

TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

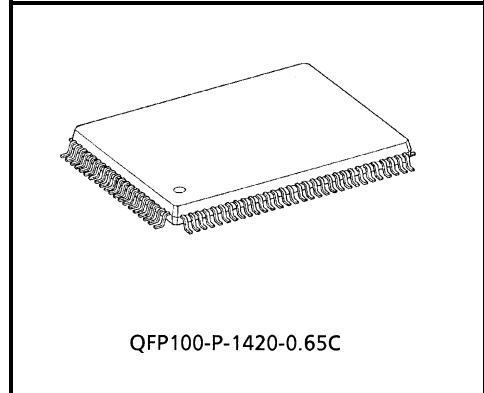
# **TB62600F**

## **64BIT SHIFT REGISTER / LATCH DRIVER**

The TB62600F is specifically designed for 64bit Thermal Head drivers. And this IC is monolithic integrated circuits designed to be used together with Bi-CMOS (DMOS) integrated circuit. The devices consist of a 64bit shift register, dual 64bit latches, and 64 output DMOS structures.

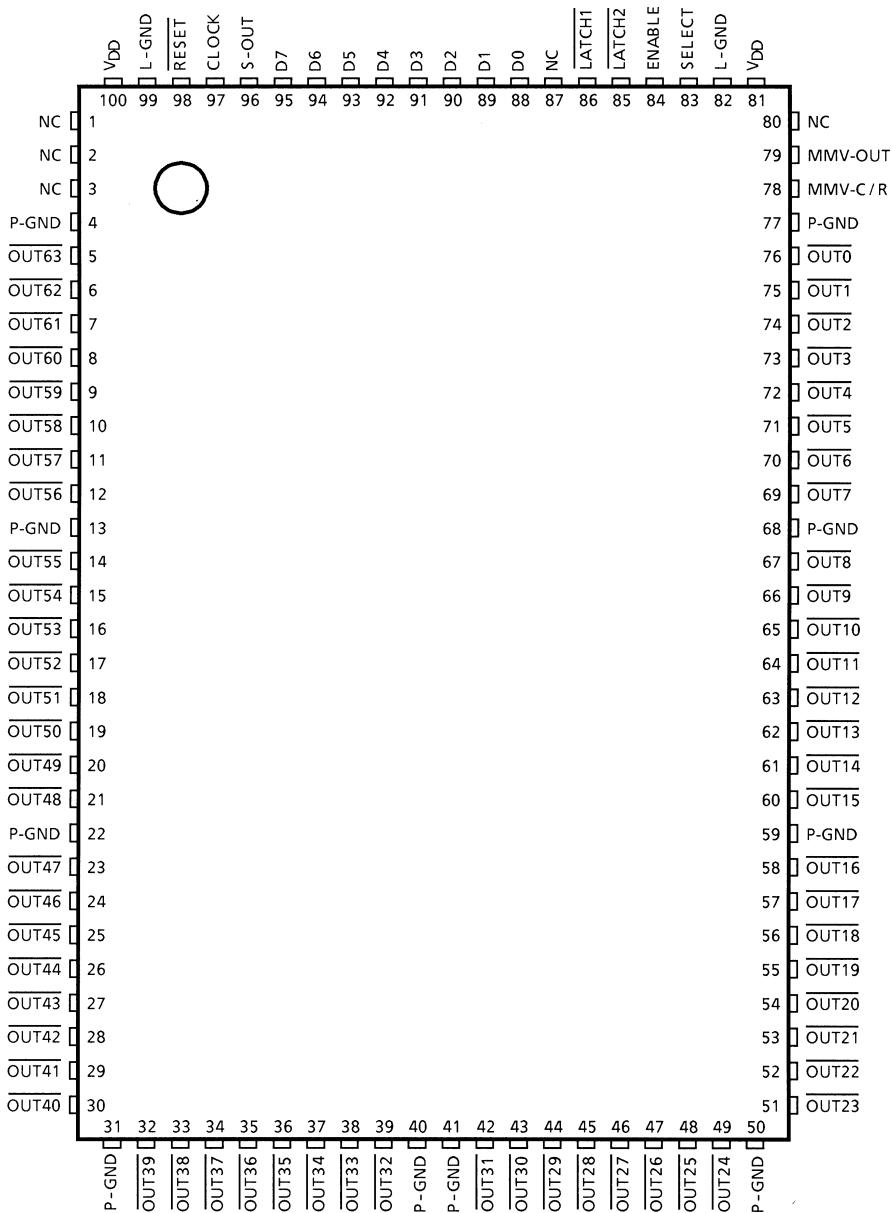
### **FEATURE**

- Built-in selection circuit : parallel-in parallel-out ( $8 \times 8$ ) or serial-in parallel-out ( $1 \times 64$ )
- CMOS compatible inputs
- Open-drain DMOS outputs
- Low steady-state power consumption
- Built-in mono stable multi-vibrator for head protection
- Package : QFP100-P-1420C

