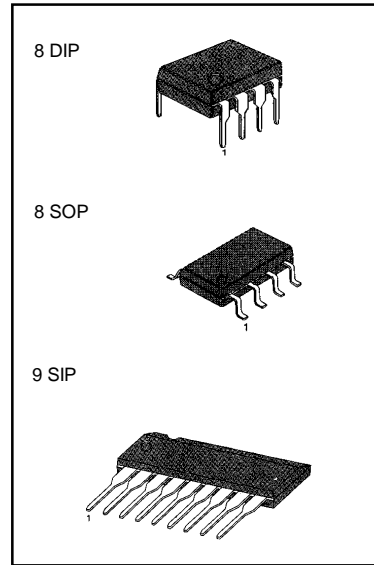


DUAL OPERATIONAL AMPLIFIERS

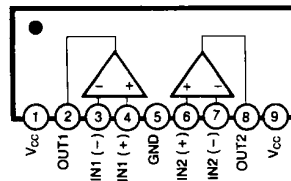
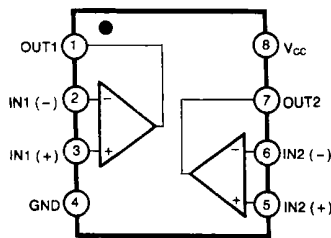
The KA258 series consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltage. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. Application areas include transducer amplifier, DC gain blocks and all the conventional OP amp circuits which now can be easily implemented in single power supply systems.

FEATURES

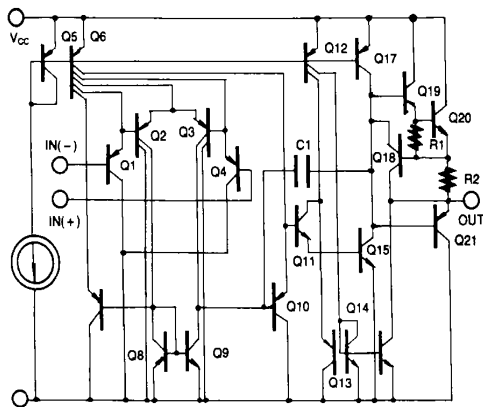
- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide power supply range: KA258/A, KA358/A: 3V~32V
(or±1.5V~i6V)
KA2004: 3V~26V (or±1.5V il3V)
- Input common-mode voltage range Includes ground
- Large output voltage swing: 0V DC to Vcc - 1.5V DC
- Power drain suitable for battery operation.



BLOCK DIAGRAM



SCHEMATIC DIAGRAM (One section only)



ORDERING INFORMATION

Device	Package	Operating Temperature
KA358 KA358A	8 DIP	0 ~ + 70°C
KA358S KA358AS	9 SIP	
KA358D KA358AD	8 SOP	
KA258 KA258A	8 DIP	
KA258S KA258AS	9 SIP	
KA258D KA258AD	8 SOP	
KA2904	8 DIP	-40 ~ + 85°C
KA2904S	9 SIP	
KA2904D	8 SOP	



