MC939F · MC839F, P

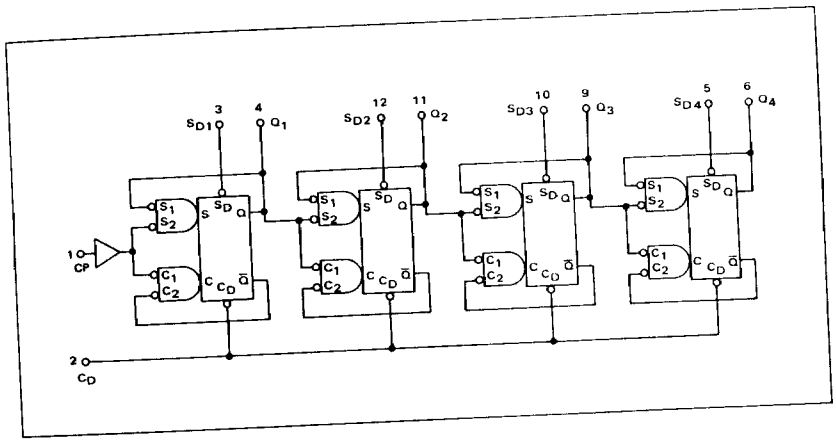
This monolithic ripple counter is designed to operate at ±20% of the nominal 5.0 volt power supply voltage and is guaranteed to 15 MHz. It has standard MDTL inputs, and uses active pull-up devices in the outputs to increase capacitive drive capabilities. The outputs correspond to a standard 8-4-2-1 binary code with individual direct sets and a common direct clear available to preset the counter to any desired condition. Typical noise margin is 1.0 volt. Typical input fall time required to toggle is 5 μs measured from 2.5 volts to 0.50 volts.

