

# MM74HC574

## 3-State Octal D-Type Edge-Triggered Flip-Flop

The MM74HC574 high speed octal D-type flip-flops utilize advanced silicon-gate P-well CMOS technology. They possess the high noise immunity and low power consumption of standard CMOS integrated circuits, as well as the ability to drive 15 LS-TTL loads. Due to the large output drive capability and the 3-STATE feature, these devices are ideally suited for interfacing with bus lines in a bus organized system.

These devices are positive edge triggered flip-flops. Data at the D inputs, meeting the set-up and hold time requirements, are transferred to the Q outputs on positive going transitions of the CLOCK (CK) input. When a high logic level is applied to the OUTPUT CONTROL (OC) input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements.

The 74HC logic family is speed, function, and pinout compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

### Features

- Typical Propagation Delay: 18 ns
- Wide Operating Voltage Range: 2 V – 6 V
- Low Input Current: 1  $\mu$ A Maximum
- Low Quiescent Current: 80  $\mu$ A Maximum
- Compatible with Bus-oriented Systems
- Output Drive Capability: 15 LS-TTL Loads

### MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	-0.5 to +7.0 V	V
DC Input Voltage	$V_{IN}$	-1.5 to $V_{CC}$ + 1.5 V	V
DC Output Voltage	$V_{OUT}$	-0.5 to $V_{CC}$ + 0.5 V	V
Clamp Diode Current	$I_{IK}, I_{OK}$	$\pm 20$	mA
DC Output Current, per pin	$I_{OUT}$	$\pm 35$	mA
DC $V_{CC}$ or GND Current, per pin	$I_{CC}$	$\pm 70$	mA
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}$ C
Power Dissipation (Note 2) S.O. Package only	$P_D$	600 500	mW
Lead Temperature (Soldering 10 s)	$T_L$	260	$^{\circ}$ C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Unless otherwise specified all voltages are referenced to ground.
2. Power Dissipation temperature derating — plastic "N" package: - 12 mW/ $^{\circ}$ C from 65 $^{\circ}$ C to 85 $^{\circ}$ C.



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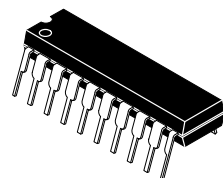
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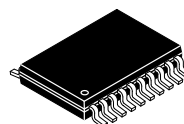
SOP20  
SJ SUFFIX  
CASE 565BG



TSSOP20  
MTC SUFFIX  
CASE 948AQ



PDIP20  
N SUFFIX  
CASE 646AC



SOIC20  
WM SUFFIX  
CASE 751BJ

### ORDERING INFORMATION

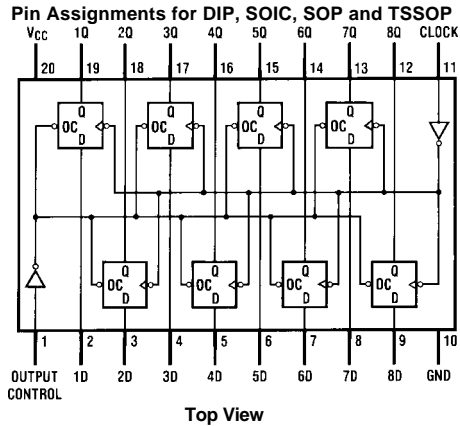
See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# MM74HC574

## ORDERING CODE

Order Number	Package Number	Package Description
MM74HC574WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
MM74HC574SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3 mm Wide
MM74HC574MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4 mm Wide
MM74HC574N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

## Connection Diagram



## Truth Table

Output Control	Clock	Data	Output
L	↑	H	H
L	↑	L	L
L	L	X	Q <sub>0</sub>
H	X	X	Z

H = HIGH Level

L = LOW Level

X = Don't Care

↑ = Transition from Low-to-HIGH

Z = High Impedance State

Q<sub>0</sub> = The level of the output before steady state input conditions were established

## RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristic	Min	Typ	Max	Units
V <sub>CC</sub>	Supply Voltage	2		6	V
V <sub>IN</sub> , V <sub>OUT</sub>	DC Input or Output Voltage	0		V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature Range	-55		+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise or Fall Times			1000 500 400	ns
				V <sub>CC</sub> = 2.0 V V <sub>CC</sub> = 4.5 V V <sub>CC</sub> = 6.0 V	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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## DC ELECTRICAL CHARACTERISTICS (Note 3)