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	KA258/KA258A	KA358/KA358A	KA2904	Unit
Supply Voltage	V_{CC}	± 16 or 32	± 16 or 32	± 13 or 26	V
Differential Input Voltage	$V_{I(DIFF)}$	± 32	± 32	± 26	V
Input Voltage	V_I	-0.3 to +32	-0.3 to +32	-0.3 to +26	V
Output Short Circuit to GND $V_{CC} \leq V$, $T_A = 25^\circ\text{C}$ (One Amp)		Continuous	Continuous	Continuous	
Operating Temperature Range	T_{OPR}	-25 ~ + 85	0 ~ + 70	-40 ~ + 85	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 ~ + 150	-65 ~ + 150	-65 ~ + 150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V, V_{EE} = GND, T = 25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions	KA258			KA358			KA2904			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V_{IO}	$V_{CM} = 0V$ to $V_{CC} - 1.5V$ $V_{O(P)} = 1.4V$, $R_S = 0\Omega$		2.9	5.0		2.9	7.0		2.9	7.0	mV
Input Offset Current	I_{IO}			3	30		5	50		5	50	nA
Input Bias Current	I_{BIAS}			45	150		45	250		45	250	nA
Input Common-Mode Voltage Range	$V_{I(R)}$	$V_{CC} = 30V$ (KA2904, $V_{CC} = 26V$)	0		$V_{CC} - 1.5$	0		$V_{CC} - 1.5$	0		$V_{CC} - 1.5$	V
Supply Current	I_{CC}	$R_L = \infty$, $V_{CC} = 30V$ (KA2902, $V_{CC} = 26V$)		0.8	2.0		0.8	2.0		0.8	2.0	mA
		$R_L = \infty$, over full temperature range		0.5	1.2		0.5	1.2		0.5	1.2	mA
Large Signal Voltage Gain	G_V	$V_{CC} = 15V$, $R_{L \geq 2K\Omega}$ $V_{O(P)} = 1V$ to 11V	50	100		25	100		25	100		V/mV
Output Voltage Swing	$V_{O(H)}$ $V_{O(L)}$	$V_{CC} = 30V$ $R_L = 2K\Omega$	26			26			22			V
		$V_{CC} = 26V$ for 2904 $R_L = 10K\Omega$	27	28		27	28		23	24		V
		$V_{CC} = 5V$, $R_L \geq 10K\Omega$		5	20		5	20		5	100	
Common-Mode Rejection Ratio	CMRR		70	85		65	80		50	80		dB
Power Supply Rejection Ratio	PSRR		65	100		65	100		50	100		dB
Channel Separation	CS	$f = 1KHz$ to 20KHz		120			120			120		dB
Short Circuit to GND	I_{SC}			40	60		40	60		40	60	mA
Output Current	I_{SOURCE} I_{SINK}	$V_{I(+)} = 1V$, $V_{I(-)} = 0V$ $V_{CC} = 15V$, $V_{O(P)} = 2V$	10	30		10	30		10	30		mA
		$V_{I(+)} = 0V$, $V_{I(-)} = 1V$ $V_{CC} = 15V$, $V_{O(P)} = 2V$	10	15		10	15		10	15		mA
		$V_{I(+)} = 0V$, $V_{I(-)} = 1V$ $V_{CC} = 15V$, $V_{O(P)} = 200mA$	12	100		12	100					
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}			V_{CC}			V_{CC}	V

ELECTRICAL CHARACTERISTICS

(V_{CC}=5.0V, V_{EE}=GND, unless otherwise specified)The following specifications apply over the range of -25°C ≤ T_A ≤ +85°C for the KA258; and the 0°C ≤ T_A ≤ +70°C for the KA358; and the -40°C ≤ T_A ≤ +85°C for the KA2904

Characteristic	Symbol	Test Conditions	KA258			KA358			KA2904			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V _{IO}	V _{CM} = 0V to V _{CC} = 1.5V V _{O(P)} = 1.4V, R _S = 0Ω			7.0			9.0			10.0	mV
Input Offset Voltage Drift	V _{IO}	R _S = 0Ω		7.0			7.0			7.0		μV/°C
Input Offset Current	I _{IO}				100			150		45	200	nA
Input Offset Current Drift	ΔI _{IO} /ΔT			10			10			10		pA/°C
Input Bias Current	I _{BIAS}			40	300		40	500		40	500	nA
Input Common-Mode Voltage Range	V _{I(R)}	V _{CC} = 30V (KA2904, V _{CC} = 26V)	0		V _{CC} =2.0	0		V _{CC} =2.0	0		V _{CC} =2.0	V
Large Signal Voltage Gain	G _V	V _{CC} = 15V, R _L ≥ 2.0KΩ V _{O(P)} = 1V to 11V	25			15			15			V/mV
Output Voltage Swing	V _{O(H)}	V _{CC} = 30V	26			26			26			V
		V _{CC} = 26V for 2904	27	28		27	28		27	28		V
	V _{O(L)}	V _{CC} = 5V, R _L ≥ 10KΩ		5	20		5	20		5	100	mV
Output Current	I _{SOURCE}	V _{I(+)} = 1V, V _{I(-)} = 0V V _{CC} = 15V, V _{O(P)} = 2V	10	30		10	30		10	30		mA
	I _{SINK}	V _{I(+)} = 0V, V _{I(-)} = 1V V _{CC} = 15V, V _{O(P)} = 2V	5	8		5	9		5	9		mA
Differential Input Voltage	V _{I(DIFF)}				V _{CC}			V _{CC}			V _{CC}	V

