High Speed CMOS Bus Interface 8-, 9-, and 10-Bit Latches

QS54/74FCT841T
QS54/74FCT843T
QS54/74FCT845T*

QS54/74FCT2841T
QS54/74FCT2843T*
QS54/74FCT2845T*

FEATURES/BENEFITS

- Pin and function compatible to the Am29841 /29843/29845 74FCT 841/843/845 and 74FCT841T/843T/845T
- CMOS power levels: <7.5 mW static
- Available in DIP, SOIC, QSOP, ZIP
- Undershoot Clamp diodes on all inputs
- TTL-compatible input and output levels
- Ground bounce controlled outputs
- Reduced output swing of 0-3.5V
- Military product compliant to MIL-STD-883

FCT-T 841T, 843T, 845T

- JEDEC-FCT spec compatible
- Fastest CMOS Logic family Available
- A, B, and C speed grades with 5.5 ns t_{PD} for C
- I_{OL} = 48 mA Com, 32 mA Mil

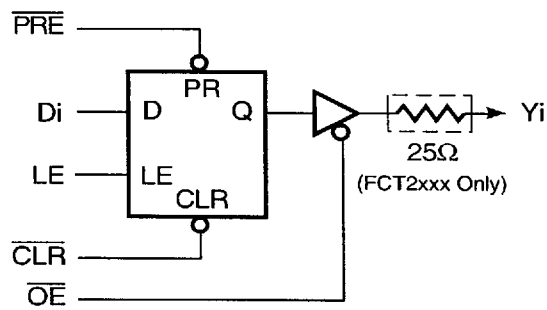
FCT-T 2841T, 2843T, 2845T

- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- A, B, and C speed grades with 5.5 ns t_{PD} for C
- I_{OL} = 12 mA Com

DESCRIPTION

The QSFCT841T, 843T, and 845T are 10, 9, and 8-bit high-speed CMOS TTL-compatible buffered latches with three-state outputs that are ideal for driving high capacitance loads such as memory and address buses. The devices come in A, B, and C speed grades with 5.5 ns (Max.) t_{PLH}/t_{PLH} for the C grade. The 2841/3/5 devices are 25Ω resistor output versions useful for driving transmission lines and reducing system noise. The 284x eliminate the need for external series resistor in high speed systems and can replace the 84x series to reduce noise in an existing design. All inputs have clamp diodes for undershoot noise suppression. All output have ground bounce suppression see QSI Application Note AN-001), and outputs will not load an active bus when Vcc is removed from the device.

FUNCTIONAL BLOCK DIAGRAM



*Note: QS54/74FCT845T, 2843T, 2845T are not recommended for use in new designs

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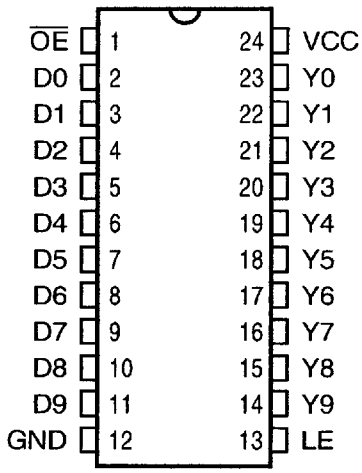
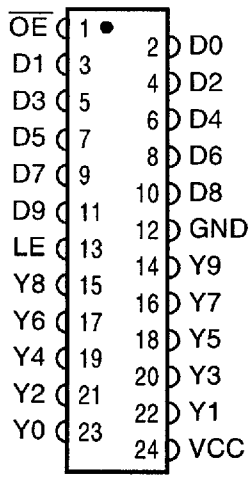
FCT841 PIN CONFIGURATIONS (All Pins Top View)

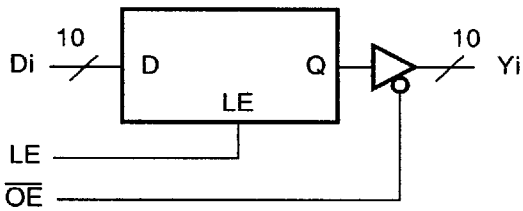
PDIP, SOIC, QSOP



ZIP



FCT841 LOGIC SYMBOL



PIN DESCRIPTION

Name	I/O	Description
Di	I	Data Inputs
Yi	O	Data Outputs - Three State
LE	I	Latch Enable
$\overline{OE}$	I	Output Enable