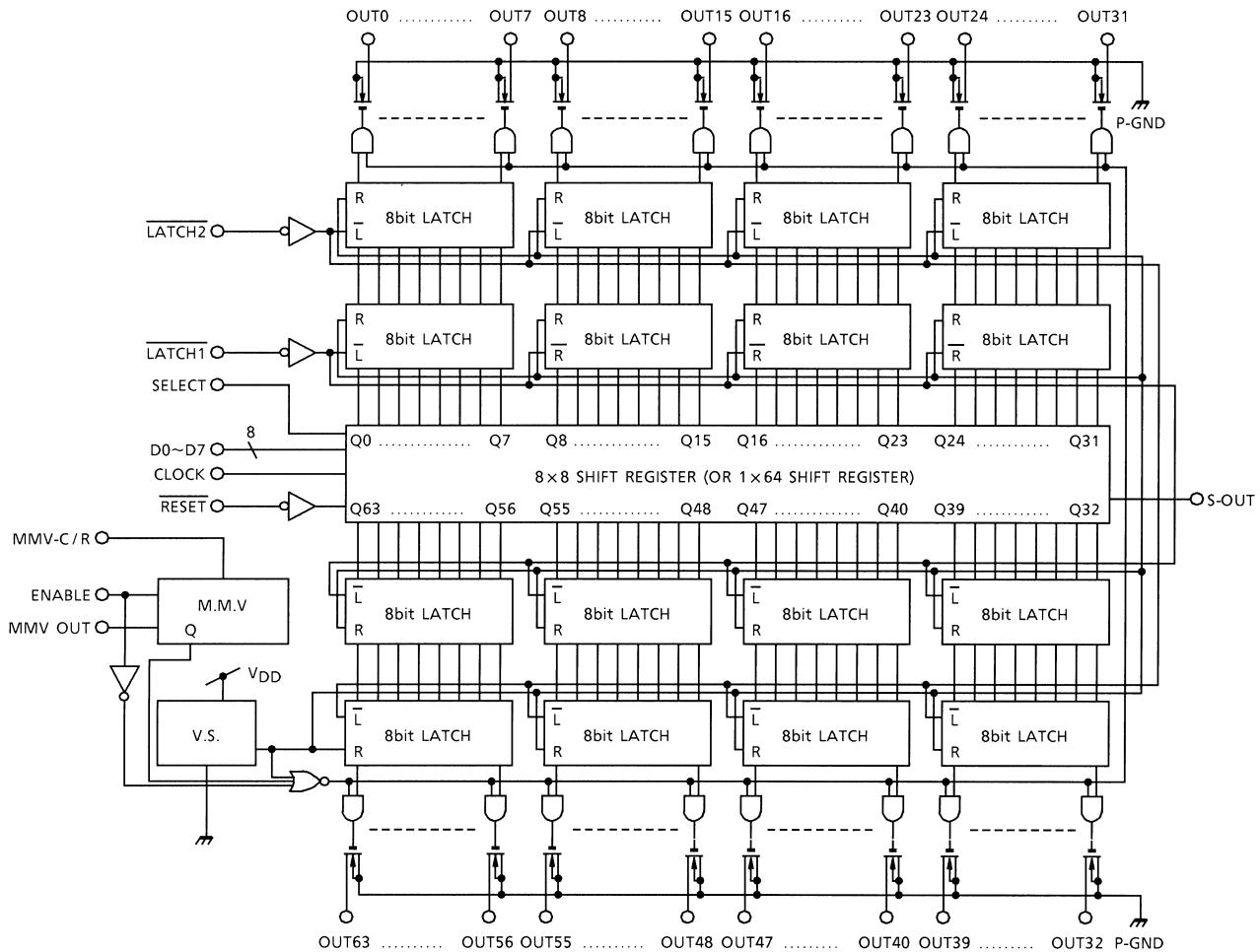


Weight: 1.6 g (Typ.)