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V. V_{EE}=GND. T_A=25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions	KA258A			KA358A			Unit
			Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V _{IO}	V _{CM} = 0V to V _{CC} = 1.5V V _{O(P)} = 1.4V, R _S = 0Ω		1.0	3.0		2.0	3.0	mV
Input Offset Current	I _{IO}			2	15		5	30	nA
Input Bias Current	I _{BIAS}			40	80		45	100	nA
Input Common-Mode Voltage Range	V _{I(R)}	V _{CC} = 30V	0		V _{CC} = 1.5	0		V _{CC} = 1.5	V
Supply Current	I _{CC}	R _L = ∞, V _{CC} = 30V		0.8	2.0		0.8	2.0	mA
		R _L = ∞, over full temperature range		0.5	1.2		0.5	1.2	mA
Large Signal Voltage Gain	G _V	V _{CC} = 15V, R _L = 2KΩ V _O = 1V to 11V	50	100		25	100		V/mV
Output Voltage Swing	V _{OH}	V _{CC} = 30V, R _L = 2KΩ	26			26			V
		V _{CC} = 26V for 2904, R _L = 10KΩ	27	28		27	28		V
	V _{OL}	V _{CC} = 5V, R _L ≥ 10KΩ		5	20		5	20	mV
Common-Mode Rejection Ratio	CMRR		70	85		65	85		dB
Power Supply Rejection Ratio	PSRR		65	100		65	100		dB
Channel Separation	CS	f = 1KHz to 20KHz		120		120			dB
Short Circuit to GND	I _{SC}			40	60		40	60	mA
Output Current	I _{SOURCE}	V _{I(+)} = 1V, V _{I(-)} = 0V V _{CC} = 15V, V _{O(P)} = 2V	20	30		20	30		mA
	I _{SINK}	V _{I(+)} = 1V, V _{I(-)} = 0V V _{CC} = 15V, V _{O(P)} = 2V	10	15		10	15		mA
		V _{in+} = 0V, V _{in-} = 1V V _{O(P)} = 200mV	12	100		12	100		μA
Differential Input Voltage	V _{I(DIFF)}				V _{CC}			V _{CC}	V

ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0V$, $V_{EE} = GND$. unless otherwise specified)

The following specification apply over the range of $-25^{\circ}C \leq T_A \leq +85^{\circ}C$ for the KA258A; and the $0^{\circ}C \leq T_A \leq +70^{\circ}C$ for the KA358A

Characteristic	Symbol	Test Conditions	KA258A			KA358A			Unit
			Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	V_{IO}	$V_{CM} = 0V$ to $V_{CC} = 1.5V$ $V_{O(P)} = 1.4V$, $R_S = 0\Omega$			4.0			5.0	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$			7.0	15		7.0	20	$\mu V/^{\circ}C$
Input Offset Current	I_{IO}				30			75	nA
Input Offset Current Drift	$\Delta I_{IO}/\Delta T$			10	200		10	300	$pA/^{\circ}C$
Input Bias Current	I_{BIAS}			40	100		40	200	nA
Input Common-Mode Voltage Range	$V_{I(R)}$	$V_{CC} = 30V$	0		$V_{CC} = 2.0$	0		$V_{CC} = 2.0$	V
Output Voltage Swing	$V_{O(H)}$	$V_{CC} = 30V$, $R_L = 2K\Omega$	26			26			V
	$V_{O(L)}$	$V_{CC} = 30V$, $R_L = 10K\Omega$	27	28		27	28		V
		$V_{CC} = 5V$, $R_L \geq 10K\Omega$		5	20		5	20	mV
Large Signal Voltage Gain	G_V	$V_{CC} = 15V$, $R_L \geq 2.0K\Omega$ $V_{O(P)} = 1V$ to $11V$	25			15			V/mV
Output Current	I_{SOURCE}	$V_{I(+)} = 1V$, $V_{I(-)} = 0V$ $V_{CC} = 15V$, $V_{O(P)} = 2V$	10	30		10	30		mA
	I_{SINK}	$V_{I(+)} = 1V$, $V_{I(-)} = 0V$ $V_{CC} = 15V$, $V_{O(P)} = 2V$	5	9		5	9		mA
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}			V_{CC}	V

