

**TC74AC164P, TC74AC164F, TC74AC164FN, TC74AC164FT**

**8 - BIT SHIFT REGISTER (S - IN, P - OUT)**

The TC74AC164 is an advanced high speed CMOS 8 - BIT SERIAL - IN PARALLEL - OUT SHIFT REGISTER fabricated with silicon gate and double - layer metal wiring C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

It consists of a serial - in, parallel - out 8 - bit shift register with a CLOCK input and an overriding CLEAR input.

Two serial data inputs (A, B) are provided so that one may be used as a data enable.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

**FEATURES :**

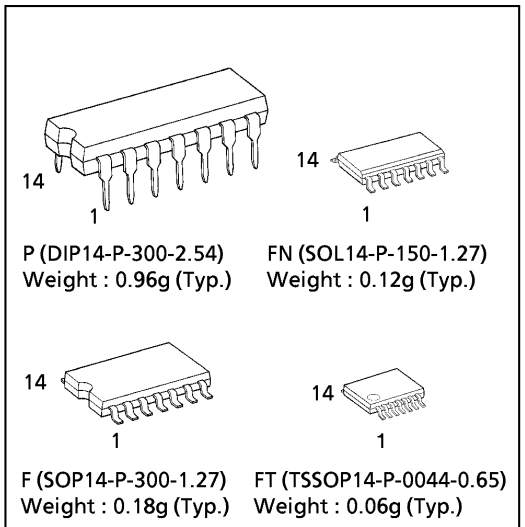
- High Speed..... $f_{MAX} = 170\text{MHz}$  (typ.) at  $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 8\mu\text{A}$ (Max.) at  $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24\text{mA}$ (Min.)  
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range...  $V_{CC}$  (opr) = 2V ~ 5.5V
- Pin and Function Compatible with 74F164

**TRUTH TABLE**

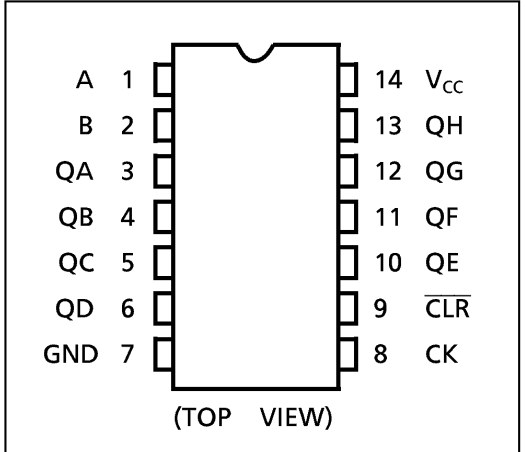
INPUTS				OUTPUTS			
<u>CLR</u>	CK	SERIAL IN		QA	QB	...	QH
		A	B				
L	X	X	X	L	L	...	L
H		X	X	NO CHANGE			
H		L	X	L	QA <sub>n</sub>	...	QG <sub>n</sub>
H		X	L	L	QA <sub>n</sub>	...	QG <sub>n</sub>
H		H	H	H	QA <sub>n</sub>	...	QG <sub>n</sub>

X : Don't Care  
 QA<sub>n</sub> ~ QG<sub>n</sub>: The level of QA ~ QG, respectively, before the most recent positive edge of the clock.

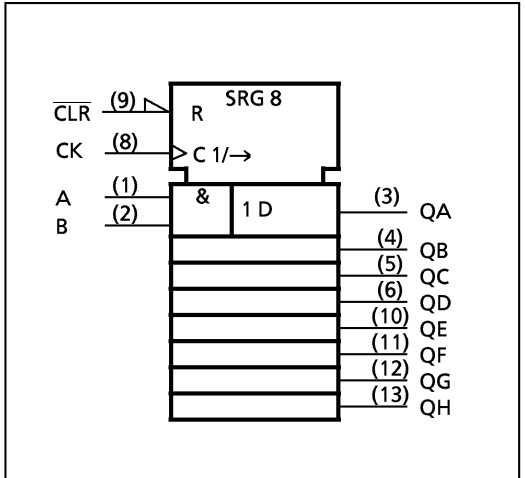
(Note) The JEDEC SOP (FN) is not available in Japan.