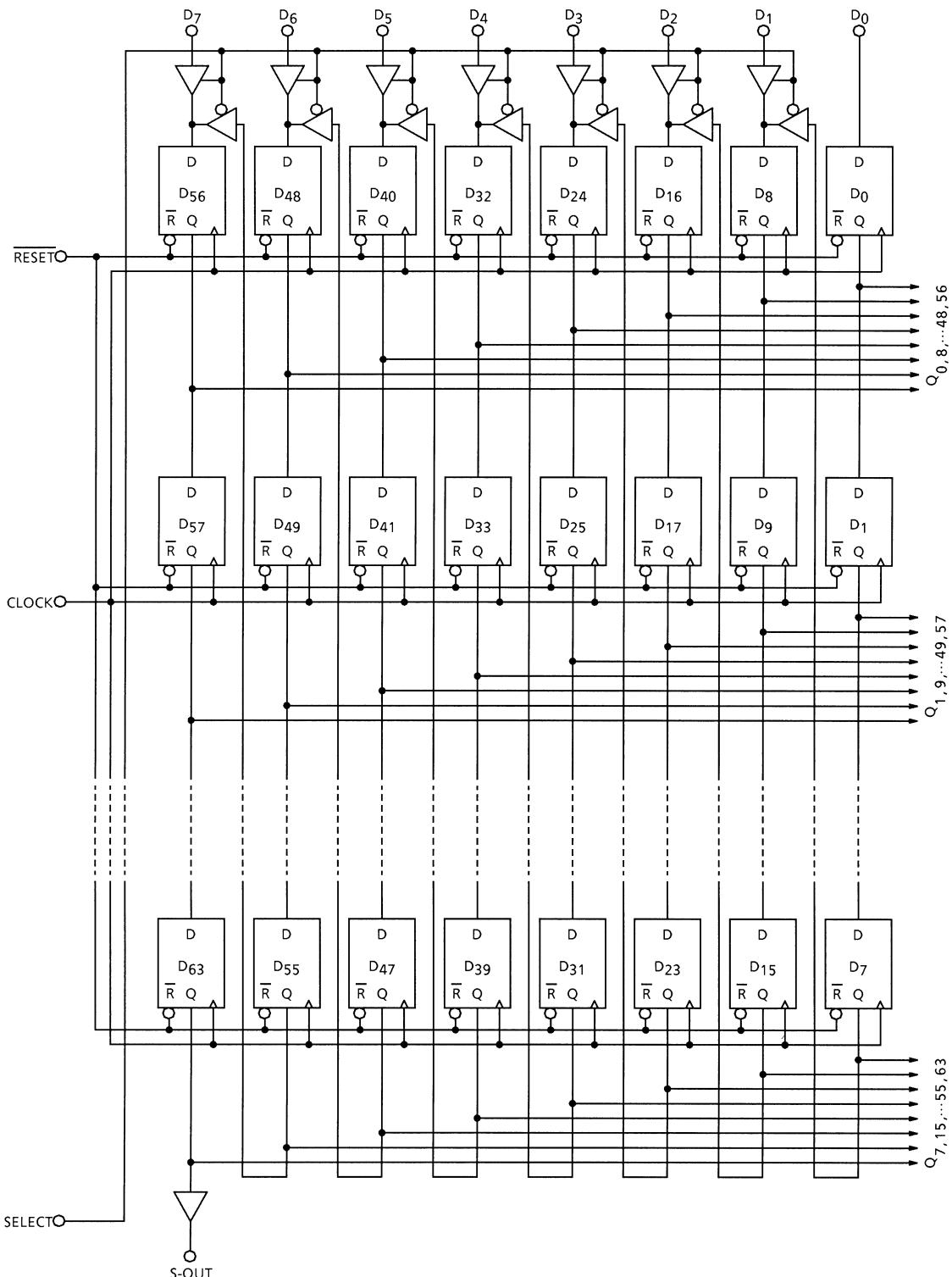
## PIN CONNECTION (TOP VIEW)



