



MOTOROLA

MC14451

OSCILLATOR/2¹¹ to 2¹⁹ DIVIDER/BUFFERED DUTY CYCLE CONTROL

The MC14451 consists of three sections: an oscillator, an 18-stage divider, and a buffered flip-flop for pulse width control and current sink drive. These circuits employ metal-gate complementary MOS devices for low-voltage operation and extremely low power dissipation.

A wide variety of output pulse widths and frequencies can be obtained using the pulse-width-control flip-flop. The number of combinations can be further increased by the variety of crystal frequencies or R-C networks used with the oscillator section.

The buffered output of the duty-cycle-control flip-flop consists of an N-channel MOSFET for maximum current sinking capability and a P-channel active pullup device. Outputs from the 18-stage divider section provide a negative logic binary count.

Applications of the MC14451 include power-off timers, low-power-consumption timers especially suited for battery applications, elapsed timers, wall clocks, auto-timers for feeding systems, fuse timers, incubator timers, weather measurement equipment, and many other battery or low-power applications.

- On-Chip Duty Cycle Control
- Buffered Duty Cycle Control Output
- On-Chip Oscillator
- Low Power Consumption — 20 μ W typical @ 1.5 Vdc and $f = 262$ kHz
- Operating Supply Voltage Range = 1.3 to 3.0 Vdc
- Diode Protection on Inputs

CMOS MSI

(LOW-POWER COMPLEMENTARY MOS)

OSCILLATOR/2¹¹ to 2¹⁹ DIVIDER/ BUFFERED DUTY CYCLE CONTROL



L SUFFIX
CERAMIC PACKAGE
CASE 620

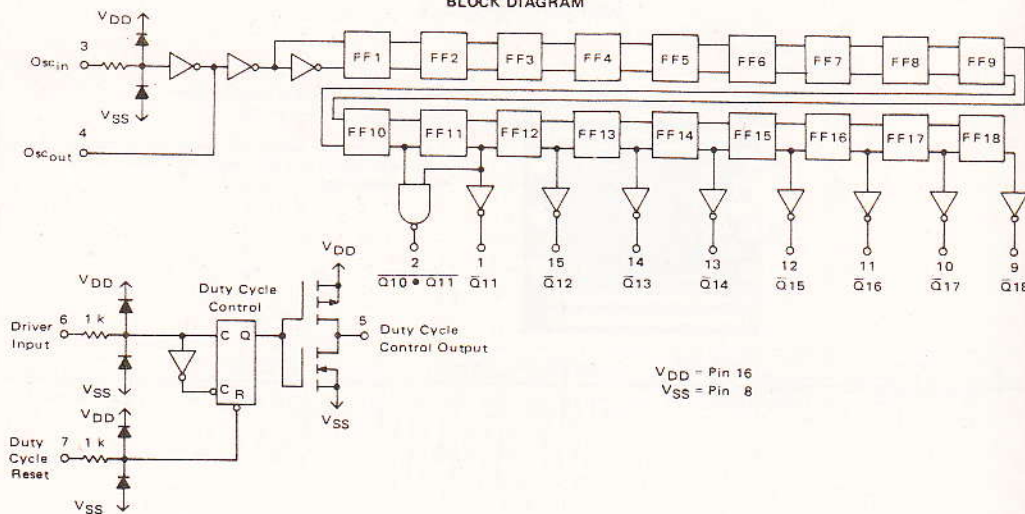


P SUFFIX
PLASTIC PACKAGE
CASE 648



MCC PREFIX
CHIP

BLOCK DIAGRAM



V_{DD} = Pin 16
 V_{SS} = Pin 8

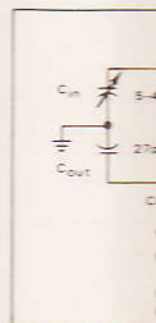
MAXIMUM RATINGS

DC Supply Voltages
Input Voltage, All Inputs
DC Current Drain per Input
Operating Temperature
Storage Temperature

ELECTRICAL CHARACTERISTICS

Power Supply Operating Voltage
Output Voltage
Output Drive Current ($V_{OH} = 1.3$ Vdc)
($V_{OL} = 0.2$ Vdc)
Input Current
Quiescent Device Current ($f = 262.144$ kHz)
Dynamic Device Current
Minimum Voltage Range