FUNCTION TABLES

QSFCT841, 2841

Inputs			Internal	Outputs	
$\overline{OE}$	LE	Di	Qi	Yi	Function
H	X	X	X	Z	Hi-Z
L	X	X	H	H	Output Enabled
L	X	X	L	L	Output Enabled
X	H	H	H	X	Transparent
X	H	L	L	X	Transparent
X	L	X	NC	X	Latched

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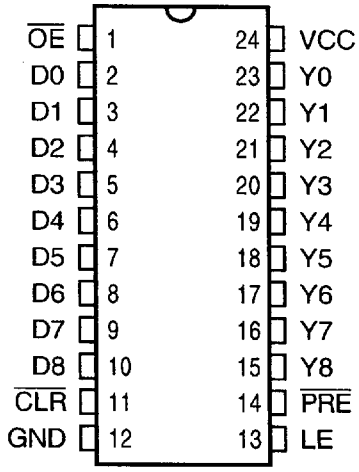
FCT843 PIN CONFIGURATIONS (All Pins Top View)

PDIP, SOIC, QSOP



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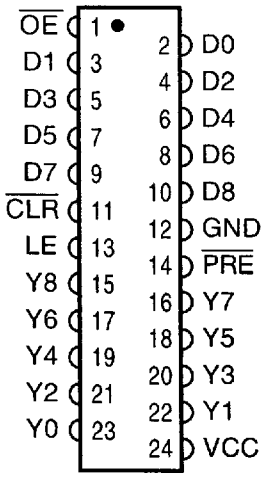
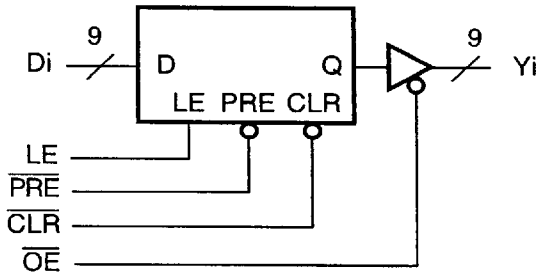


FCT843 LOGIC SYMBOL



PIN DESCRIPTION

Name	I/O	Description
Di	I	Data Inputs
Yi	O	Data Outputs - Three State
$\overline{OE}$	I	Output Enable
LE	I	Latch Enable
$\overline{PRE}$	I	Preset
$\overline{CLR}$	I	Asynchronous Reset

FUNCTION TABLE
QSFCT843, 2843, 845, 2845

Inputs					Internal	Outputs	
$\overline{CLR}$	$\overline{PRE}$	$\overline{OE}$	LE	Di	Qi	Yi	Function
H	H	H	X	X	X	Z	Hi-Z
X	X	L	X	X	H	H	Output Enabled
X	X	L	X	X	L	L	Output Enabled
H	H	L	H	H	H	H	Transparent
H	H	L	H	L	L	L	Transparent
H	H	L	L	X	NC	NC	Latched
H	L	L	X	X	H	H	Preset
L	H	L	L	X	L	L	Clear
L	L	L	L	X	H	H	Preset

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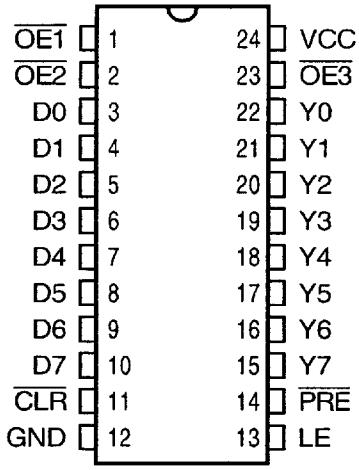
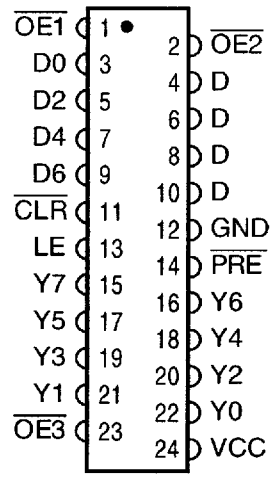
FCT845 PIN CONFIGURATIONS (All Pins Top View)

