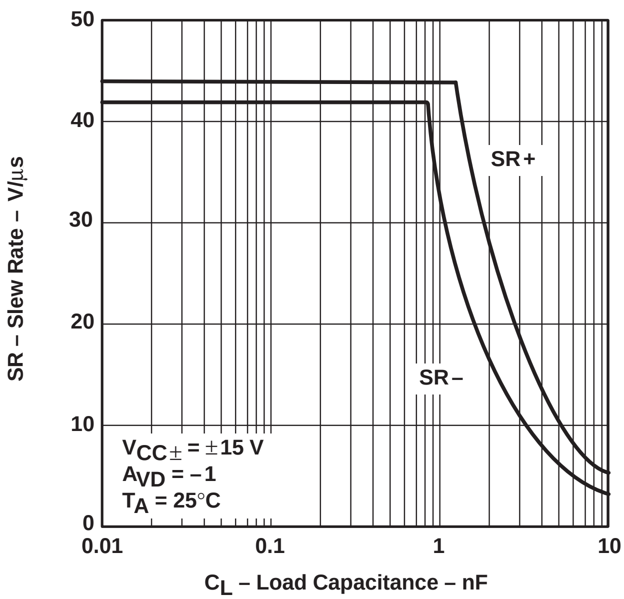
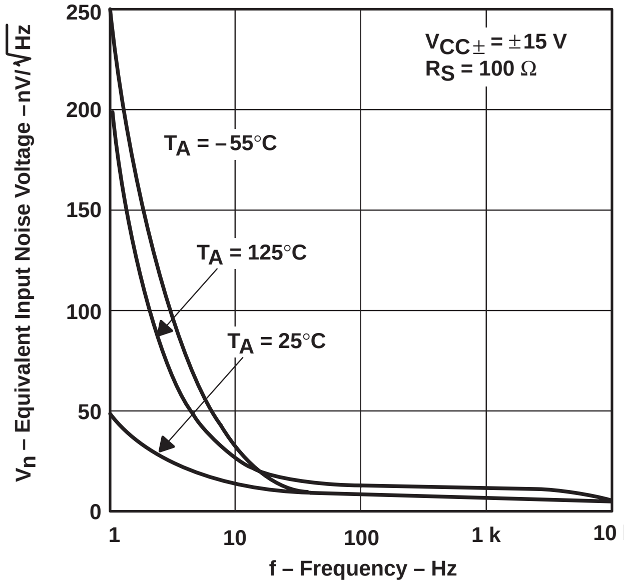
available features

- Low Noise:
  10 Hz . . . 15 nV/√Hz
  1 kHz . . . 10.5 nV/√Hz
- 10000-pF Load Capability
- 20-mA Min Short-Circuit Output Current
- 30-V/μs Min Slew Rate
- High Gain-Bandwidth Product . . . 5.9 MHz
- Low V_{IO} . . . 500 μV Max at 25°C
- Single or Split Supply . . . 4 V to 44 V
- Fast Settling Time
  340 ns to 0.1%
  400 ns to 0.01%
- Saturation Recovery . . . 150 ns
- Large Output Swing . . . V_{CC-} +0.1 V to V_{CC+} – 1 V

SLEW RATE
vs
LOAD CAPACITANCE



EQUIVALENT INPUT NOISE VOLTAGE
vs
FREQUENCY



description

The TLE2141M and TLE2141AM are high-performance, internally compensated operational amplifiers built using Texas Instruments complementary bipolar Excalibur process. The TLE2141AM is a tighter offset voltage grade of the TLE2141M. Both are pin-compatible upgrades to standard industry products.

The design incorporates a patent-pending input stage that simultaneously achieves low audio band noise of 10.5 nV/√Hz with a 10-Hz 1/f corner and symmetrical 40-V/μs slew rate typically with loads up to 800 pF. The resulting low distortion and high power bandwidth are important in high-fidelity audio applications. A fast settling time of 340 ns to 0.1% of a 10-V step with a 2-kΩ/100-pF load is useful in fast actuator/positioning drivers. Under similar test conditions, settling time to 0.01% is 400 ns.

AVAILABLE OPTIONS

T_A	V_{IO} max AT 25°C	PACKAGE		CHIP FORM (Y)
		CHIP CARRIER (FK)	CERAMIC DIP (JG)	
–55°C to 125°C	500 μV 900 μV	TLE2141AMFK TLE2141MFK	TLE2141AMJG TLE2141MJG	TLE2141Y

description (continued)

The devices are stable with capacitive loads up to 10 nF, although the 6-MHz bandwidth decreases to 1.8 MHz at this high loading level. As such, the TLE2141M and TLE2141AM are useful for low-droop sample and holds and direct buffering of long cables, including four 20-mA current loops.

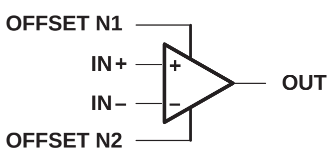
The special design also exhibits an improved insensitivity to inherent IC component mismatches as is evidenced by a 500-µV maximum offset voltage and 1.7-µV/°C typical drift. Minimum common-mode rejection ratio and supply-voltage rejection ratio are 85 dB and 90 dB, respectively.

Device performance is relatively independent of supply voltage over the ±2-V to ±22-V range. Inputs can operate between $V_{CC-} - 0.3$ to $V_{CC+} - 1.8$ V without inducing phase reversal, although excessive input current may flow out of each input exceeding the lower common-mode input range. The all NPN output stage provides a nearly rail-to-rail output swing of $V_{CC-} + 0.1$ to $V_{CC+} - 1$ V under light current loading conditions. The device can sustain shorts to either supply since output current is internally limited, but care must be taken to ensure that maximum package power dissipation is not exceeded.

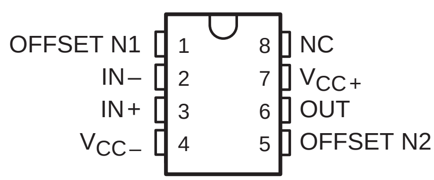
Both versions can also be used as comparators. Differential inputs of $V_{CC\pm}$ can be maintained without damage to the device. Open-loop propagation delay with TTL supply levels is typically 200 ns. This gives a good indication as to output stage saturation recovery when the device is overdriven beyond the limits of recommended output swing.

Both the TLE2141M and TLE2141AM are available in a wide variety of packages, including both the industry-standard 8-pin small-outline version and chip form for high-density system applications. The M-suffix is characterized for operation over the full military temperature range of –55°C to 125°C.

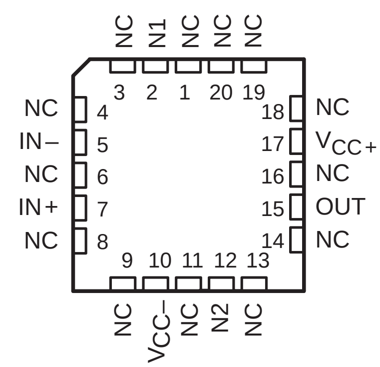
symbol



JG PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)

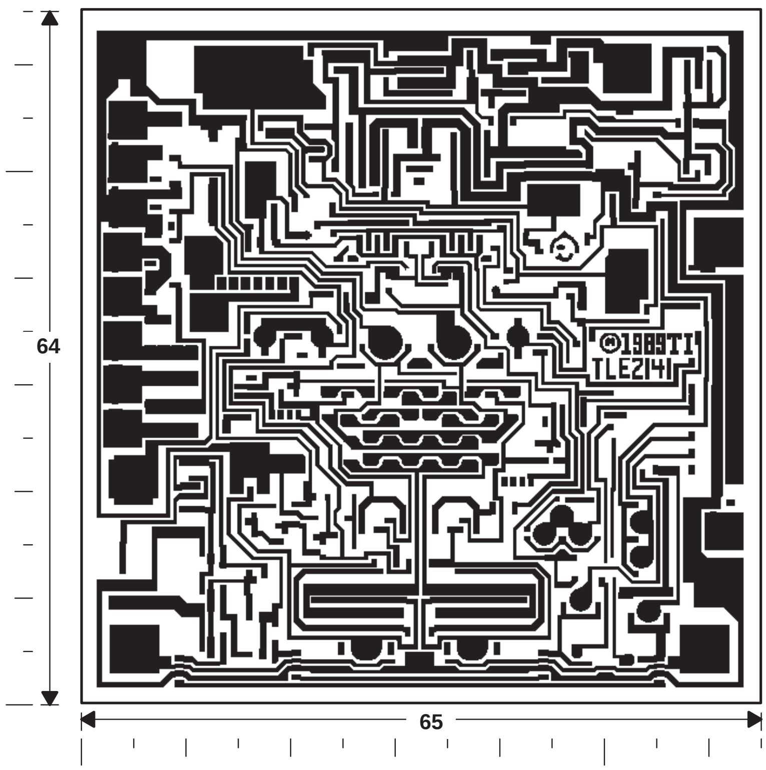


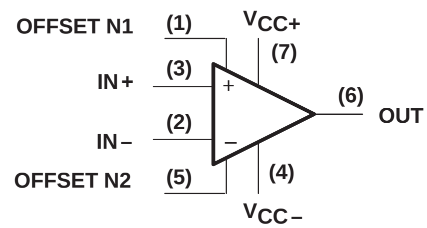
NC – No internal connection

chip information

These chips, when properly assembled, display characteristics similar to the TLE2141M. Thermal compression or ultrasonic bonding may be used on the doped aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.

