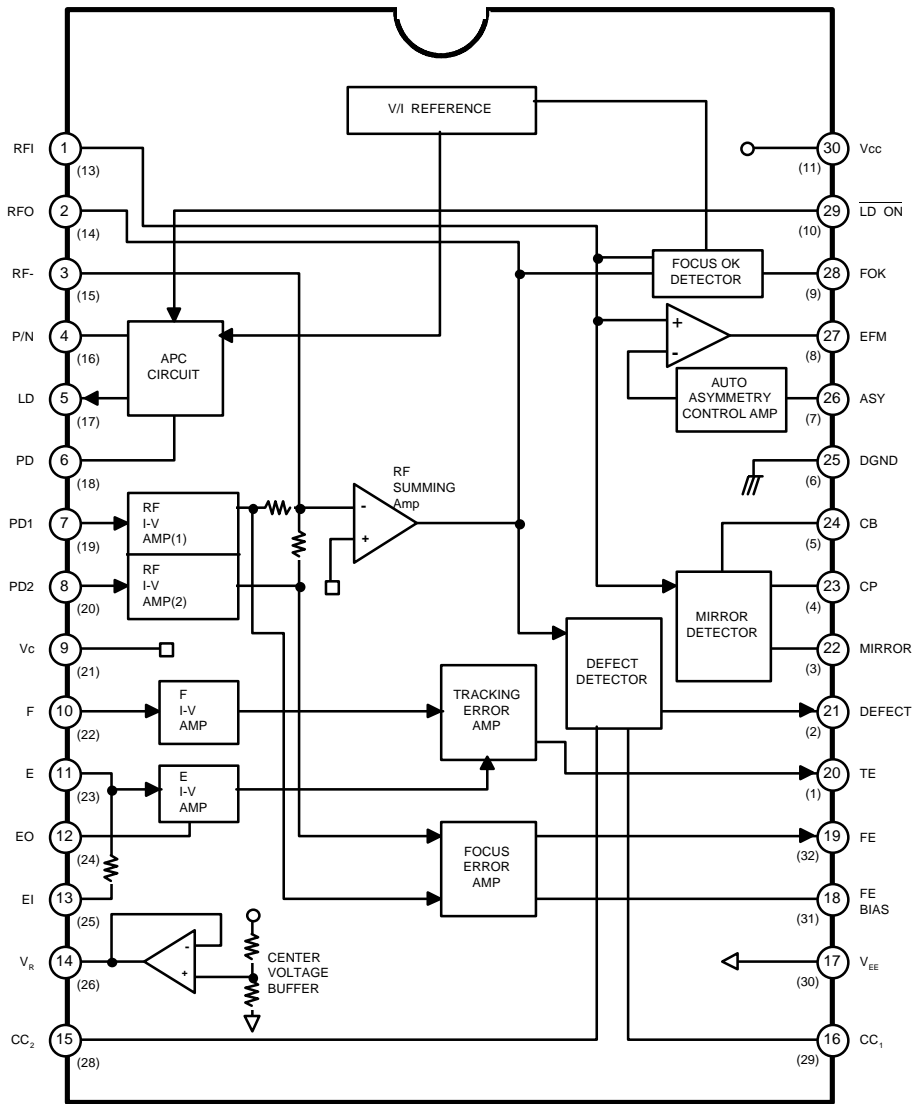


	V_{CC}	V_{EE}	V_C	$V_R (V_{ref})$	D_{GND}
Single Power Supply	Power Supply	GND	V_R	VC	GND
Split Power Supply	+ Power Supply	- Power Supply	D_{GND}	No Connecting	GND

ORDERING INFORMATION

Device	Package	Operating Temperature
KA9201M	30-SDIP-400	-25°C to +75°C
KA9201D	30-SOP-375	
KA9201Q	32-QFP-0707	

BLOCK DIAGRAM



NOTES:

