SN52709AL

AMPLIFICATEURS OPERATIONNELS
OPERATIONAL AMPLIFIERS

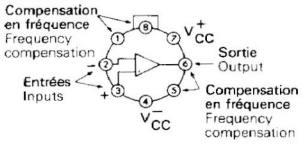
The 2709 is a monolithic operational amplifier intended for general-purpose applications. The design, in addition to providing high gain, minimizes both offset voltage and bias currents.

The 2709 A is identical to the SFC 2709 but this device displays exceptional temperature stability. Furthermore both input offset voltage and input offset current are specified over a −55°C to +125°C temperature range.

External components are used to frequency compensate the amplifier. Although the unity-gain compensation network specified will make the amplifier unconditionally stable in all feed-back configurations, compensation can be tailored to optimize high-frequency performances for any gain setting.

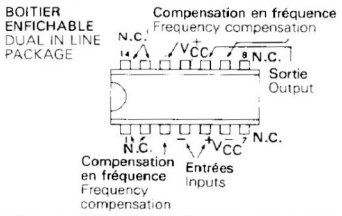
BROCHAGES (vues de dessus)
PIN CONFIGURATIONS (top views)

TO-99 (CB-11)
BOITIER METAL
METAL CAN

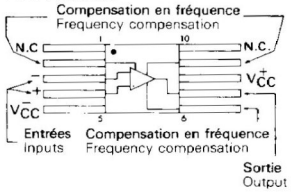


La broche 4 est reliée au boîtier
Pin 4 connected to case

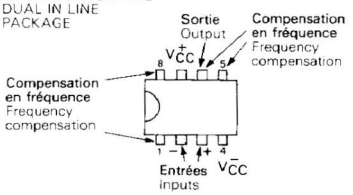
TO-116 (CB-2)
BOITIER ENFICHABLE
DUAL IN LINE PACKAGE



TO-91 (CB-86)
BOITIER PLAT
FLAT PACKAGE



CB-98
BOITIER ENFICHABLE
DUAL IN LINE PACKAGE

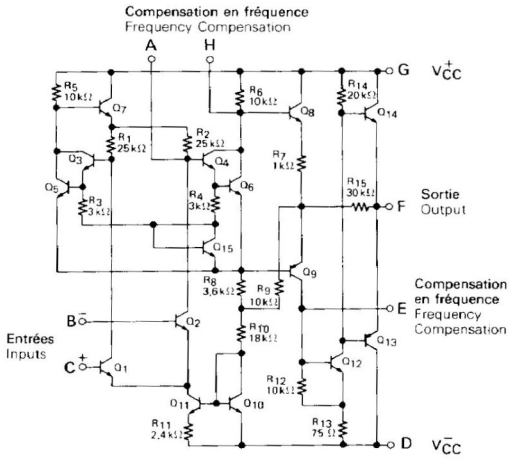


DONNEES PRINCIPALES
- Asservissement
- Instrumentation
- Sommateur
- Générateur de fonctions linéaires, et de fonctions de transfert non linéaires

PRINCIPAL FEATURES
- DC servo systems
- Low-level instrumentation
- Summing amplifier
- Generation of special linear and non-linear transfer functions

SN52709AL

SCHEMA ELECTRIQUE
SCHEMATIC

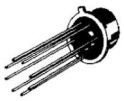


BROCHAGES
PIN CONFIGURATIONS

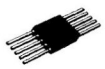
	A	B	C	D	E	F	G	H
TO-99	1	2	3	4	5	6	7	8
TO-116	3	4	5	6	9	10	11	12
TO-91	2	3	4	5	6	7	8	9
CB-98	1	2	3	4	5	6	7	8

BOITIERS
PACKAGES

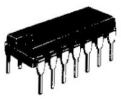
TO-99
(CB-11)



TO-91
(CB-86)



TO-116
(CB-2)



CB-98

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CARACTÉRISTIQUES ÉLECTRIQUES
ELECTRICAL CHARACTERISTICS

Sauf indications contraires, ces spécifications sont applicables pour :
Unless otherwise specified, these specifications are apply for:
$-55°C \leq T_{amb} \leq +125°C$, $\pm 9V \leq V_{CC} \leq \pm 15V$,