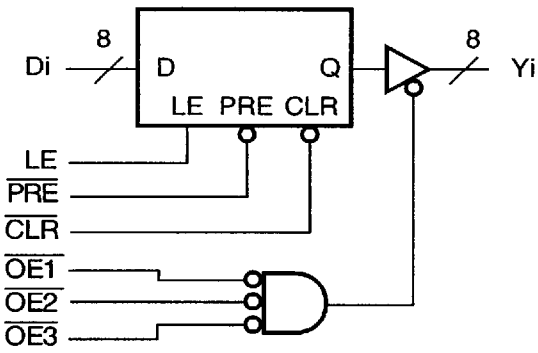
PDIP, SOIC, QSOP



ZIP



FCT845 LOGIC SYMBOL



PIN DESCRIPTION

Name	I/O	Description
Di	I	Data Inputs
Yi	O	Data Outputs - Three State
$\overline{OEi}$	I	Output Enable
LE	I	Latch Enable
$\overline{PRE}$	I	Preset
$\overline{CLR}$	I	Asynchronous Reset

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ABSOLUTE MAXIMUM RATINGS

Supply Voltage to Ground	–0.5V to +7.0V
DC Output Voltage V_{OUT}	–0.5V to +7.0V
DC Input Voltage V_{IN}	–0.5V to +7.0V
AC Input Voltage (for a pulse width ≤ 20 ns)	–3.0V
DC Input Diode Current with $V_{IN} < 0$	–20 mA
DC Output Diode Current with $V_{OUT} < 0$	–50 mA
DC Output Current Max. Sink Current/Pin	120 mA
Maximum Power Dissipation	0.5 watts
T_{STG} Storage Temperature	–65° to +150°C

Note: Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to QSI devices that result in functional or reliability type failures.

CAPACITANCE

T_A = 25°C, f = 1 MHz, V_{IN} = 0V, V_{OUT} = 0V

Pins	SOIC	QSOP	PDIP	ZIP	Unit
1-11, 13, 14, 23	4	4	5	7	pF
15-22	6	6	7	9	pF

Note: Capacitance is characterized but not tested.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]	Min	Max	Unit
Icc	Quiescent Power Supply Current	Vcc = Max., freq = 0 0V ≤ V_{IN} ≤ 0.2V or Vcc-0.2V ≤ V_{IN} ≤ Vcc	—	1.5	mA
ΔIcc	Supply Current per Input @ TTL HIGH	Vcc = Max., V_{IN} = 3.4V, freq = 0[2]	—	2.0	mA
Q_{CCD}	Supply Current per Input per MHz	Vcc = Max., Outputs open and enabled One bit toggling @ 50% duty cycle Other inputs at GND or Vcc[3,4]	—	0.25	mA/ MHz

Notes:

1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. Per TTL driven input (V_{IN} = 3.4V).
3. For flip-flops, Q_{CCD} is measured by switching one of the data input pins so that the output changes every clock cycle. This is a measurement of device power consumption only and does not include power to drive load capacitance or tester capacitance. This parameter is guaranteed by design but not tested.
4. Ic can be computed using the above parameters as explained in the Technical Overview section.

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DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Commercial T_A = 0°C to 70°C, V_{CC} = 5.0V ± 5% Military T_A = −55°C to 125°C, V_{CC} = 5.0V ± 10%