1. Pin 12, 27 of 32 QFP is no connection
2. The number of () is the type of 32-QFP

ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	$V_{CC} - V_{EE}$	12	V
Power Dissipation	P_D	800	mW
Operating Temperature	T_{OPR}	-25 ~ + 75	°C
Storage Temperature	T_{STG}	-55 ~ + 150	°C

ELECTRICAL CHARACTERISTICS

($T_a = 25^\circ\text{C}$, $V_{CC} = 2.5\text{ V}$, $V_{EE} = D_{GND} = -2.5\text{ V}$, $V_C = GND$, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Circuit Current	1	V_{CC} Current	I_{CC}	DC Current	8.0	11.4	15.5	mA
	2	V_{EE} Current	I_{EE}		-15.0	-11.0	-7.5	mA
	3	D_{GND} Current	$I_{D(GND)}$		-1.1	-0.85	-0.6	mA
RF	4	Input Offset Voltage	V_{IO1}	DC voltage	-50	0	50	mV
	5	Voltage Gain	G_{V1}	$V_I = 2\text{KHz}$, 40mV sinewave, Output: sinewave	25.1	28.1	31.1	dB
	6	Maximum Output Amplitude	$V_{O(MAX)1}$	$V_I = 0.2\text{V DC}$, Output: + peak voltage	1.3	-	-	V
	7	Maximum Output Amplitude	$V_{O(MAX)2}$	$V_I = -0.2\text{V DC}$, Output: - peak voltage	-	-	-0.3	V
Focus Error AMP	8	Input Offset Voltage	V_{IO2}	DC voltage	-120	-	120	mV
	9	Voltage Gain	G_{V2}	$V_I = 1\text{KHz}$, 32mV sinewave,	27	30	33	dB
	10	Voltage Gain	G_{V3}	Output: sinewave	27	30	33	dB
	11	Gain Difference	ΔG_{V1}		-3	0	3	dB
	12	Maximum Output Amplitude H	$V_{OH(MAX)1}$	$V_I = -0.2\text{V DC}$, Output: - peak voltage	1.9	-	-	V
	13	Maximum Output Amplitude L	$V_{OL(MAX)1}$	$V_I = 0.2\text{V DC}$, Output: - peak voltage	-	-	-1.9	V

ELECTRICAL CHARACTERISTICS (Continued)(Ta = 25°C, V_{CC} = 2.5 V, V_{EE} = D_{GND} = -2.5 V, V_C = GND, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Tracking Error AMP	14	Input Offset Voltage	V _{IO3}	DC voltage	-50	-	50	mV
	15	Voltage Gain F	G _{V4}	V _I =1KHz, 0.3Vsinewave,input to output ratio Output: sinewave	7	10	13	dB
	16	Voltage Gain E	G _{V5}		7	10	13	dB
	17	Gain Difference	ΔG _{V2}		-3	-	3	dB
	18	Maximum Output Amplitude H	V _{OH(MAX)2}	V _I = 2.0 V DC, Output: + peak voltage	1.9	-	-	V
	19	Maximum Output Amplitude L	V _{OL(MAX)2}	V _I = -2.0 V DC, Output: - peak voltage	-	-	-1.9	V
APC AMP	20	Output Voltage 1	V _{O1}	V _I = 190mV DC	1.4	-	-	V
	21	Output Voltage 2	V _{O2}	V _I = 90mV DC	-	-	-1.4	V
	22	Output Voltage 3	V _{O3}	V _I = 100mV DC	1.4	-	-	V
	23	Output Voltage 4	V _{O4}	V _I = 170mV DC	-	-	-1.4	V
	24	Output Voltage 5	V _{O5}	V _I = 0V DC	1.4	-	-	V
	25	Output Voltage 6	V _{O6}	V _I = 0V DC	-	-	-1.4	V
	26	Maximum Output Amplitude H	V _{OH(MAX)3}	V _a = 0 V, I _a = -0.8mA Output: + peak voltage	0	-	-	V
	27	Maximum Output Amplitude L	V _{OL(MAX)3}	V _a = 0.6V, I _a = 0.8mA Output: - peak voltage	-	-	0	V
Focus OK	28	Threshold Voltage	V _{TH1}	V _I = output (V _{CC} + D _{GND})/2 must be adjusted by the DC voltage across RFI and RFO	-430	-390	-350	mV
	29	High Output Voltage	V _{OH(FOK)1}	Input across RFI and RFO 1V, 375 mV(DC) sinewave Output: pulse	2.2	-	-	V
	30	Low Output Voltage	V _{OL(FOK)1}		-	-	1.8	V
	31	Maximum Operating Frequency	f _(MAX)		45	-	-	KHz