Input Loading Factor:
S_D = 1.5
C_D = 5
CP = 1

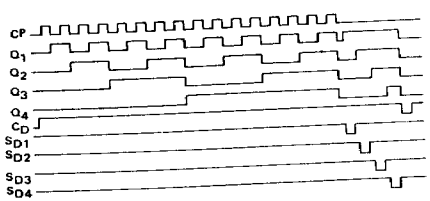
Output Loading Factor = 8

Total Power Dissipation = 150 mW typ/pkg

Maximum Counting Frequency = 30 MHz typ



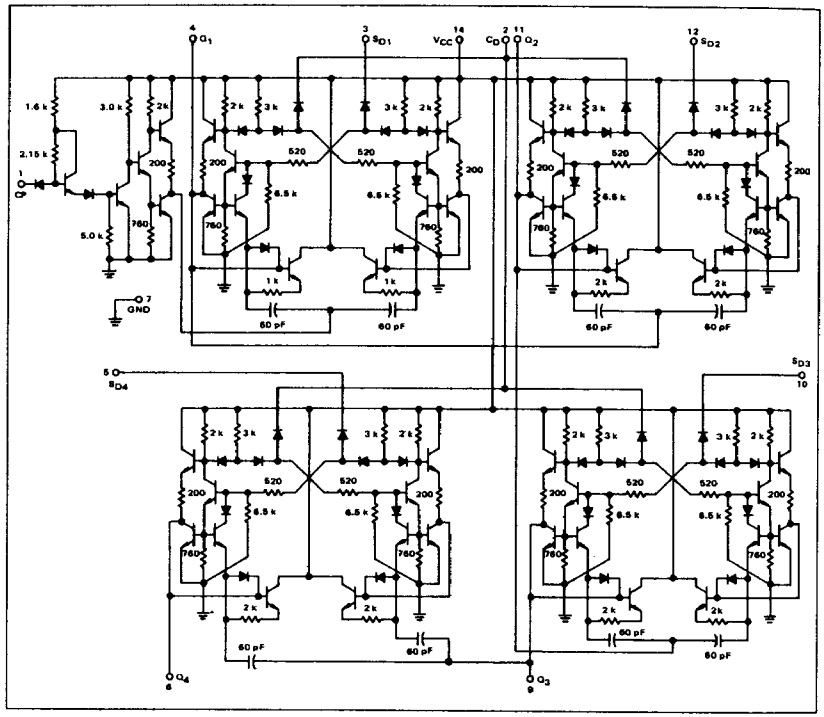
COUNTER SEQUENCE



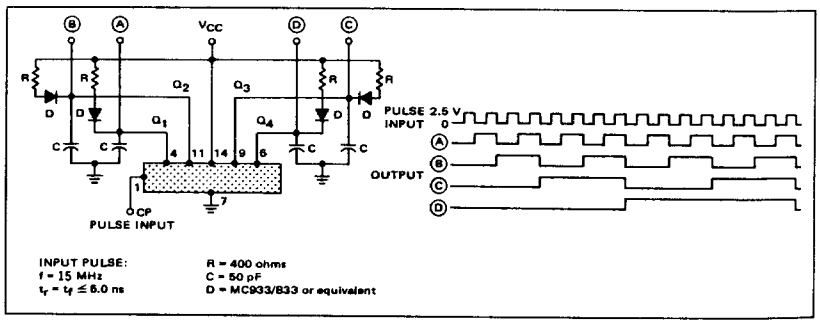
DECODING LOGIC

0	$\bar{Q}_1$	$\bar{Q}_2$	$\bar{Q}_3$	$\bar{Q}_4$
1	Q_1	$\bar{Q}_2$	$\bar{Q}_3$	$\bar{Q}_4$
2	$\bar{Q}_1$	Q_2	$\bar{Q}_3$	$\bar{Q}_4$
3	Q_1	Q_2	$\bar{Q}_3$	$\bar{Q}_4$
4	$\bar{Q}_1$	$\bar{Q}_2$	Q_3	$\bar{Q}_4$
5	Q_1	$\bar{Q}_2$	Q_3	$\bar{Q}_4$
6	$\bar{Q}_1$	Q_2	Q_3	$\bar{Q}_4$
7	Q_1	Q_2	Q_3	$\bar{Q}_4$
8	$\bar{Q}_1$	$\bar{Q}_2$	$\bar{Q}_3$	Q_4
9	Q_1	$\bar{Q}_2$	$\bar{Q}_3$	Q_4
10	$\bar{Q}_1$	Q_2	$\bar{Q}_3$	Q_4
11	Q_1	Q_2	$\bar{Q}_3$	Q_4
12	$\bar{Q}_1$	$\bar{Q}_2$	Q_3	Q_4
13	Q_1	$\bar{Q}_2$	Q_3	Q_4
14	$\bar{Q}_1$	Q_2	Q_3	Q_4
15	Q_1	Q_2	Q_3	Q_4

CIRCUIT SCHEMATIC



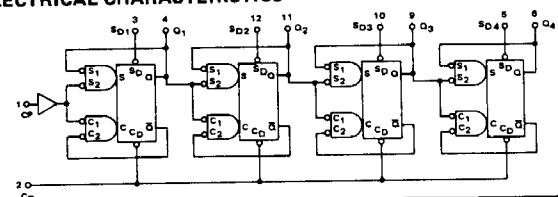
COUNTING FREQUENCY TEST CIRCUIT AND WAVEFORMS



INPUT PULSE:
f = 15 MHz
$t_r = t_f \leq 6.0$ ns

R = 400 ohms
C = 50 pF
D = MC933/833 or equivalent

ELECTRICAL CHARACTERISTICS

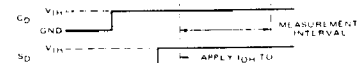


@ Test Temperature		TEST CURRENT / VOLTAGE VALUES: mA I_{OL}	mA I_{OH}	Volts V_{IH}	Volts V_F	Volts V_R	Volts V_{CC}	Volts V_{CCL}	Volts V_{CCH}	Volts V_{max}
MC939	−55°C	11.4	-0.12	2.10	0	4.00	-	4.50	5.50	-
	+25°C	12.0	-0.12	2.00	0	4.00	5.00	4.50	5.50	8.00
	+125°C	10.8	-0.12	2.00	0	4.00	-	4.50	5.50	-
MC839	0°C	12.0	-0.500	2.00	0.45	4.00	-	5.00	5.00	-
	+25°C	12.0	-0.500	1.90	0.45	4.00	5.00	5.00	5.00	8.00
	+75°C	11.4	-0.500	1.80	0.50	4.00	-	5.00	5.00	-