R1 = 1,5 kΩ
C1 = 5000 pF
R2 = 51 Ω
C2 = 200 pF

PARAMÈTRES PARAMETERS	SYMBOLES SYMBOLS	CONDITIONS DE MESURE TEST CONDITIONS	SF.C 2709 A			SF.C 2709 M			UNITÉS UNITS
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Tension de décalage à l'entrée Input offset voltage	V_{IO}	$T_{amb} = +25°C$, $R_S \leq 10k\Omega$		0,6	2		1	5	mV
		$R_S \leq 10k\Omega$			3			6	
Courant de décalage à l'entrée Input offset current	I_{IO}	$T_{amb} = +25°C$		10	50		50	200	nA
		$T_{amb} = T_{max}$		3,5	50		20	200	
		$T_{amb} = T_{min}$		40	250		100	500	
Courant de polarisation moyen Input bias current	I_B	$T_{amb} = +25°C$		100	200		200	500	nA
		$T_{amb} = T_{min}$		300	600		500	1500	
Amplification en tension Large signal voltage gain	A_V	$V_{CC} = \pm 15V$, $R_L \geq 2k\Omega$ $V_O = \pm 10V$, $T_{amb} = +25°C$		45			45		V/mV
		$V_{CC} = \pm 15V$, $R_L \geq 2k\Omega$ $V_O = \pm 10V$	25		70	25		70	
Courant fourni par les alimentations Supply current	I_{CC1}, I_{CC2}	$T_{amb} = +25°C$, $V_{CC} = \pm 15V$		2,5	3,6		2,6	5,5	mA
		$T_{amb} = T_{max}$, $V_{CC} = \pm 15V$		2,1	3				
		$T_{amb} = T_{min}$, $V_{CC} = \pm 15V$		2,7	4,5				
Tension d'entrée limite Input voltage range	$V_{I\,max}$	$V_{CC} = \pm 15V$	± 8	± 10		± 8	± 10		V
Impédance de sortie Output resistance	Z_O	$T_{amb} = +25°C$		150			150		Ω

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$R1 = 1,5\ k\Omega$
$C1 = 5000\ pF$
$R2 = 51\ \Omega$
$C2 = 200\ pF$

PARAMETRES PARAMETERS	SYMBOLES SYMBOLS	CONDITIONS DE MESURE TEST CONDITIONS		SFC 2709 A			SFC 2709 M			UNITÉS UNITS
				MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Taux de réjection dû aux alimentations Supply voltage rejection ratio	SVR	$R_S \leq 10k\Omega$			40	100		25	150	$\mu V/V$
Coefficient de température de la tension de décalage à l'entrée Temperature coefficient of input offset voltage	DV_{IO}	$R_S = 50\Omega$	$T_{amb} = +25°C$ à to T_{max}		1,8	10		3		$\mu V/°C$
			$T_{amb} = +25°C$ à to T_{min}		1,8	10		3		
		$R_S = 10k\Omega$	$T_{amb} = +25°C$ à to T_{max}		2	15		6		
			$T_{amb} = +25°C$ à to T_{min}		4,8	25		6		
Coefficient de température du courant de décalage à l'entrée Temperature coefficient of input offset current	DI_{IO}	$T_{amb} = +25°C$ à to T_{min}			0,45	2,8				nA/°C
		$T_{amb} = +25°C$ à to T_{max}			0,08	0,5				
Taux de réjection en mode commun Common mode rejection ratio	CMR	$R_S \leq 10k\Omega$		80	110		70	90		dB
Impédance d'entrée (différentielle) Input resistance	Z_I	$T_{amb} = +25°C$		350	700		150	400		kΩ
		$T_{amb} = T_{min}$		85	170		40	100		
Dynamique de sortie Output voltage swing	V_{OPP}	$V_{CC} = \pm 15V$, $R_L \geq 10k\Omega$		± 12	± 14		± 12	± 14		V
		$V_{CC} = \pm 15V$, $R_L \geq 2k\Omega$		± 10	± 13		± 10	± 13		
Pente maximale du signal de sortie Slew rate	S_{VO}	$T_{amb} = +25°C$			0,25			0,25		$V/\mu s$
Amplificateur suiveur Follower amplifier		$V_{CC} = \pm 15V$, $C_L \leq 100pF$ $V_I = 20mV$, $R_L = 2k\Omega$ $T_{amb} = +25°C$								
Temps de transition à la croissance Rise time	T_{TLH}					1,5		0,3	1	μs
Facteur de rebondissement Overshoot factor	K_{VO}					30		10	30	%