Symbol	Parameter	Test Conditions	Min	Typ(1)	Max	Unit
V_{IH}	Input HIGH Voltage	Logic HIGH for All Inputs	2.0	—	—	V
V_{IL}	Input LOW Voltage	Logic LOW for All Inputs	—	—	0.8	V
ΔV_T	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs	—	0.2	—	V
$\lvert I_{IH} \rvert$ $\lvert I_{IL} \rvert$	Input Current Input HIGH or LOW	Vcc = Max., $0 \le V_{IN} < V_{CC}$	—	—	5	µA
$\lvert I_{OZ} \rvert$	Off-State Output Current (Hi-Z)	Vcc = Max., $0 \le V_{IN} \le V_{CC}$	—	—	5	µA
I_{OS}	Short Circuit Current (FCTXXX)	Vcc = Max., V_{OUT} = GND(2,3)	−60	—	—	mA
I_{OR}	Current Drive (FCT2XXX – 25Ω)	Vcc = Min., V_{OUT} = 2.0V(3)	50	—	—	mA
V_{IC}	Input Clamp Voltage	Vcc = Min., I_{IN} = −18 mA, T_A = 25°C(3)	—	−0.7	−1.2	V
V_{OH}	Output HIGH Voltage	Vcc = Min. I_{OH} = −12 mA (MIL) I_{OH} = −15 mA (COM)	2.4 2.4	— —	— —	V
V_{OL}	Output LOW Voltage (FCTXXX)	Vcc = Min. I_{OL} = 32 mA (MIL) I_{OL} = 48 mA (COM)	— —	— —	0.50 0.50	V
V_{OL}	Output LOW Voltage (FCT2XXX – 25Ω)	Vcc = Min. I_{OL} = 12 mA (MIL) I_{OL} = 12 mA (COM)	— —	— —	0.50 0.50	V
R_{OUT}	Output Resistance (FCT2XXX – 25Ω)	Vcc = Min. I_{OL} = 12 mA (MIL) I_{OL} = 12 mA (COM)	— 20	25 28	— 40	Ω

Notes:
1. Typical values indicate Vcc = 5.0V and T_A = 25°C.
2. Not more than one output should be shorted and the duration is ≤1 second.
3. These parameters are guaranteed by design but not tested.

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SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Commercial T_A = 0°C to 70°C, Vcc = 5.0V ± 5% Military T_A = –55°C to 125°C, Vcc = 5.0V ± 10%
C_{LOAD} = 50 pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description		841A 843A 845A 2841A 2843A 2845A Min	841A 843A 845A 2841A 2843A 2845A Max	841B 843B 845B 2841B 2843B 2845B Min	841B 843B 845B 2841B 2843B 2845B Max	841C 843C 845C 2841C 2843C 2845C Min	841C 843C 845C 2841C 2843C 2845C Max	Unit
t_{PHL} t_{PLH}	Data to Y Delay $\overline{OE}$ = LOW, 841/3/5	COM MIL		9.0 10		6.5 7.5		5.5 6.3	ns
t_{PHL} t_{PLH}	Data to Y Delay(2,3) $\overline{OE}$ = LOW, 841/3/5	COM MIL		13 15		13 15		13 15	ns
t_{PHL} t_{PLH}	Data to Y Delay $\overline{OE}$ = LOW, 2841/3/5	COM MIL		9.5 11		6.5 7.5		5.5 6.3	ns
t_{PHL} t_{PLH}	Data to Y Delay(2,3) $\overline{OE}$ = LOW, 2841/3/5	COM MIL		20 20		13 15		13 15	ns
t_S	Data to LE Setup	COM MIL	2.5 2.5		2.5 2.5		2.5 2.5		ns
t_H	Data to LE Hold Time	COM MIL	2.5 3.0		2.5 2.5		2.5 2.5		ns
t_{LEY}	LE to Y Delay $\overline{OE}$ = LOW, 841/3/5	COM MIL		12 13		8.0 10.5		6.4 6.8	ns
t_{LEY}	LE to Y Delay(2,3) $\overline{OE}$ = LOW, 841/3/5	COM MIL		16 20		15.5 18		15 16	ns
t_{LEY}	LE to Y Delay $\overline{OE}$ = LOW, 2841/3/5	COM MIL		12 13		8 10.5		8 10.5	ns
t_{LEY}	LE to Y Delay(2,3) $\overline{OE}$ = LOW, 2841/3/5	COM MIL		16 20		15.5 18		15 16	ns

Notes:
1. See Test Circuit and Waveforms.
2. This parameter is guaranteed by design but not tested.
3. C_{LOAD} = 300 pF.

