National Semiconductor

January 1995

54F/74F378
Parallel D Register with Enable

General Description

The 'F378 is a 6-bit register with a buffered common Enable. This device is similar to the 'F174, but with common Enable rather than common Master Reset.

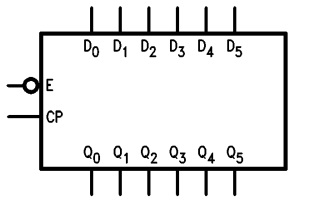
Features

- 6-bit high-speed parallel register
- Positive edge-triggered D-type inputs
- Fully buffered common clock and enable inputs
- Input clamp diodes limit high-speed termination effects
- Full TTL and CMOS compatible

Commercial	Military	Package Number	Package Description
74F378PC		N16E	16-Lead (0.300″ Wide) Molded Dual-In-Line
	54F378DM (QB)	J16A	16-Lead Ceramic Dual-In-Line
74F378SC (Note 1)		M16A	16-Lead (0.150″ Wide) Molded Small Outline, JEDEC
74F378SJ (Note 1)		M16D	16-Lead (0.300″ Wide) Molded Small Outline, EIAJ
	54F378FM (QB)	W16A	16-Lead Cerpack
	54F378LM (QB)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

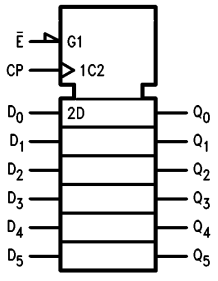
Note 1: Devices also available in 13″ reel. Use suffix = SCX and SJX.

Logic Symbols



TL/F/9526–1

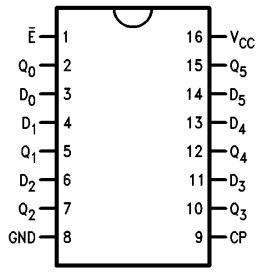
IEEE/IEC



TL/F/9526–4

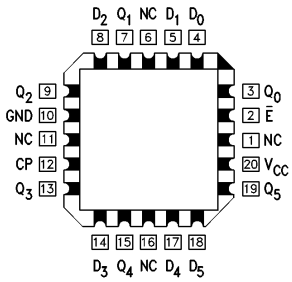
Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



TL/F/9526–2

Pin Assignment for LCC



TL/F/9526–3

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Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
$\overline{E}$	Enable Input (Active LOW)	1.0/1.0	20 μA/ −0.6 mA
D_0–D_5	Data Inputs	1.0/1.0	20 μA/ −0.6 mA
CP	Clock Pulse Input (Active Rising Edge)	1.0/1.0	20 μA/ −0.6 mA
Q_0–Q_5	Outputs	50/33.3	−1 mA/20 mA

Functional Description

The 'F378 consists of six edge-triggered D-type flip-flops with individual D inputs and Q inputs. The Clock (CP) and Enable ($\overline{E}$) inputs are common to all flip-flops.

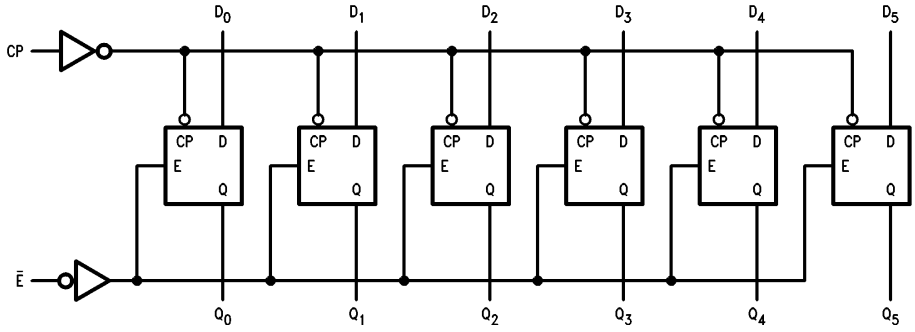
When the $\overline{E}$ input is LOW, new data is entered into the register on the LOW-to-HIGH transition of the CP input. When the $\overline{E}$ input is HIGH the register will retain the present data independent of the CP input.