TYPICAL PERFORMANCE CHARACTERISTICS

Fig. 1 SUPPLY CURRENT

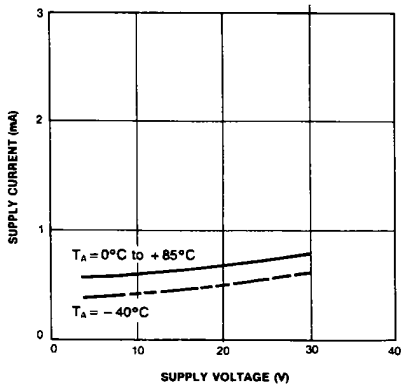


Fig. 2 VOLTAGE GAIN

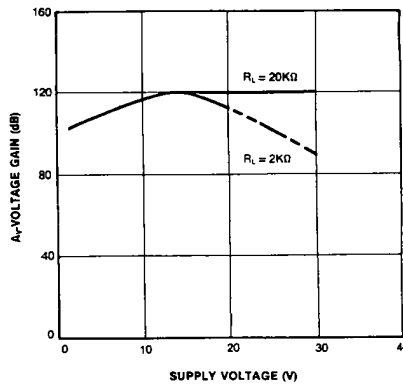


Fig. 3 OPEN LOOP FREQUENCY RESPONSE

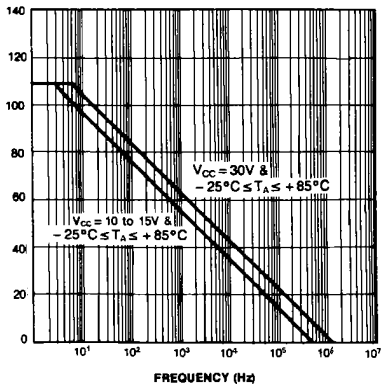


Fig. 4 LARGE SIGNAL FREQUENCY

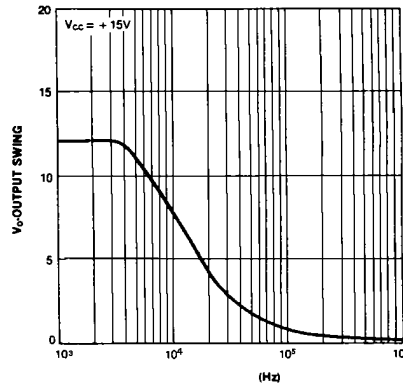