ELECTRICAL CHARACTERISTICS (Continued)(Ta = 25°C, V_{CC} = 2.5 V, V_{EE} = D_{GND} = -2.5 V, V_C = GND, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Mirror AMP	32	High Output Voltage	V _{OH(MIR)1}	V _I = 10kHz 0.8V, -0.4V(DC) sinewave, Output: pulse	1.8	-	-	V
	33	Low Output Voltage	V _{OL(MIR)1}		-	-	-2.2	V
	34	Mirror Hold Frequency Response	f _{RES(M)}	V _I = 0.8V, 0.2V(DC), f(carrier) = 500kHz AM modulation Output: pulse	-	400	600	Hz
	35	Bottom Hold Frequency Response	f _{RES(B)}	V _I = 0.8V, 0.4V(DC) sinewave, Output: pulse	-	500	900	Hz
	36	Maximum Input Operating Frequency	f _{I(MAX)1}		30	70	-	KHz
	37	Minimum Input Voltage	V _{I(MIN)1}		V _I = 10KHz 0.4V(DC) sinewave, Output: pulse	-	0.1	0.2
		38	Maximum Input Voltage	V _{I(MAX)1}		1.8	-	-
Defect AMP	39	High Output Voltage	V _{OH(DEF)1}	V _I = 32mV, +15mV(DC) sinewave, Output pulse	1.8	-	-	V
	40	Low Output Voltage	V _{OL(DEF)1}		-	-	-2.2	V
	41	Minimum Input Operating Frequency	f _{I(MIN)2}	V _I = 32mV, + 15mV(DC) sinewave, Output; pulse	-	670	1000	Hz
	42	Maximum Input Operating Frequency	f _{I(MAX)2}		2.0	4.7	-	KHz
	43	Minimum Input Voltage	V _{I(MIN)2}	V _I 50Hz, 15mV (DC) pulsewave, symmetry: 95% Output: pulse	-	0.3	0.5	V
	44	Maximum Input Voltage	V _{I(MAX)2}		1.8	-	-	V