Characteristic	Symbol	Pin Under Test	MC939 TEST LIMITS −55°C Min	−55°C Max	+25°C Min	+25°C Max	+125°C Min	+125°C Max	Unit	MC839 TEST LIMITS 0°C Min	0°C Max	+25°C Min	+25°C Max	+75°C Min	+75°C Max	Unit	TEST CURRENT / VOLTAGE APPLIED TO PINS LISTED BELOW: I_{OL}	I_{OH}	V_{IH}	V_F	V_R	V_{CC}	V_{CCL}	V_{CCH}	V_{max}	Gnd
Output Voltage	V_{OL}	4	-	0.40	-	0.40	-	0.45	Vdc	-	0.45	-	0.45	-	0.50	Vdc	4	-	3,5,10,12	-	-	-	14	-	-	1,2††,7
		6	-	↓	-	↓	-	↓	↓	-	↓	-	↓	-	↓	↓	6	-	↓	-	-	-	↓	-	-	↓
		9	-		-		-			-		-		-			9	-		-	-	-		-	-	
		11	-		-		-			-		-		-			11	-								
	V_{OH}	4	2.50	-	2.60	-	2.50	-		2.60	-	2.60	-	2.50	-		-	4*	2*,3*, 5,10,12	-	-	-		-	-	1,7
		6	↓	-	↓	-	↓	-		↓	-	↓	-	↓	-		-	6*	2*,3,5*, 10,12	-	-	-		-	-	↓
		9		-		-		-			-		-		-		-	9*	2*,3,5, 10*,12	-	-	-		-	-	
		11		-		-		-	↓		-		-		-	↓	-	11*	2*,3,5, 10,12*	-	-	-	↓	-	-	↓
Short-Circuit Current	I_{SC}	4	-9.0	-	-12.0	-	-10.0	-	mAdc	-9.0	-	-10.0	-	-9.0	-	mAdc	-	-	2,5,10,12	-	-	-	-	14	-	1,3,4,7
		6	↓	-	↓	-	↓	-	↓	↓	-	↓	-	↓	-	↓	-	-	2,3,10,12	-	-	-	-	↓	-	1,5,6,7
		9		-		-		-			-		-		-		-	-	2,3,5,12	-	-	-	-		-	1,7,9,10
		11		-		-		-			-		-		-		-	-	2,3,5,10	-	-	-	-		-	1,7,11,12

(continued)

Pins not listed are left open.
† Momentarily ground this terminal before applying test condition.
†† Momentary ground. Release ground on pin 2 before taking measurement.
* Inputs to C_D (pin 2) and appropriate S_D (pins 3, 5, 10, or 12) as shown:

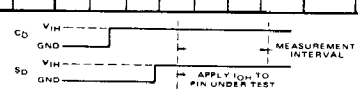


@ Test Temperature		TEST CURRENT / VOLTAGE VALUES								
		mA		Volts						
		I_{OL}	I_{OH}	V_{IH}	V_F	V_R	V_{CC}	V_{CCL}	V_{CCH}	V_{max}
MC939	−55°C	11.4	-0.12	2.10	0	4.00	-	4.50	5.50	-
	+25°C	12.0	-0.12	2.00	0	4.00	5.00	4.50	5.50	8.00
	+125°C	10.8	-0.12	2.00	0	4.00	-	4.50	5.50	-
MC839	0°C	12.0	-0.500	2.00	0.45	4.00	-	5.00	5.00	-
	+25°C	12.0	-0.500	1.90	0.45	4.00	5.00	5.00	5.00	8.00
	+75°C	11.4	-0.500	1.80	0.50	4.00	-	5.00	5.00	-

