



**ABSOLUTE MAXIMUM RATINGS**

(Note 1)

Supply Voltage ..... 18V  
 Power Dissipation ..... 500mW  
 Operating Temperature Range  
 LTC1059C .....  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$   
 LTC1059AM, LTC1059M .....  $-55^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$   
 Storage Temperature Range .....  $-65^{\circ}\text{C}$  to  $150^{\circ}\text{C}$   
 Lead Temperature (Soldering, 10 sec) .....  $300^{\circ}\text{C}$

**PACKAGE/ORDER INFORMATION**

	<b>ORDER PART NUMBER</b>  LTC1059CN LTC1059CS
N PACKAGE 14-LEAD PDIP $T_{JMAX} = 110^{\circ}\text{C}$ , $\theta_{JA} = 130^{\circ}\text{C/W}$ (N) $T_{JMAX} = 110^{\circ}\text{C}$ , $\theta_{JA} = 110^{\circ}\text{C/W}$ (S)	S PACKAGE 14-LEAD PLASTIC SO $T_{JMAX} = 110^{\circ}\text{C}$ , $\theta_{JA} = 110^{\circ}\text{C/W}$ (S)
J PACKAGE 14-LEAD CERDIP $T_{JMAX} = 150^{\circ}\text{C}$ , $\theta_{JA} = 80^{\circ}\text{C/W}$  <b>OBSELETE PACKAGE</b> Consider the N or S Package for Alternate Source	LTC1059ACJ LTC1059AMJ LTC1059CJ LTC1059MJ

Consult LTC Marketing for parts specified with wider operating temperature ranges.

**ELECTRICAL CHARACTERISTICS**

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^{\circ}\text{C}$ .

(Complete Filter)  $V_S = \pm 5\text{V}$ ,  $T^2L$  clock input level unless otherwise specified.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Center Frequency Range, $f_0$	$f_0 \bullet Q \leq 400\text{kHz}$ , Mode 1 $f_0 \bullet Q \leq 1.6\text{MHz}$ , Mode 1 $f_0 \bullet Q \leq 250\text{kHz}$ , Mode 3, $V_S = \pm 7.5\text{V}$ $f_0 \bullet Q \leq 1\text{MHz}$ , Mode 3, $V_S = \pm 7.5\text{V}$		0.1 - 40k 0.1 - 18k 0.1 - 20k 0.1 - 16k		Hz Hz Hz Hz
Input Frequency Range			0 - 200k		Hz
Clock-to-Center Frequency Ratio	Mode 1, 50:1, $f_{CLK} = 250\text{kHz}$ , $Q = 10$ Mode 1, 100:1, $f_{CLK} = 500\text{kHz}$ , $Q = 10$	● ●		$50 \pm 0.8\%$ $100 \pm 0.8\%$	
Q Accuracy	Mode 1, 50:1 or 100:1, $f_0 = 5\text{kHz}$ $Q = 10$	●	$\pm 0.5$	5	%
$f_0$ Temperature Coefficient	Mode 1, $f_{CLK} < 500\text{kHz}$		5		ppm/ $^{\circ}\text{C}$
Q Temperature Coefficient	Mode 1, $f_{CLK} < 500\text{kHz}$ , $Q = 10$		15		ppm/ $^{\circ}\text{C}$
DC Offset	$V_{OS1}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS2}$ $V_{OS3}$ $V_{OS3}$ $V_{OS3}$ $V_{OS3}$	● ● ● ● ● ● ● ● ● ● ● ● ● ●	2 3 3 6 6 2 2 4 4 2 2 4 4	15 30 40 60 80 20 30 40 60 20 30 40 60	mV mV mV mV mV mV mV mV mV mV mV mV mV mV

## ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ\text{C}$ .

(Complete Filter)  $V_S = \pm 5\text{V}$ ,  $T^2\text{L}$  Clock Input Level unless otherwise specified.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
DC Lowpass Gain Accuracy	Mode 1, $R_1 = R_2 = 50\text{k}\Omega$	●	$\pm 0.1$	2	%
BP Gain Accuracy at $f_0$	Mode 1, $Q = 10$ , $f_0 = 5\text{kHz}$		$\pm 0.1$		%
Clock Feedthrough	$f_{\text{CLK}} \leq 1\text{MHz}$		10		mV
Max Clock Frequency	Mode 1, $Q < 5$ , $V_S \geq \pm 5\text{V}$		2		MHz
Power Supply Current		●	3.5	5.5 7	mA mA

(Complete Filter)  $V_S = \pm 2.37\text{V}$  unless otherwise specified.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Center Frequency Range	$f_0 \cdot Q \leq 120\text{kHz}$ , Mode 1, 50:1		0.1 - 12k		Hz
	$f_0 \cdot Q \leq 120\text{kHz}$ , Mode 3, 50:1		0.1 - 10k		Hz
Input Frequency Range			60k		Hz
Clock-to-Center Frequency Ratio	Mode 1, 50:1, $f_{\text{CLK}} = 250\text{kHz}$ , $Q = 10$ Mode 1, 100:1, $f_{\text{CLK}} = 250\text{kHz}$ , $Q = 10$		$50 \pm 0.8\%$ $100 \pm 0.8\%$		
Q Accuracy	Mode 1, $f_{\text{CLK}} = 250\text{kHz}$ , $Q = 10$ 50:1 and 100:1		$\pm 2$		%
Max Clock Frequency			700		kHz
Power Supply Current			1.5	2.5	mA

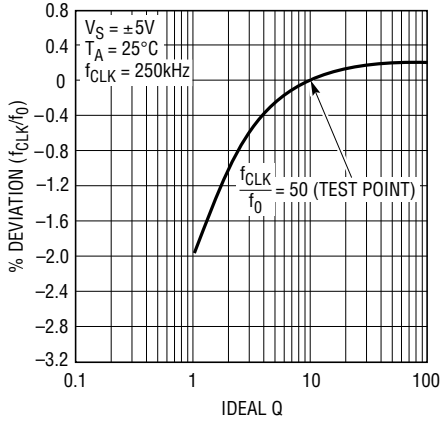
(Internal Op Amps) The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ\text{C}$ .

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage Range		$\pm 2.375$		$\pm 8$	V
Voltage Swings	$V_S = \pm 5\text{V}$ , $R_L = 5\text{k}$ (Pins 1, 14) $R_L = 3.5\text{k}$ (Pins 2, 13)	●	$\pm 3.8$ $\pm 3.6$	$\pm 4.2$	V V
Input Offset Voltage		●	1	15	mV
Input Bias Current			3		pA
Output Short-Circuit Current Source/Sink	$V_S = \pm 5\text{V}$ (N Package) $V_S = \pm 5\text{V}$ (S Package)		40/3 25/3		mA mA
DC Open Loop Gain	$V_S = \pm 5\text{V}$		80		dB
GBW	$V_S = \pm 5\text{V}$		2		MHz
Slew Rate	$V_S = \pm 5\text{V}$		7		V/ $\mu\text{s}$

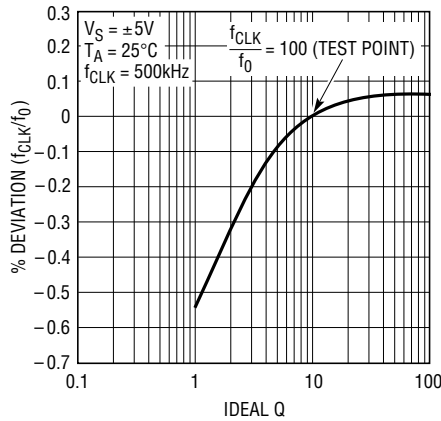
**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