ELECTRICAL CHARACTERISTICS (Continued)(Ta = 25°C, V_{CC} = 2.5 V, V_{EE} = D_{GND} = -2.5 V, V_C = GND, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
EFM Compara tor	45	Duty Cycle 1	D ₁	V _I = 750KHz, 0.7V sinewave, Output: DC voltage	-50	0	50	mV
	46	Duty Cycle 2	D ₂	V _I = 750KHz, 0.7V , + 0.25V (DC) sinewave Output: DC voltage	0	50	100	mV
	47	High Output Voltage	V _{OH(EFM)1}	V _I = 750KHz, 0.7V sinewave, Output: pulse	1.2	-	-	V
	48	Low Output Voltage	V _{OL(EFM)1}		-	-	-1.2	V
	49	Minimum Input Voltage	V _{(MIN)3}	V _I = 750KHz sinewave, Output; pulse	-	-	0.12	V
	50	Maximum Input Voltage	V _{(MAX)3}		1.8	-	-	V
	51	Maximum Input Operating Frequency	f _{(MAX)3}	V _I = 750KHz, 0.7V sinewave, Output: pulse	4.0	-	-	KHz
Center Voltage Buffer	52	Input Offset Voltage	V _{IO4}	DC voltage	-100	0	100	mV
	53	Maximum Output Current (+)	I _{O+(MAX)}	-	5	-	-	mA
	54	Maximum Output Current (-)	I _{O-(MAX)}	-	-	-	-5	mA
(Ta = 25°C, V _{CC} = 5.0V, V _{EE} = -5.0V, D _{GND} = V _C = GND, unless otherwise specified)								
RF AMP	55	Maximum Output Amplitude (H)	V _{OH(MAX)4}	V _I = 0.2V DC Output: DC voltage	3.5	-	-	V
	56	Maximum Output Amplitude (L)	V _{OL(MAX)4}	V _I = -0.2V DC Output: DC voltage	-	-	0.3	V
Focus Error AMP	57	Maximum Output Amplitude (H)	V _{OH(MAX)5}	V _I = -0.2V DC Output: DC voltage	4.2	-	-	V
	58	Maximum Output Amplitude (L)	V _{OL(MAX)5}	V _I = 0.2V DC Output: DC voltage	-	-	-2.2	V
Tracking Error AMP	59	Maximum Output Amplitude (H)	V _{OH(MAX)6}	V _I = 2.0V DC Output: DC voltage	4.2	-	-	V
	60	Maximum Output Amplitude (L)	V _{OL(MAX)6}	V _I = -2.0V DC Output: DC voltage	-	-	-2.2	V

ELECTRICAL CHARACTERISTICS (Continued)(Ta = 25°C, V_{CC} = 2.5 V, V_{EE} = D_{GND} = -2.5 V, V_C = GND, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
APC AMP	61	Output Voltage 7	V _{O7}	V _I = 190mV DC, Output: DC voltage	1.4	-	-	V
	62	Output Voltage 8	V _{O8}	V _I = 90mV DC, Output: DC voltage	-	-	-1.4	V
	63	Output Voltage 9	V _{O9}	V _I = 100mV DC, Output: DC voltage	1.4	-	-	V
	64	Output Voltage 10	V _{I10}	V _I = 170mV DC, Output: DC voltage	-	-	-1.4	V
	65	Output Voltage 11	V _{I11}	V _I = 0V DC, Output: DC voltage	3.8	-	-	V
	66	Output Voltage 12	V _{I12}	V _I = 190mV DC, Output; DC voltage	-	-	-3.8	V
	67	Maximum Output Amplitude H	V _{OH(MAX)7}	V _a = 0V, I _a = -0.8mA Output: DC voltage	2.5	-	-	V
	68	Maximum Output Amplitude L	V _{OL(MAX)7}	V _a = 0.6V, I _a = 0.8mA Output: DC voltage	-	-	-2.5	V
Focus OK Amp	69	Threshold Voltage	V _{TH2}	Input DC voltage: output(V _{CC} + D _{GND})/2 must be adjusted by the DC voltage across RFI and RFO	-430	-390	-350	mV
	70	High Output Voltage	V _{OH(FOK)2}	V _I = 1V, -375mV(DC) across RFI and RFO; sinewave, Output; pulse	4.7	-	-	V
	71	Low Output Voltage	V _{OL(FOK)2}		-	-	0.7	V
Mirror AMP	72	High Output Voltage	V _{OH(MIX)2}	V _I = 10KHz 0.8V, -0.4V(DC) sinewave, Output: pulse	4.3	-	-	V
	73	Low Output Voltage	V _{OL(MIR)2}		-	-	0.3	V
Defect AMP	74	High Output Voltage	V _{OH(DEF)2}	V _I = 1KHz 32mV, +15mV(DC) sinewave, Output: pulse	4.3	-	-	V
	75	Low Output Voltage	V _{OL(DEF)2}		-	-	-0.3	V

ELECTRICAL CHARACTERISTICS (Continued)(Ta = 25°C, V_{CC} = 2.5 V, V_{EE} = D_{GND} = -2.5 V, V_C = GND, unless otherwise specified)