ELECTRICAL CHARACTERISTICS (continued)

Characteristic	Symbol	Pin Under Test	MC939 TEST LIMITS −55°C Min	−55°C Max	+25°C Min	+25°C Max	+125°C Min	+125°C Max	Unit	MC839 TEST LIMITS 0°C Min	0°C Max	+25°C Min	+25°C Max	+75°C Min	+75°C Max	Unit	TEST CURRENT / VOLTAGE APPLIED TO PINS LISTED BELOW: I_{OL}	I_{OH}	V_{IH}	V_F	V_R	V_{CC}	V_{CCL}	V_{CCH}	V_{max}	Gnd
Reverse Current	I_R	1	-	2.0	-	2.0	-	5.0	µAdc	-	5.0	-	5.0	-	10	µAdc	-	-	-	-	1	-	-	14	-	7
		3	-	↓	-	↓	-	↓	↓	-	↓	-	↓	-	↓	↓	-	-	-	-	3†	-	-	↓	-	↓
		5	-		-		-			-		-		-			-	-	-	-	5†	-	-		-	
		10	-		-		-			-		-		-			-	-	-	-	10†	-	-		-	
		12	-		-		-			-		-		-			-	-	-	-	12†	-	-		-	
	$4\ I_R$	2	-	8.0	-	8.0	-	20		-	20	-	20	-	40		-	-	-	-	2†	-	-		-	
Forward Current	I_F	1	-	-1.60	-	-1.60	-	-1.50	mAdc	-	-1.40	-	-1.40	-	-1.33	mAdc	-	-	-	1	-	-	-	14	-	7
	$1.5\ I_F$	3	-	-2.40	-	-2.40	-	-2.25	↓	-	-2.10	-	-2.10	-	-2.00	↓	-	-	-	3	-	-	-	↓	-	↓
		5	-	↓	-	↓	-	↓		-	↓	-	↓	-	↓		-	-	-	5	-	-	-		-	
		10	-		-		-			-		-		-			-	-	-	10	-	-	-		-	
		12	-		-		-			-		-		-			-	-	-	12	-	-	-		-	
	$5\ I_F$	2	-	-8.00	-	-8.00	-	-7.50		-	-7.00	-	-7.00	-	-6.65		-	-	-	2	-	-	-		-	
Power Drain Current	I_{PDH}	14	-	-	-	40	-	-	mAdc	-	-	-	43.5	-	-	mAdc	-	-	2†	-	-	14	-	-	-	7
	I_{max}	14	-	-	-	28	-	-	mAdc	-	-	-	32	-	-	mAdc	-	-	-	-	-	-	-	-	14	2,3,5,7, 10,12
Counting Frequency	f_C	1, 4, 6, 9, 11	-	-	-	15	-	-	MHz	-	-	-	15	-	-	MHz	Pulse In: 1	Pulse Out: 4,6,9,11	-	-	-	14	-	-	-	7

Pins not listed are left open.
† Momentarily ground this terminal before applying test condition.
†† Momentary ground. Release ground on pin 2 before taking measurement.
* Inputs to C_D (pin 2) and appropriate S_D (pins 3, 5, 10, or 12) as shown:



PRODUCT DOCUMENTATION

The three documents listed in the following table are required for a complete description of the DSP56301 and are necessary to design properly with the part. Documentation is available from one of the following locations (see back cover for detailed information):

- A local Motorola distributor
- A Motorola semiconductor sales office
- A Motorola Literature Distribution Center
- The World Wide Web (WWW)

See the **Additional Support** section of the *DSP56300 Family Manual* for detailed information on the multiple support options available to you.

Table 1 DSP56301 Documentation

Name	Description	Order Number
DSP56300 Family Manual	Detailed description of the DSP56300 family processor core and instruction set	DSP56300FM/AD
DSP56301 User's Manual	Detailed functional description of the DSP56301 memory configuration, operation, and register programming	DSP56301UM/AD
DSP56301 Technical Data	DSP56301 features list and physical, electrical, timing, and package specifications	DSP56301/D