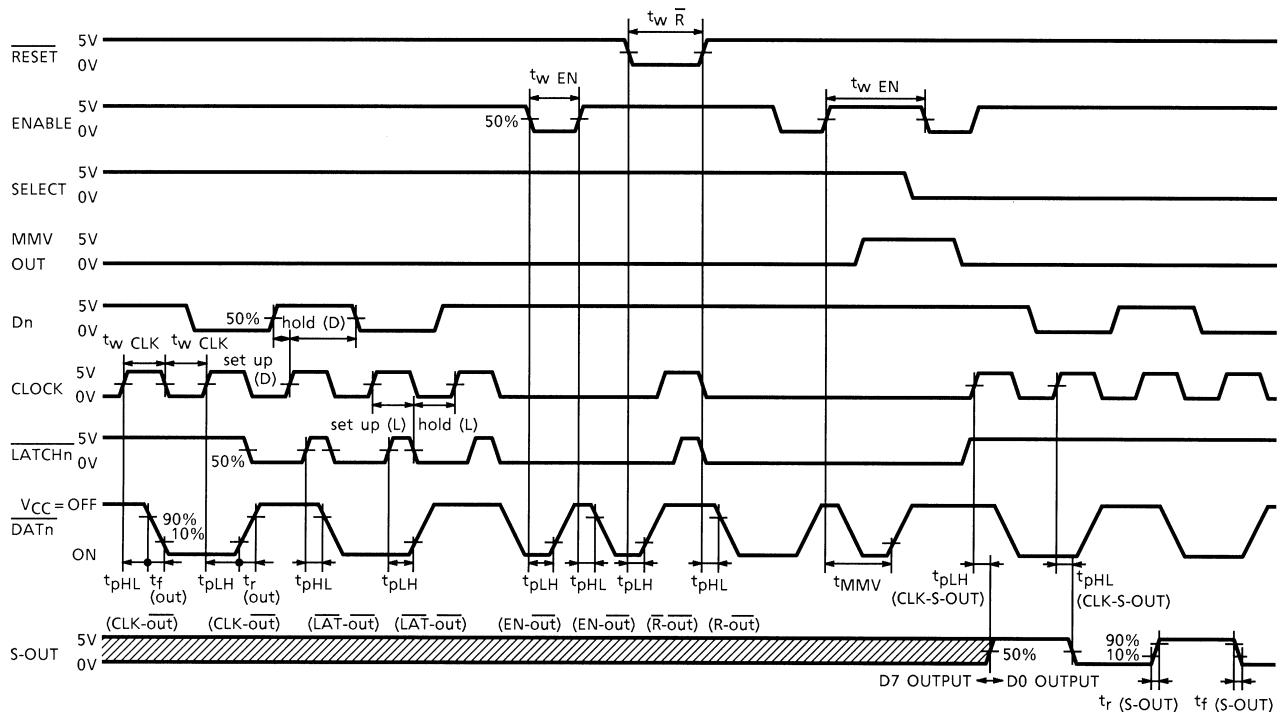
## BLOCK DIAGRAM



## BLOCK DIAGRAM (8 × 8, 1 × 64 shift register)



## TIMING WAVEFORM



**TERMINAL DESCRIPTION**

PIN NAME	PIN No.	FUNCTION
CLOCK	97	Input Terminals for Shift register Clock.
ENABLE	84	"L" : All Outputs "On". Pull-Down Input Terminal.
<u>RESET</u>	98	"L" : Reset shift register and latch. Pull-Down Input Terminal.
D0~D7	88~95	Input Terminals for Output Data. "H" : Output On, "L" : Output Off.
MMV-C/R	78	CR Connection Terminal for CR Timer (MMV)
MMV-OUT	79	Output Terminal for CR Timer (MMV)
OUT0 ~ 63	—	Output Terminals. These are Open Drain Outputs.
SELECT	83	Input Terminal for Input Mode Data. "H" : 8bit Parallel Input Mode, "L" : 1bit Serial Input Mode.
S-OUT	96	Output Terminal for Serial Data "D63".
LATCH1 / <u>LATCH2</u>	86 / 85	Input Terminal for Latch. "H" : Data Through, "L" : Data Latch.
V <sub>DD</sub>	81, 100	Supply Voltage Terminal for Control Logic.
L-GND	82, 99	Ground Terminal for Control Logic
P-GND	—	Ground Terminal for Drivers. 10 Terminals.