Stage	No	Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
EFM Compara tor	76	Duty 3	D ₃	V _I = 750KHz 0.7V sinewave Output: DC voltage	2.45	2.50	2.55	V
	77	Duty 4	D ₄	V _I = 750KHz 0.7V 0.25V(DC) sinewave, Output: pulse	2.50	2.55	2.60	V
	78	High Output Voltage	V _{OH(EFM)2}	V _I = 750KHz 0.7V, sinewave, Output: pulse	3.7	-	-	V
	79	Low Output Voltage	V _{OL(EFM)2}		-	-	1.3	

TEST METHOD (SWITCH CONDITION)

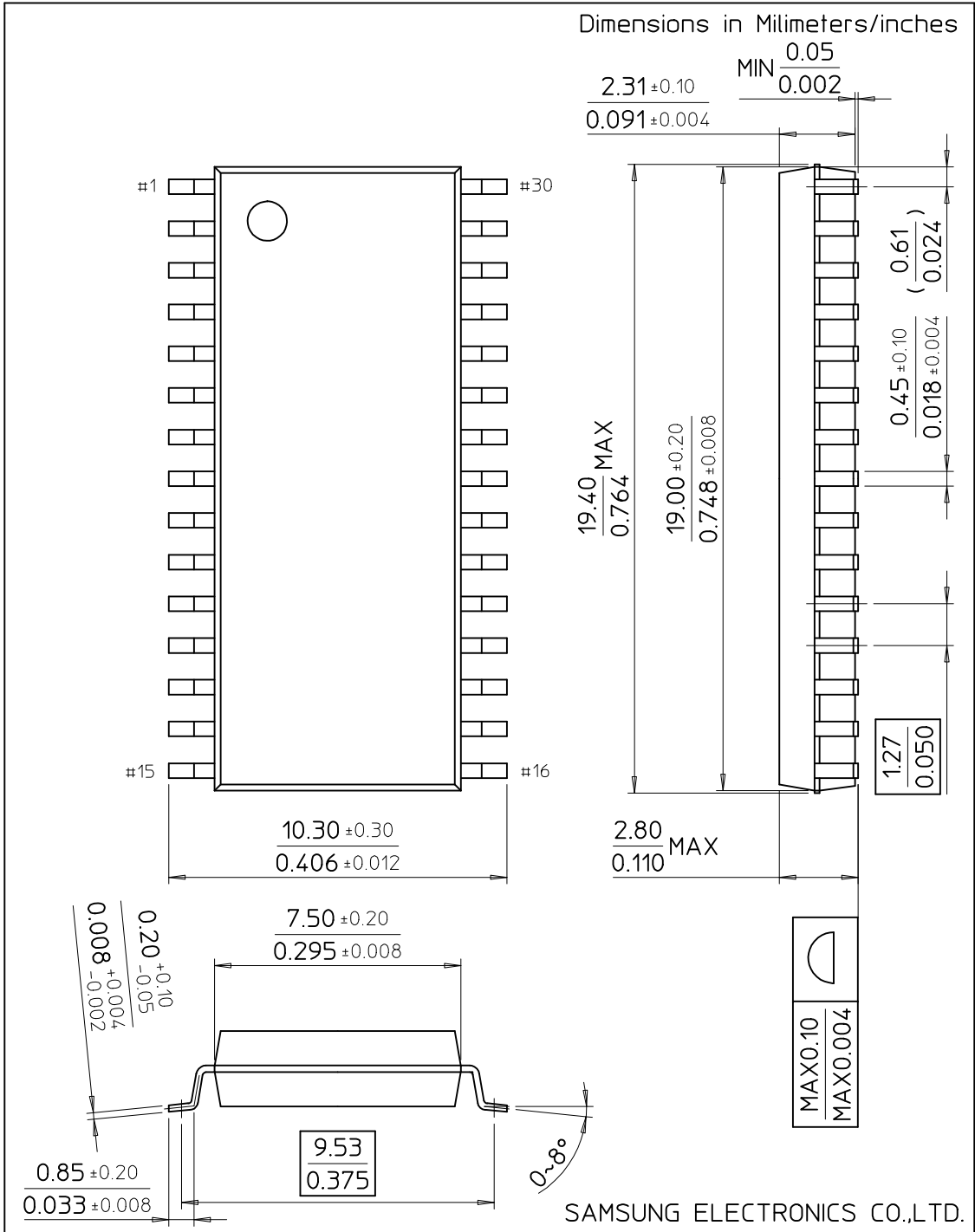
($V_{CC} = 2.5V$, $V_{EE} = D_{GND} = -2.5V$, $V_C = GND$)

