

*New*

- **Fast Response Times**
- **Improved Gain and Accuracy**
- **Fan-Out to 10 Series 54/74 TTL Loads**
- **Strobe Capability**
- **Short-Circuit and Surge Protection**
- **Designed to be Interchangeable with National Semiconductor LM106, LM206, and LM306**

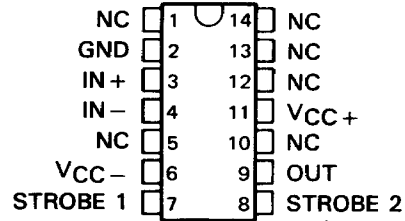
**description**

The LM106, LM206, and LM306 are high-speed voltage comparators with differential inputs, a low-impedance high-sink-current (100 mA) output, and two strobe inputs. These devices detect low-level analog or digital signals and can drive digital logic or lamps and relays directly. Short-circuit protection and surge-current limiting is provided.

The circuit is similar to a TL810 with gated output. A low-level input at either strobe causes the output to remain high regardless of the differential input. When both strobe inputs are either open or at a high logic level, the output voltage is controlled by the differential input voltage. The circuit will operate with any negative supply voltage between -3 volts and -12 volts with little difference in performance.

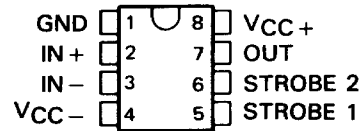
The LM106 is characterized for operation over the full military temperature range of -55°C to 125°C, the LM206 is characterized for operation from -25°C to 85°C, and the LM306 from 0°C to 70°C.

**J OR N DUAL-IN-LINE  
 OR W FLAT PACKAGE  
 (TOP VIEW)**

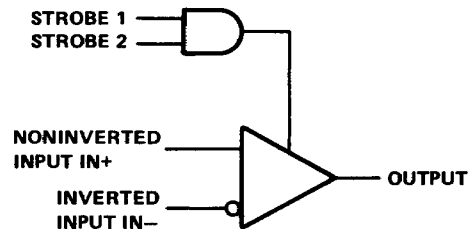


NC—No internal connection

**D, JG OR P DUAL-IN-LINE PACKAGE  
 (TOP VIEW)**



**functional block diagram**



**PRODUCTION DATA** documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

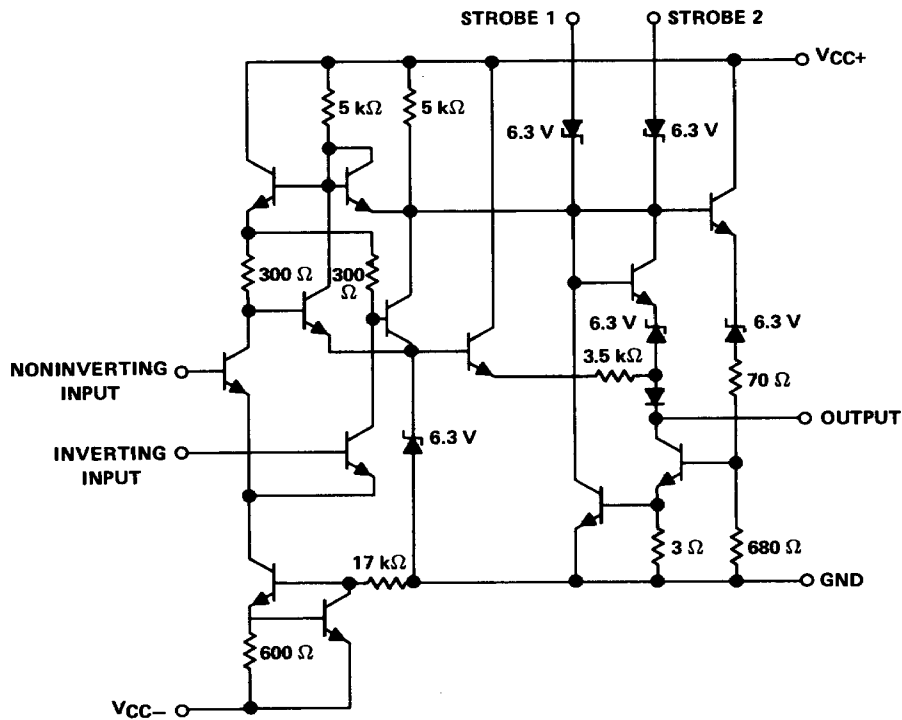


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# LM106, LM206, LM306 DIFFERENTIAL COMPARATORS WITH STROBES

schematic



Resistor values are nominal in ohms.