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CARACTERISTIQUES ELECTRIQUES
ELECTRICAL CHARACTERISTICS

Sauf indications contraires, ces spécifications sont applicables pour :
Unless otherwise specified, these specifications are apply for:

$-25\,°C \leqslant T_{amb} \leqslant +85\,°C$, $\pm 9\,V \leqslant V_{CC} \leqslant \pm 15\,V$,
$0\,°C \leqslant T_{amb} \leqslant +70\,°C$, $\pm 9\,V \leqslant V_{CC} \leqslant \pm 15\,V$,

R1 = 1,5 kΩ
C1 = 5000 pF
R2 = 51 Ω
C2 = 200 pF

PARAMETRES PARAMETERS	SYMBOLES SYMBOLS	CONDITIONS DE MESURE TEST CONDITIONS	SF.C 2709 T			SF.C 2709 C			UNITÉS UNITS
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Tension de décalage à l'entrée Input offset voltage	V_{IO}	$T_{amb} = +25\,°C$, $R_S \leqslant 10\,k\Omega$		1	5		2	7,5	mV
		$R_S \leqslant 10\,k\Omega$			7,5			10	
Courant de décalage à l'entrée Input offset current	I_{IO}	$T_{amb} = +25\,°C$		50	300		100	500	nA
		$T_{amb} = T_{max}$		30	300		75	400	
		$T_{amb} = T_{min}$		80	500		125	750	
Courant de polarisation moyen Input bias current	I_B	$T_{amb} = +25\,°C$		0,3	0,75		0,3	1,5	μA
		$T_{amb} = T_{min}$		0,36	2		0,36	2	
Amplification en tension Large signal voltage gain	A_V	$V_{CC} = \pm 15\,V$, $R_L \geqslant 2\,k\Omega$ $V_O = \pm 10\,V$, $T_{amb} = +25\,°C$		45		15	45		V/mV
		$V_{CC} = \pm 15\,V$, $R_L \geqslant 2\,k\Omega$ $V_O = \pm 10\,V$	25			12			
Courant fourni par les alimentations Supply current	I_{CC1}, I_{CC2}	$T_{amb} = +25\,°C$, $V_{CC} = \pm 15\,V$		2,6	6,6		2,6	6,6	mA
Tension d'entrée limite Input voltage range	V_{Imax}	$V_{CC} = \pm 15\,V$	± 8	± 10		± 8	± 10		V
Impédance de sortie Output resistance	Z_O	$T_{amb} = +25\,°C$		150			150		Ω
	SVR	$R_S \leqslant 10\,k\Omega$		25	200		25	200	μV/V

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CARACTERISTIQUES ELECTRIQUES
ELECTRICAL CHARACTERISTICS

Sauf indications contraires, ces spécifications sont applicables pour :
Unless otherwise specified, these specifications are apply for:

$-25°C \leq T_{amb} \leq +85°C$, $\pm 9V \leq V_{CC} \leq \pm 15V$,
$0°C \leq T_{amb} \leq +70°C$, $\pm 9V \leq V_{CC} \leq \pm 15V$,