Stage	No	Characteristic	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	Input	Test Point			
Circuit Current	1	I_{CC}			ON													ON	ON	ON	ON	ON	ON								-	Q		
	2	I_{EE}			ON														ON	ON	ON	ON	ON									-	E	
	3	$I_{D(GND)}$																	ON	ON	ON	ON	ON										-	L
RF AMP	4	V_{IO1}			ON													ON					ON						ON	ON		-	A	
	5	G_{V1}						ON	ON									ON					ON							ON	SIG-2		A	
	6	$V_{O(MAX)1}$			ON			ON	ON		b							ON					ON							ON	Vb		A	
	7	$V_{O(MAX)2}$			ON			ON	ON		b						ON					ON								ON	Vb		A	
Focus Error AMP	8	V_{IO2}																ON					ON						ON	ON		-	G	
	9	G_{V2}						ON	ON		a							ON					ON							ON	SIG-2		G	
	10	G_{V3}					ON	ON			a							ON					ON							ON	SIG-2		G	
	11	$i\hat{a}G_{V1}$																																
	12	$V_{OH(MAX)1}$						ON	ON		b							ON					ON							ON	Vb		G	
	13	$V_{OL(MAX)1}$					ON	ON		b							ON					ON							ON	Vb		G		
Tracking Errpr AMP	14	V_{IO3}			ON													ON					ON						ON	ON			I	
	15	G_{V4}										ON	ON	a				ON					ON							ON	SIG-3		I	
	16	G_{V5}										ON	ON	a				ON					ON							ON	SIG-3		I	
	17	$i\hat{a}G_{V2}$																																
	18	$V_{OH(MAX)2}$											ON	ON	b			ON					ON							ON	Vt		I	
	19	$V_{OL(MAX)2}$										ON	ON	b			ON					ON							ON	Vt		I		
APC AMP	20	V_{O1}																ON					ON						ON	ON		Va	C	
	21	V_{O2}																ON					ON						ON	ON		Va	C	
	22	V_{O3}			ON													ON					ON						ON	ON		Va	C	
	23	V_{O4}			ON													ON					ON						ON	ON		Va	C	
	24	V_{O5}																ON					ON						ON	ON		Va	C	
	25	V_{O6}			ON	ON												ON					ON						ON	ON		Va	C	
	26	$V_{OH(MAX)3}$			ON	ON												ON					ON						ON	ON	Va,1a		C	
	27	$V_{OL(MAX)3}$			ON													ON					ON						ON	ON	Va,1a		C	
Focus OK AMP	28	V_{TH1}	ON															ON					ON					ON	ON		SIG-1		P	
	29	$V_{OH(FOK)1}$	ON															ON					ON					ON	ON		SIG-1		P	
	30	$V_{OL(FOK)1}$	ON															ON					ON					ON	ON		SIG-1		P	
	31	$f_{i(MAX)}$	ON															ON					ON					ON	ON		SIG-1		P	
Mirror AMP	32	$V_{OH(MIR)1}$	ON															ON				ON	ON						ON	SIG-1		K		
	33	$V_{OL(MIR)1}$	ON															ON				ON	ON						ON	SIG-1		K		
	34	$f_{RES(M)}$	ON															ON				ON	ON						ON	SIG-1		K		
	35	$f_{RES(B)}$	ON															ON				ON	ON						ON	SIG-1		K		
	36	$f_{i(MAX)1}$	ON															ON				ON	ON						ON	SIG-1		K		
	37	$f_{i(MIN)1}$	ON															ON				ON	ON						ON	SIG-1		K		
	38	$V_{I(MAX)1}$	ON														ON					ON	ON					ON	SIG-1		K			