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SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Commercial T_A = 0°C to 70°C, Vcc = 5.0V ± 5% Military T_A = –55°C to 125°C, Vcc = 5.0V ± 10%
C_{LOAD} = 50 pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description[1]		841A 843A 845A 2841A 2843A 2845A Min	841A 843A 845A 2841A 2843A 2845A Max	841B 843B 845B 2841B 2843B 2845B Min	841B 843B 845B 2841B 2843B 2845B Max	841C 843C 845C 2841C 2843C 2845C Min	841C 843C 845C 2841C 2843C 2845C Max	Unit
t_{SLEC}	$\overline{CLR}$ to LE Setup	COM	3		2.5		2.5		ns
		MIL	3		2.5		2.5		
t_{CLR} t_{PRE}	$\overline{CLR}$, $\overline{PRE}$ to Y Delay, 843/5	COM		12		8		7	ns
		MIL		14		10		9	
t_{CLR} t_{PRE}	$\overline{CLR}$, $\overline{PRE}$ to Y Delay, 2843/5	COM		12		8		7	ns
		MIL		14		10		9	
t_{CLRR} t_{PRER}	$\overline{CLR}$, $\overline{PRE}$[2] Recovery Time	COM		14		8		8	ns
		MIL		17		10		9	
t_{LEH}	LE Pulse Width HIGH[2]	COM	6		4		4		ns
		MIL	6		4		4		
t_{PREL}	$\overline{PRE}$, $\overline{CLR}$[2] Pulse Width LOW	COM	8		4		4		ns
		MIL	9		4		4		
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$ to Yi, 841	COM		11.5		8		6.5	ns
		MIL		13		8.5		8.5	
t_{PZH} t_{PZL}	Output Enable Time[2,3] $\overline{OE}$ to Yi, 841	COM		23		14		12	ns
		MIL		25		15		13	
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$ to Yi, 2841	COM		11.5		8		6.5	ns
		MIL		13		8.5		8.5	
t_{PZH} t_{PZL}	Output Enable Time[2,3] $\overline{OE}$ to Yi, 2841	COM		23		14		12	ns
		MIL		25		15		13	
t_{PHZ} t_{PLZ}	Output Disable Time[2,4] $\overline{OE}$ to Yi	COM		7		6		5.7	ns
		MIL		9		6.5		6	
t_{PHZ} t_{PLZ}	Output Disable Time[2] $\overline{OE}$ to Yi	COM		8		7		6	ns
		MIL		10		7.5		6.3	

Notes:
1. See Test Circuit and Waveforms.
2. This parameter is guaranteed by design but not tested.
3. C_{LOAD} = 300 pF.
4. C_{LOAD} = 5 pF.

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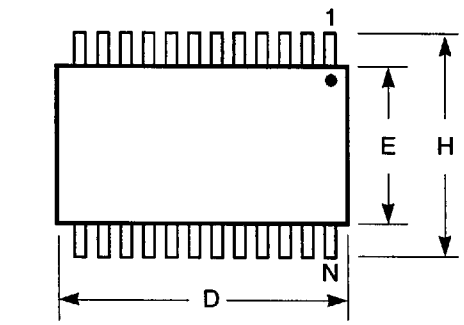
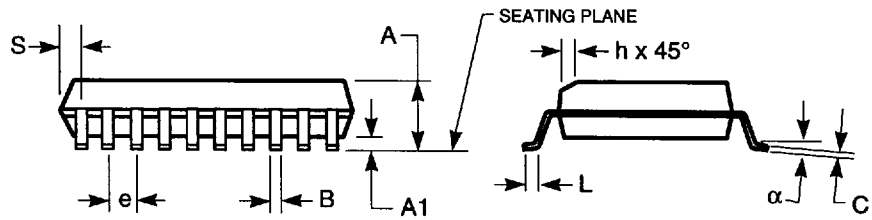
150-MIL QSOP - Package Code Q

Quarter-Size Outline Package
Plastic Small Outline Gull-Wing

Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006 in. per side.
5. Lead coplanarity is 0.004 in. maximum.