R1 = 1,5 kΩ
C1 = 5000 pF
R2 = 51 Ω
C2 = 200 pF

PARAMÈTRES PARAMETERS	SYMBOLES SYMBOLS	CONDITIONS DE MESURE TEST CONDITIONS	SF.C 2709 T MIN.	 TYP.	 MAX.	SF.C 2709 C MIN.	 TYP.	 MAX.	UNITÉS UNITS
Coefficient de température de la tension de décalage à l'entrée Temperature coefficient of input offset voltage	DV_{IO}	$R_S = 50\Omega$		3	20		6		$\mu V/°C$
		$R_S = 10k\Omega$		6			12		
Coefficient de température du courant de décalage à l'entrée Temperature coefficient of input offset current	DI_{IO}	$T_{amb} = +25°C$ à to T_{max}		0,3	2				nA/°C
		$T_{amb} = +25°C$ à to T_{min}		0,6	4				
Taux de réjection en mode commun Common mode rejection ratio	CMR	$R_S \leq 10k\Omega$	65	90		65	90		dB
Impédance d'entrée (différentielle) Input resistance	Z_I	$T_{amb} = +25°C$	70	250		50	250		kΩ
		$T_{amb} = T_{min}$	70	250		35			
Dynamique de sortie Output voltage swing	V_{OPP}	$V_{CC} = \pm 15V$, $R_L \geq 10k\Omega$	± 12	± 14		± 12	± 14		V
		$V_{CC} = \pm 15V$, $R_L \geq 2k\Omega$	± 10	± 13		± 10	± 13		
Pente maximale du signal de sortie Slew rate	S_{VO}	$T_{amb} = +25°C$		0,25			0,25		$V/\mu s$
Amplificateur suiveur *Follower amplifier*		$V_{CC} = \pm 15V$, $C_L \leq 100pF$ $V_I = 20mV$, $R_L \approx 2k\Omega$ $T_{amb} = +25°C$							
Temps de transition à la croissance Rise time	T_{TLH}			0,3	1		0,3		μs
Facteur de rebondissement Overshoot factor	K_{VO}			10	30		10		%

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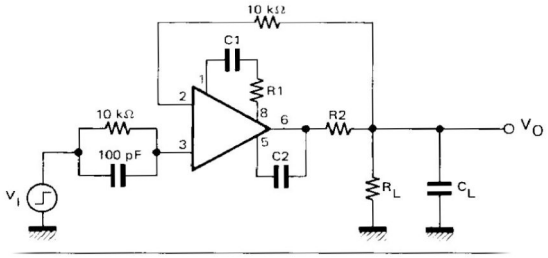
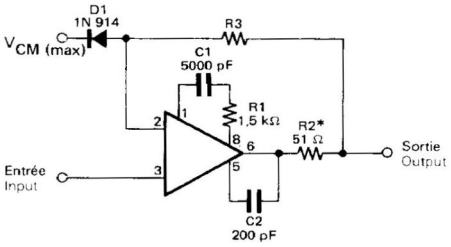
SCHEMAS DE MESURES
MEASUREMENT DIAGRAMS

CIRCUIT DE MESURE DU TEMPS DE REPONSE
TRANSIENT RESPONSE TEST CIRCUIT



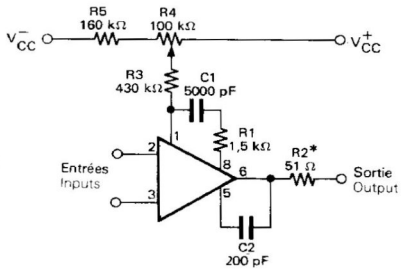
APPLICATIONS TYPIQUES
TYPICAL APPLICATIONS

AMPLIFICATEUR SUIVEUR
VOLTAGE FOLLOWER

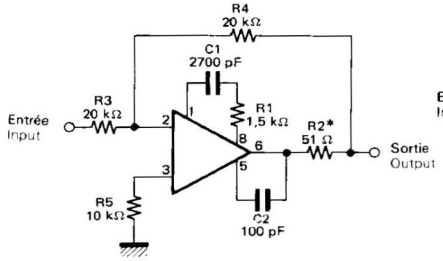


R3 égale à la résistance de la source d'entrée
R3 should be equal to dc source resistance on input

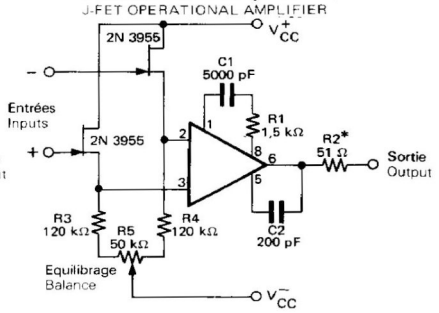
CIRCUIT DE COMPENSATION DE LA TENSION RESIDUELLE
OFFSET BALANCING CIRCUIT



AMPLIFICATEUR INVERSEUR A GAIN UNITE
UNITY GAIN INVERTING AMPLIFIER



AMPLIFICATEUR OPERATIONNEL
(TRANSISTORS "EFFET DE CHAMP")
J-FET OPERATIONAL AMPLIFIER



Les numéros de ces brochages sont ceux des boîtiers TO-99 et CB-98
Pin numbers only apply to TO-99 and CB-98 packages