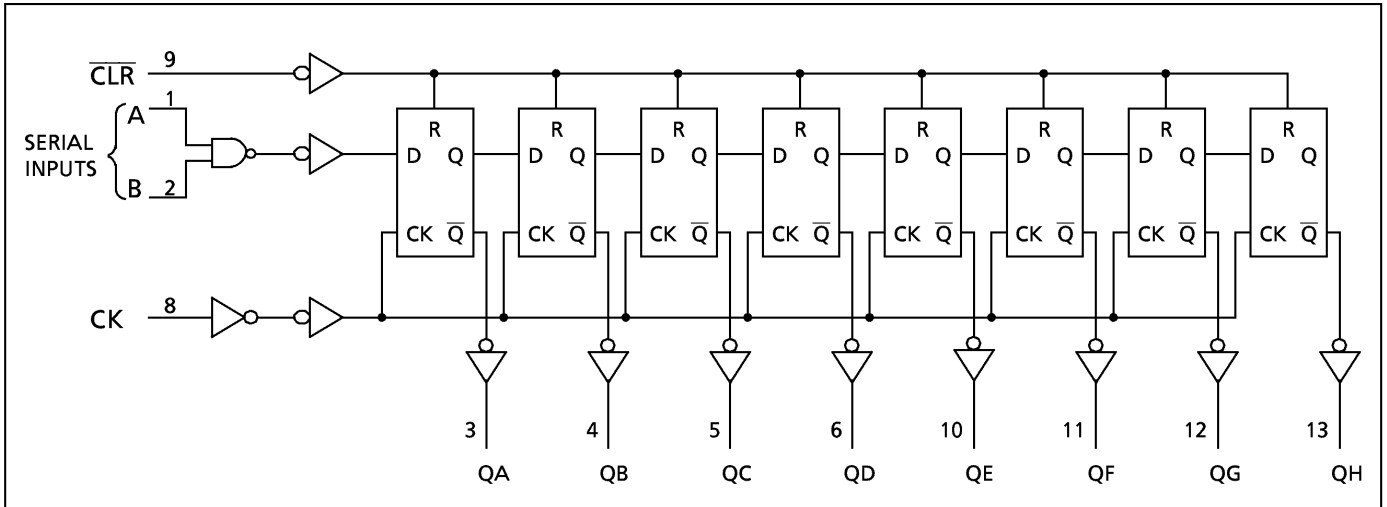
**PIN ASSIGNMENT**



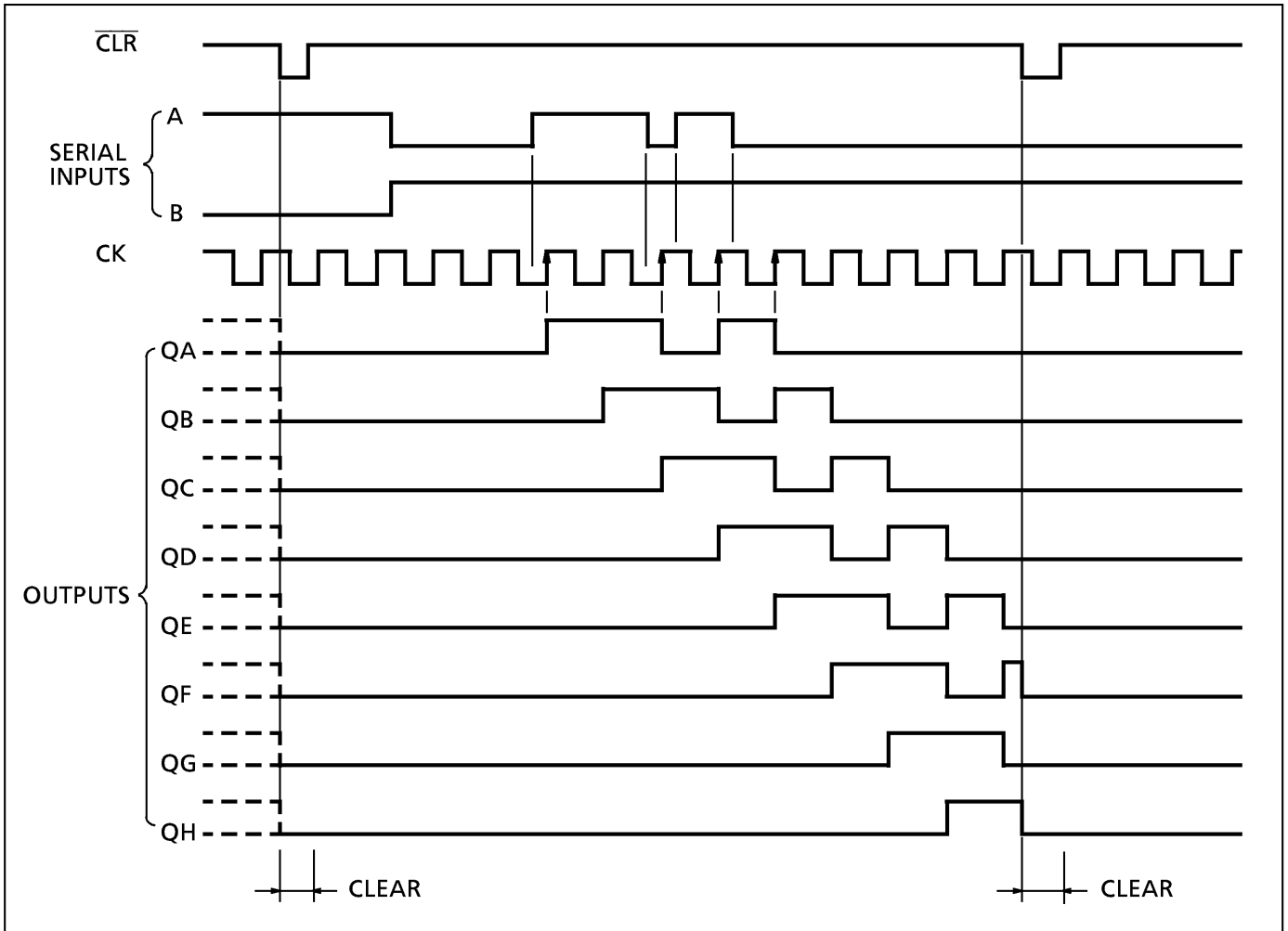
**IEC LOGIC SYMBOL**



**SYSTEM DIAGRAM**



**TIMING CHART**



## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	V
DC Input Voltage	$V_{IN}$	-0.5~ $V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 50$	mA
DC Output Current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 200$	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP/TSSOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°C

\*500mW in the range of  $T_a = -40^\circ\text{C} \sim 65^\circ\text{C}$ . From  $T_a = 65^\circ\text{C}$  to  $85^\circ\text{C}$  a derating factor of  $-10\text{mW}/^\circ\text{C}$  should be applied up to 300mW.

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2.0~5.5	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise and Fall Time	$dt/dV$	0~100 ( $V_{CC} = 3.3 \pm 0.3\text{V}$ ) 0~20 ( $V_{CC} = 5 \pm 0.5\text{V}$ )	ns/V

## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	$V_{IH}$		2.0	1.50	—	—	1.50	—	V	
			3.0	2.10	—	—	2.10	—		
			5.5	3.85	—	—	3.85	—		
Low - Level Input Voltage	$V_{IL}$		2.0	—	—	0.50	—	0.50	V	
			3.0	—	—	0.90	—	0.90		
			5.5	—	—	1.65	—	1.65		
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -50\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			$I_{OH} = -4\text{mA}$ $I_{OH} = -24\text{mA}$ $I_{OH} = -75\text{mA}^*$	3.0	2.58	—	—	2.48	—	
				4.5	3.94	—	—	3.80	—	
				5.5	—	—	—	3.85	—	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 50\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			$I_{OL} = 12\text{mA}$ $I_{OL} = 24\text{mA}$ $I_{OL} = 75\text{mA}^*$	3.0	—	—	0.36	—	0.44	
				4.5	—	—	0.36	—	0.44	
				5.5	—	—	—	—	1.65	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	8.0	—	80.0		

\* : This spec indicates the capability of driving  $50\Omega$  transmission lines.  
One output should be tested at a time for a 10ms maximum duration.