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

Supply voltage $V_{CC+}$ (see Note 1)	15 V
Supply voltage $V_{CC-}$ (see Note 1)	-15 V
Differential input voltage (see Note 2)	$\pm 5$ V
Input voltage (either input, see Notes 1 and 3)	$\pm 7$ V
Strobe voltage range (see Note 1)	0 V to $V_{CC+}$
Output voltage (see Note 1)	24 V
Voltage from output to $V_{CC-}$	30 V
Duration of output short-circuit (see Note 4)	10 s
Continuous total power dissipation at (or below) 25°C free-air temperature (see Note 5)	600 mW
Operating free-air temperature range:	
LM106 Circuits	-55°C to 125°C
LM206 Circuits	-25°C to 85°C
LM306 Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J, JG or W package	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, or P package	260°C

- NOTES: 1. All voltage values, except differential voltages and the voltage from the output to  $V_{CC-}$ , are with respect to the network ground terminal.  
 2. Differential voltages are at the noninverting input terminal with respect to the inverting input terminal.  
 3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 7 volts, whichever is less.  
 4. The output may be shorted to ground or either power supply.  
 5. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves, Section 2. In the J and JG packages, LM106 chips are alloy mounted; LM206 and LM306 chips are glass mounted.

# LM106, LM206, LM306 DIFFERENTIAL COMPARATORS WITH STROBES

electrical characteristics at specified free-air temperature,  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -3\text{ V}$  to  $-12\text{ V}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		LM106‡, LM206			LM306			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IO}$ Input offset voltage	$R_S \leq 200\ \Omega$	See Note 6	25°C	0.5‡	2	1.6‡	5	mV	
			Full range	3			6.5		
$\alpha_{VIO}$ Average temperature coefficient of input offset voltage	$R_S = 50\ \Omega$	See Note 6	Full range	3	10	5	20	$\mu\text{V}/^\circ\text{C}$	
$I_{IO}$ Input offset current		See Note 6	25°C	0.7‡	3	1.8‡	5	$\mu\text{A}$	
			MIN	2	7	1	7.5		
			MAX	0.4	3	0.5	5		
$\alpha_{IIO}$ Average temperature coefficient of input offset current		See Note 6	MIN to 25°C	15	75	24	100	nA/°C	
			25°C to MAX	5	25	15	50		
$I_{IB}$ Input bias current	$V_O = 0.5\text{ V}$ to $5\text{ V}$		MIN to 25°C	45		40		$\mu\text{A}$	
			25°C to MAX	7‡	20	16‡	25		
$I_{L(S)}$ Low-level strobe current	$V_{(\text{strobe})} = 0.4\text{ V}$		Full range	-1.7‡	-3.2	-1.7‡	-3.2	mA	
$V_{IH(S)}$ High-level strobe voltage			Full range	2.2		2.2		V	
$V_{IL(S)}$ Low-level strobe voltage			Full range	0.9		0.9		V	
$V_{ICR}$ Common-mode input voltage range	$V_{CC-} = -7\text{ V}$ to $-12\text{ V}$		Full range	$\pm 5$		$\pm 5$		V	
$V_{ID}$ Differential input voltage range			Full range	$\pm 5$		$\pm 5$		V	
$A_{VD}$ Large-signal differential voltage amplification	No load, $V_O = 0.5\text{ V}$ to $5\text{ V}$		25°C	40‡		40‡		V/mV	
$V_{OH}$ High-level output voltage	$I_{OH} = -400\ \mu\text{A}$		$V_{ID} = 5\text{ mV}$	Full range	2.5	5.5		V	
			$V_{ID} = 8\text{ mV}$	Full range			2.5		5.5
$V_{OL}$ Low-level output voltage	$I_{OL} = 100\text{ mA}$		$V_{ID} = -5\text{ mV}$	25°C	0.8‡	1.5		V	
			$V_{ID} = -7\text{ mV}$	25°C			0.8‡		2
	$I_{OL} = 50\text{ mA}$	$V_{ID} = -5\text{ mV}$	Full range			1			
		$V_{ID} = -8\text{ mV}$	Full range			1			
	$I_{OL} = 16\text{ mA}$	$V_{ID} = -5\text{ mV}$	Full range			0.4			
		$V_{ID} = -8\text{ mV}$	Full range			0.4			
$I_{OH}$ High-level output current	$V_{OH} = 8\text{ V}$ to $24\text{ V}$		$V_{ID} = 5\text{ mV}$	MIN to 25°C	0.02‡	1		$\mu\text{A}$	
				25°C to MAX	100				
			$V_{ID} = 7\text{ mV}$	MIN to 25°C			0.02‡		2
				25°C to MAX			100		
$I_{CC+}$ Supply current from $V_{CC+}$	$V_{ID} = -5\text{ mV}$ , No load		Full range	6.6‡	10	6.6‡	10	mA	
$I_{CC-}$ Supply current from $V_{CC-}$	No load		Full range	-1.9‡	-3.6	-1.9‡	-3.6	mA	