BONDING PAD ASSIGNMENTS





CHIP THICKNESS: 15 TYPICAL

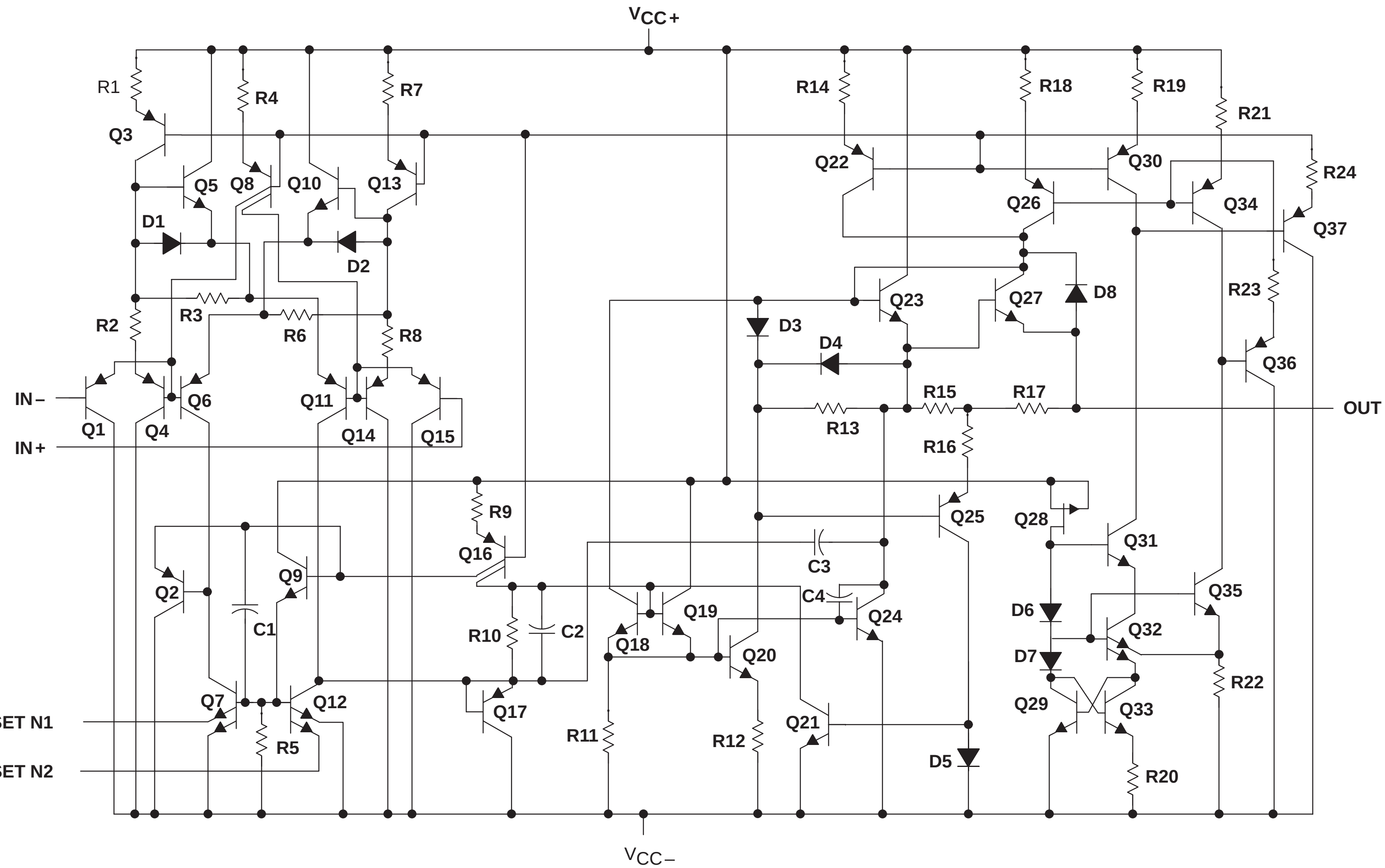
BONDING PADS: 4 × 4 MINIMUM

T_{Jmax} = 150°C

TOLERANCES ARE ±10%

ALL DIMENSIONS ARE IN MILS

equivalent schematic



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC+} (see Note 1) . . . 22 V
Supply voltage, V_{CC-} (see Note 1) . . . –22 V
Differential input voltage (see Note 2) . . . ±44 V
Input voltage range, V_I (any input) . . . V_{CC+} to V_{CC-} – 0.3 V
Input current, I_I (each input) . . . ±1 mA
Output current, I_O . . . ±80 mA
Total current into V_{CC+} . . . 80 mA
Total current out of V_{CC-} . . . 80 mA
Duration of short-circuit current at (or below) 25°C (see Note 3) . . . unlimited
Continuous total dissipation . . . See Dissipation Rating Table
Operating free-air temperature range, T_A . . . –55°C to 125°C
Storage temperature range . . . –65°C to 150°C
Case temperature for 60 seconds: FK package . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG package . . . 300°C

NOTES: 1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at the noninverting input with respect to the inverting input. Excessive current will flow if input voltage is brought below V_{CC-} – 0.3 V.
3. The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25°C$ POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING	T_A = 105°C POWER RATING	T_A = 125°C POWER RATING
FK	1375 mW	11.0 mW/°C	880 mW	495 mW	275 mW
JG	1050 mW	8.4 mW/°C	672 mW	378 mW	210 mW

recommended operating conditions

		MIN	MAX	UNIT
Supply voltage, $V_{CC\pm}$		±2	±22	V
Common-mode input voltage, V_{IC}	V_{CC} = 5 V	0	2.7	V
	$V_{CC\pm}$ = ±15 V	–15	12.7	
Operating free-air temperature, T_A		–55	125	°C

electrical characteristics at specified free-air temperature, V_{CC} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLE2141M			TLE2141AM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_O = 2.5 V, R_S = 50 Ω, V_{IC} = 2.5 V	25°C		225	1400		200	1000	µV
			Full range			2100			1700	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		1.7			1.7		µV/°C
I_{IO}	Input offset current		25°C		8	100		8	100	nA
			Full range			250			250	
I_{IB}	Input bias current		25°C		–0.8	–2		–0.8	–2	µA
			Full range			–2.3			–2.3	
V_{ICR}	Common-mode input voltage range	R_S = 50 Ω	25°C	0 to 3	–0.3 to 3.2		0 to 3	–0.3 to 3.2		V
			Full range	0 to 2.7	–0.3 to 2.9		0 to 2.7	–0.3 to 2.9		
V_{OH}	High-level output voltage	I_{OH} = –150 µA	25°C	3.9	4.1		3.9	4.1		V
		I_{OH} = –1.5 mA		3.8	4		3.8	4		
		I_{OH} = –15 mA		3.2	3.7		3.2	3.7		
		I_{OH} = –100 µA	Full range	3.75			3.75			
		I_{OH} = –1 mA		3.65			3.65			
		I_{OH} = –10 mA		3.25			3.25			
V_{OL}	Low-level output voltage	I_{OL} = 150 µA	25°C		75	125		75	125	mV
		I_{OL} = 1.5 mA			150	225		150	225	
		I_{OL} = 15 mA			1.2	1.4		1.2	1.4	V
		I_{OL} = 100 µA	Full range			200			200	
		I_{OL} = 1 mA				250			250	mV
		I_{OL} = 10 mA				1.25			1.25	
A_{VD}	Large-signal differential voltage amplification	V_{CC} = ±2.5 V, R_L = 2 kΩ, V_O = 1 V to –1.5 V	25°C	50	220		50	220		V/mV
			Full range	5			5			
r_i	Input resistance		25°C		70			70		MΩ
c_i	Input capacitance		25°C		2.5			2.5		pF
z_o	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR} min, R_S = 50 Ω	25°C	85	118		85	118		dB
			Full range	80			80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm}$ = ±2.5 V to ±15 V, R_S = 50 Ω	25°C	90	106		90	106		dB
			Full range	85			85			
I_{CC}	Supply current	V_O = 2.5 V, No load, V_{IC} = 2.5 V	25°C		3.4	4.4		3.4	4.4	mA
			Full range			4.6			4.6	

† Full range is –55°C to 125°C.

operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		TLE2141M			TLE2141AM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR+	Positive slew rate	A_{VD} = –1, C_L = 500 pF	R_L = 2 kΩ†,		45			45		V/µs
SR–	Negative slew rate				42			42		V/µs
	Settling time	A_{VD} = –1, 2.5-V step	To 0.1%		0.16			0.16		µs
			To 0.01%		0.22			0.22		µs
V_n	Equivalent input noise voltage	R_S = 100 Ω,	f = 10 Hz		15			15		nV/√Hz
		R_S = 100 Ω,	f = 1 kHz		10.5			10.5		nV/√Hz
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 1 Hz			0.48			0.48		µV
		f = 0.1 Hz to 10 Hz			0.51			0.51		µV
I_n	Equivalent input noise current	f = 10 Hz			1.92			1.92		pA/√Hz
		f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	V_O = 1 V to 3 V, A_{VD} = 2,	R_L = 2 kΩ†, f = 10 kHz		0.0052%			0.0052%		
B1	Unity-gain bandwidth	R_L = 2 kΩ†,	C_L = 100 pF		5.9			5.9		MHz
	Gain-bandwidth product	R_L = 2 kΩ†, f = 100 kHz	C_L = 100 pF,		5.8			5.8		MHz
B_{OM}	Maximum output-swing bandwidth	R_L = 2 kΩ†, A_{VD} = 1	$V_{O(PP)}$ = 2 V,		6.6			6.6		MHz
ϕ_m	Phase margin at unity gain	R_L = 2 kΩ†,	C_L = 100 pF		57°			57°		

† R_L terminates at 2.5 V.

electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 15$ V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A†	TLE2141M MIN	TLE2141M TYP	TLE2141M MAX	TLE2141AM MIN	TLE2141AM TYP	TLE2141AM MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$, $R_S = 50\ \Omega$	25°C		200	900		175	500	μV
			Full range			1700			1200	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		1.7			1.7		μV/°C
I_{IO}	Input offset current		25°C		7	100		7	100	nA
			Full range			250			250	
I_{IB}	Input bias current		25°C		–0.7	–1.5		–0.7	–1.5	μA
			Full range			–1.8			–1.8	
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$	25°C	–15 to 13	–15.3 to 13.2		–15 to 13	–15.3 to 13.2		V
			Full range	–15 to 12.7	–15.3 to 12.9		–15 to 12.7	–15.3 to 12.9		
V_{OM+}	Maximum positive peak output voltage swing	$I_O = -150$ μA	25°C	13.8	14.1		13.8	14.1		V
		$I_O = -1.5$ mA		13.7	14		13.7	14		
		$I_O = -15$ mA		13.1	13.7		13.1	13.7		
		$I_O = -100$ μA	Full range	13.7			13.7			
		$I_O = -1$ mA		13.6			13.6			
		$I_O = -10$ mA		13.1			13.1			
V_{OM-}	Maximum negative peak output voltage swing	$I_O = 150$ μA	25°C	–14.7	–14.9		–14.7	–14.9		V
		$I_O = 1.5$ mA		–14.5	–14.8		–14.5	–14.8		
		$I_O = 15$ mA		–13.4	–13.8		–13.4	–13.8		
		$I_O = 100$ μA	Full range	–14.6			–14.6			
		$I_O = 1$ mA		–14.5			–14.5			
		$I_O = 10$ mA		–13.4			–13.4			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm 10$ V, $R_L = 2$ kΩ	25°C	100	450		100	450		V/mV
			Full range	20			20			
r_i	Input resistance		25°C		65			65		MΩ
c_i	Input capacitance		25°C		2.5			2.5		pF
z_o	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50\ \Omega$	25°C	85	108		85	108		dB
			Full range	80			80			
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$)	$V_{CC\pm} = \pm 2.5$ V to ± 15 V, $R_S = 50\ \Omega$	25°C	90	106		90	106		dB
			Full range	85			85			
I_{OS}	Short-circuit output current	$V_O = 0$, $V_{ID} = 1$ V	25°C	–25	–50		–25	–50		mA
		$V_O = 0$, $V_{ID} = -1$ V		20	31		20	31		
I_{CC}	Supply current	$V_O = 0$, $V_{IC} = 2.5$ V, No load	25°C		3.5	4.5		3.5	4.5	mA
			Full range			4.7			4.7	

† Full range is –55°C to 125°C.

operating characteristics, $V_{CC\pm} = \pm15$, $T_A = 25°C$

PARAMETER		TEST CONDITIONS		TLE2141M			TLE2141AM			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR+	Positive slew rate	$A_{VD} = -1$, $C_L = 500$ pF	$R_L = 2$ kΩ,	30	45		30	45		V/µs
SR–	Negative slew rate			30	42		30	42		
	Settling time	$A_{VD} = -1$, 10-V step	To 0.1%		0.34			0.34		µs
			To 0.01%		0.4			0.4		
V_n	Equivalent input noise voltage	$R_S = 100$ Ω,	f = 10 Hz		15			15		nV/√Hz
		$R_S = 100$ Ω,	f = 1 kHz		10.5			10.5		
$V_{N(PP)}$	Peak-to-peak equivalent input noise voltage	f = 0.1 Hz to 1 Hz			0.48			0.48		µV
		f = 0.1 Hz to 10 Hz			0.51			0.51		
I_n	Equivalent input noise current	f = 10 Hz			1.89			1.89		pA/√Hz
		f = 1 kHz			0.47			0.47		
THD + N	Total harmonic distortion plus noise	$V_{O(PP)} = 20$ V, $A_{VD} = 10$,	$R_L = 2$ kΩ, f = 10 kHz		0.01%			0.01%		
B_1	Unity-gain bandwidth	$R_L = 2$ kΩ,	$C_L = 100$ pF		6			6		MHz
	Gain-bandwidth product	$R_L = 2$ kΩ, f = 100 kHz	$C_L = 100$ pF,		5.9			5.9		MHz
B_{OM}	Maximum output-swing bandwidth	$V_{O(PP)} = 20$ V, $A_{VD} = 1$,	$R_L = 2$ kΩ, $C_L = 100$ pF		668			668		kHz
ϕ_m	Phase margin at unity gain	$R_L = 2$ kΩ,	$C_L = 100$ pF		58°			58°		

electrical characteristics, $V_{CC}\pm = \pm15$ V, $T_A = 25°C$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	$V_{IC} = 0$,	$R_S = 50\ \Omega$, $V_O = 0$			200	1000	µV
I_{IO}	Input offset current	$V_{IC} = 0$,	$R_S = 50\ \Omega$, $V_O = 0$			7	100	nA
I_{IB}	Input bias current	$V_{IC} = 0$,	$R_S = 50\ \Omega$, $V_O = 0$			–0.7	–1.5	µA
V_{ICR}	Common-mode input voltage range	$R_S = 50\ \Omega$			–15 to 13	–15.3 to 13.2		V
V_{OM+}	Maximum positive peak output voltage swing	$I_O = -150$ µA			13.8	14.1		V
		$I_O = -1.5$ mA			13.7	14		
		$I_O = -15$ mA			13.3	13.7		
V_{OM-}	Maximum negative peak output voltage swing	$I_O = 150$ µA			–14.7	–14.9		V
		$I_O = 1.5$ mA			–14.5	–14.8		
		$I_O = 15$ mA			–13.4	–13.8		
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm10$ V,	$R_L = 2\ k\Omega$		100	450		V/mV
r_i	Input resistance					65		MΩ
c_i	Input capacitance					2.5		pF
z_o	Open-loop output impedance	f = 1 MHz				30		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$ min,	$R_S = 50\ \Omega$		80	108		dB
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$)	$V_{CC\pm} = \pm2.5$ V	to ±15 V, $R_S = 50\ \Omega$		85	106		dB
I_{OS}	Short-circuit output current	$V_O = 0$		$V_{ID} = 1$ V	–25	–50		mA
				$V_{ID} = -1$ V	20	31		
I_{CC}	Supply current	$V_O = 0$,	No load			3.5	4.5	mA

TYPICAL CHARACTERISTICS

Table of Graphs

				FIGURE
V_{IO}	Input offset voltage		Distribution	1
I_{IO}	Input offset current		vs Temperature	2
I_{IB}	Input bias current		vs Temperature vs Common-mode input voltage	3 4
V_{OM+}	Maximum positive peak output voltage		vs Supply voltage vs Temperature vs Output current vs Setting time	5 6 7 9
V_{OM-}	Maximum negative peak output voltage		vs Supply voltage vs Temperature vs Output curren vs Setting time	5 6 8 9
$V_{O(PP)}$	Maximum peak-to-peak output voltage swing		vs Frequency	10
V_{OH}	High-level output voltage		vs Output current	11
V_{OL}	Low-level output voltage		vs Output current	12
A_{VD}	Differential voltage amplification		vs Temperature vs Frequency	13 14
z_o	Closed loop output impedance		vs Frequency	15
I_{OS}	Short-circuit output current		vs Supply current	16
CMRR	Common-mode rejection ratio		vs Supply current vs Temperature	17 18
k_{SVR}	Supply-voltage rejection ratio		vs Frequency vs Temperature	19 20
I_{CC}	Supply current		vs Temperature vs Supply voltage	21 22
V_n	Equivalent input noise voltage		vs Frequency	23
$V_{N(PP)}$	Equivalent input noise voltage		Over a 10-second period	24
I_n	Noise current		vs Frequency	25
THD + N	Total harmonic distortion plus noise		vs Frequency	26
SR	Slew rate		vs Temperature vs Load capacitance	27 28
	Pulse response	Noninverting large signal	vs Time	29
		Inverting large signal	vs Time	30
		Small signal	vs Time	31
B_1	Unity-gain-bandwidth		vs Load capacitance	32
	Gain margin		vs Load capacitance	33
ϕ_m	Phase margin		vs Load capacitance	34
	Phase shift		vs Frequency	14