# TYPICAL PERFORMANCE CHARACTERISTICS

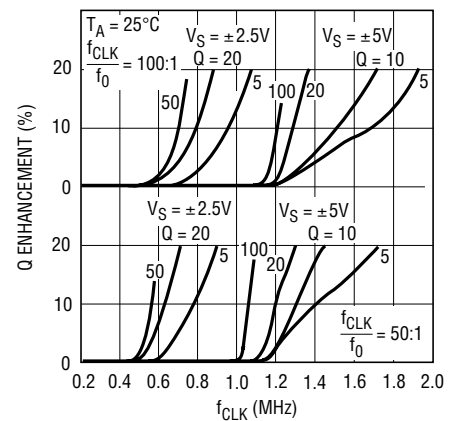
**Graph 1. Mode 1:  
( $f_{CLK}/f_0$ ) Deviation vs Q**



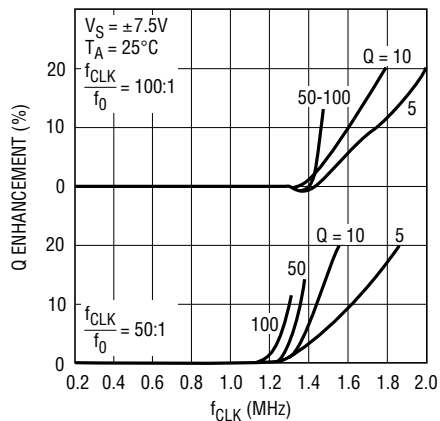
**Graph 2. Mode 1:  
( $f_{CLK}/f_0$ ) Deviation vs Q**



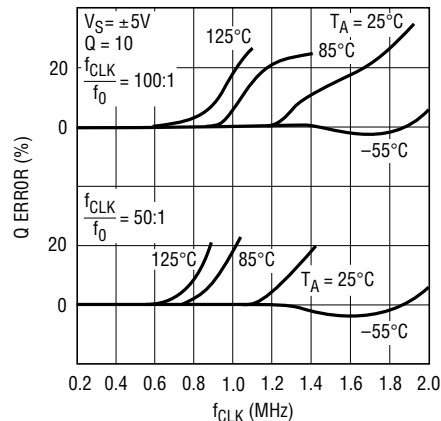
**Graph 3. Mode 1: Q Error  
vs Clock Frequency**



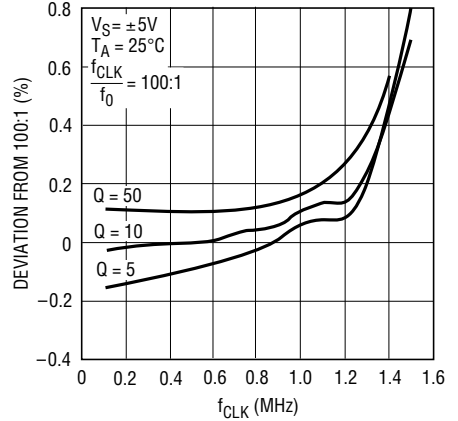
**Graph 4. Mode 1: Q Error  
vs Clock Frequency**



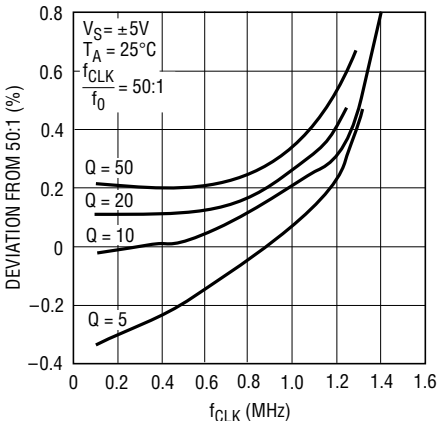
**Graph 5. Mode 1: Measured Q  
vs  $f_{CLK}$  and Temperature**