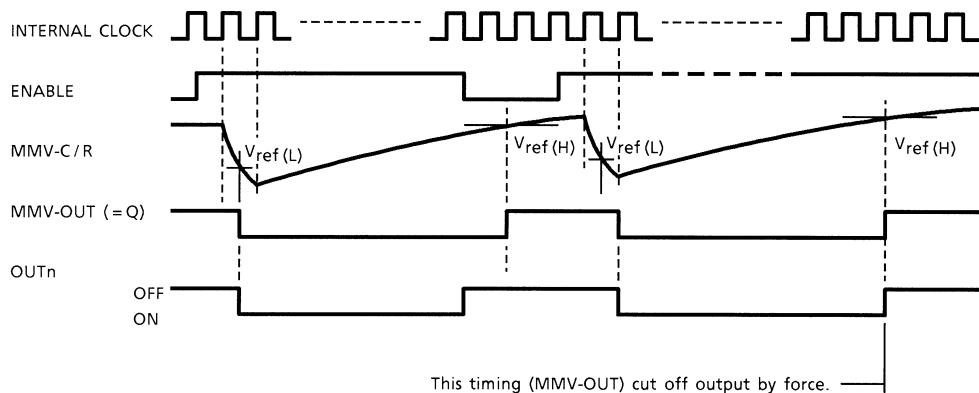
## MMV OPERATION

MMV Output of Q becomes "L" when the MMV / E voltage becomes less than  $V_{ref}(L)$  after the first rising edge of Internal Clock.

And becomes "H" when the MMV / E voltage above  $V_{ref}(H)$  after re-changing of external capacitance connect to MMV / E. The external capacitance and resistor connect to MMV / E control MMV Output "ON" period.

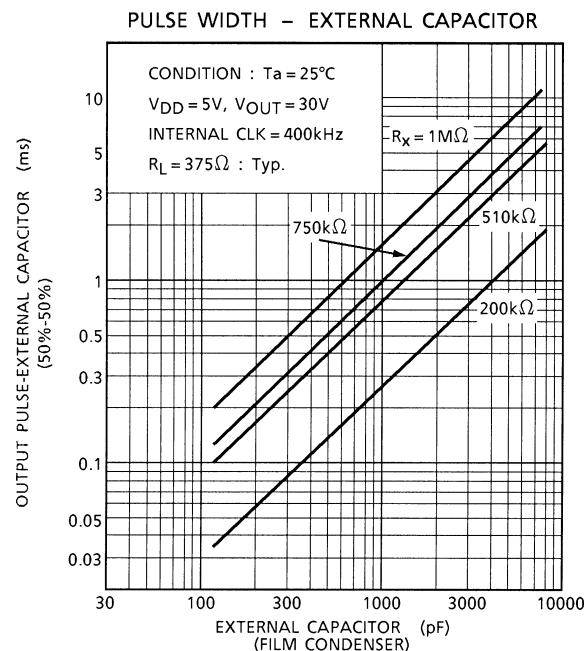
So Output Load is protected from burn-out. It's required enough discharging time (decided by Time period of Internal Clock) of external capacitance.

(Refer to figure below)



## ● PULSE WIDTH OF MMV

See Below



## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>DD</sub>	-0.3~7.0	V
Output Drain-Source Voltage	V <sub>DS</sub>	-0.4~30	V
Output Current	I <sub>DS</sub>	130	mA / ch
Input Current	I <sub>IN</sub>	±5	mA
Input Voltage	V <sub>IN</sub>	-0.3~V <sub>DD</sub> ± 0.3	V
Power Dissipation (Note 1)	P <sub>D</sub>	1.0	W
PCB		1.3	
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

Note 1: 60 × 60 × 1.6 mm Cu 24% Glass Epoxy PCB

RECOMMENDED OPERATING CONDITIONS (Ta = -40~85°C, V<sub>SS</sub> = 0 V)

CHARACTERISTIC	SYMBOL	CONDITION		MIN	TYP.	MAX	UNIT	
Supply Voltage	V <sub>DD</sub>	—		4.5	5	5.5	V	
Input Voltage	"H" LEVEL	V <sub>IH</sub>	—	0.7 V <sub>DD</sub>	—	V <sub>DD</sub>	V	
	"L" LEVEL	V <sub>IL</sub>	—	0	—	0.3 V <sub>DD</sub>		
Output Drain-Source Voltage	V <sub>OUT</sub>	—		—	—	24	V	
Output Current	I <sub>OUT</sub>	Duty = 100%	All Output "L" Level	—	—	44	mA / ch	
		Duty = 80%		—	—	49		
		Duty = 50%		—	—	62		
External Resistor	R <sub>EXT</sub>	—		200	—	1000	kΩ	
External Capacitance	C <sub>EXT</sub>	—		100	—	4000	pF	
Power Dissipation	P <sub>D</sub>	—		—	—	0.67	mW	