TYPICAL CHARACTERISTICS

**TLE2141M
DISTRIBUTION OF
INPUT OFFSET VOLTAGE**

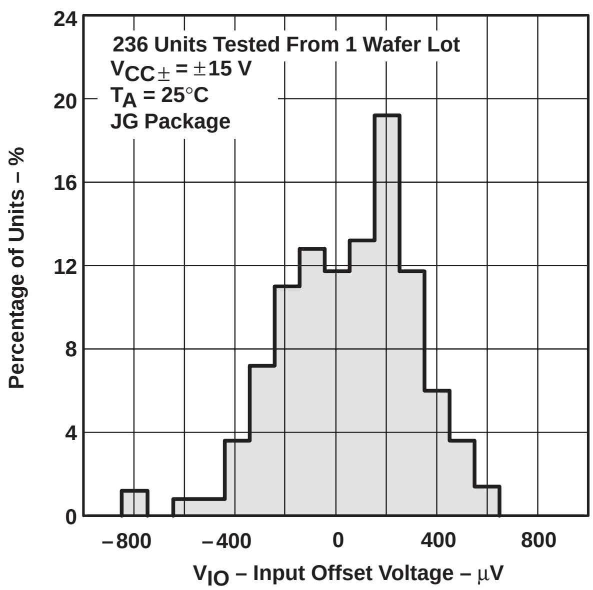


Figure 1

**INPUT OFFSET CUURENT
vs
FREE-AIR TEMPERATURE**

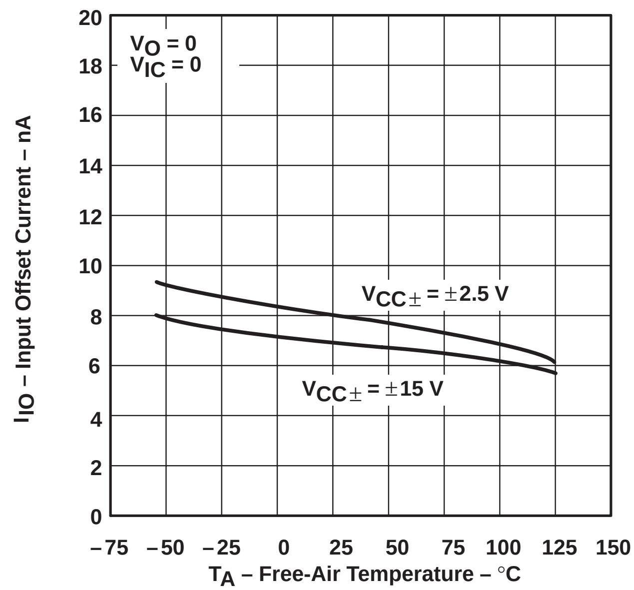


Figure 2

**INPUT BIAS CURRENT
vs
FREE-AIR TEMPERATURE**

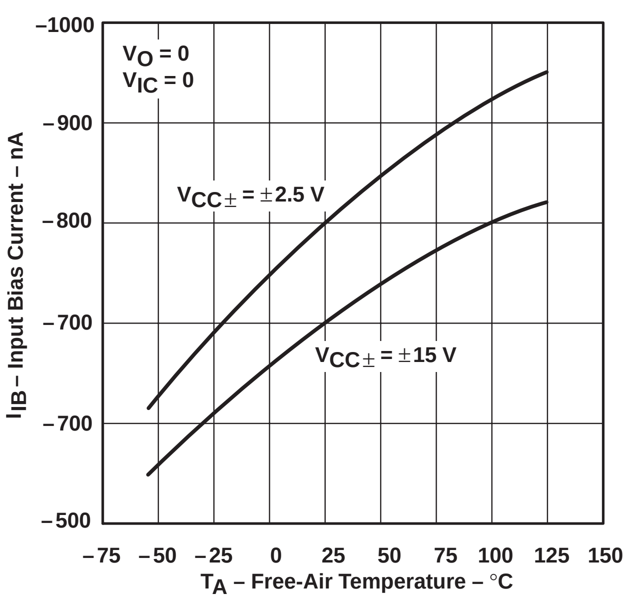


Figure 3

**INPUT BIAS CURRENT
vs
COMMON-MODE INPUT VOLTAGE**

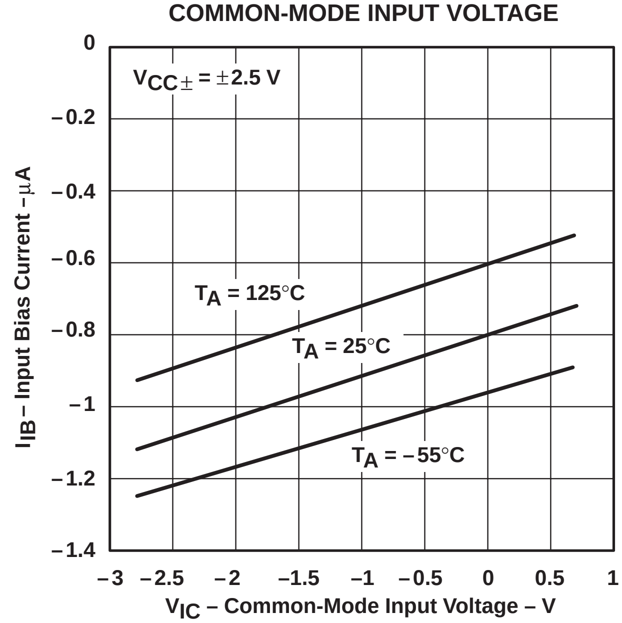


Figure 4

TYPICAL CHARACTERISTICS

MAXIMUM PEAK OUTPUT VOLTAGE vs SUPPLY VOLTAGE

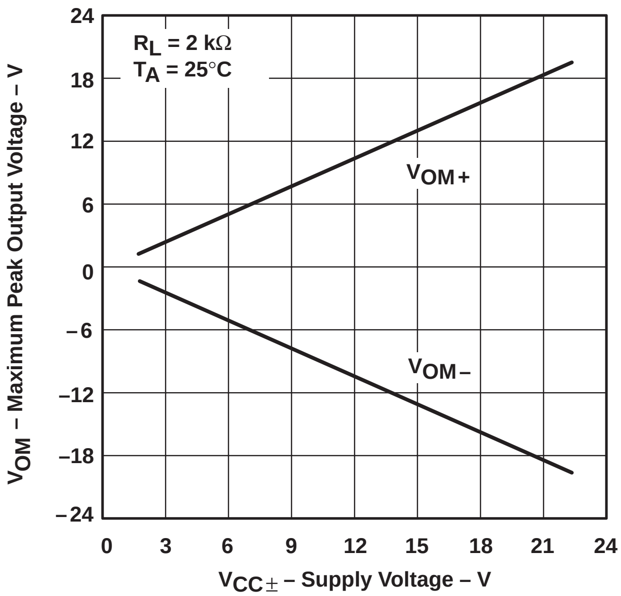


Figure 5

MAXIMUM PEAK OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

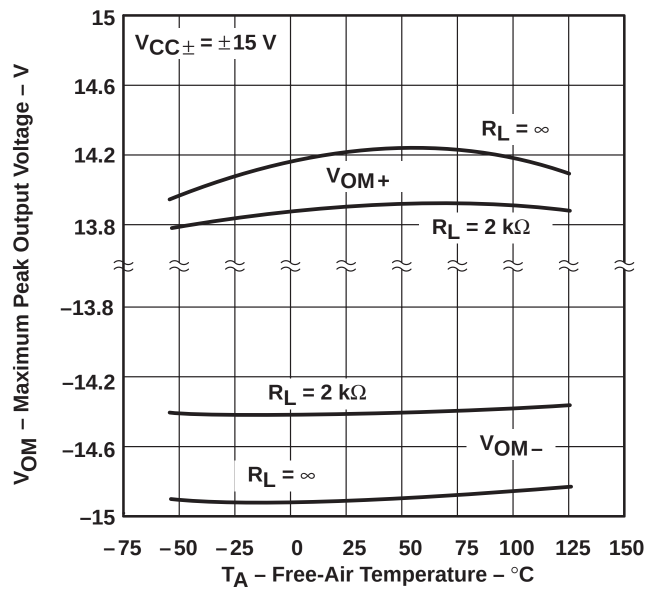


Figure 6

MAXIMUM POSITIVE PEAK OUTPUT VOLTAGE vs OUTPUT CURRENT