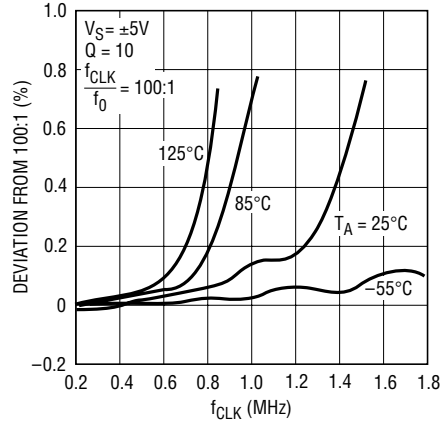
**Graph 6. Mode 1: ( $f_{CLK}/f_0$ )  
vs  $f_{CLK}$  and Q**



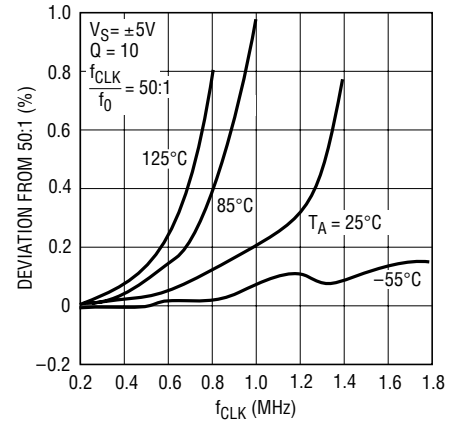
**Graph 7. Mode 1: ( $f_{CLK}/f_0$ )  
vs  $f_{CLK}$  and Q**