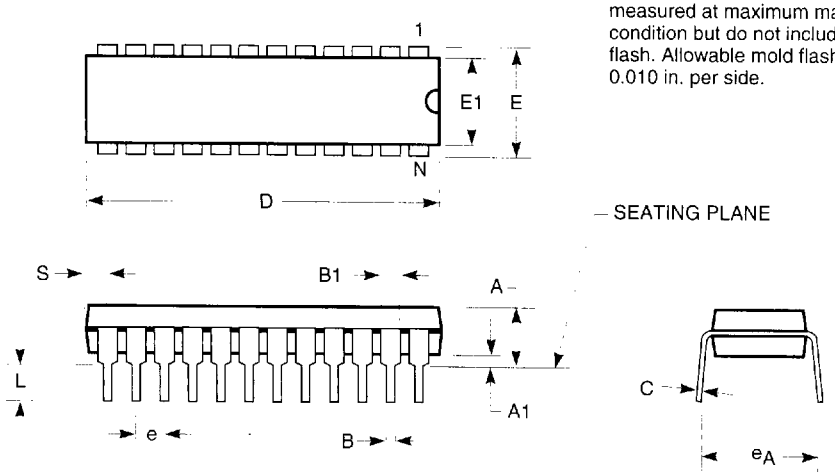


JEDEC#	MO-137AB			MO-137AD			MO-137AE			MO-137AF		
DWG#	PSS-16A			PSS-20A			PSS-24A			PSS-28A		
Symbol	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A	0.060	0.064	0.068	0.060	0.064	0.068	0.060	0.064	0.068	0.060	0.064	0.068
A1	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008	0.004	0.006	0.008
B	0.009	0.010	0.012	0.009	0.010	0.012	0.009	0.010	0.012	0.009	0.010	0.012
C	0.007	0.008	0.010	0.007	0.008	0.010	0.007	0.008	0.010	0.007	0.008	0.010
D	0.189	0.193	0.197	0.337	0.341	0.344	0.337	0.341	0.344	0.386	0.390	0.394
E	0.150	0.154	0.157	0.150	0.154	0.157	0.150	0.154	0.157	0.150	0.154	0.157
e	0.025 BSC			0.025 BSC			0.025 BSC			0.025 BSC		
H	0.230	0.236	0.244	0.230	0.236	0.244	0.230	0.236	0.244	0.230	0.236	0.244
h	0.010	0.013	0.016	0.010	0.013	0.016	0.010	0.013	0.016	0.010	0.013	0.016
L	0.016	0.025	0.035	0.016	0.025	0.035	0.016	0.025	0.035	0.016	0.025	0.035
N	16			20			24			28		
α	0°	5°	8°	0°	5°	8°	0°	5°	8°	0°	5°	8°
S	0.006	0.009	0.010	0.056	0.058	0.060	0.031	0.033	0.035	0.031	0.033	0.035

300-MIL PDIP - Package Code P

Plastic Dual In-line Package

Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E1 are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.010 in. per side.

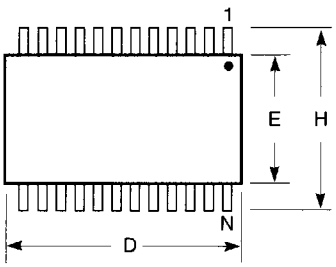


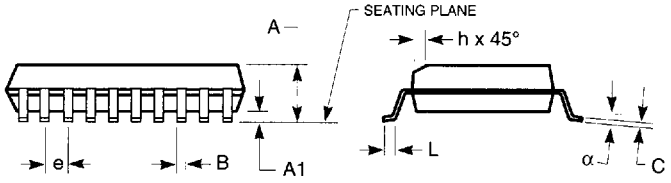
JEDEC#	MS-001AC		MS001AA		MS-001AE		N/A		MS-001AF		MO-095AH	
DWG#	PD14A		PD16A		PD20A		PT22B		PT24A		PT28A	
Symbol	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
A	0.130	0.170	0.130	0.170	0.130	0.170	0.130	0.170	0.130	0.170	0.130	0.180
A1	0.015	0.040	0.015	0.040	0.015	0.040	0.015	0.040	0.015	0.040	0.015	0.040
B	0.016	0.020	0.016	0.020	0.016	0.020	0.016	0.020	0.016	0.020	0.016	0.020
B1	0.045	0.070	0.045	0.070	0.045	0.070	0.045	0.070	0.045	0.070	0.045	0.060
C	0.009	0.012	0.009	0.012	0.009	0.012	0.009	0.012	0.009	0.012	0.009	0.012
D	0.745	0.765	0.745	0.765	1.020	1.040	1.020	1.040	1.150	1.260	1.345	1.385
E	0.300	0.325	0.300	0.325	0.300	0.325	0.300	0.325	0.300	0.325	0.300	0.325
E1	0.240	0.270	0.240	0.270	0.240	0.270	0.240	0.270	0.250	0.280	0.275	0.295
e	0.090	0.110	0.090	0.110	0.090	0.110	0.090	0.110	0.090	0.110	0.090	0.110
e_A	0.310	0.380	0.310	0.380	0.310	0.380	0.310	0.380	0.310	0.380	0.310	0.380
L	0.120	0.140	0.120	0.140	0.120	0.140	0.120	0.140	0.120	0.140	0.120	0.140
S	0.070	0.080	0.020	0.035	0.060	0.070	0.010	0.020	0.025	0.080	0.020	0.040
N	14		16		20		22		24		28	

300-MIL SOIC - Package Code SO

Plastic Small Outline Gull-Wing

Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006 in. per side.
5. Lead coplanarity is 0.004 in. maximum.