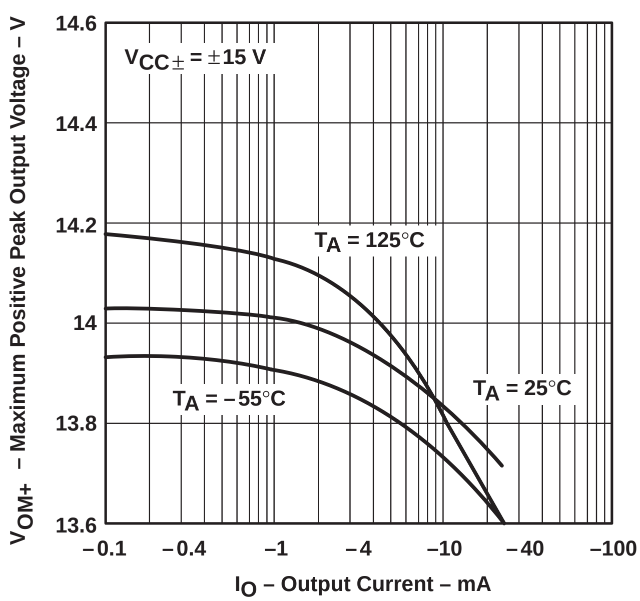


Figure 7

MAXIMUM NEGATIVE PEAK OUTPUT VOLTAGE vs OUTPUT CURRENT

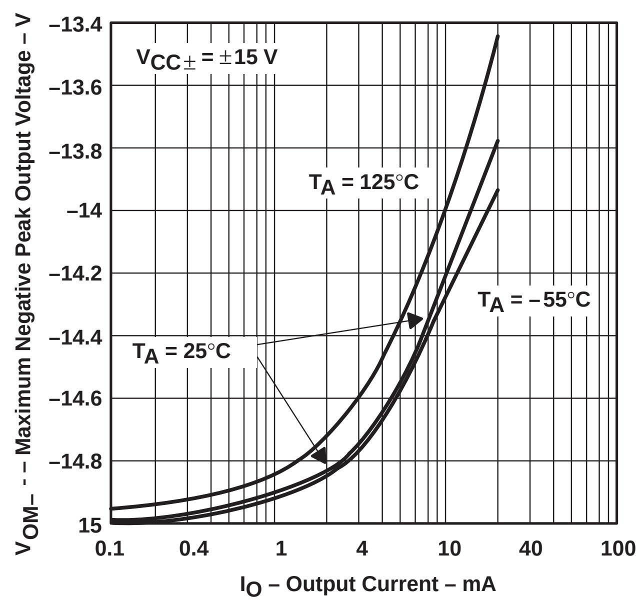


Figure 8

TYPICAL CHARACTERISTICS

MAXIMUM PEAK OUTPUT VOLTAGE vs SETTLING TIME

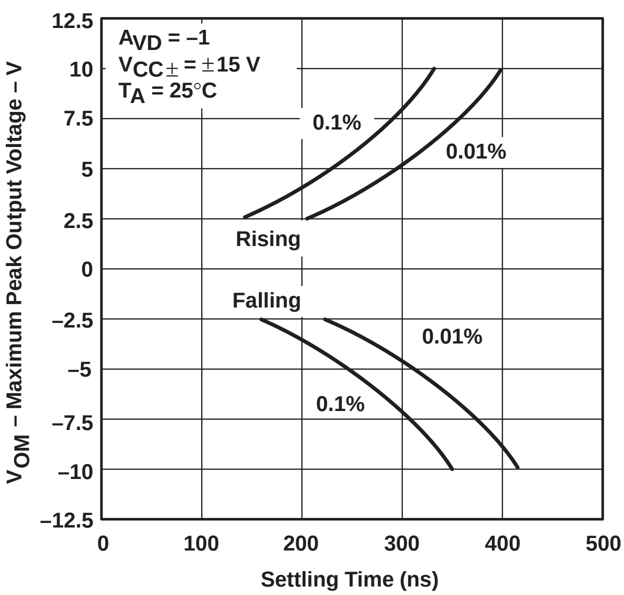


Figure 9

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

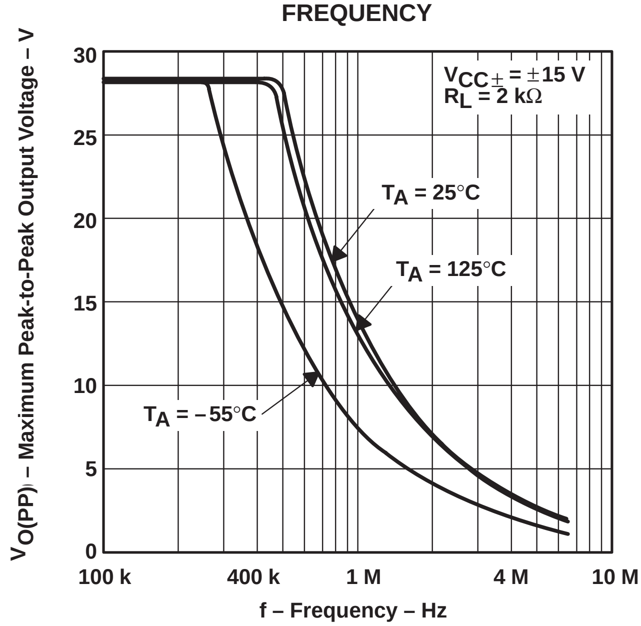


Figure 10

HIGH-LEVEL OUTPUT VOLTAGE vs OUTPUT CURRENT

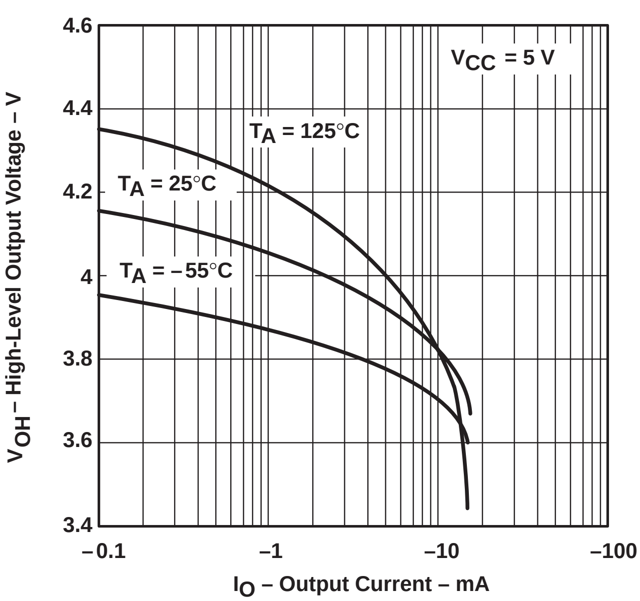


Figure 11

LOW-LEVEL OUTPUT VOLTAGE vs OUTPUT CURRENT

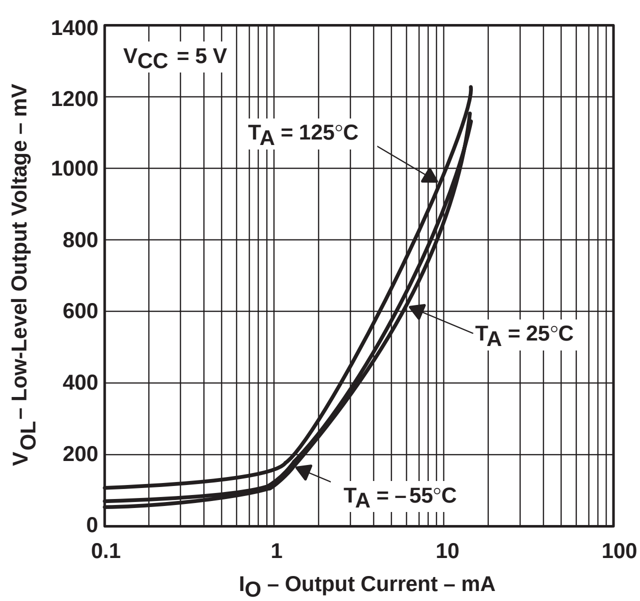


Figure 12

TYPICAL CHARACTERISTICS

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREE-AIR TEMPERATURE

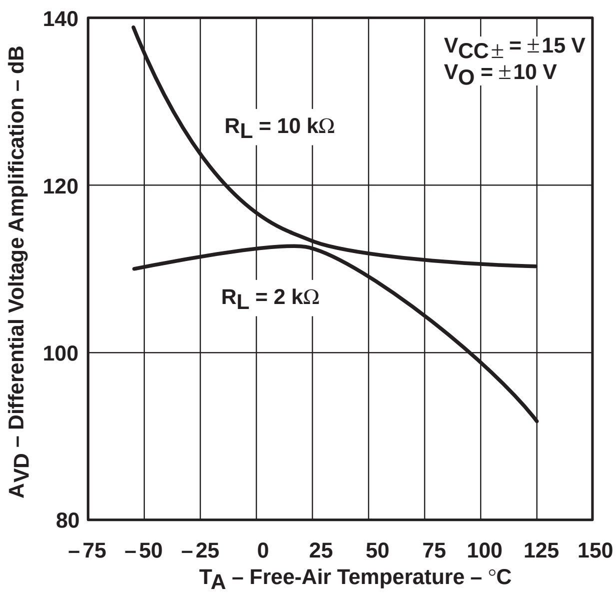


