

16-STAGE COUNTER

- LOW QUIESCENT POWER DISSIPATION
- WIDE SUPPLY VOLTAGE RANGE: 3 to 15V
- HIGH NOISE IMMUNITY: 45% of V_{CC} (TYP.)
- INPUTS FULLY PROTECTED
- INVERTER AVAILABILITY IN CRYSTAL OSCILLATOR IMPLEMENTATION FOR TIMING APPLICATIONS

The **M 702 D2** (extended temperature range) and **M 702 D1/B1** (intermediate temperature range) are 16-stage binary counts constructed with COS/MOS technology in a single monolithic chip. The devices may be used as timing circuits the chips consists of 16-flip-flop, input inverter for use in a cristal oscillator, and an output buffer capable of driving standard stepping motors.

The device is available in 8-lead dual in-line miniature plastic package and 8-lead metal-can.

ABSOLUTE MAXIMUM RATINGS *

V_{DD}^{**}	Supply voltage	-0.5 to 15	V
V_I	Input voltage (at any pin)	-0.5 to $V_{DD} + 0.5$	V
P_{tot}	Total power dissipation (per package)	200	mW
T_{stg}	Storage temperature	-65 to 150	°C
T_{op}	Operating temperature: for D2 type	-55 to 125	°C
	for D1/B1 type	-40 to 85	°C

* Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

** This voltage value are referred to V_{SS} pin voltage.

ORDERING NUMBERS:

M 702 D2 for TO-99 metal can

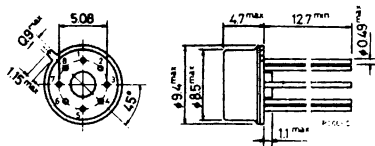
M 702 D1 for TO-99 metal can

M 702 B1 for dual in-line plastic package

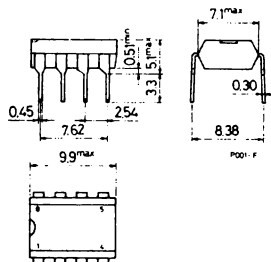
MECHANICAL DATA

Dimensions in mm

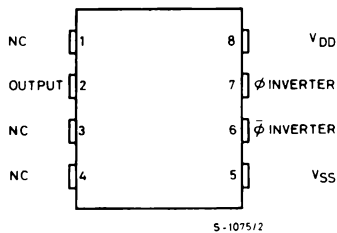
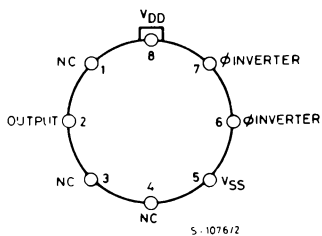
TO-99 metal can



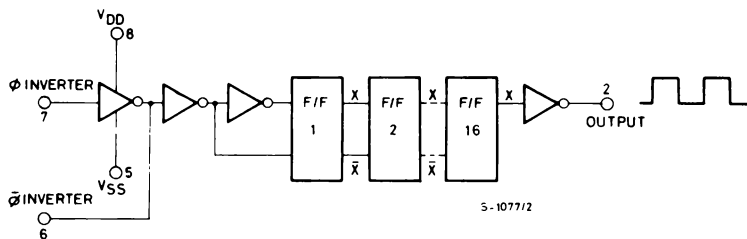
Dual in-line plastic package



CONNECTION DIAGRAMS



LOGIC BLOCK DIAGRAM



RECOMMENDED OPERATING CONDITIONS

V_{DD}	Supply voltage: for general applications	3 to 15	V
	for crystal oscillator in clock applications	7 to 15	V
V_i	Input voltage	0 to V_{DD}	V
T_{op}	Operating temperature: for D2 type	-55 to 125	°C
	for D1/B1 types	-40 to 85	°C

STATIC ELECTRICAL CHARACTERISTICS (Over recommended operating conditions) D2 type (extended temperature range)

Parameter		Test conditions		Values									Unit
		V _O (V)	V _{DD} (V)	-55°C			25°C			125°C			
				Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
I _L	Quiescent supply current		5			15		0.5	15			900	μA
			10			25		1	25			1500	
			15			50		1	50			2000	
V _{OH}	Output high voltage	I _O = 0	5	4.99		4.99	5		4.95				V
			10	9.99		9.99	10		9.95				
V _{OL}	Output low voltage	I _O = 0	5			0.01	0	0.01				0.05	V
			10			0.01	0	0.01			0.05		
V _{NH}	Noise immunity		5	1.4			1.5	2.25		1.5			V
			10	2.9			3	4.5		3			
V _{NL}	Noise immunity		5	1.5			1.5	2.25		1.4			V
			10	3			3	4.5		2.9			
I _{DN}	Output drive current N-channel		0.5	5	12.5			12	15		8		mA
			0.5	10	18.5			18	20		14		
I _{DP}	Output drive current P-channel		4.5	5	-12.5			-12	-15		-8		mA
			9.5	10	-18.5			-18	-20		-14		
I _{IH} , I _{IL}	Input leak current	Any input	15			± 1		± 10 ⁻⁵	± 1			± 1	μA

D1/B1 types (intermediate temperature range)

Parameter		Test conditions		Values									Unit
				V _O (V)	V _{DD} (V)	-40°C			25°C			85°C	
		Min.	Typ.			Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
I _L	Quiescent supply current		5			50		1	50			700	μA
			10			100		2	100			1400	
			15			900		10	900			5000	
V _{OH}	Output high voltage	I _{OH} =0	5	4.99		4.99	5		4.95				V
			10	9.99		9.99	10		9.95				
V _{OL}	Output low voltage	I _{OL} =0	5			0.01		0	0.01			0.05	V
			10			0.01		0	0.01			0.05	
V _{NH}	Noise immunity		5	1.4			1.5			1.5			V
		10	2.9			3	4.5		3				
V _{NL}	Noise immunity		5	1.5			1.5	2.25		1.4			V
		10	3			3	4.5		2.9				
I _{DN}	Output drive current N-channel	0.5	5	12.5			12	15		8			mA
		0.5	10	18.5			18	20		14			
I _{DP}	Output drive current P-channel	4.5	5	-12.5			-12	-15		-8			mA
		9.5	10	-18.5			-18	-20		-14			
I _{IH} , I _{IL}	Input leak current	Any input	15			± 1		± 10 ⁻⁵	± 1			± 1	μA

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 15\text{ pF}$, typical temperature coefficient for all $V_{DD} = 0.3\%/^{\circ}\text{C}$ values, all input rise and fall time = 20 ns)

Parameter		Test conditions	Values							Unit
			V _{DD} (V)	M 702 D2			M 702 D1/B1			
				Min.	Typ.	Max.	Min.	Typ.	Max.	
t _{WH} , t _{WL}	Minimum input pulse width		5		100	115		100	140	ns
			10		50	60		50	75	
t _r , t _f	Input clock rise and fall time		5			15			15	μs
			10			10			10	
f _{max}	Maximum clock frequency		5	4.4	5		8.5	10		MHz
			10	3.5	5		6.5	10		
C _I	Input capacitance	Any input			5			5		pF

TYPICAL APPLICATIONS

Digital equipment in which ultra-low dissipation and/or operation using a battery source are primary design requirements.

Accurate timing from a crystal oscillator for timing applications such as wall clocks, table clocks, automobile clocks, and digital timing references in any circuit requiring accurately timed outputs.

Driving miniature synchronous motors, stepping motors, or external bipolar transistors in push-pull fashion.

Electronic watch application circuit

