

TC74HC74AP, TC74HC74AF, TC74HC74AFN

Dual D-Type Flip Flop Preset and Clear

The TC74HC74A is a high speed CMOS D FLIP FLOP fabricated with silicon gate C²MOS technology.

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

The signal level applied to the D INPUT is transferred to Q OUTPUT during the positive going transition of the CLOCK pulse.

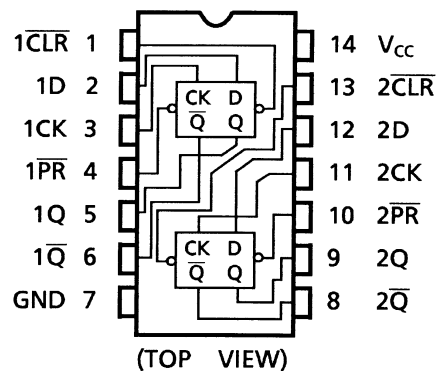
$\overline{\text{CLEAR}}$ and $\overline{\text{PRESET}}$ are independent of the CLOCK and are accomplished by setting the appropriate input to an "L" level.

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

Features

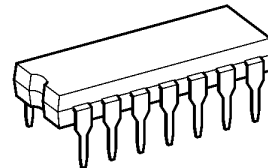
- High speed: $f_{\text{max}} = 77 \text{ MHz (typ.)}$ at $V_{\text{CC}} = 5 \text{ V}$
- Low power dissipation: $I_{\text{CC}} = 2 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{\text{NIH}} = V_{\text{NIL}} = 28\% V_{\text{CC (min)}}$
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{\text{OH}}| = I_{\text{OL}} = 4 \text{ mA (min)}$
- Balanced propagation delays: $t_{\text{pLH}} \approx t_{\text{pHL}}$
- Wide operating voltage range: $V_{\text{CC (opr)}} = 2 \sim 6 \text{ V}$
- Pin and function compatible with 74LS74

Pin Assignment



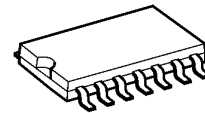
Note: xxxFN (JEDEC SOP) is not available in Japan.

TC74HC74AP

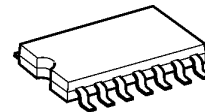


DIP14-P-300-2.54

TC74HC74AF

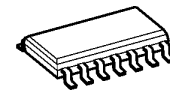


SOP14-P-300-1.27A



SOP14-P-300-1.27

TC74HC74AFN

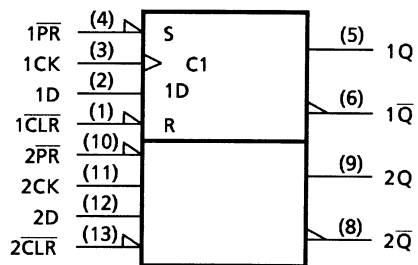


SOL14-P-150-1.27

Weight

DIP14-P-300-2.54	: 0.96 g (typ.)
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOP14-P-300-1.27	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)