TIMING REQUIREMENTS (Input  $t_r = t_f = 3\text{ns}$ )

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C		Ta = -40~85°C		UNIT
			V <sub>CC</sub> (V)	LIMIT	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		3.3 ± 0.3	9.0	10.0	ns	
			5.0 ± 0.5	5.0	6.0		
Minimum Pulse Width ( $\overline{\text{CLR}}$ )	$t_{W(L)}$		3.3 ± 0.3	9.0	10.0		
			5.0 ± 0.5	5.0	6.0		
Minimum Set-up Time	$t_s$		3.3 ± 0.3	7.0	7.0		
			5.0 ± 0.5	4.0	4.0		
Minimum Hold Time	$t_h$		3.3 ± 0.3	1.0	1.0		
			5.0 ± 0.5	1.0	1.0		
Minimum Removal Time ( $\overline{\text{CLR}}$ )	$t_{rem}$		3.3 ± 0.3	8.5	8.5		
			5.0 ± 0.5	5.0	5.0		

AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50pF, R<sub>L</sub> = 500 Ω, Input  $t_r = t_f = 3\text{ns}$ )

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT	
			V <sub>CC</sub> (V)	MIN.	TYP.	MAX.	MIN.		MAX.
Propagation Delay Time (CK-Q)	$t_{pLH}$ $t_{pHL}$		3.3 ± 0.3	—	9.6	16.3	1.0	18.6	ns
			5.0 ± 0.5	—	6.6	9.8	1.0	11.2	
Propagation Delay Time ( $\overline{\text{CLR}}$ -Q)	$t_{pHL}$		3.3 ± 0.3	—	8.0	15.4	1.0	17.5	ns
			5.0 ± 0.5	—	6.0	11.0	1.0	12.5	
Maximum Clock Frequency	$f_{MAX}$		3.3 ± 0.3	45	100	—	45	—	MHz
			5.0 ± 0.5	80	150	—	80	—	
Input Capacitance	C <sub>IN</sub>		—	5	10	—	10	pF	
Power Dissipation Capacitance	C <sub>PD</sub> (1)		—	110	—	—	—		

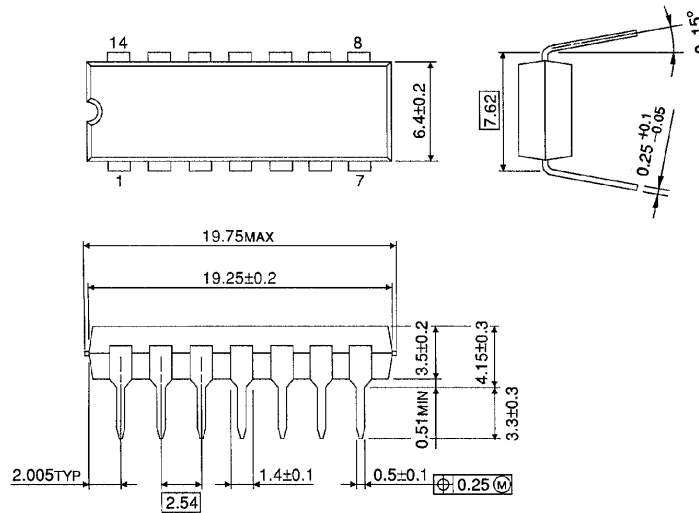
Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

**DIP 14PIN PACKAGE DIMENSIONS (DIP14-P-300-2.54)**

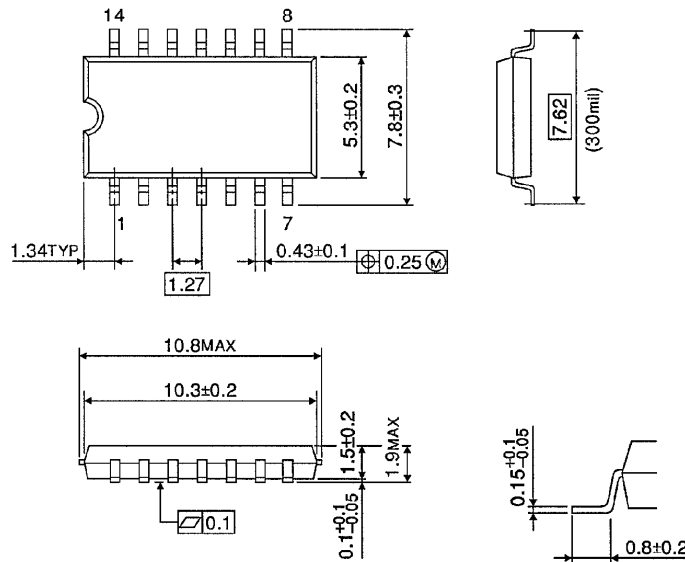
Unit in mm



Weight : 0.96g (Typ.)