Fig. 5 OUTPUT CHARACTERISTICS CURRENT SOURCING

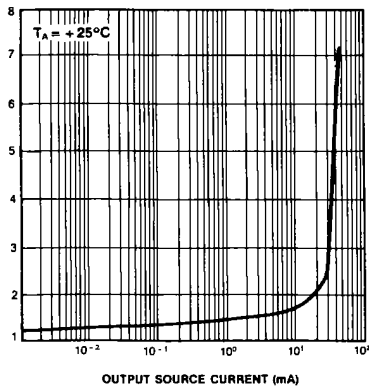


Fig. 6 OUTPUT CHARACTERISTICS CURRENT SINKING

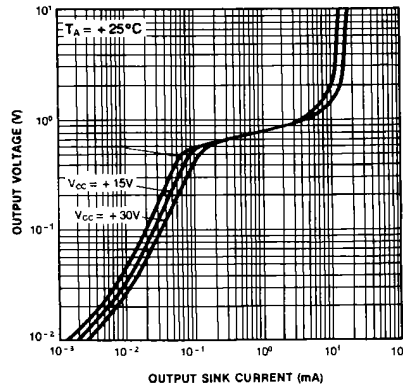


Fig. 7 INPUT VOLTAGE RANGE

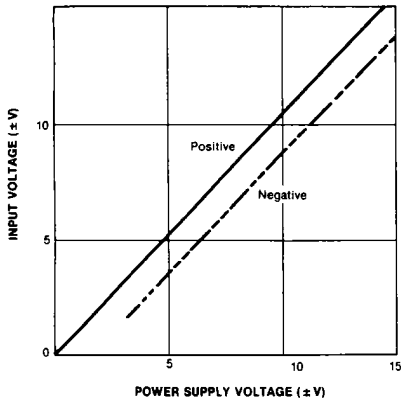


Fig. 8 COMMON-MODE REJECTION RATIO

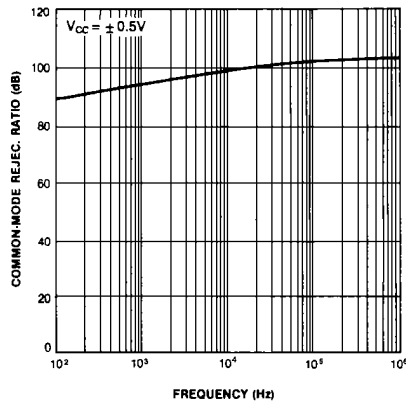


Fig. 9 CURRENT LIMITING