**Graph 8. Mode 1: ( $f_{CLK}/f_0$ )  
vs  $f_{CLK}$  and Temperature**

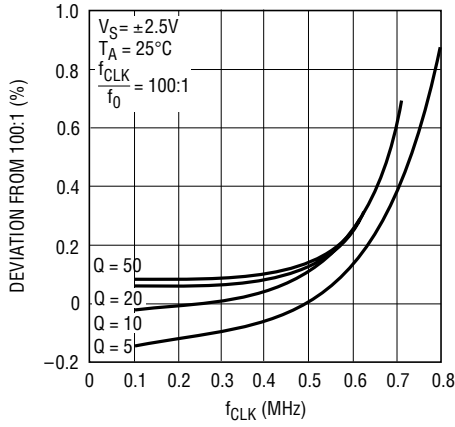


**Graph 9. Mode 1: ( $f_{CLK}/f_0$ )  
vs  $f_{CLK}$  and Temperature**



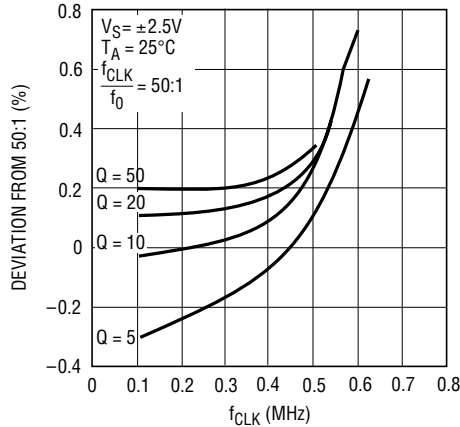
# TYPICAL PERFORMANCE CHARACTERISTICS

**Graph 10. Mode 1: ( $f_{CLK}/f_0$ ) vs  $f_{CLK}$  and Q**



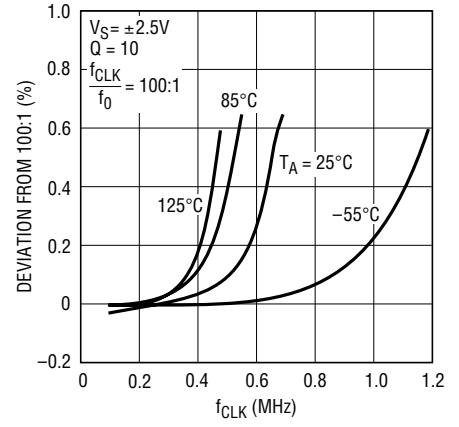
1059 G10

**Graph 11. Mode 1: ( $f_{CLK}/f_0$ ) vs  $f_{CLK}$  and Q**



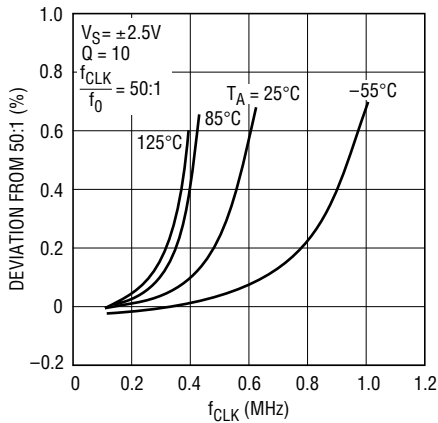
1059 G11

**Graph 12. Mode 1: ( $f_{CLK}/f_0$ ) vs  $f_{CLK}$  and Temperature**



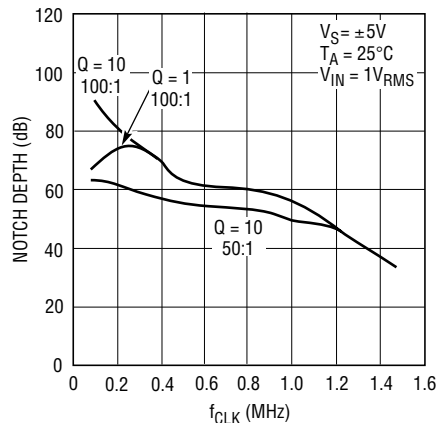
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**Graph 13. Mode 1: ( $f_{CLK}/f_0$ ) vs  $f_{CLK}$  and Temperature**