IEC Logic Symbol

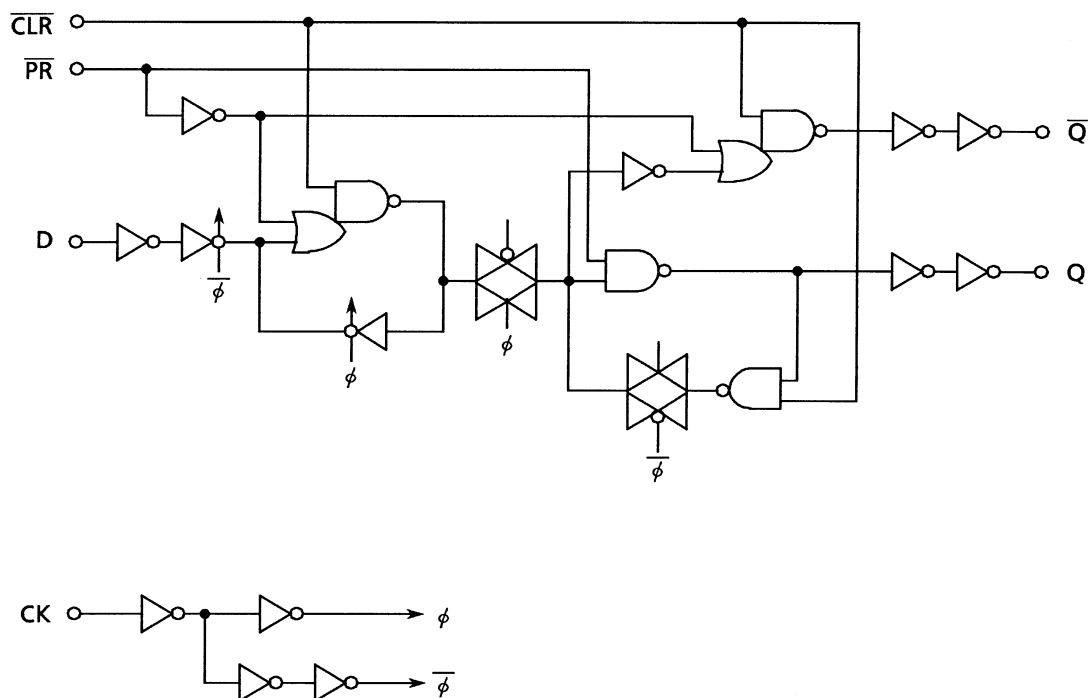


Truth Table

Inputs				Outputs		Function
CLR̄	PR̄	D	CK	Q	Q̄	
L	H	X	X	L	H	Clear
H	L	X	X	H	L	Preset
L	L	X	X	H	H	—
H	H	L	↑	L	H	—
H	H	H	↑	H	L	—
H	H	X	↓	Q _n	Q̄ _n	No Change

X: Don't care

System Diagram



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5~7	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}	± 20	mA
Output diode current	I_{OK}	± 20	mA
DC output current	I_{OUT}	± 25	mA
DC V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	-65~150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of $-10 \text{ mW}/^\circ\text{C}$ shall be applied until 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2~6	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	t_r, t_f	0~1000 ($V_{CC} = 2.0 \text{ V}$) 0~500 ($V_{CC} = 4.5 \text{ V}$) 0~400 ($V_{CC} = 6.0 \text{ V}$)	ns

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V _{IH}	—		2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V
Low-level input voltage	V _{IL}	—		2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
			I _{OH} = -4 mA	4.5	4.18	4.31	—	4.13	—	
I _{OH} = -5.2 mA	6.0	5.68		5.80	—	5.63	—			
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			I _{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33	
I _{OL} = 5.2 mA	6.0	—		0.18	0.26	—	0.33			
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	2.0	—	20.0	μA

Timing Requirements (input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C		Ta = -40 ~85°C	Unit
			V _{CC} (V)	Typ.	Limit	
Minimum pulse width (CK)	t_W (L) t_W (H)	—	2.0	—	75	95
			4.5	—	15	19
			6.0	—	13	16
Minimum pulse width ($\overline{\text{CLR}}$, $\overline{\text{PR}}$)	t_W (L)	—	2.0	—	75	95
			4.5	—	15	19
			6.0	—	13	16
Minimum set-up time	t_s	—	2.0	—	75	95
			4.5	—	15	19
			6.0	—	13	16
Minimum hold time	t_h	—	2.0	—	0	0
			4.5	—	0	0
			6.0	—	0	0
Minimum removal time ($\overline{\text{CLR}}$, $\overline{\text{PR}}$)	t_{rem}	—	2.0	—	25	30
			4.5	—	5	6
			6.0	—	4	5
Clock frequency	f	—	2.0	—	6	5
			4.5	—	31	25
			6.0	—	36	29

AC Characteristics ($C_L = 15 \text{ pF}$, $V_{CC} = 5 \text{ V}$, $T_a = 25^\circ\text{C}$, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	t_{TLH}	—	—	6	12	ns
	t_{THL}					
Propagation delay time (CK-Q, $\overline{\text{Q}}$)	t_{PLH}	—	—	13	26	ns
	t_{PHL}					
Propagation delay time ($\overline{\text{CLR}}$, $\overline{\text{PR}}$ -Q, $\overline{\text{Q}}$)	t_{PLH}	—	—	14	26	ns
	t_{PHL}					
Maximum clock frequency	f_{max}	—	36	77	—	MHz