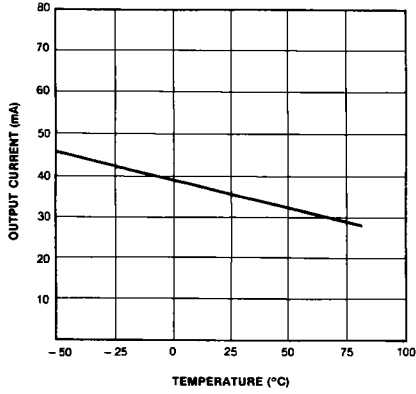


Fig. 10 INPUT CURRENT

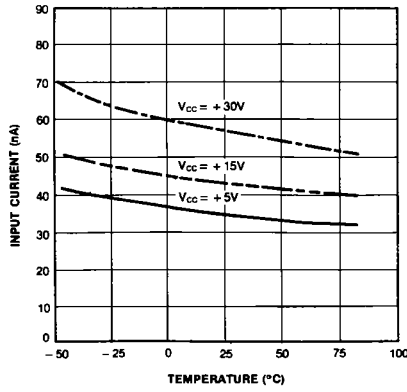


Fig. 11 VOLTAGE FOLLOWER PULSE RESPONSE

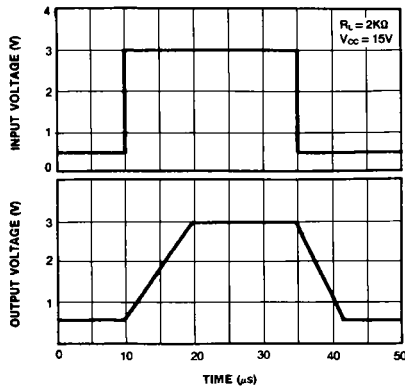
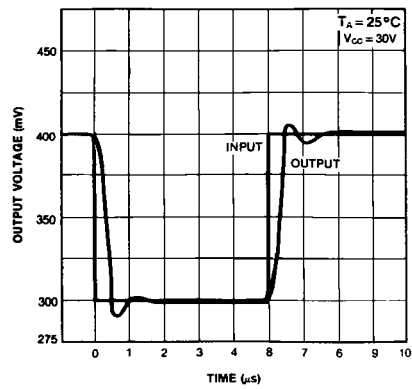
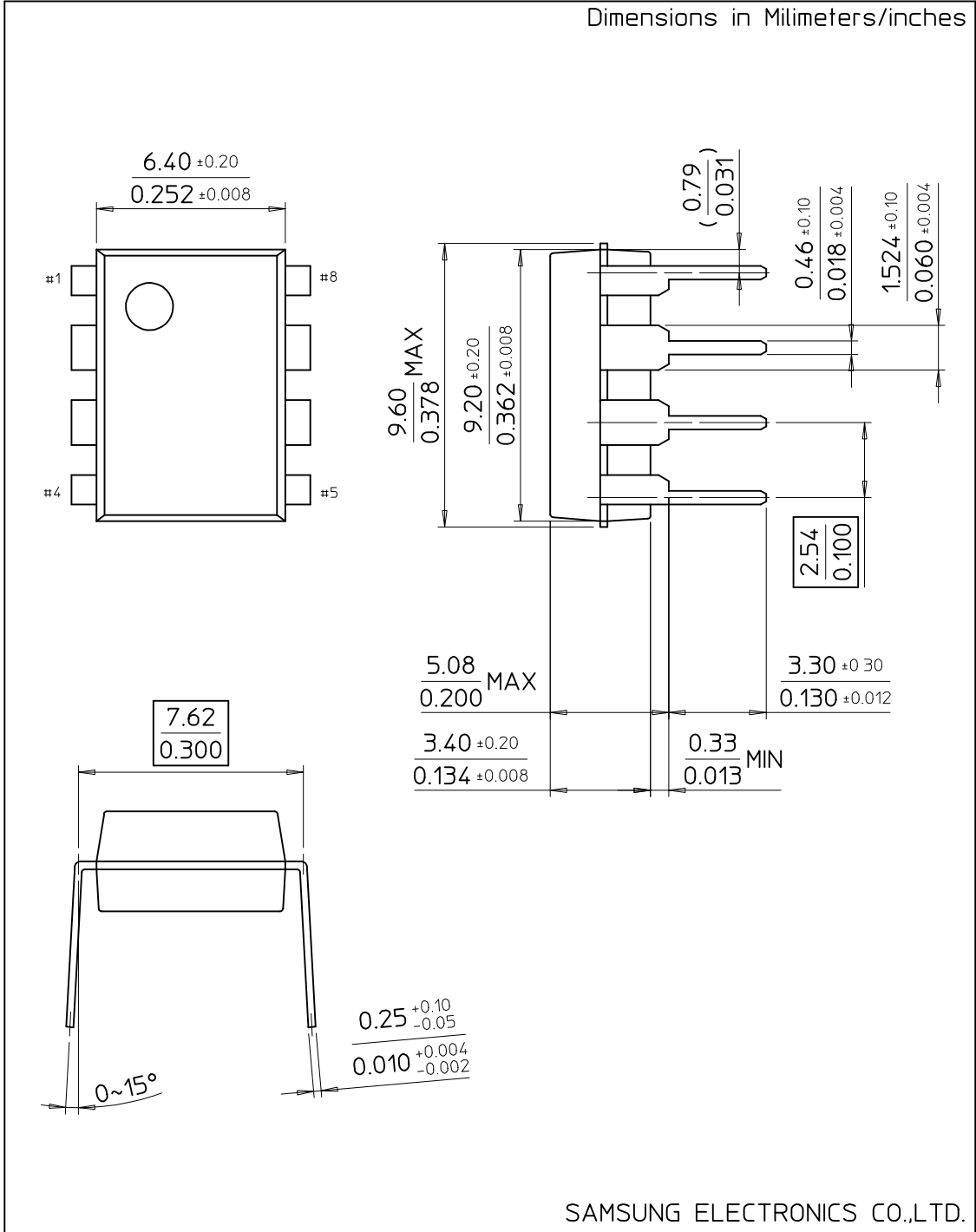


Fig. 12 VOLTAGE FOLLOWER PULSE RESPONSE (SMALL SIGNAL)