Truth Table

Inputs			Output
$\overline{E}$	CP	D_n	Q_n
H	⌐‾	X	No Change
L	⌐‾	H	H
L	⌐‾	L	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
⌐‾ = LOW-to-HIGH Clock Transition

Logic Diagram



TL/F/9526–5

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	−55°C to +175°C
Plastic	−55°C to +150°C
V_{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V_{CC} = 0V)	
Standard Output	−0.5V to V_{CC}
TRI-STATE® Output	−0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated I_{OL} (mA)

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	−55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

DC Electrical Characteristics

Symbol	Parameter		54F/74F			Units	V_{CC}	Conditions
			Min	Typ	Max			
V_{IH}	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized as a LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54F 10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA
		74F 10% V_{CC}	2.5					I_{OH} = −1 mA
		74F 5% V_{CC}	2.7					I_{OH} = −1 mA
V_{OL}	Output LOW Voltage	54F 10% V_{CC}			0.5	V	Min	I_{OL} = 20 mA
		74F 10% V_{CC}			0.5			I_{OL} = 20 mA
I_{IH}	Input HIGH Current	54F			20.0	μA	Max	V_{IN} = 2.7V
		74F			5.0			
I_{BVI}	Input HIGH Current Breakdown Test	54F			100	μA	Max	V_{IN} = 7.0V
		74F			7.0			
I_{CEX}	Output HIGH Leakage Current	54F			250	μA	Max	V_{OUT} = V_{CC}
		74F			50			
V_{ID}	Input Leakage Test	74F	4.75			V	0.0	I_{ID} = 1.9 μA All Other Pins Grounded
I_{OD}	Output Leakage Circuit Current	74F			3.75	μA	0.0	V_{IOD} = 150 mV All Other Pins Grounded
I_{IL}	Input LOW Current				−0.6	mA	Max	V_{IN} = 0.5V
I_{OS}	Output Short-Circuit Current		−60		−150	mA	Max	V_{OUT} = 0V
I_{CCL}	Power Supply Current			30	45	mA	Max	V_O = LOW

AC Electrical Characteristics

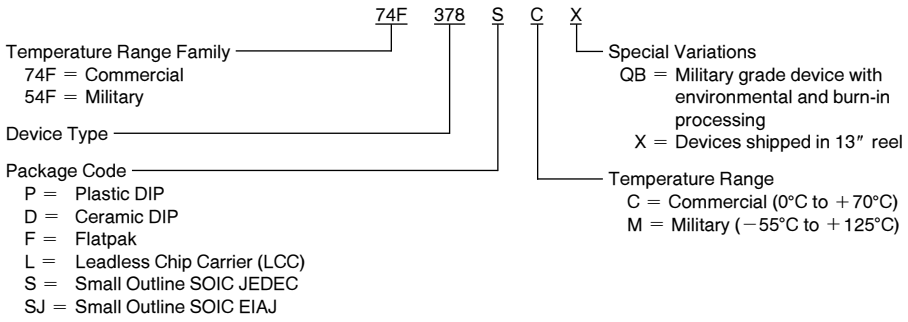
Symbol	Parameter	74F $T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF			54F T_A, V_{CC} = Mil, $C_L = 50$ pF		74F T_A, V_{CC} = Com, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	Min	Max	
f_{max}	Maximum Input Frequency	80	100		70		80		MHz
t_{PLH}	Propagation Delay	3.0	5.5	7.5	3.0	10.0	3.0	8.5	ns
t_{PHL}	CP to Q_n	3.5	6.0	8.5	3.5	10.5	3.5	9.5	