* Doit être utilisé lorsque la charge est capacitive
To be used with any capacitive loading output

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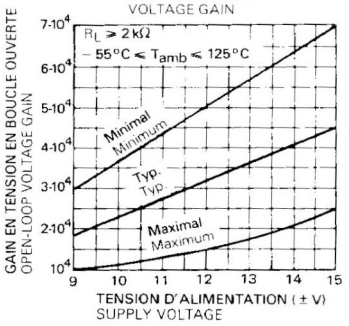
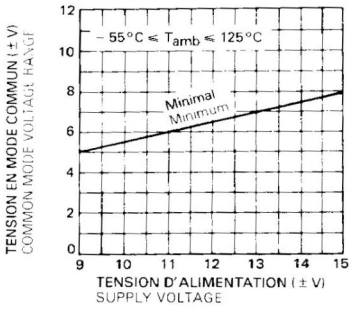
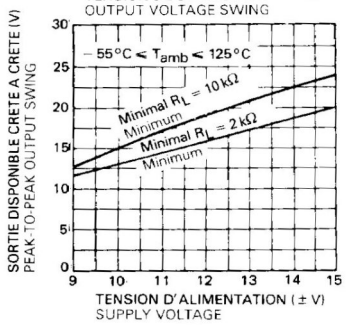
GAIN EN TENSION
VOLTAGE GAIN



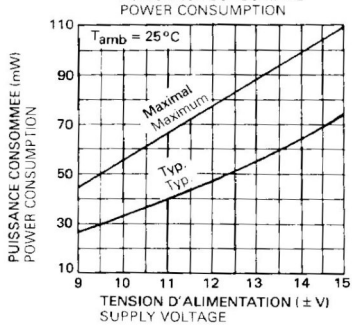
TENSION D'ENTREE EN MODE COMMUN (Note 1)
INPUT COMMON MODE VOLTAGE RANGE



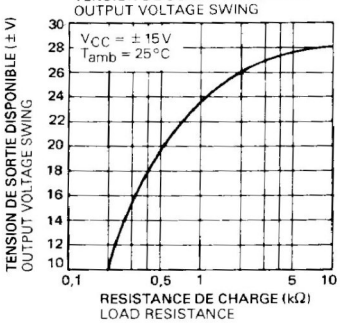
TENSION DE SORTIE DISPONIBLE
OUTPUT VOLTAGE SWING



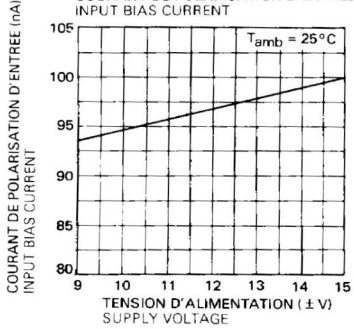
PUISSANCE CONSOMMEE
POWER CONSUMPTION



TENSION DE SORTIE DISPONIBLE
OUTPUT VOLTAGE SWING



COURANT DE POLARISATION D'ENTREE
INPUT BIAS CURRENT



$-55\,°C \leq T_{amb} \leq +125\,°C,\ \pm 5\,V \leq V_{CC} \leq \pm 20\,V$
$0\,°C \leq T_{amb} \leq +\ 70\,°C,\ \pm 5\,V \leq V_{CC} \leq \pm 15\,V$

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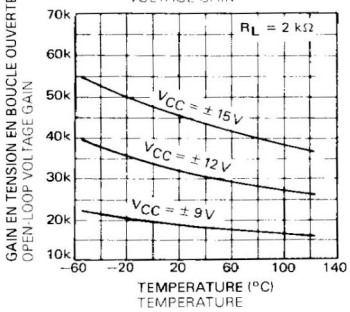
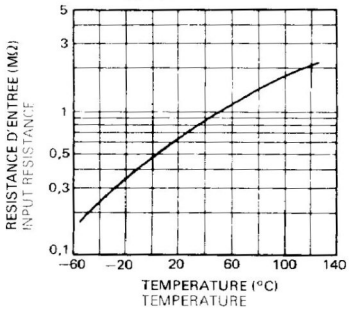
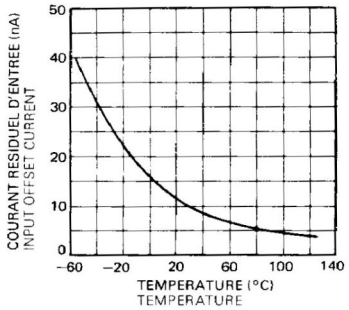
GAIN EN TENSION
VOLTAGE GAIN