† Unless otherwise noted, all characteristics are measured with both strobos open.

‡ LM106 limits are guaranteed by equivalent testing unless otherwise noted.

§ These typical values are at  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -6\text{ V}$ ,  $T_A = 25^\circ\text{C}$ . Full range (MIN to MAX) for LM106 is  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ ; for LM206 is  $-25^\circ\text{C}$  to  $85^\circ\text{C}$ ; and for LM306 is  $0^\circ\text{C}$  to  $70^\circ\text{C}$ .

NOTE 6: The offset voltages and offset currents given are the maximum values required to drive the output down to the low range ( $V_{OL}$ ) or up to the high range ( $V_{OH}$ ). Thus these parameters actually define an error band and take into account the worst-case effects of voltage gain and input impedance.

switching characteristics,  $V_{CC+} = 12\text{ V}$ ,  $V_{CC-} = -6\text{ V}$ ,  $T_A = 25^\circ\text{C}$

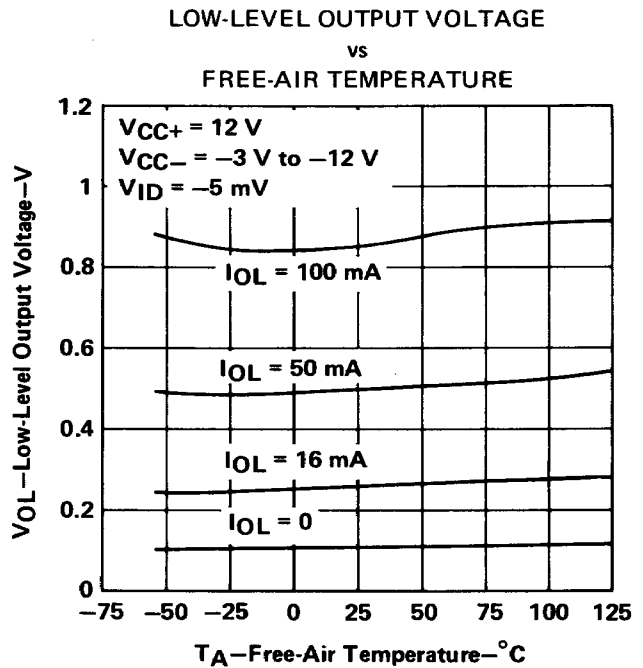
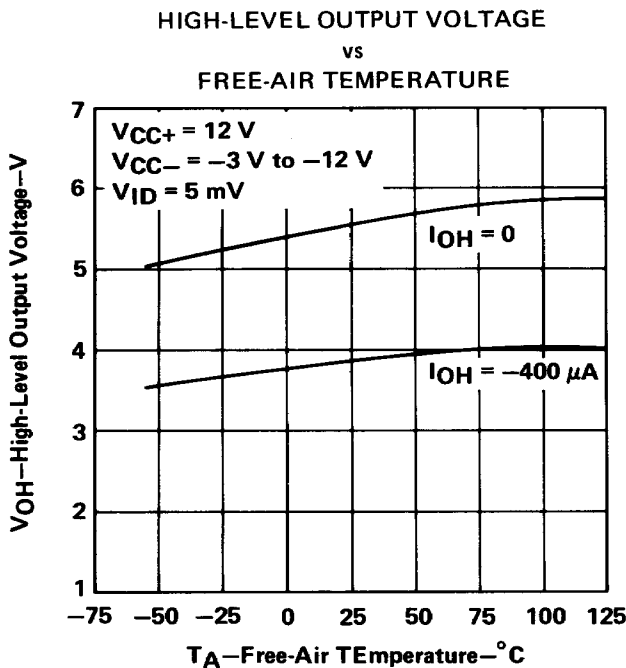
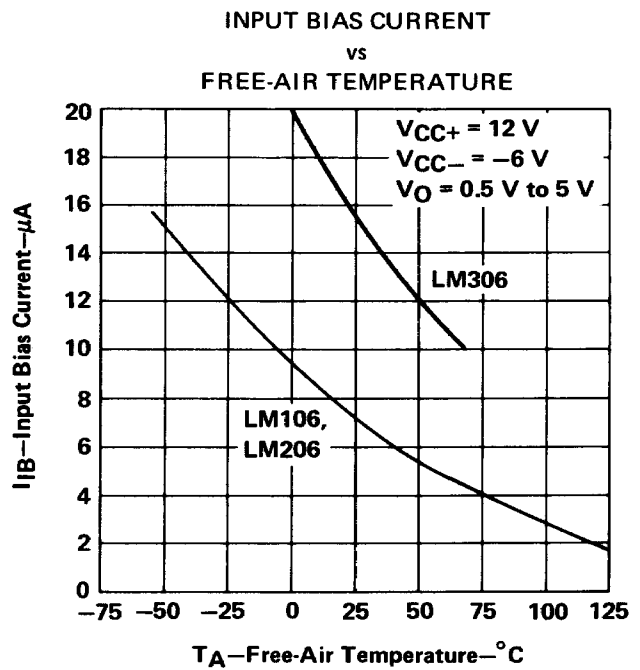
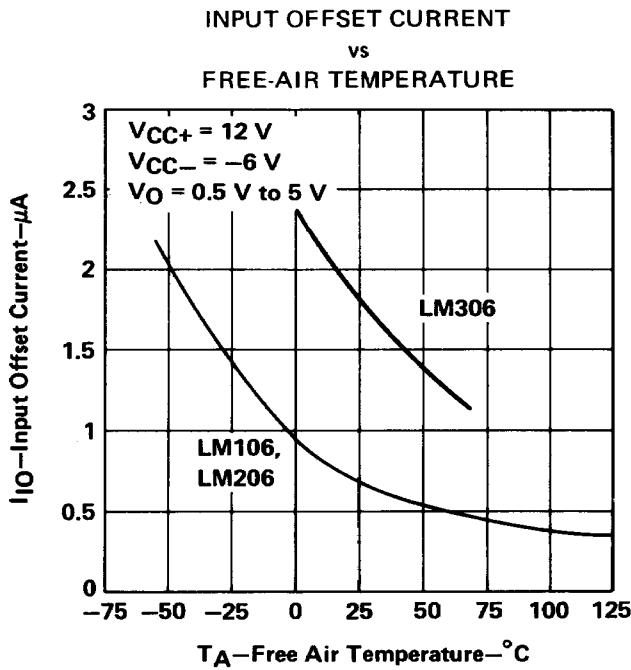
PARAMETER	TEST CONDITIONS†	LM106, LM206			LM306			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
Response time, low-to-high-level output	$R_L = 390\ \Omega$ to $5\text{ V}$ , $C_L = 15\text{ pF}$ , See Note 7		28	40		28	40	ns

NOTE 7: The response time specified is for a 100-mV input step with 5-mV overdrive and is the interval between the input step function and the instant when the output crosses 1.4 V.

  
**TEXAS  
INSTRUMENTS**

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**TYPICAL CHARACTERISTICS†**



† Data for free-air temperature outside the range specified in the absolute maximum ratings for LM206 or LM306 is not applicable for those types.