AC Operating Requirements

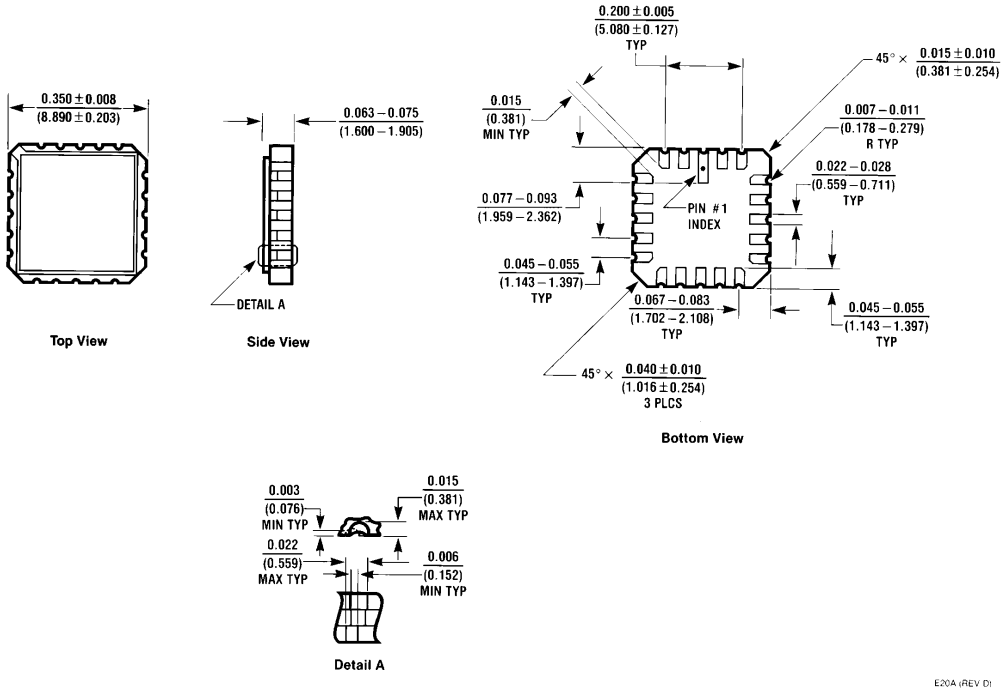
Symbol	Parameter	74F $T_A = +25°C$, $V_{CC} = +5.0V$		54F T_A, V_{CC} = Mil		74F T_A, V_{CC} = Com		Units
		Min	Max	Min	Max	Min	Max	
$t_s(H)$	Setup Time, HIGH or LOW	4.0		5.0		4.0		ns
$t_s(L)$	D_n to CP	4.0		5.0		4.0		
$t_h(H)$	Hold Time, HIGH or LOW	0		2.0		0		ns
$t_h(L)$	D_n to CP	0		2.0		0		
$t_s(H)$	Setup Time, HIGH or LOW	6.0		4.5		6.0		ns
$t_s(L)$	$\overline{E}$ to CP	10.0		13.0		10.0		
$t_h(H)$	Hold Time, HIGH or LOW	0		0		0		ns
$t_h(L)$	$\overline{E}$ to CP	0		0		0		
$t_w(H)$	CP Pulse Width	4.0		5.0		4.0		ns
$t_w(L)$	HIGH or LOW	6.0		7.5		6.0		

Ordering Information

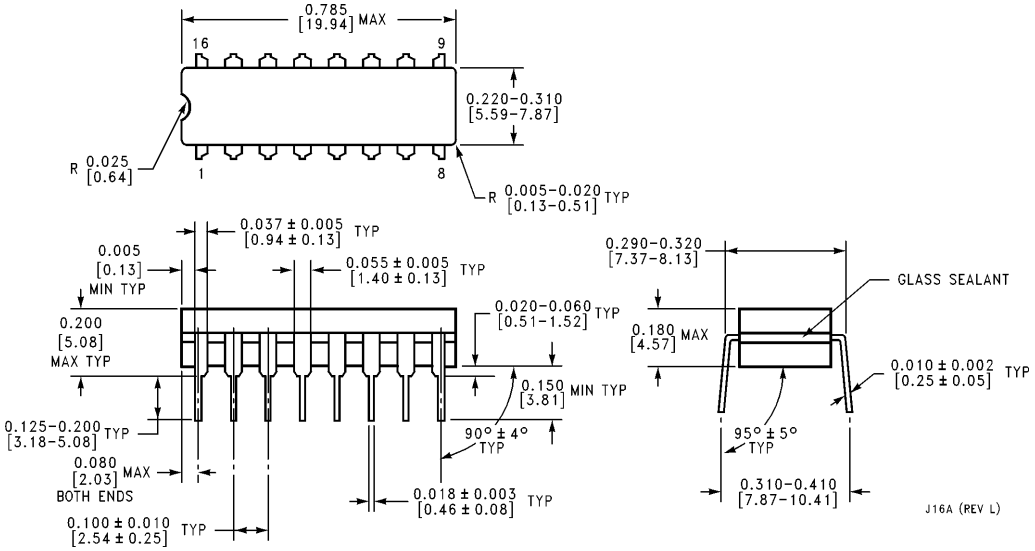
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