Symbol	Parameter	Conditions	V <sub>CC</sub>	T <sub>A</sub> = 25°C		T <sub>A</sub> = -40 to 85°C	T <sub>A</sub> = -55 to 125°C	Units
				Typ	Guaranteed Limits			
V <sub>IH</sub>	Minimum HIGH Level Input Voltage		2.0 V		1.5	1.5	1.5	V
			4.5 V		3.15	3.15	3.15	
			6.0 V		4.2	4.2	4.2	
V <sub>IL</sub>	Maximum LOW Level Input Voltage		2.0 V		0.5	0.5	0.5	V
			4.5 V		1.35	1.35	1.35	
			6.0 V		1.8	1.8	1.8	
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 20 μA	2.0 V	2.0	1.9	1.9	1.9	V
			4.5 V	4.5	4.4	4.4	4.4	
		6.0 V	6.0	5.9	5.9	5.9		
		4.5 V	4.2	3.98	3.84	3.7	V	
6.0 V	5.7	5.48	5.34	5.2	5.2			
V <sub>OL</sub>	Maximum LOW Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 20 μA	2.0 V	0	0.1	0.1	0.1	V
			4.5 V	0	0.1	0.1	0.1	
		6.0 V	0	0.1	0.1	0.1		
		4.5 V	0.2	0.26	0.33	0.4	V	
6.0 V	0.2	0.26	0.33	0.4	0.4			
I <sub>IN</sub>	Maximum Input Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0 V		±0.1	±1.0	±1.0	μA
I <sub>OZ</sub>	Maximum 3-STATE Output Leakage Current	V <sub>OUT</sub> = V <sub>CC</sub> or GND OC = V <sub>IH</sub>	6.0 V		±0.5	±5.0	±10	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0 μA	6.0 V		8.0	80	160	μA
ΔI <sub>CC</sub>	Quiescent Supply Current per Input Pin	V <sub>CC</sub> = 5.5 V V <sub>IN</sub> = 2.4 V or 0.4 V (Note 3)	OE	1.0	1.5	1.8	2.0	mA
			CLK	0.6	0.8	1.0	1.1	
			DATA	0.4	0.5	0.6	0.7	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. For a power supply of 5 V ±10% the worst-case output voltages (V<sub>OH</sub>, and V<sub>OL</sub>) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst-case V<sub>IH</sub> and V<sub>IL</sub> occur at V<sub>CC</sub> = 5.5 V and 4.5 V respectively. (The V<sub>IH</sub> value at 5.5 V is 3.85 V.) The worst-case leakage current (I<sub>IN</sub>, I<sub>CC</sub>, and I<sub>OZ</sub>) occur for CMOS at the higher voltage and so the 6.0 V values should be used.

## AC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, t<sub>r</sub> = t<sub>f</sub> = 6 ns)

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
f <sub>MAX</sub>	Maximum Operating Frequency		60	33	MHz
t <sub>PHL</sub> , t <sub>PLH</sub>	Maximum Propagation Delay, Clock to Q	C <sub>L</sub> = 45 pF	17	27	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	Maximum Output Enable Time	R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 45 pF	19	28	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Maximum Output Disable Time	R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 5 pF	14	25	ns
t <sub>S</sub>	Minimum Setup Time, Data to Clock		10	12	ns
t <sub>H</sub>	Minimum Hold Time, Clock to Data		-3	5	ns
t <sub>W</sub>	Minimum Pulse Clock Width		8	15	ns

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## AC ELECTRICAL CHARACTERISTICS ( $V_{CC} = 2.0 - 6.0$ V, $C_L = 50$ pF, $t_r = t_f = 6$ ns unless otherwise specified)