TYPICAL CHARACTERISTICS†

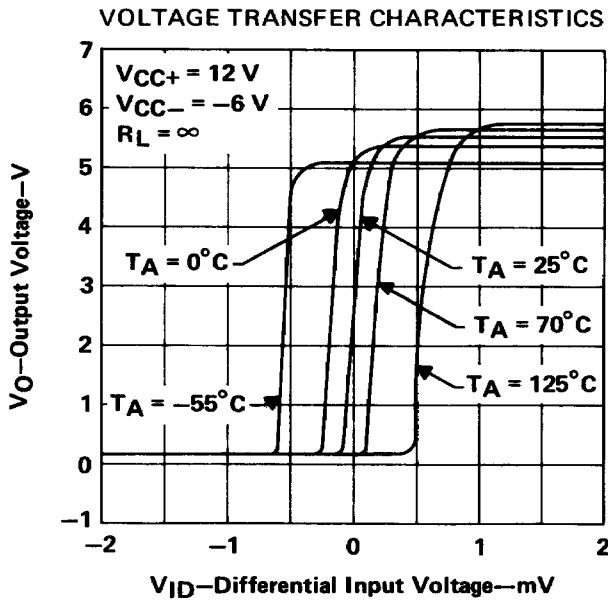


FIGURE 5

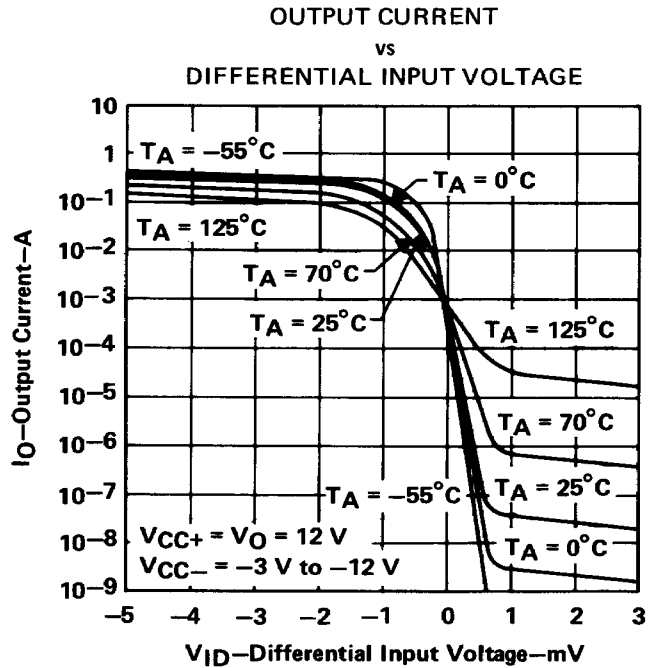


FIGURE 6

LARGE-SIGNAL DIFFERENTIAL  
VOLTAGE AMPLIFICATION  
vs  
FREE-AIR TEMPERATURE

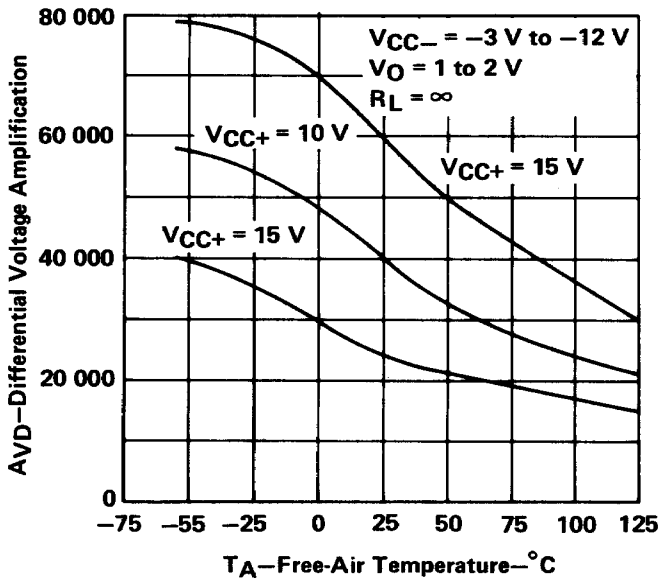


FIGURE 7

SHORT-CIRCUIT OUTPUT CURRENT  
vs  
FREE-AIR TEMPERATURE

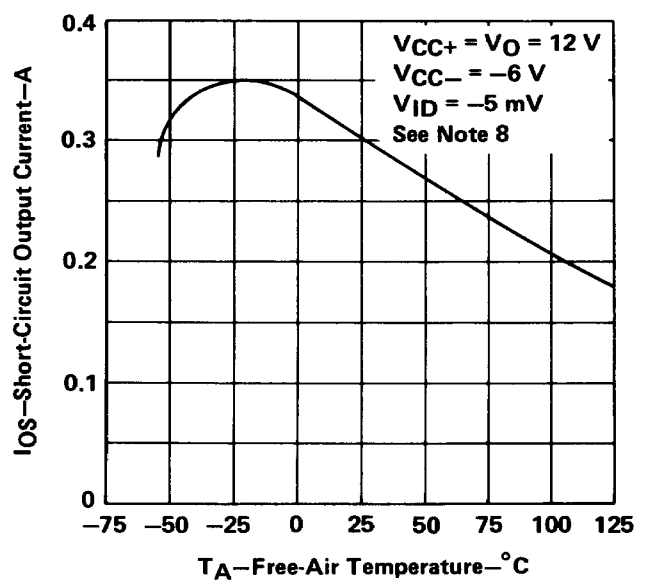
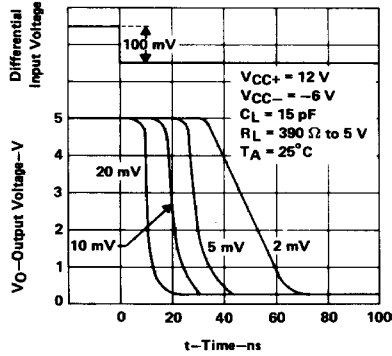


FIGURE 8

†Data for free-air temperature outside the range specified in the absolute maximum ratings for LM206 or LM306 is not applicable for those types.  
NOTE 8: This parameter was measured using a single 5-ms pulse.

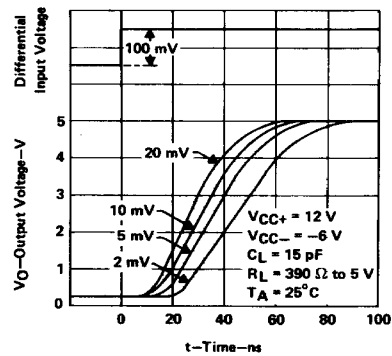