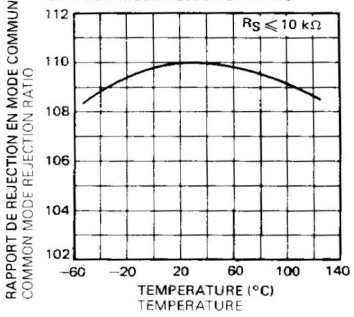
RESISTANCE D'ENTREE
INPUT RESISTANCE



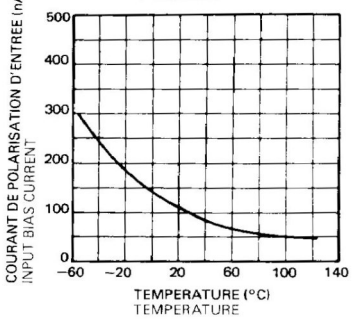
COURANT RESIDUEL D'ENTREE
INPUT OFFSET CURRENT



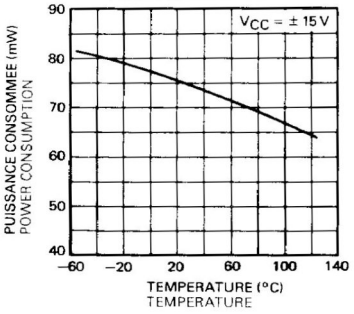
RAPPORT DE REJECTION EN MODE COMMUN
COMMON MODE REJECTION RATIO



COURANT DE POLARISATION D'ENTREE
INPUT BIAS CURRENT



PUISSANCE CONSOMMEE
POWER CONSUMPTION



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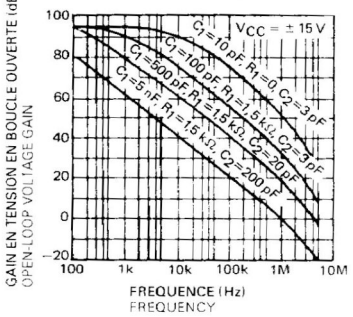
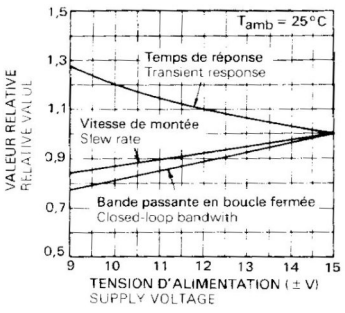
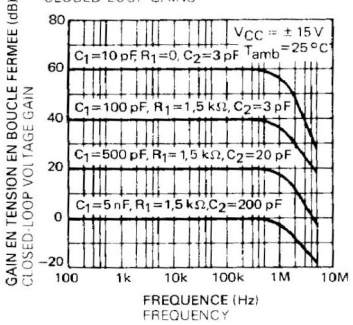
REPONSE EN FREQUENCE EN BOUCLE OUVERTE
OPEN-LOOP FREQUENCY RESPONSE



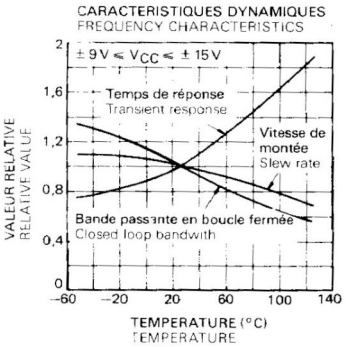
CARACTERISTIQUES DYNAMIQUES
FREQUENCY CHARACTERISTICS



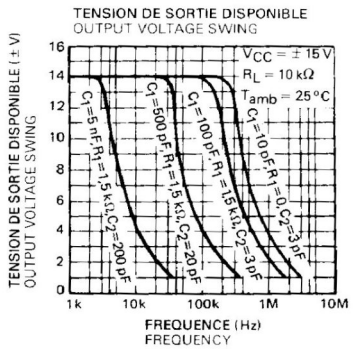
REPONSE EN FREQUENCE EN BOUCLE FERMEE
FREQUENCY RESPONSE FOR VARIOUS
CLOSED-LOOP GAINS