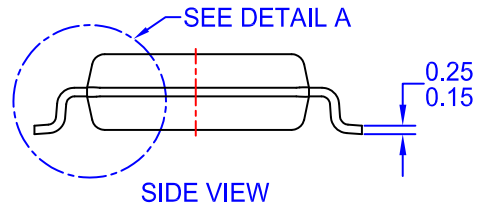
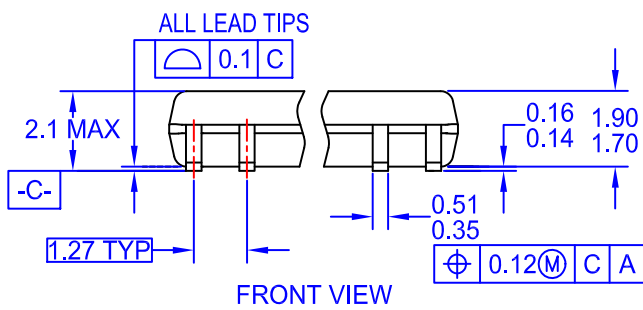
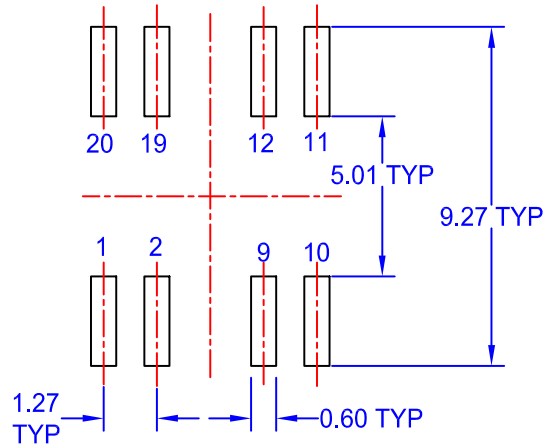
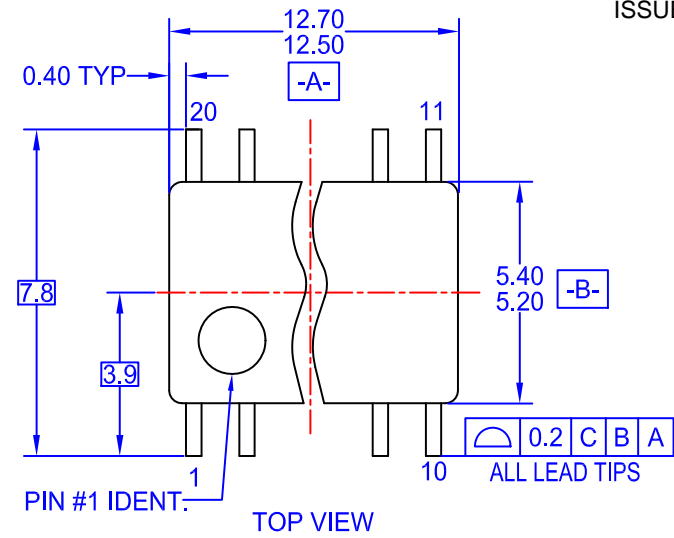
Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ\text{C}$		$T_A = -40$ to $85^\circ\text{C}$	$T_A = -55$ to $125^\circ\text{C}$	Units
				Typ	Guaranteed Limits			
$f_{MAX}$	Maximum Operating Frequency	$C_L = 50$ pF	2.0 V 4.5 V 6.0 V		33 30 35	28 24 28	23 20 23	MHz
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Clock to Q	$C_L = 50$ pF $C_L = 150$ pF	2.0 V	18	30	38	45	ns
			2.0 V	51	155	194	233	
			4.5 V 4.5 V	13 19	23 31	29 47	35 47	
$t_{PZH}, t_{PLZ}$	Maximum Output Enable Time	$R_L = 1$ k $\Omega$ $C_L = 50$ pF $C_L = 150$ pF	2.0 V	22	30	38	45	ns
			2.0 V	59	180	225	270	
			4.5 V 4.5 V	14 20	28 36	35 45	42 54	
$t_{PHZ}, t_{PLZ}$	Maximum Output Disable Time	$R_L = 1$ k $\Omega$ $C_L = 50$ pF	2.0 V	15	30	38	45	ns
			4.5 V	12	25	31	38	
			6.0 V	10	21	27	32	
$t_S$	Minimum Setup Time Data to Clock		2.0 V 4.5 V 6.0 V	6	12 20 17	15 25 21	18 30 25	ns
$t_H$	Minimum Hold Time Clock to Data		2.0 V 4.5 V 6.0 V	-1	5 0 0	6 0 0	8 0 0	
$t_{THL}, t_{TLH}$	Maximum Output Rise and Fall Time	$C_L = 50$ pF	2.0 V 4.5 V 6.0 V	6 7 6	12 12 10	15 15 13	18 18 15	
$t_W$	Minimum Clock Pulse Width		2.0 V 4.5 V 6.0 V	30 9 8	15 16 14	20 20 18	24 24 20	ns
$t_r, t_f$	Maximum Clock Input Rise and Fall Time		2.0 V 4.5 V 6.0 V		1000 500 400	1000 500 400	1000 500 400	
$C_{PD}$		OC = $V_{CC}$ OC = GND		5 58				
$C_{IN}$	Maximum Input Capacitance			5	10	10	10	pF
$C_{OUT}$	Maximum Output Capacitance			15	20	20	20	pF