**TYPICAL CHARACTERISTICS†**

**OUTPUT RESPONSE FOR  
VARIOUS INPUT OVERDRIVES**



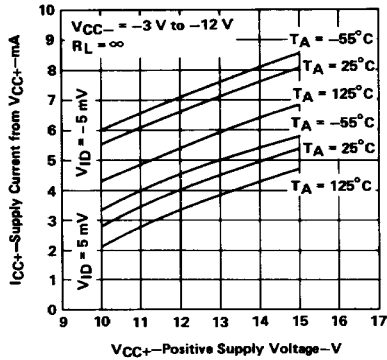
**FIGURE 9**

**OUTPUT RESPONSE FOR  
VARIOUS INPUT OVERDRIVES**



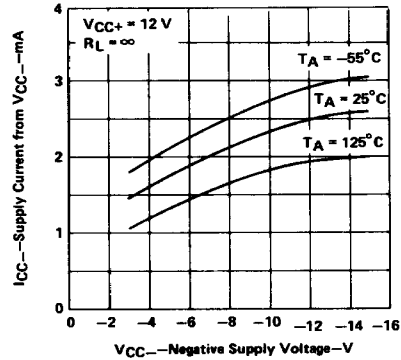
**FIGURE 10**

**SUPPLY CURRENT FROM VCC+  
vs  
SUPPLY VOLTAGE VCC+**



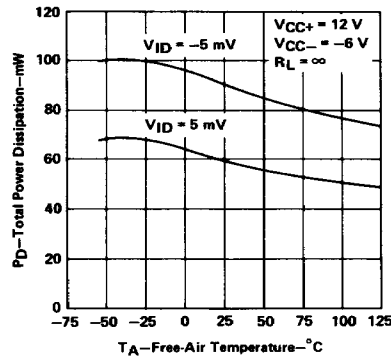
**FIGURE 11**

**SUPPLY CURRENT FROM VCC-  
vs  
SUPPLY VOLTAGE VCC-**



**FIGURE 12**

**TOTAL POWER DISSIPATION  
vs  
FREE-AIR TEMPERATURE**



**FIGURE 13**

†Data for free-air temperature outside the range specified in the absolute maximum ratings for LM206 or LM306 is not applicable for those types.