## ELECTRICAL CHARACTERISTICS

(Ta = -10~80°C, V<sub>DD</sub> = 4.5~5.5 V, V<sub>SS</sub> = 0 V, "H" = V<sub>IH</sub>, "L" = V<sub>IL</sub>)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN	TYP.	MAX	UNIT
Output Voltage	"L" Level	V <sub>DS1</sub>	—	I <sub>OUT</sub> = 40 mA, Ta = 25°C		—	0.16	0.32	V
		V <sub>DS1</sub>	—	I <sub>OUT</sub> = 40 mA		—	—	0.48	
		V <sub>DS2</sub>	—	I <sub>OUT</sub> = 100 mA, Ta = 25°C		—	0.40	0.80	
		V <sub>DS2</sub>	—	I <sub>OUT</sub> = 100 mA		—	—	1.20	
Output Current	"H" Level	I <sub>OH</sub>	—	S-OUT MMV-OUT	V <sub>OH</sub> = 4.6 V Ta = 25°C	—	0.2	0.5	mA
	"L" Level	I <sub>OL</sub>	—		V <sub>OH</sub> = 0.4 V Ta = 25°C	—	0.2	0.5	
Output Resistor		R <sub>ON</sub>	—	Ta = 25°C		—	4.00	8.00	Ω
Output Leakage Current		I <sub>OZ1</sub>	—	V <sub>OUT</sub> = 30V, EN = "L", 1bit		—	—	10	μA
		I <sub>OZ2</sub>	—	V <sub>OUT</sub> = 30V, EN = "L", 64bit		—	—	100	
Input Current		I <sub>IN</sub>	—	V <sub>IN</sub> = V <sub>DD</sub> or V <sub>SS</sub>		—	—	±1	μA
Input Voltage	"H" Level	V <sub>IH</sub>	—	—		0.7 V <sub>DD</sub>	—	—	V
	"L" Level	V <sub>IL</sub>	—	—		0	—	0.3 V <sub>DD</sub>	
Voltage Supervisor Operating Voltage		V <sub>VS</sub>	—	—		2.0	—	4.0	V
Supply Current		I <sub>DD</sub>	—	—		—	—	300	μA
Operating Supply Current		I <sub>DD1</sub>	—	f <sub>CLK</sub> = 5MHz, Duty = 50% Data = 1 / 2 f <sub>CLK</sub> , OUTPUT off LATCH = "L", LATCH -Data = "L"		—	—	5.0	mA
		I <sub>DD2</sub>	—	f <sub>CLK</sub> = 1MHz, Duty = 50% Data=1 / 64 f <sub>CLK</sub> All OUTPUT open LATCH = "H", 1bit ON		—	—	6.0	
Input Pull-Up Resistor		R <sub>VDD</sub>	—	V <sub>DD</sub> = 5.0 V, Ta = 25°C		150	300	600	kΩ
Input Pull-Down Resistor		R <sub>VSS</sub>	—	V <sub>DD</sub> = 5.0 V, Ta = 25°C		150	300	600	
Internal Clock Frequency		f <sub>int</sub>	—	V <sub>DD</sub> = 5.0 V, Ta = 25°C		400	800	—	kHz

RECOMMENDED TIMING CONDITIONS ( $T_a = -40\text{~}85^\circ\text{C}$ ,  $V_{DD} = 4.5\text{~}5.5\text{ V}$ ,  $V_{SS} = 0\text{ V}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Clock Pulse Width	$t_w$ CLK	—	50	—	—	ns
Enable Pulse Width	$t_w$ EN	—	0.5	—	—	μs
Latch Pulse Width	$t_w$ LAT	—	50	—	—	ns
Clear Pulse Width	$t_w$ CLR	—	80	—	—	ns
Data Set up Time	$t_{\text{setup}}$	—	37	50	—	ns
Data Hold Time	$t_{\text{hold}}$	—	50	—	—	ns