FIGURE 1



MC14451

Rating		Symbol	Value	Unit
DC Supply Voltages		V _{DD}	+3.0 to -0.5	Vdc
Input Voltage, All Inputs		V _{in}	V _{DD} + 0.5 to V _{SS} - 0.5	Vdc
DC Current Drain per Pin		I	10	mAdc
Operating Temperature Range		T _A	-10 to +60	°C
Storage Temperature Range		T _{stg}	-30 to +85	°C

MAXIMUM RATINGS (Voltages referenced to V_{SS}, Pin 8)

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit. For proper operation it is recommended that V_{in} and V_{out} be constrained to the range V_{SS} ≤ V_{in} or V_{out} ≤ V_{DD}. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}).

Characteristic		Symbol	Min	Typ	Max	Unit
Power Supply Operating Range		V _{DD}	1.3	1.5	3.0	Vdc
Output Voltage		V _{OH}	1.38	1.5	—	Vdc
		V _{OL}	—	0.0	0.2	Vdc
Output Drive Current (V _{OH} = 1.3 Vdc) Divider Outputs Duty Cycle Control Outputs	Divider Outputs	I _{OH}	-8.0	-25	—	μAde
	Duty Cycle Control Outputs	I _{OH}	-8.0	-25	—	μAde
	Divider Outputs	I _{OL}	15	50	—	μAde
	Duty Cycle Control Outputs	I _{OL}	400	1200	—	μAde
Input Current		I _{in}	—	0.00001	—	μAde
Quiescent Device Current		I _Q	—	1.0	15	μAde
Dynamic Device Current (f = 262.144 KHz, no output load)		I _{DD}	—	20	200	μAde
Minimum Voltage Required for Oscillator Start		V _{DS}	—	1.2	1.5	Vdc

ELECTRICAL CHARACTERISTICS (V_{DD} = 1.58 Vdc, V_{SS} = 0, T_A = 25°C unless otherwise noted.)