AC Characteristics ($C_L = 50 \text{ pF}$, input: $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C				Ta = -40~85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time (CK-Q, $\bar{Q}$)	t_{PLH} t_{PHL}	—	2.0	—	48	150	—	190	ns
			4.5	—	16	30	—	38	
			6.0	—	13	26	—	32	
Propagation delay time ($\bar{\text{CLR}}$, $\bar{\text{PR}}$ -Q, $\bar{Q}$)	t_{PLH} t_{PHL}	—	2.0	—	51	150	—	190	ns
			4.5	—	17	30	—	38	
			6.0	—	15	26	—	32	
Maximum clock frequency	f_{max}	—	2.0	6	21	—	5	—	MHz
			4.5	31	63	—	25	—	
			6.0	36	67	—	29	—	
Input capacitance	C_{IN}	—	—	—	5	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)	—	—	34	—	—	—	pF

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

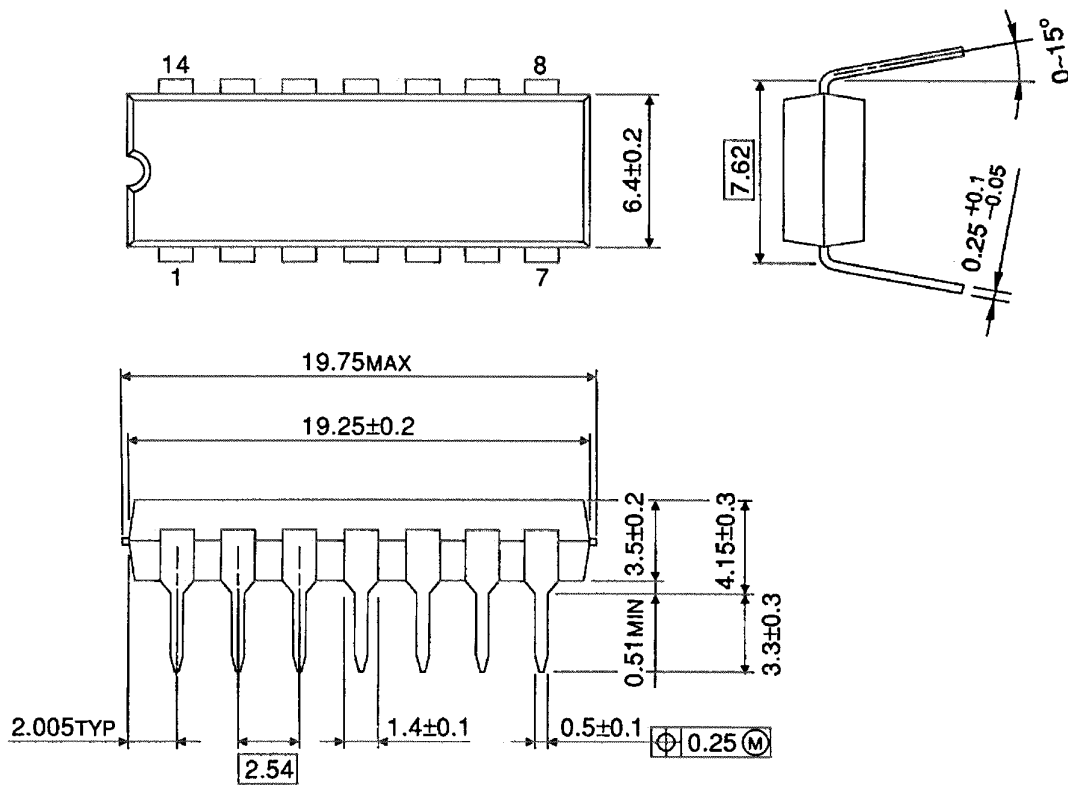
Average operating current can be obtained by the equation:

$$I_{\text{CC}} (\text{opr}) = C_{\text{PD}} \cdot V_{\text{CC}} \cdot f_{\text{IN}} + I_{\text{CC}}/2 \text{ (per F/F)}$$