Figure 13

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT vs FREQUENCY

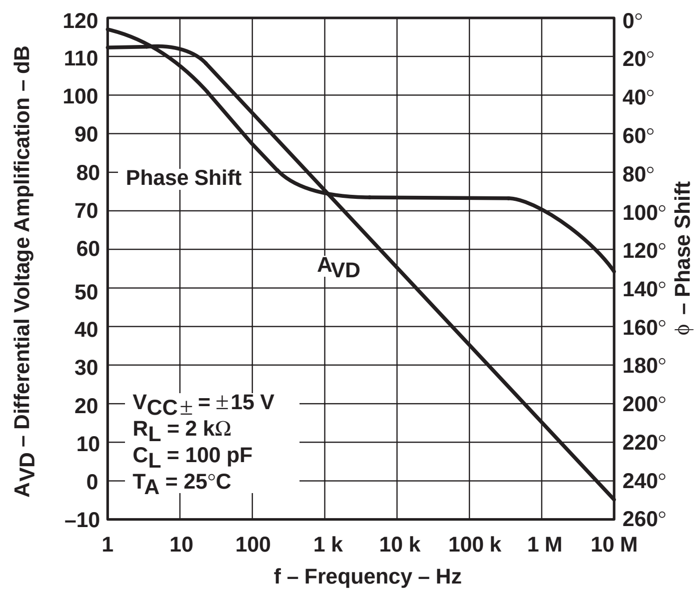


Figure 14

CLOSED-LOOP OUTPUT IMPEDANCE vs FREQUENCY

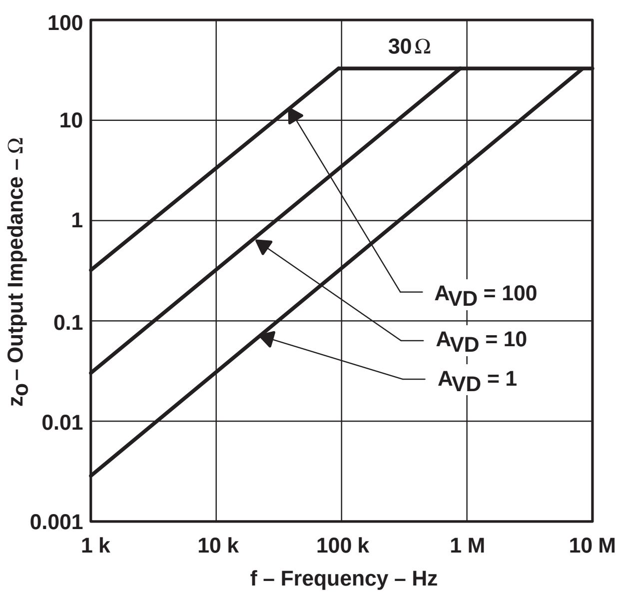


Figure 15

SHORT-CIRCUIT OUTPUT CURRENT vs FREE-AIR TEMPERATURE

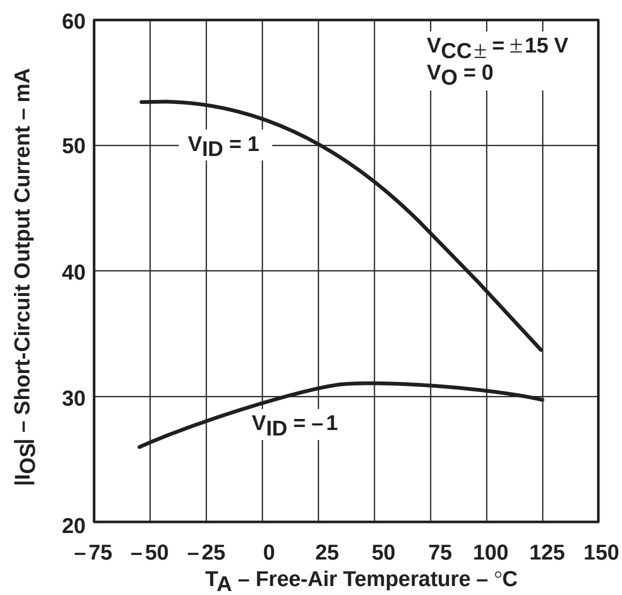


Figure 16

TYPICAL CHARACTERISTICS

COMMON-MODE REJECTION RATIO
vs
FREQUENCY

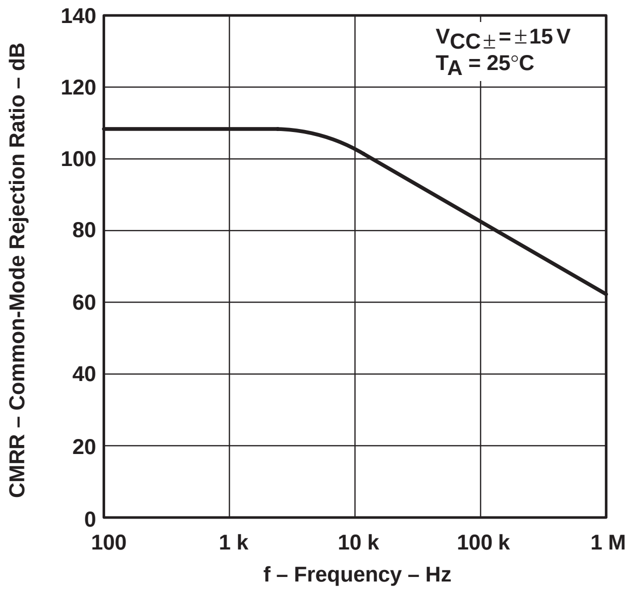


Figure 17

COMMON-MODE REJECTION RATIO
vs
FREE-AIR TEMPERATURE

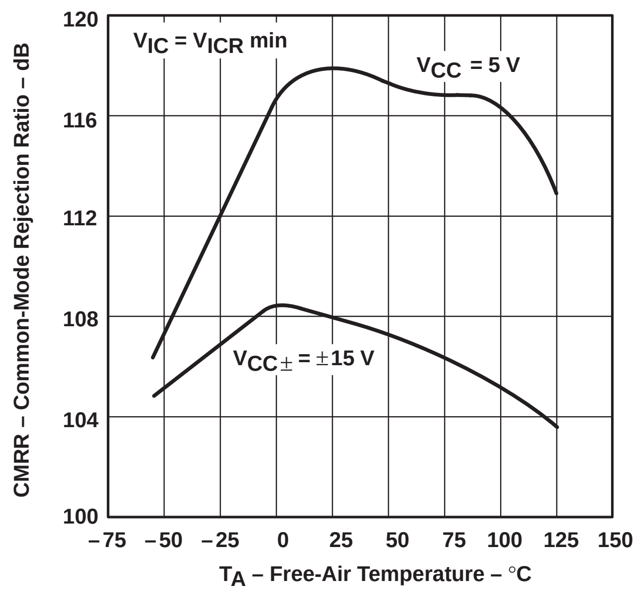


Figure 18

SUPPLY VOLTAGE REJECTION RATIO
vs
FREQUENCY

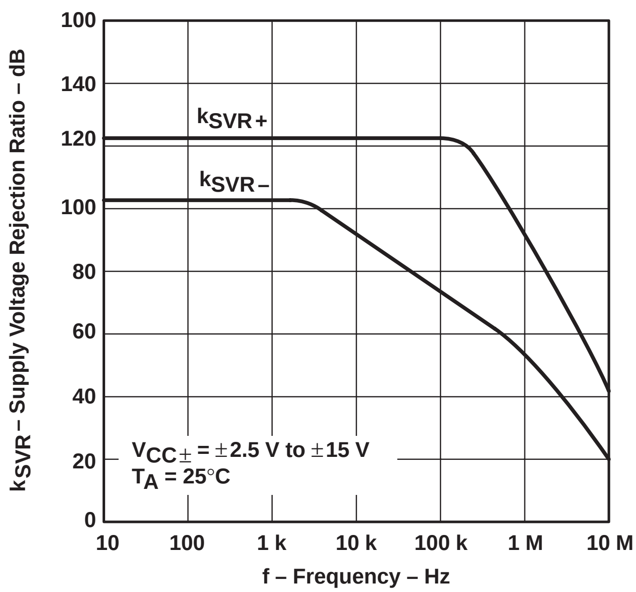


Figure 19

SUPPLY VOLTAGE REJECTION RATIO
vs
FREE-AIR TEMPERATURE