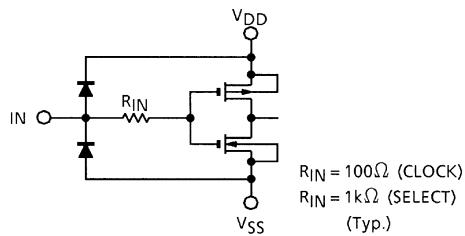
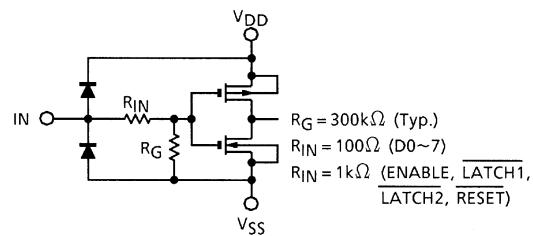
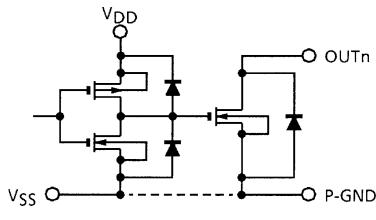
## SWITCHING CHARACTERISTICS

(Ta = 25°C, V<sub>DD</sub> = 5 V, V<sub>OUT</sub> = 26 V, R<sub>1</sub> = 650 Ω, C<sub>L</sub> = 15 pF)

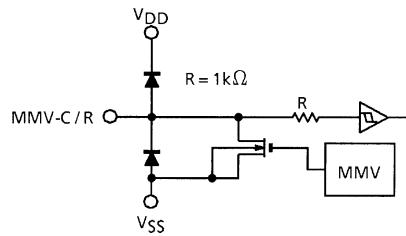
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Propagation Delay Time (Low-to-High)	CLK- Out <sub>n</sub>	$t_{\text{pLH}}$	MMV-C / R = "L"	—	—	1000
	$\bar{R}$ - Out <sub>n</sub>		MMV-C / R = "L"	—	—	1000
	LAT1 - Out <sub>n</sub>		MMV-C / R = "L"	—	—	1000
	LAT2 - Out <sub>n</sub>		MMV-C / R = "L"	—	—	1000
	EN- Out <sub>n</sub>		R = 750 kΩ, C = 2600 pF, Ta = 25°C	—	—	2500
Propagation Delay Time (High-to-Low)	CLK- Out <sub>n</sub>	$t_{\text{pHL}}$	MMV-C / R = "L"	—	—	1000
	$\bar{LAT1}$ - Out <sub>n</sub>		MMV-C / R = "L"	—	—	1000
	$\bar{LAT2}$ - Out <sub>n</sub>		MMV-C / R = "L"	—	—	1000
	EN- Out <sub>n</sub>		R = 750 kΩ, C = 2600 pF, Ta = 25°C	—	—	2500
	CLK- LAT <sub>n</sub>		—	—	70	120
Set Up Time	CLK-S-IN	$t_{\text{setup}}$ (D)	—	—	—	30
	CLK- LAT <sub>n</sub>	$t_{\text{setup}}$ (L)	—	—	—	70
Hold Time	CLK-S-IN	$t_{\text{hold}}$ (D)	—	—	—	20
	CLK- LAT <sub>n</sub>	$t_{\text{hold}}$ (L)	—	—	—	0
Clock Pulse Width	$t_w$ CLK	—	—	—	50	ns
Latch Pulse Width	$t_w$ LAT <sub>n</sub>	—	—	—	50	ns
Reset Pulse Width	$t_w$ R	—	—	—	50	ns
Enable Pulse Width	$t_w$ EN	—	—	—	400	ns
Output Rise Time	$t_{\text{or}}$	OUT <sub>n</sub>	—	200	500	ns
Output Fall Time	$t_{\text{of}}$	OUT <sub>n</sub>	—	200	500	ns
Maximum Clock Frequency	$f_{\text{MAX}}$	Duty = 50%	10	15	—	
Voltage Supervisor Operating Pulse Width	$t_w$ VS	$V_{DD}$ (H) = 5 V, $V_{DD}$ (L) = 2 V	—	200	—	
MMV Reset Time	$t_{\text{MMV}}$	R = 750 kΩ, C = 2600 pF, Ta = 25°C	1	3	5	