4.  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

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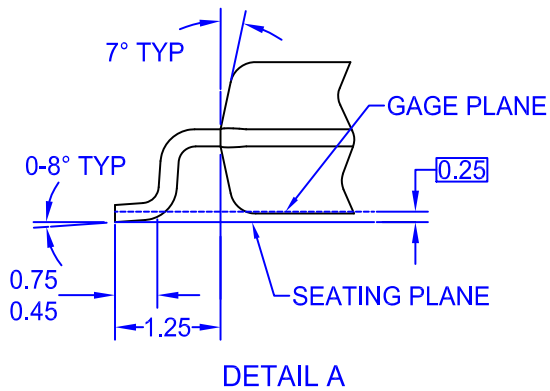
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SOP20  
CASE 565BG  
ISSUE O



NOTES:

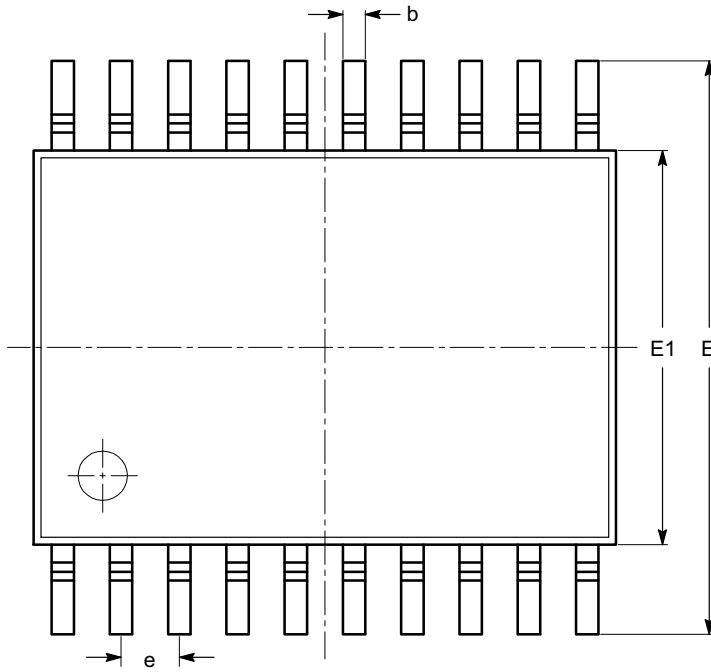
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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.



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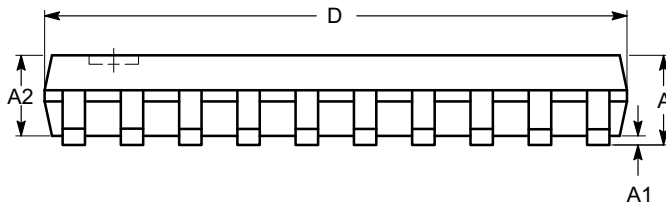
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TSSOP20, 4.4x6.5  
CASE 948AQ-01  
ISSUE A

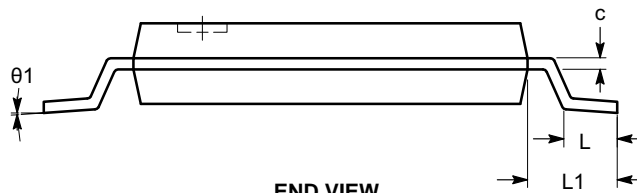


TOP VIEW

SYMBOL	MIN	NOM	MAX
A			1.20
A1	0.05		0.15
A2	0.80		1.05
b	0.19		0.30
c	0.09		0.20
D	6.40	6.50	6.60
E	6.30	6.40	6.50
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
$\theta$	0°		8°



SIDE VIEW



END VIEW

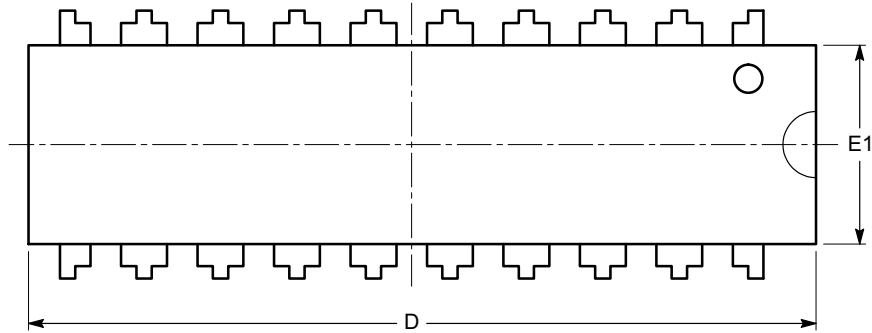
**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.