TEST METHOD (SWITCH CONDITION) (Continued)

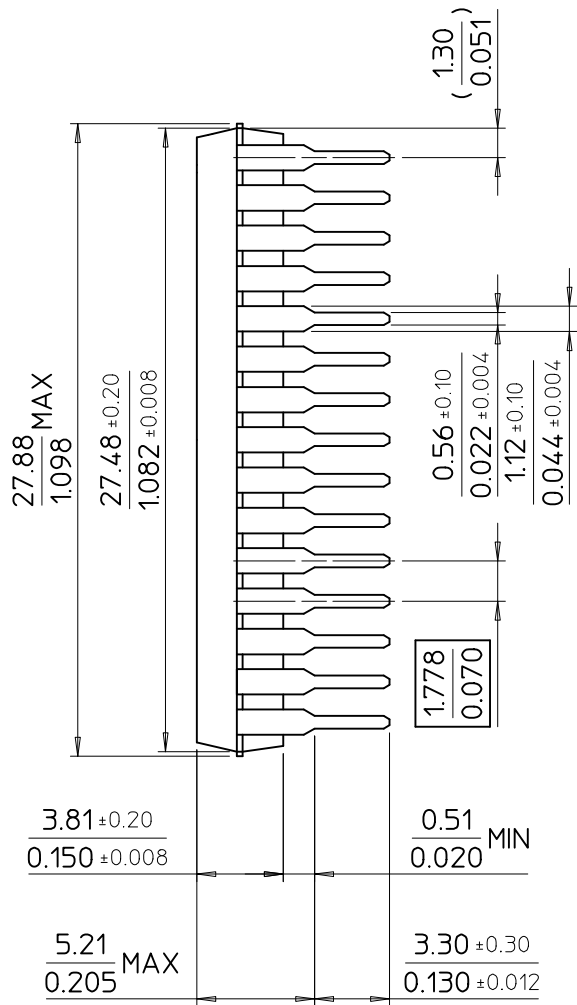
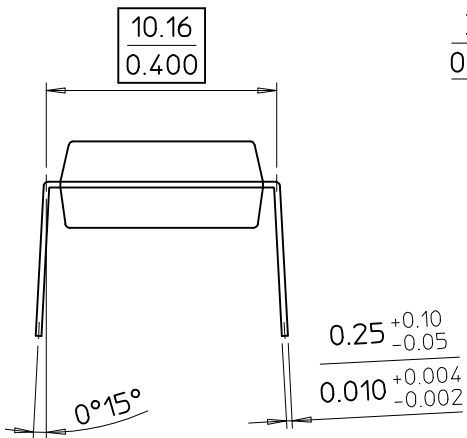
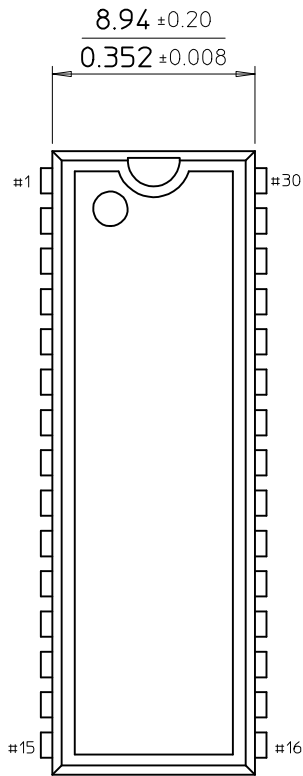
Stage	No	Characteristic	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	Input	Test Point
Defect AMP	39	$V_{OH(DEF)1}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
	40	$V_{OL(DEF)1}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
	41	$f_{i(MIN)2}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
	42	$f_{i(MAX)2}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
	43	$V_{I(MIN)2}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
	44	$V_{I(MAX)2}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
EFM Comparator	45	D_1	ON	ON			ON	ON		a								ON				ON							ON	SIG-1	M
	46	D_2	ON	ON														ON				ON	ON	ON	ON				ON	SIG-1	M
	47	$V_{OH(EFM)1}$	ON															ON				ON	ON	ON	ON				ON	SIG-1	O
	48	$V_{OL(EFM)1}$	ON															ON				ON	ON						ON	SIG-1	O
	49	$V_{I(MIN)3}$	ON															ON						ON					ON	SIG-1	N
	50	$V_{I(MAX)3}$	ON															ON					ON	ON					ON	SIG-1	N
51	$f_{i(MAX)3}$	ON															ON					ON	ON					ON	SIG-1	N	
Center Voltage Buffer	52	V_{IO4}		ON														ON				ON	ON						ON	-	D
	53	$I_{O+(MAX)}$		ON														ON	ON				ON						ON	1b	D
	54	$I_{O+(MAX)}$		ON								ON						ON	ON				ON						ON	1b	D
$V_{CC}=5.0, V_{EE}=-5.0V, D_{GND}=V_C=GND$																															
RF AMP	55	$V_{OH(MAX)4}$		ON			ON	ON		b								ON					ON						ON	Vb	A
	56	$V_{OL(MAX)4}$		ON			ON	ON		b								ON					ON						ON	Vb	A