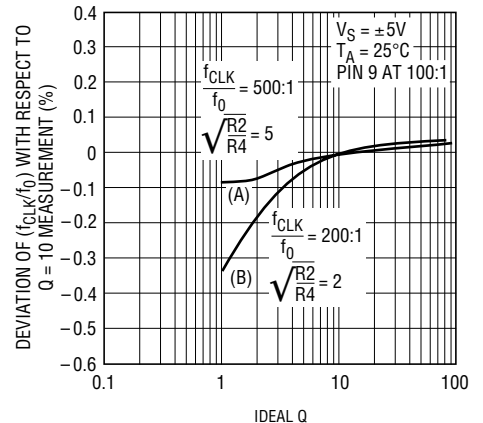
1059 G13

**Graph 14. Mode 1: Notch Depth vs Clock Frequency**



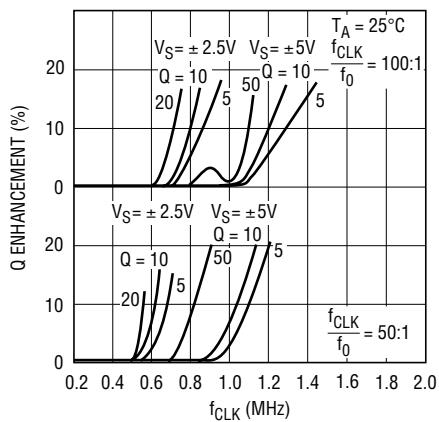
1059 G14

**Graph 15. Mode 3: Deviation of ( $f_{CLK}/f_0$ ) with Respect to Q = 10 Measurement**



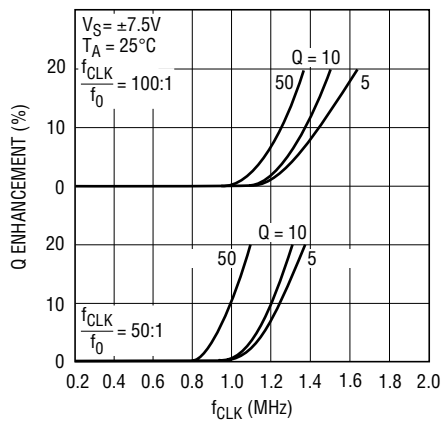
1059 G15

**Graph 16. Mode 3: Q Error vs Clock Frequency**



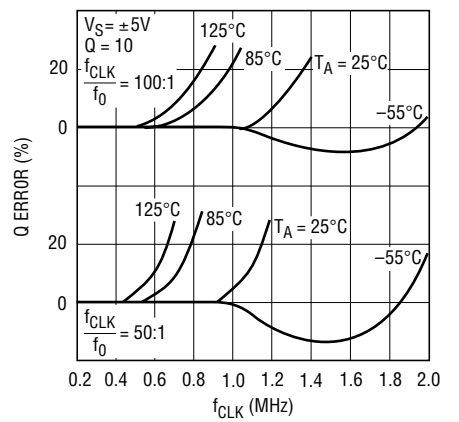
1059 G16

**Graph 17. Mode 3 (R2 = R4): Q Error vs Clock Frequency**



1059 G17

**Graph 18. Mode 3 (R2 = R4): Measured Q vs  $f_{CLK}$  and Temperature**

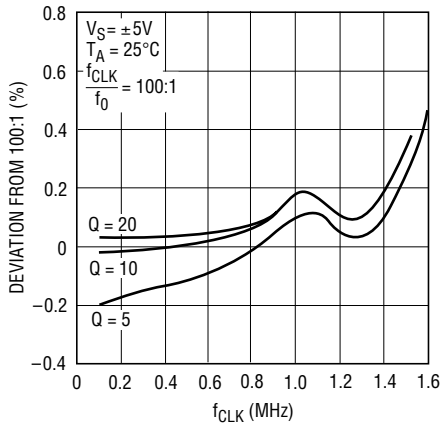


1059 G18

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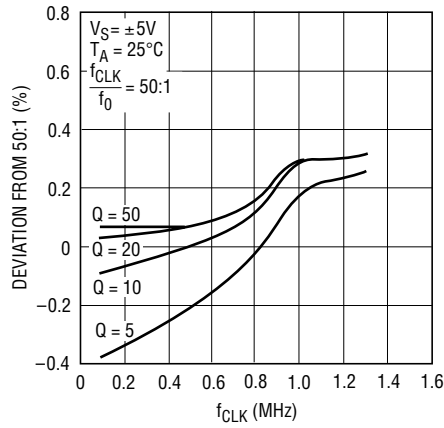
**TYPICAL PERFORMANCE CHARACTERISTICS**