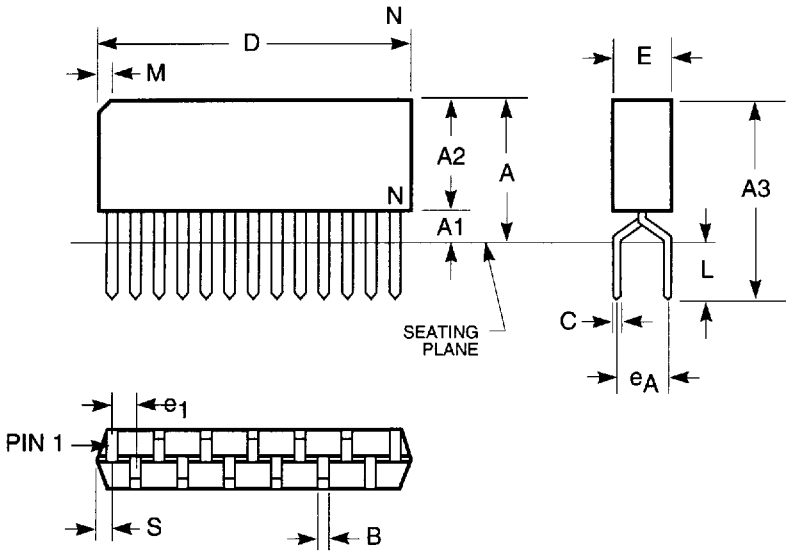


JEDEC#	MS-013AA		MS-013AC		MS-013AD		MS-013AE	
DWG#	PS16A		PS20A		PS24A		PS28A	
Symbol	Min	Max	Min	Max	Min	Max	Min	Max
A	0.096	0.104	0.096	0.104	0.096	0.104	0.096	0.104
A1	0.005	0.011	0.005	0.011	0.005	0.011	0.005	0.011
B	0.014	0.019	0.014	0.019	0.014	0.019	0.014	0.019
C	0.009	0.012	0.009	0.012	0.009	0.012	0.009	0.012
D	0.402	0.412	0.500	0.510	0.602	0.612	0.701	0.711
E	0.292	0.299	0.292	0.299	0.292	0.299	0.292	0.299
e	0.044	0.056	0.044	0.056	0.044	0.056	0.044	0.056
H	0.396	0.416	0.396	0.416	0.396	0.416	0.396	0.416
h	0.010	0.016	0.010	0.016	0.010	0.016	0.010	0.016
L	0.020	0.040	0.020	0.040	0.020	0.040	0.020	0.040
N	16		20		24		28	
α	0°	8°	0°	8°	0°	8°	0°	8°

7466803 0003423 951

300-MIL ZIP - Package Code Z

Zig-zag In-line Packages



JEDEC#	MO-072AB		MO-072AC		MO-072AD	
DWG#	PZ20A		PZ24A		PZ28A	
Symbol	Min	Max	Min	Max	Min	Max
A	0.350	0.400	0.350	0.400	0.350	0.400
A1	0.030	0.070	0.030	0.070	0.032	0.055
A2	0.280	0.340	0.320	0.350	0.335	0.345
A3	0.450	0.550	0.450	0.550	0.460	0.550
B	0.015	0.024	0.015	0.024	0.015	0.024
C	0.008	0.012	0.008	0.012	0.008	0.012
D	1.008	1.030	1.200	1.250	1.409	1.424
E	0.100	0.120	0.100	0.120	0.110	0.120
e1	0.050 BSC		0.050 BSC		0.050 BSC	
eA	0.100 BSC		0.100 BSC		0.100 BSC	
L	0.100	0.150	0.100	0.150	0.110	0.150
M	0.035	0.085	0.035	0.085	0.035	0.085
N	20		24		28	
S	0.018	0.032	0.018	0.032	0.025	0.038

Notes:
1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.010 in. per side.