Focus Error AMP	57	$V_{OH(MAX)5}$					ON	ON		b								ON	ON				ON						ON	Vb	G
58	$V_{OL(MAX)5}$						ON	ON		b								ON	ON				ON						ON	Vb	G
Tracking Error AMP	59	$V_{OH(MAX)6}$										ON		ON		b		ON		ON			ON						ON	Vt	I
	60	$V_{OL(MAX)6}$										ON		ON		b		ON		ON			ON						ON	Vt	I
APC AMP	61	V_{O7}																ON					ON					ON	ON	Va	C
	62	V_{O8}																ON					ON					ON	ON	Va	C
	63	V_{O9}			ON													ON					ON					ON	ON	Va	C
	64	V_{O10}			ON													ON					ON					ON	ON	Va	C
	65	V_{O11}																ON					ON						ON	Va	C
	66	V_{O12}			ON													ON					ON						ON	Va	C
	67	$V_{OH(MAX)7}$			ON	ON												ON					ON					ON	ON	Va, Ia	C
	68	$V_{OL(MAX)7}$			ON	ON												ON					ON					ON	ON	Va, Ia	C
Focus OK AMP	69	V_{TH2}	ON															ON					ON				ON	ON	SIG-1	P	
	70	$V_{OH(FOK)2}$	ON															ON					ON				ON	ON	SIG-1	P	
	71	$V_{OL(FOK)2}$	ON															ON					ON				ON	ON	SIG-1	P	
Mirror AMP	72	$V_{OH(MIR)2}$	ON															ON				ON	ON						ON	SIG-1	K
	73	$V_{OL(MIR)2}$	ON															ON				ON	ON						ON	SIG-1	K
Defect AMP	74	$V_{OH(DEF)2}$					ON	ON		a								ON			ON	ON							ON	SIG-1	J
	75	$V_{OL(DEF)2}$					ON	ON		a								ON			ON	ON							ON	SIG-2	J
EFM Comparator	76	D_3	ON	ON														ON				ON	ON	ON						SIG-2	M
	77	D_4	ON	ON														ON				ON	ON	ON						SIG-1	M
	78	$V_{OH(EFM)2}$	ON															ON				ON	ON	ON						SIG-1	O
	79	$V_{OL(EFM)2}$	ON															ON				ON	ON	ON						SIG-1	O

30-SOP-375



30-SDIP-400

Dimensions in Millimeters/inches



SAMSUNG ELECTRONICS CO.,LTD.