TYPICAL OSCILLATOR CIRCUITS

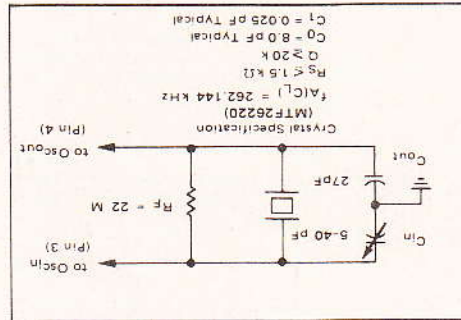


FIGURE 1 - 262-kHz CIRCUIT

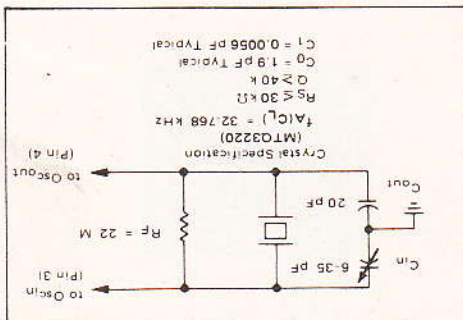
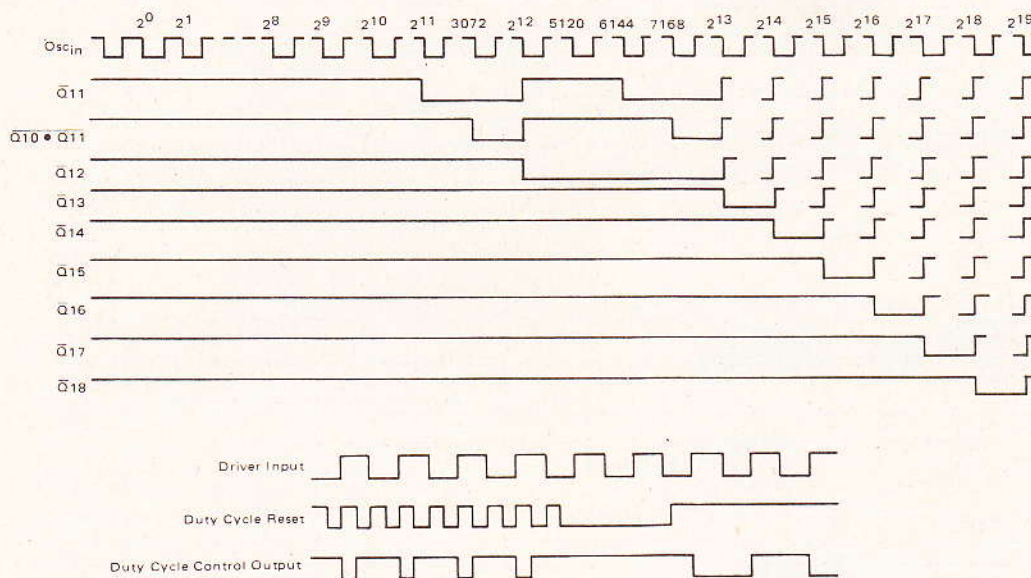
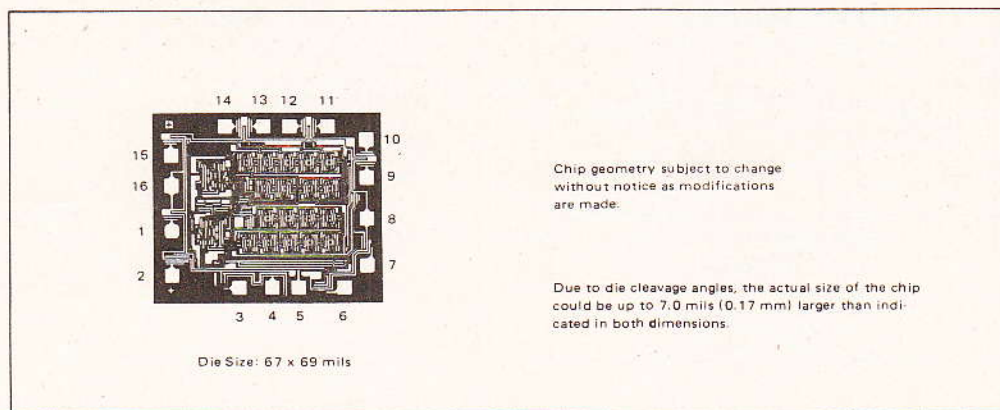


FIGURE 2 - 32.768 kHz CIRCUIT

FIGURE 3 - TIMING DIAGRAM



MCC14451 BONDING PADS



Crystal Frequency = 25.0 MHz

Pin 6 (Driver Input) Connected	To:	Character
Pin 9 Q18	Pulse Width f _{out}	
Pin 10 Q17	Pulse Width f _{out}	
Pin 11 Q16	Pulse Width f _{out}	
Pin 12 Q15	Pulse Width f _{out}	
Pin 13 Q14	Pulse Width f _{out}	
Pin 14 Q13	Pulse Width f _{out}	
Pin 15 Q12	Pulse Width f _{out}	
Pin 1 Q11	Pulse Width f _{out}	

Crystal Frequency = 32.768 MHz

Pin 6 (Driver Input) Connected	To:	Character
Pin 9 Q18	Pulse Width f _{out}	
Pin 10 Q17	Pulse Width f _{out}	
Pin 11 Q16	Pulse Width f _{out}	
Pin 12 Q15	Pulse Width f _{out}	
Pin 13 Q14	Pulse Width f _{out}	
Pin 14 Q13	Pulse Width f _{out}	
Pin 15 Q12	Pulse Width f _{out}	
Pin 1 Q11	Pulse Width f _{out}	

FIGURE 4 – FUNCTIONAL MATRIX

[illegible]

Crystal Frequency = 262.144 KHz

Pin 6 (Driver Input) To: Connected		Pin 1 Characteristic		Pin 2 Q10 + Q11		Pin 15 Q12		Pin 14 Q13		Pin 13 Q14		Pin 12 Q15		Pin 11 Q16		Pin 10 Q17		Pin 9 Q18																																																																																																																																	
Pin 7 Duty Cycle Reset Connected To:	Pin 7	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width	Pulse Width																																																																																																																																
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Crystal Frequency = 32.768 kHz