8-DIP-300

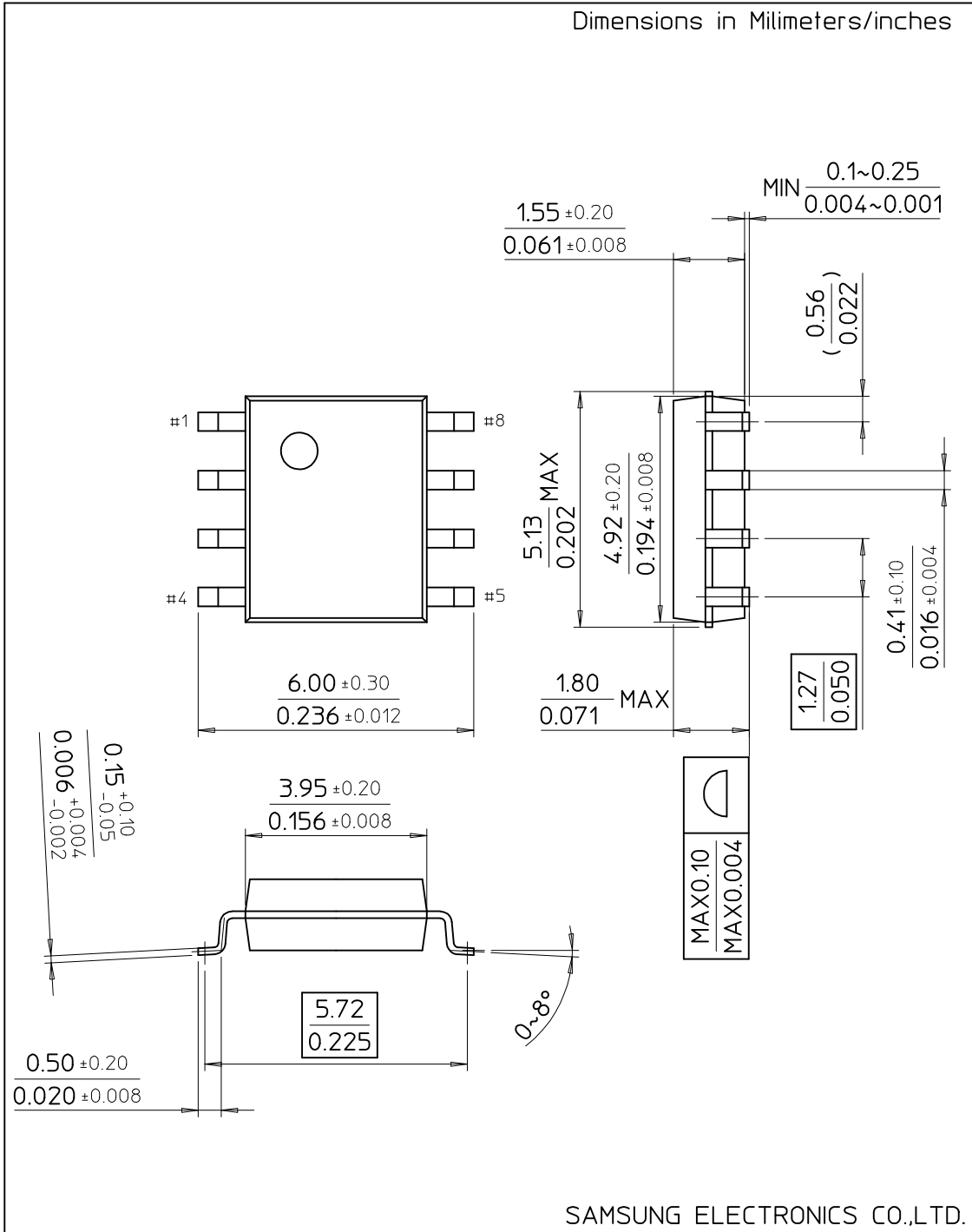
Dimensions in Millimeters/inches



SAMSUNG ELECTRONICS CO.,LTD.