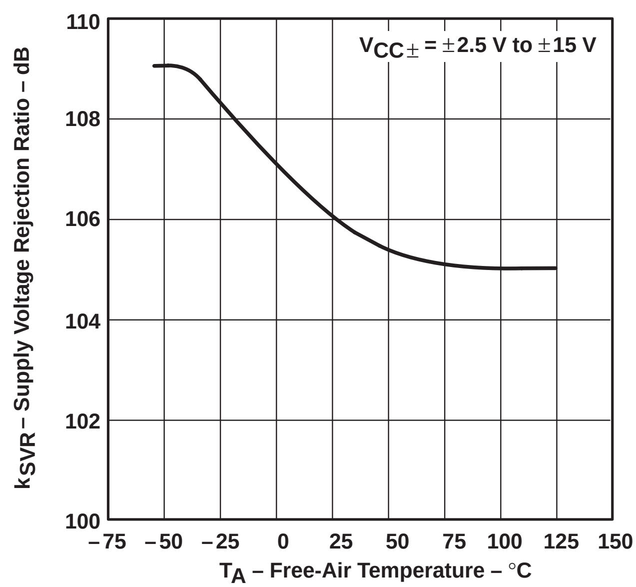


Figure 20

TYPICAL CHARACTERISTICS

SUPPLY CURRENT
vs
FREE-AIR TEMPERATURE

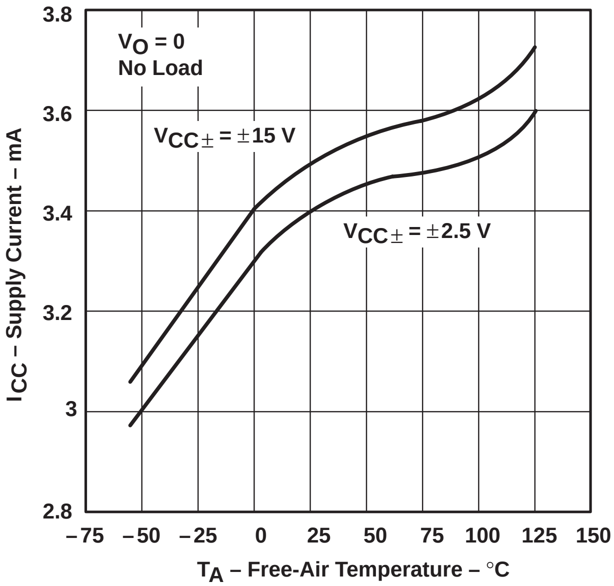


Figure 21

SUPPLY CURRENT
vs
SUPPLY VOLTAGE

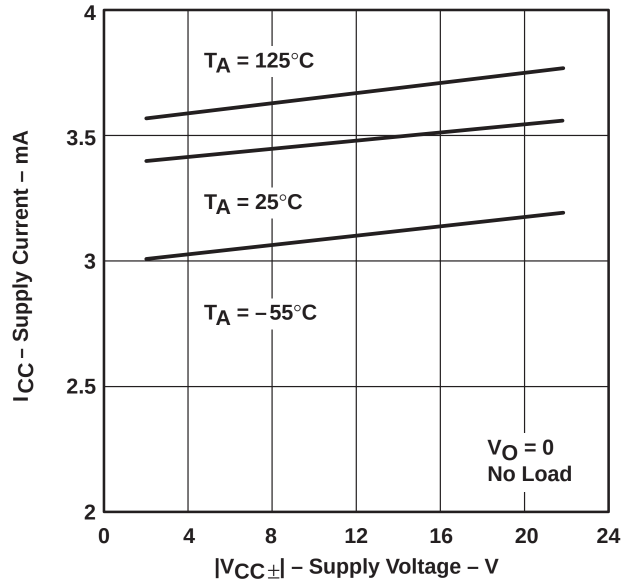


Figure 22

EQUIVALENT INPUT NOISE VOLTAGE
vs
FREQUENCY

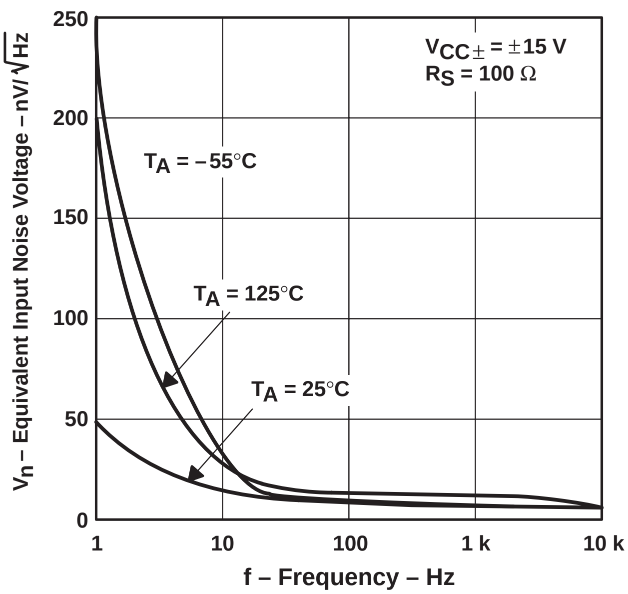


Figure 23

EQUIVALENT INPUT NOISE VOLTAGE
OVER A 10-SECOND PERIOD

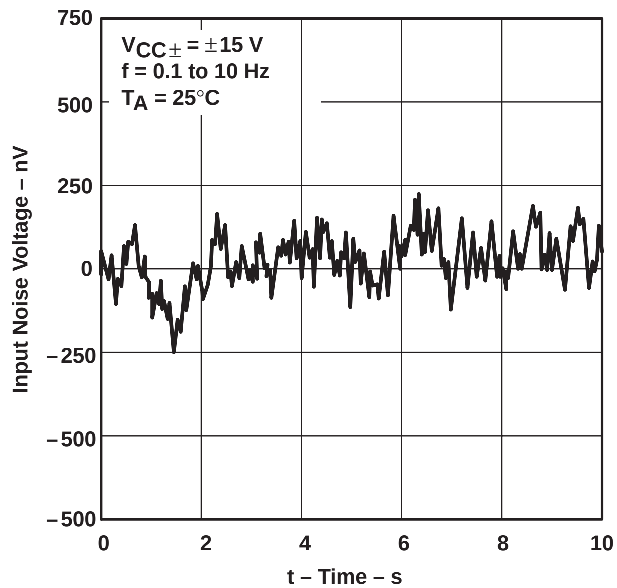


Figure 24

TYPICAL CHARACTERISTICS

NOISE CURRENT vs FREQUENCY

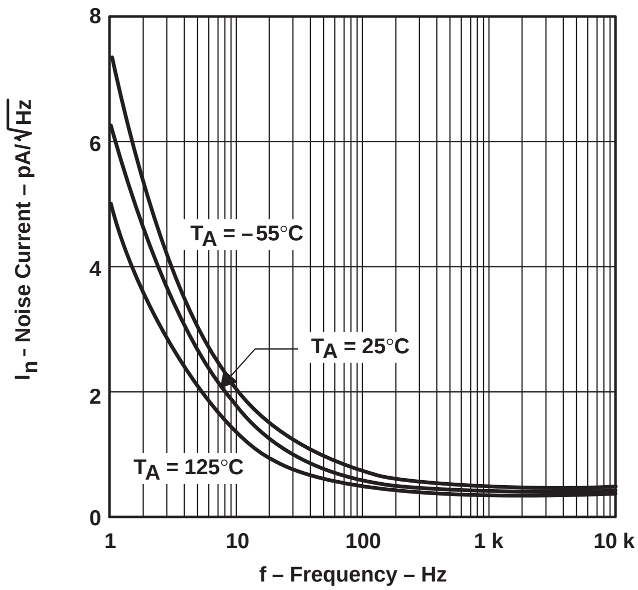


Figure 25

TOTAL HARMONIC DISTORTION PLUS NOISE vs FREQUENCY

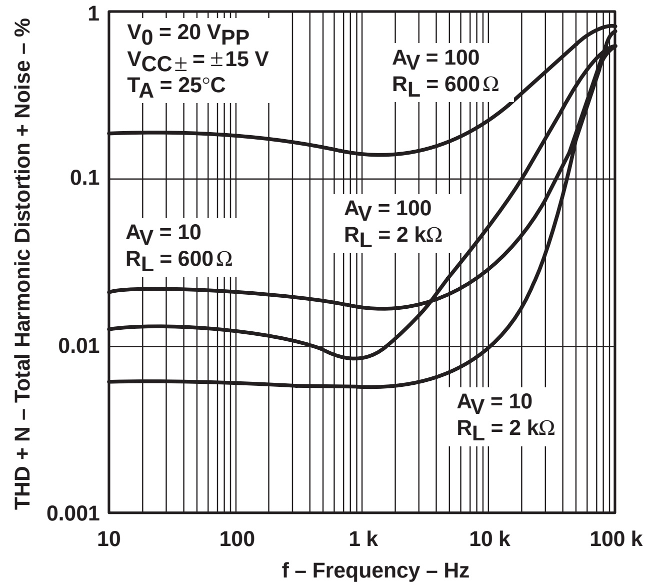


Figure 26

SLEW RATE vs FREE-AIR TEMPERATURE

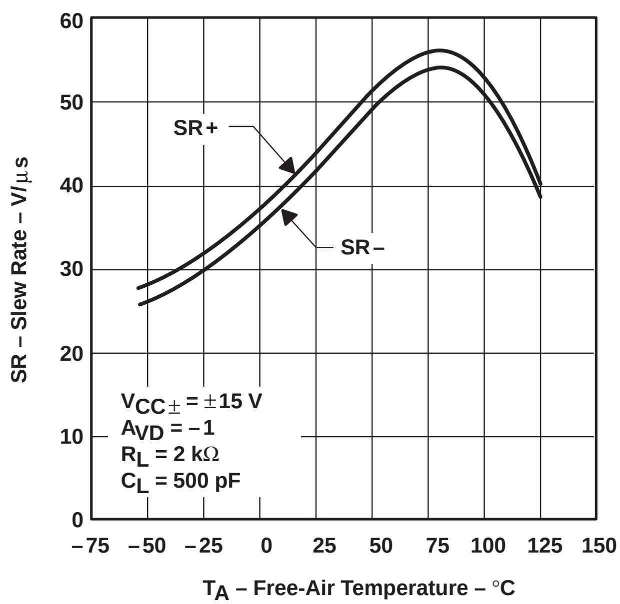