Package Dimensions

DIP14-P-300-2.54

Unit : mm

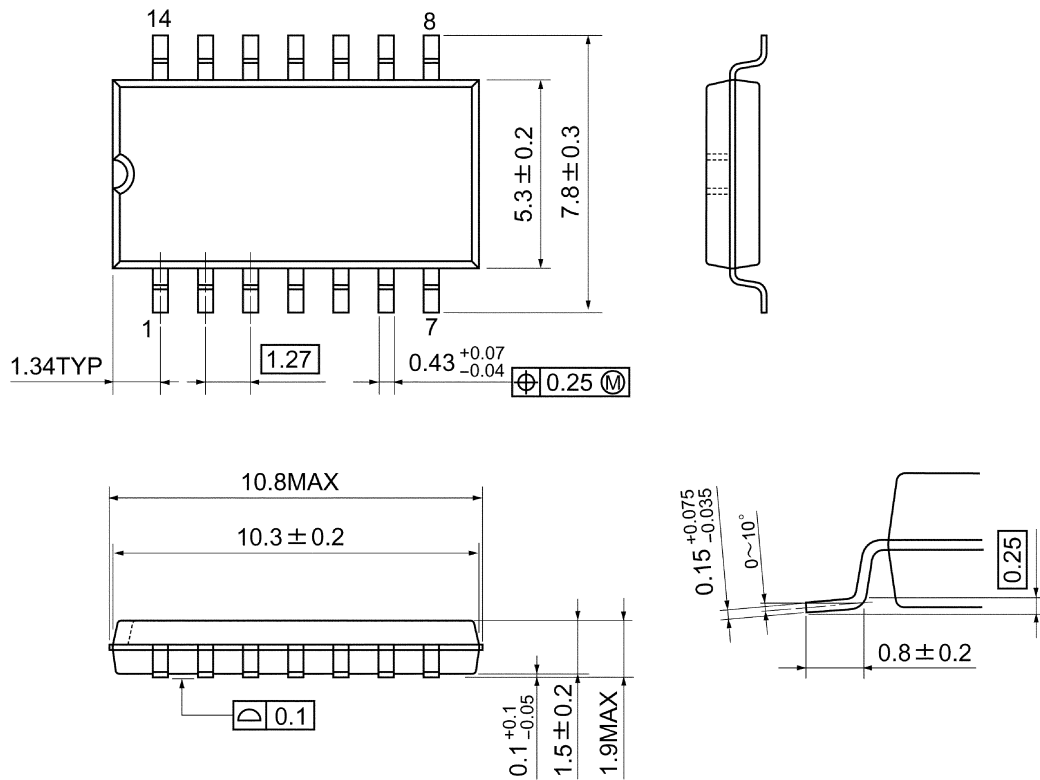


Weight: 0.96 g (typ.)

Package Dimensions

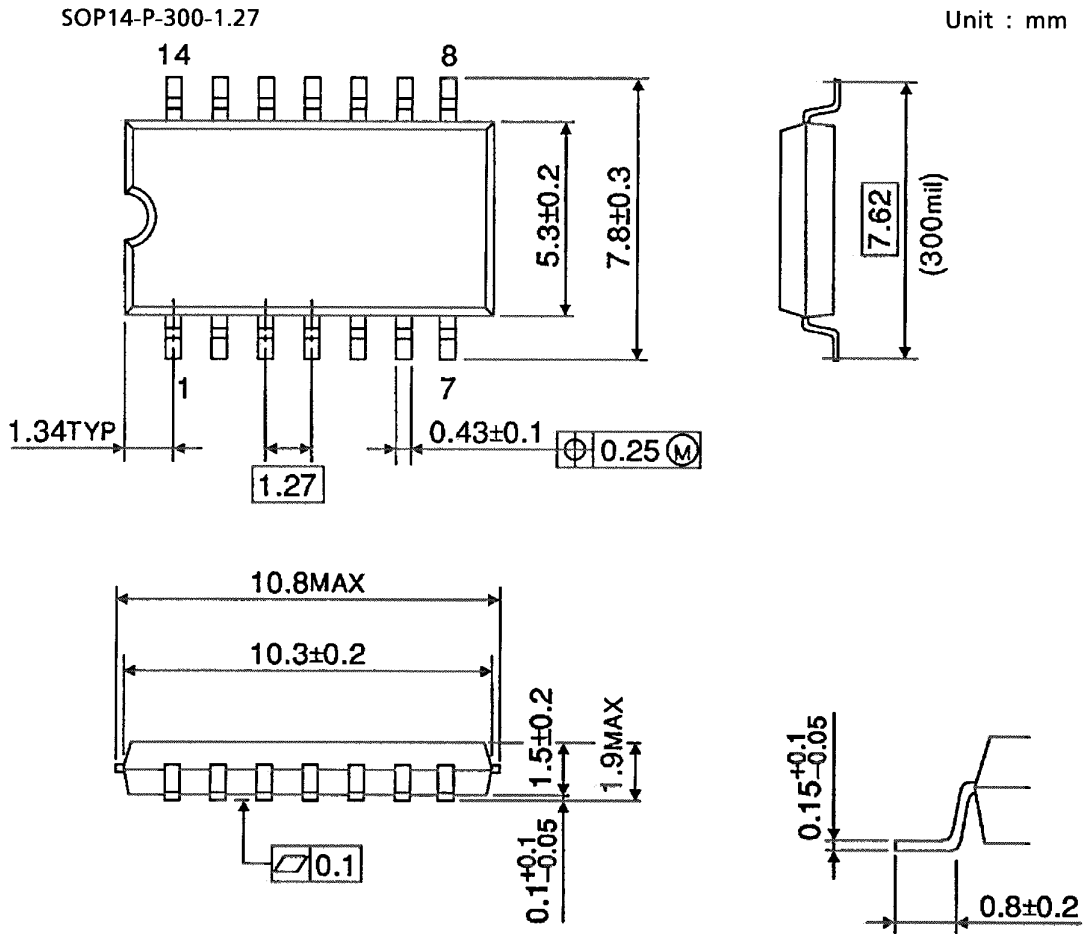
SOP14-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