8-SOP-225

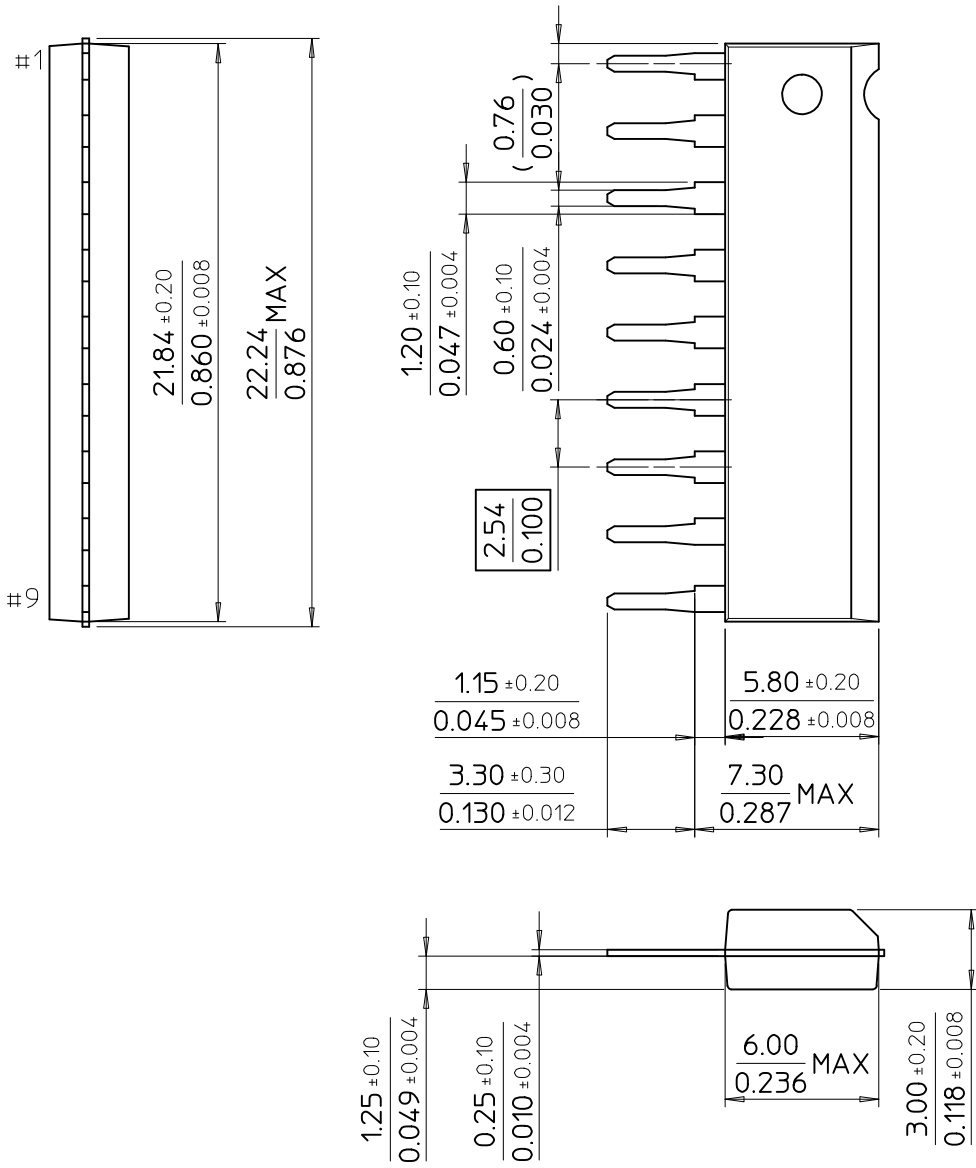
Dimensions in Millimeters/inches



SAMSUNG ELECTRONICS CO.,LTD.

9-SIP

Dimensions in Milimeters/Inches



SAMSUNG ELECTRONICS CO.,LTD.