**SOP 14PIN (200mil BODY) PACKAGE DIMENSIONS (SOP14-P-300-1.27)**

Unit in mm

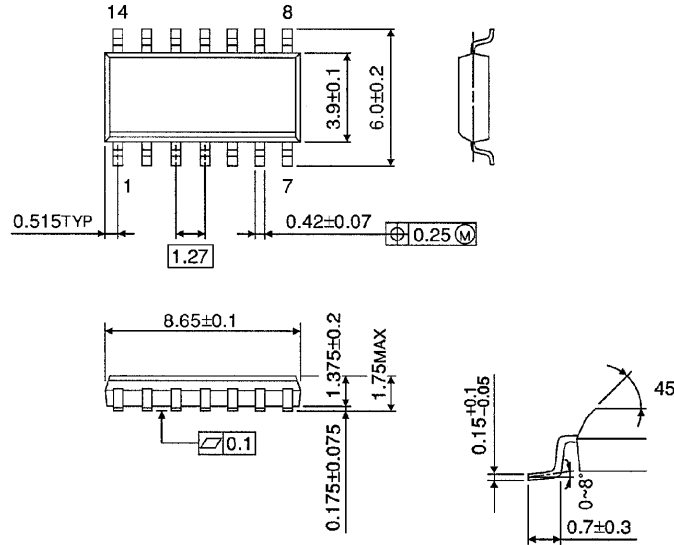


Weight : 0.18g (Typ.)

**SOP 14PIN (150mil BODY) PACKAGE DIMENSIONS (SOL14-P-150 -1.27)**

Unit in mm

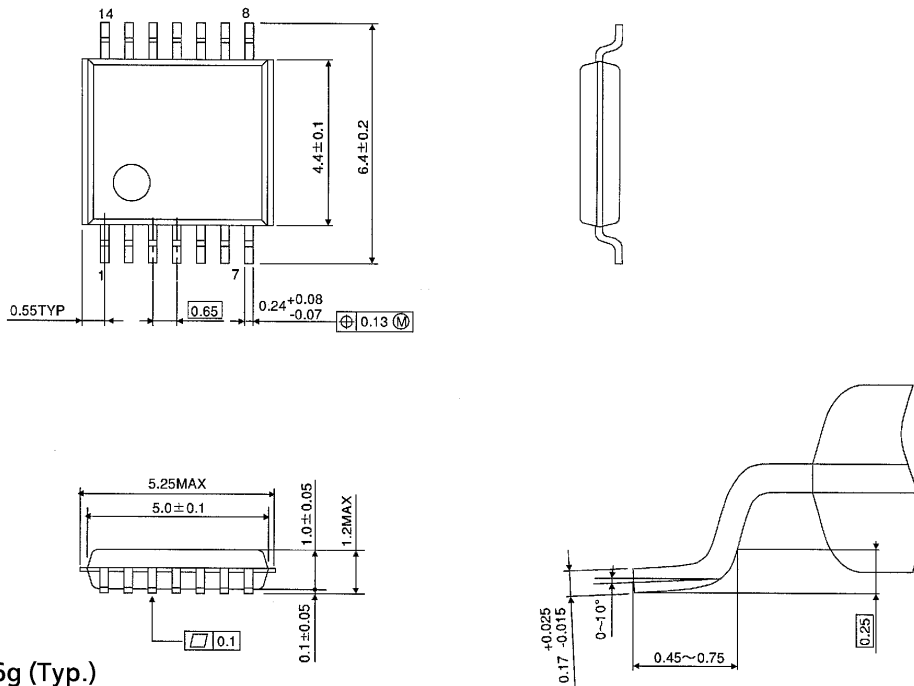
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

**TSSOP 14PIN (170mil BODY) PACKAGE DIMENSIONS (TSSOP14-P-0044-0.65)**

Unit in mm



Weight : 0.06g (Typ.)

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