**Graph 19. Mode 3 (R2 = R4):  
(f<sub>CLK</sub>/f<sub>0</sub>) vs f<sub>CLK</sub> and Q**



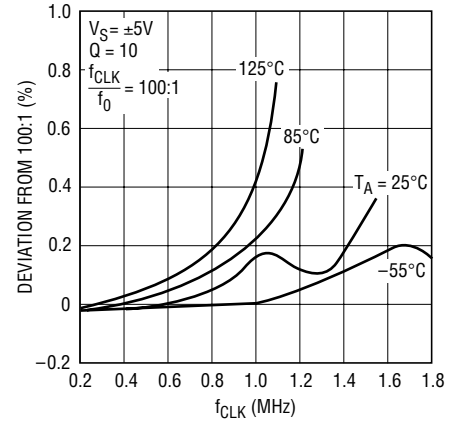
1059 G19

**Graph 20. Mode 3 (R2 = R4):  
(f<sub>CLK</sub>/f<sub>0</sub>) vs f<sub>CLK</sub> and Q**



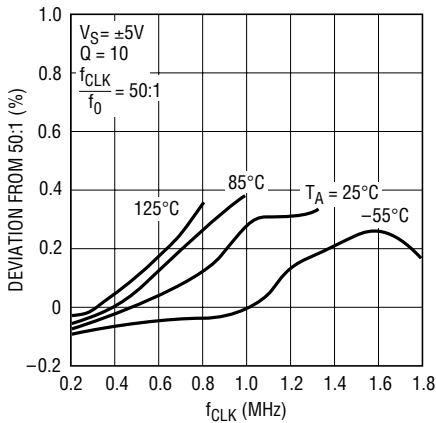
1059 G20

**Graph 21. Mode 3 (R2 = R4):  
(f<sub>CLK</sub>/f<sub>0</sub>) vs f<sub>CLK</sub> and Temperature**



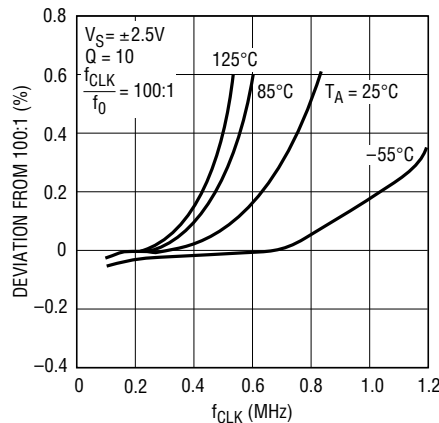
1059 G21

**Graph 22. Mode 3 (R2 = R4):  
(f<sub>CLK</sub>/f<sub>0</sub>) vs f<sub>CLK</sub> and Temperature**



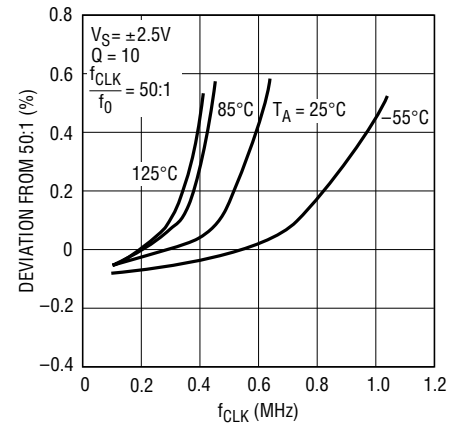
1059 G22

**Graph 23. Mode 3 (R2 = R4):  
(f<sub>CLK</sub>/f<sub>0</sub>) vs f<sub>CLK</sub> and Temperature**



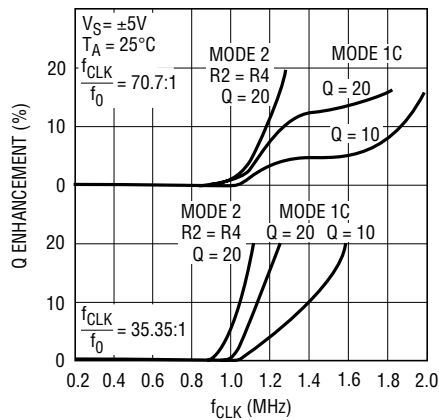
1059 G23

**Graph 24. Mode 3 (R2 = R4):  
(f<sub>CLK</sub>/f<sub>0</sub>) vs f<sub>CLK</sub> and Temperature**



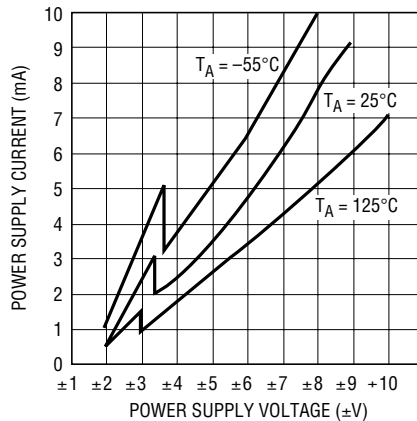
1059 G24

**Graph 25. Mode 1c (R5 = 0),  
Mode 2 (R2 = R4): Q Error vs  
Clock Frequency**



1059 G25

**Graph 26. Supply Current  
vs Supply Voltage**



1059 G26

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