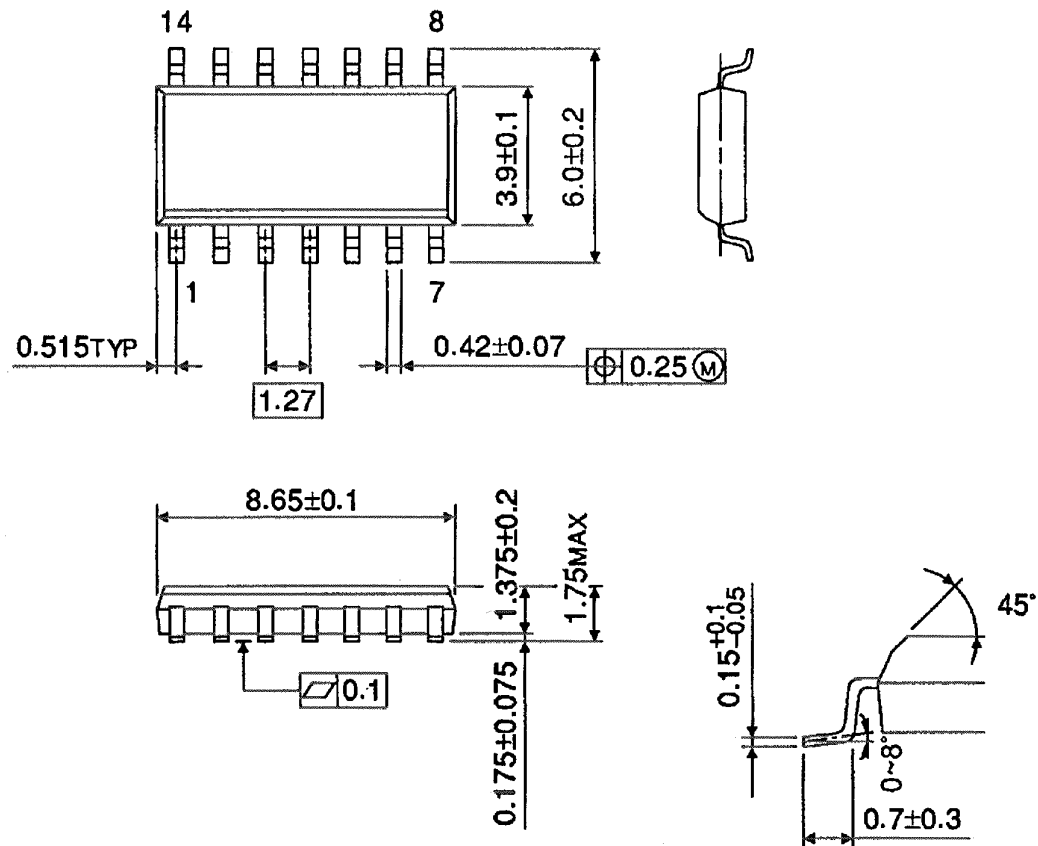


Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Note: Lead (Pb)-Free Packages

DIP14-P-300-2.54 SOP14-P-300-1.27A SOL14-P-150-1.27

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