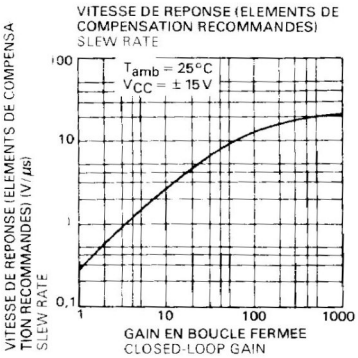
CARACTERISTIQUES DYNAMIQUES
FREQUENCY CHARACTERISTICS



TENSION DE SORTIE DISPONIBLE
OUTPUT VOLTAGE SWING



VITESSE DE REPONSE (ELEMENTS DE COMPENSATION RECOMMANDES)
SLEW RATE



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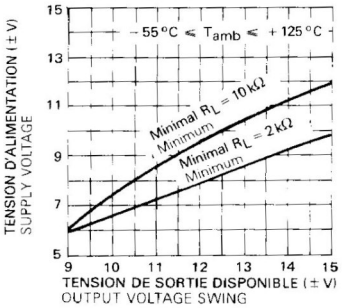
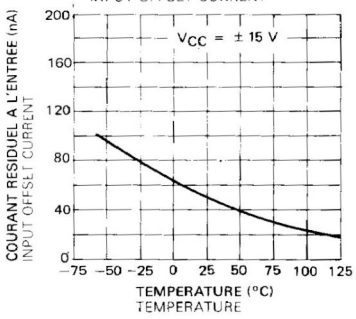
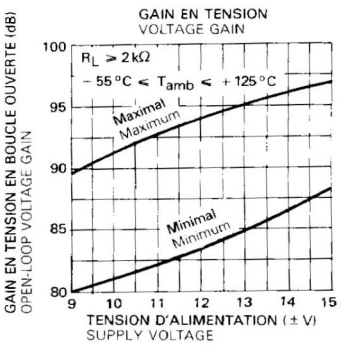
TENSION DE SORTIE DISPONIBLE
OUTPUT VOLTAGE SWING



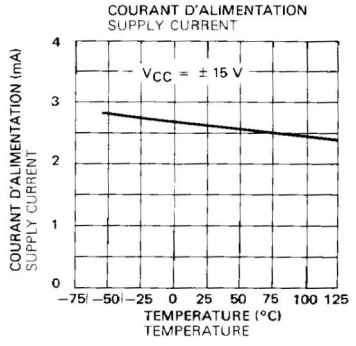
COURANT RESIDUEL A L'ENTREE
INPUT OFFSET CURRENT



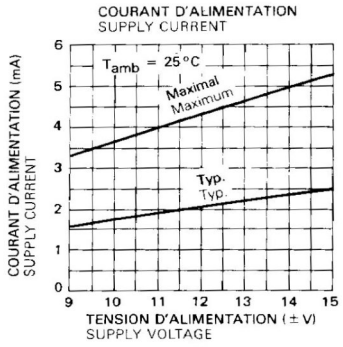
GAIN EN TENSION
VOLTAGE GAIN



COURANT D'ALIMENTATION
SUPPLY CURRENT



COURANT D'ALIMENTATION
SUPPLY CURRENT



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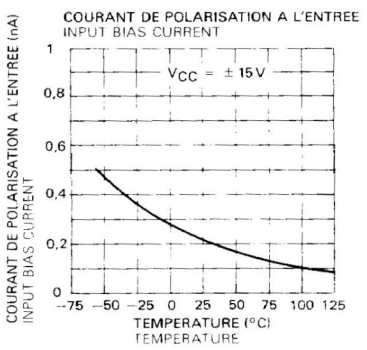

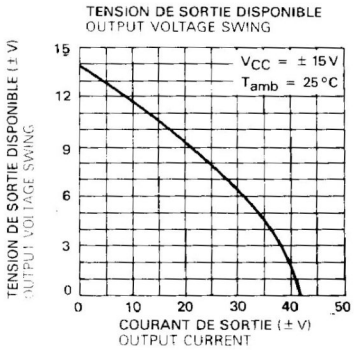

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