## EQUIVALENT OF INPUTS AND OUTPUT CIRCUIT

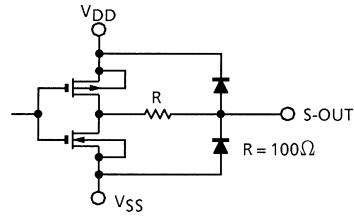
## 1. CLOCK, SELECT

2. ENABLE,  $\overline{LATCH1}$ ,  $\overline{LATCH2}$ ,  $\overline{RESET}$ , D0~73.  $\overline{OUTn}$ 

## 4. MMV-C / R



## 5. S-OUT, MMV-OUT



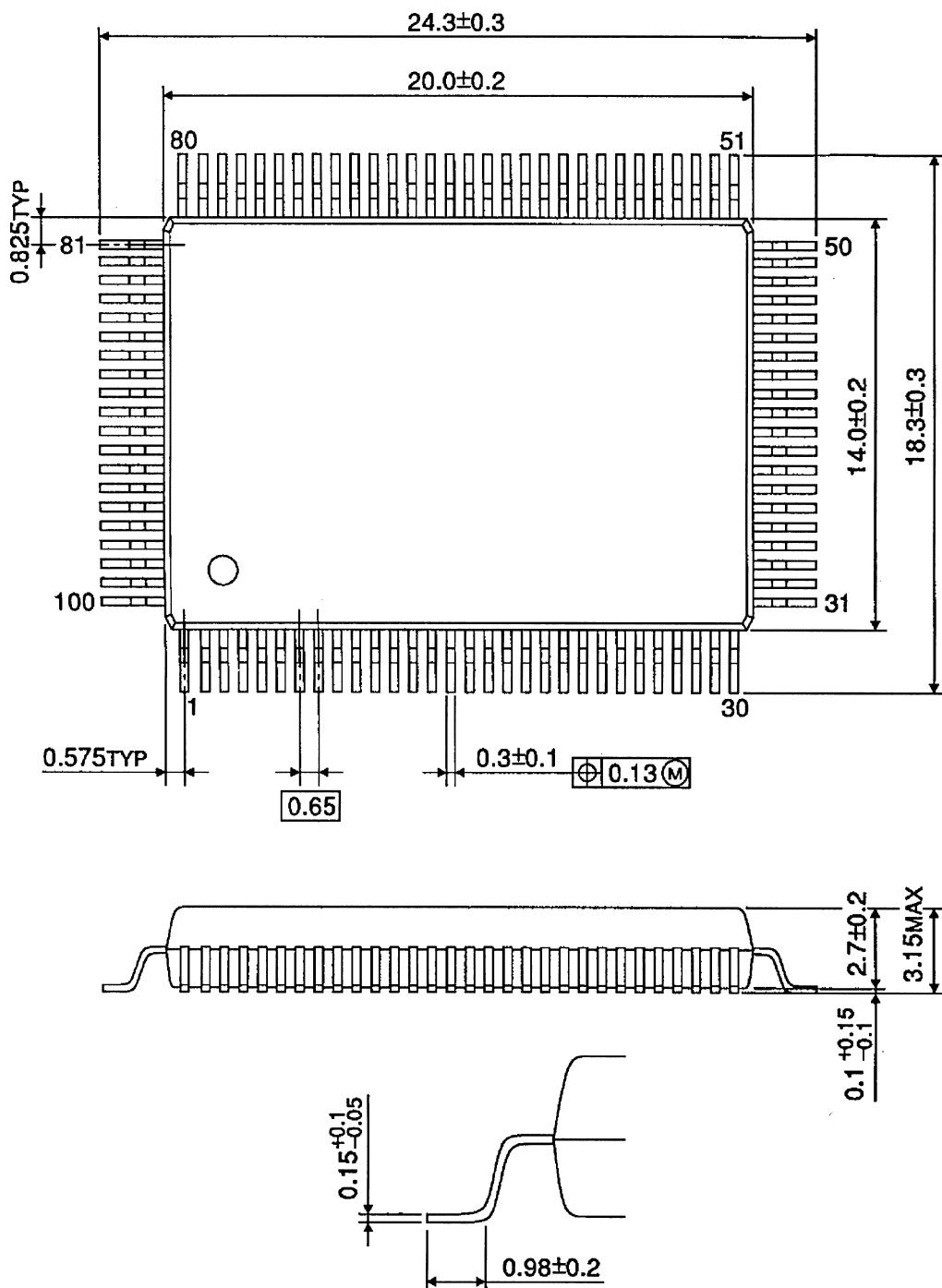
## PRECAUTIONS for USING

This IC does not integrate protection circuits such as overcurrent and overvoltage protectors. Thus, if excess current or voltage is applied to the IC, the IC may be damaged. Please design the IC so that excess current or voltage will not be applied to the IC. Utmost care is necessary in the design of the output line, VCC (VDD) and GND (L-GND, P-GND) line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

## PACKAGE DIMENSIONS

QFP100-P-1420-0.65C

Unit: mm



Weight: 1.6 g (Typ.)

## RESTRICTIONS ON PRODUCT USE

000707EBA

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