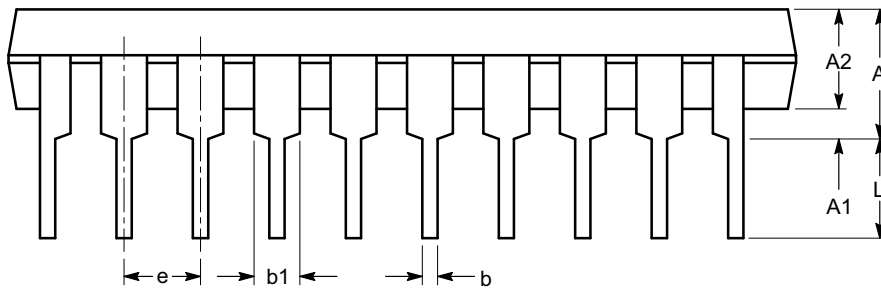
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## PACKAGE DIMENSIONS

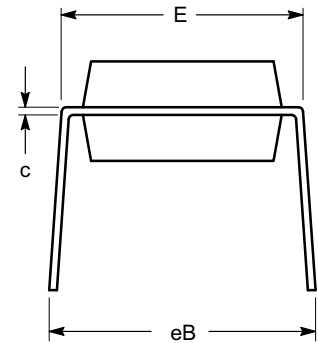
PDIP-20, 300 mils  
CASE 646AC-01  
ISSUE A



TOP VIEW



SIDE VIEW



END VIEW

SYMBOL	MIN	NOM	MAX
A	3.56		5.33
A1	0.38		
A2	2.92	3.30	4.95
b	0.36	0.45	0.55
b1	1.15	1.52	1.77
c	0.21	0.26	0.35
D	24.89	26.16	26.92
E	7.62	7.87	8.25
E1	6.10	6.35	7.11
e	2.54 BSC		
eB	7.88		10.92
L	2.99	3.30	3.81

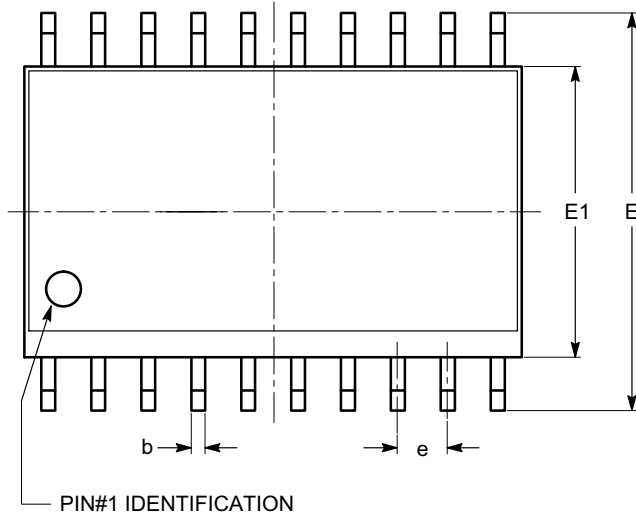
**Notes:**

- (1) All dimensions are in millimeters.
- (2) Complies with JEDEC MS-001.

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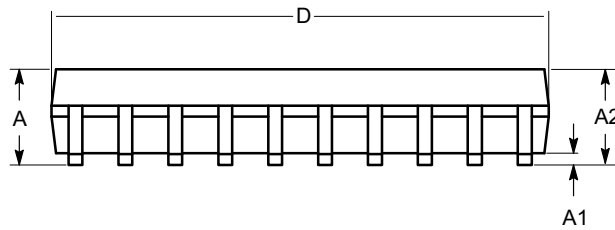
## PACKAGE DIMENSIONS

SOIC-20, 300 mils  
CASE 751BJ-01  
ISSUE O

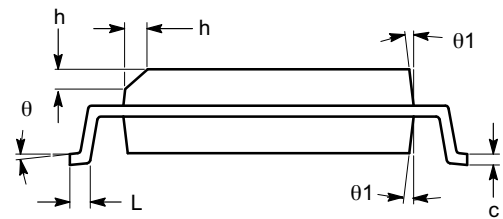


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	2.36	2.49	2.64
A1	0.10		0.30
A2	2.05		2.55
b	0.31	0.41	0.51
c	0.20	0.27	0.33
D	12.60	12.80	13.00
E	10.01	10.30	10.64
E1	7.40	7.50	7.60
e	1.27 BSC		
h	0.25		0.75
L	0.40	0.81	1.27
$\theta$	0°		8°
$\theta 1$	5°		15°



SIDE VIEW



END VIEW

### Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MS-013.

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