Figure 27

SLEW RATE vs LOAD CAPACITANCE

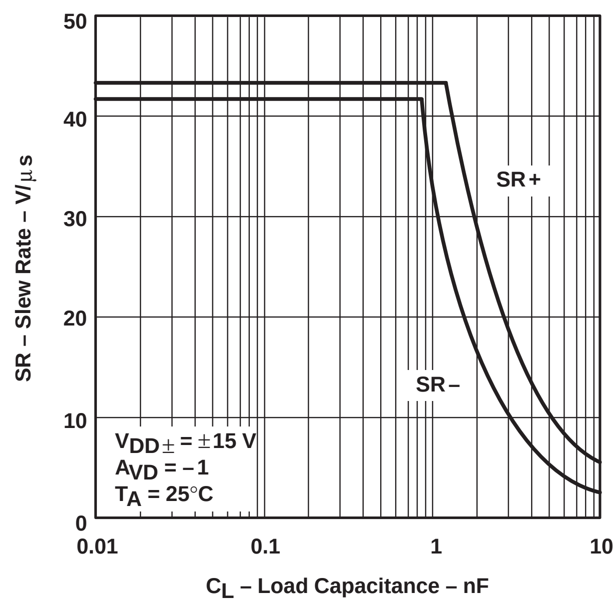


Figure 28

TYPICAL CHARACTERISTICS

NONINVERTING
LARGE-SIGNAL
PULSE RESPONSE

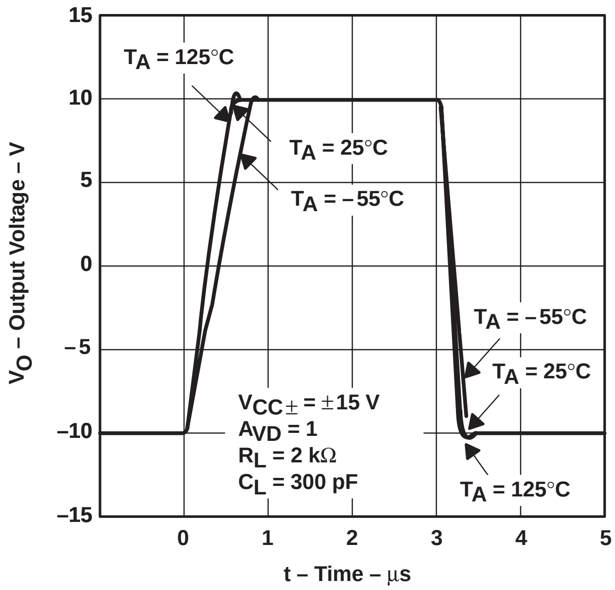


Figure 29

INVERTING
LARGE-SIGNAL
PULSE RESPONSE

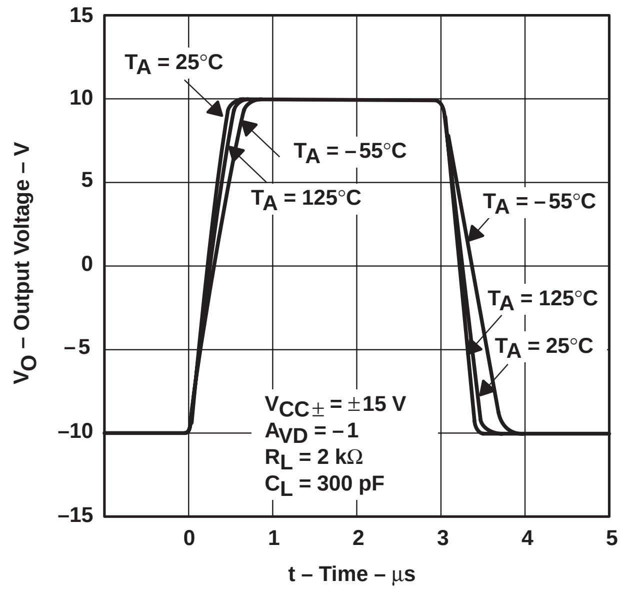


Figure 30

SMALL-SIGNAL
PULSE RESPONSE

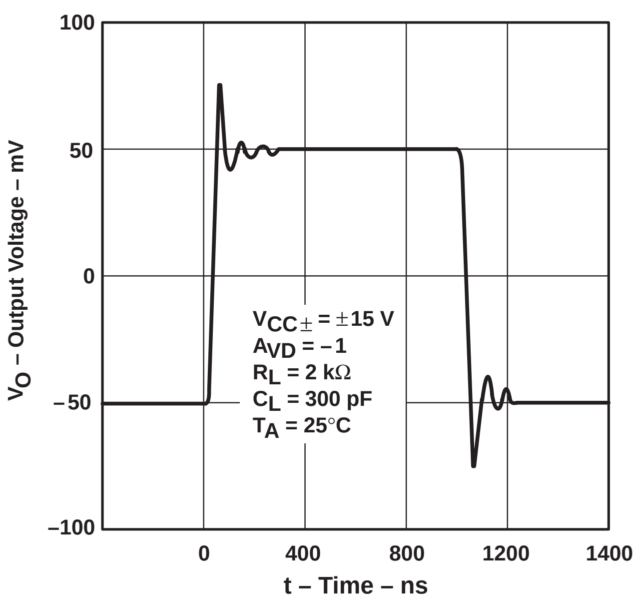


Figure 31

UNITY-GAIN BANDWIDTH
vs
LOAD CAPACITANCE

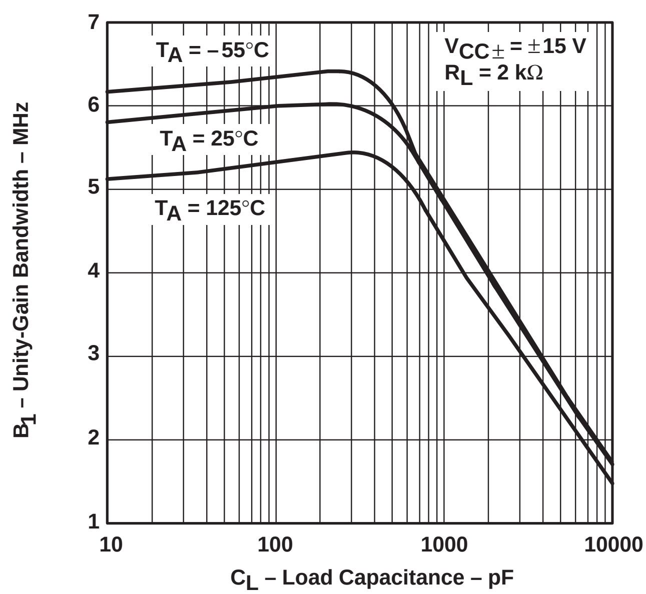


Figure 32

TYPICAL CHARACTERISTICS

GAIN MARGIN vs LOAD CAPCITANCE

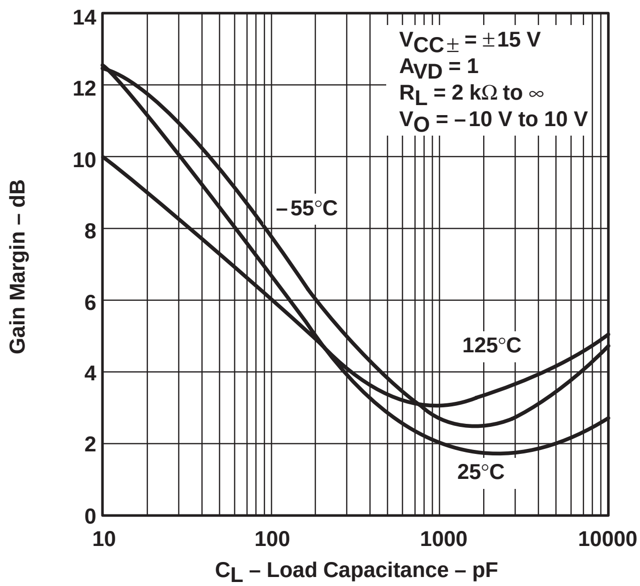


Figure 33

PHASE MARGIN vs LOAD CAPACITANCE

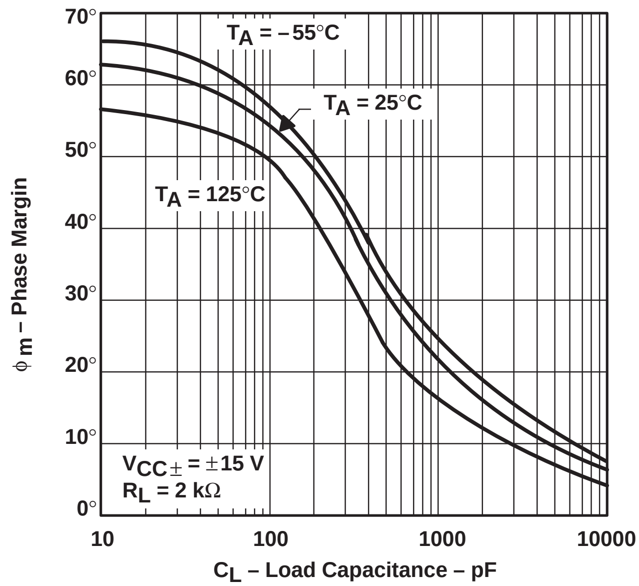


Figure 34

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