Physical Dimensions inches (millimeters)

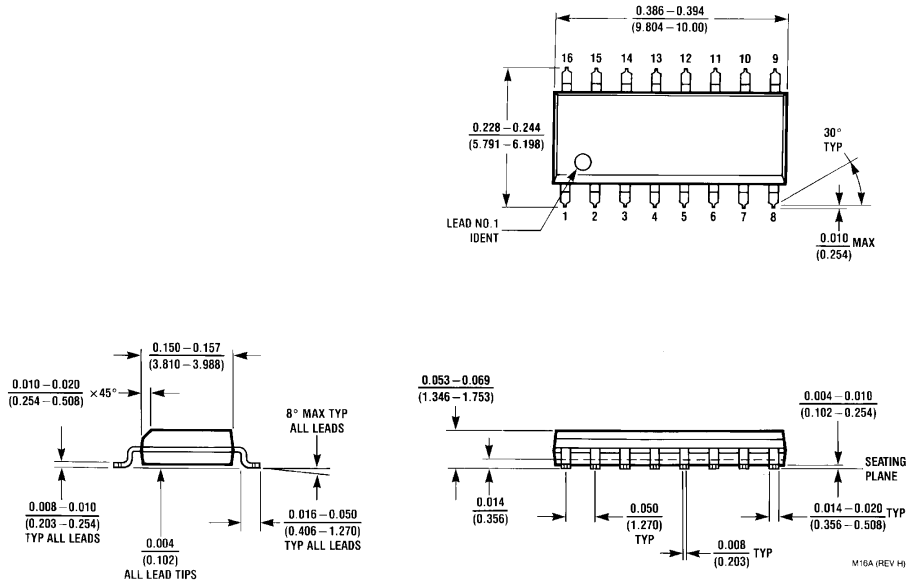


20-Lead Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

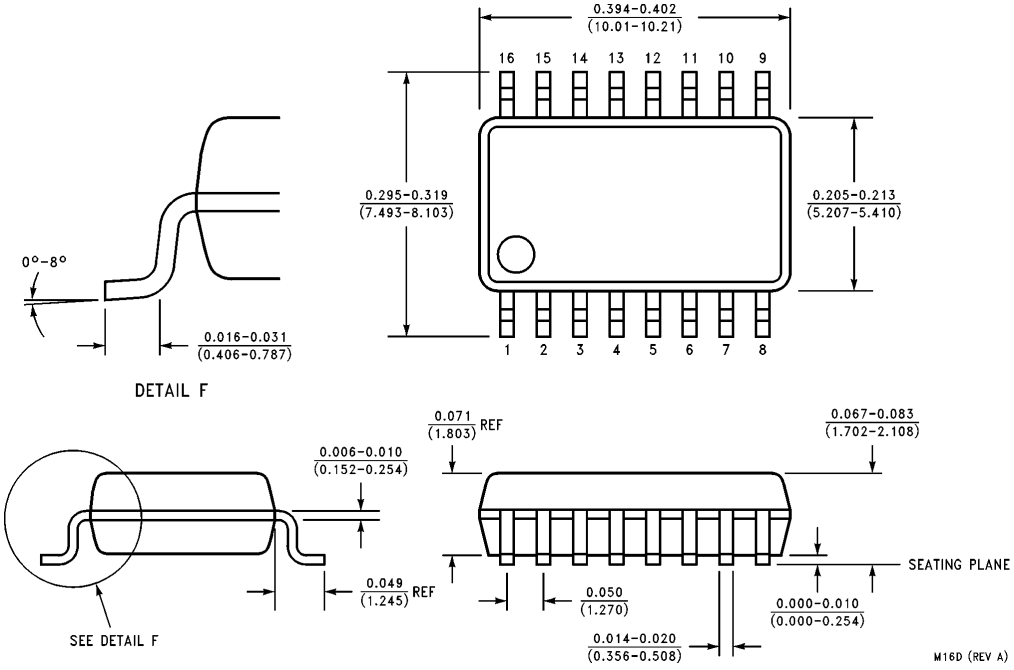


16-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J16A

Physical Dimensions inches (millimeters) (Continued)

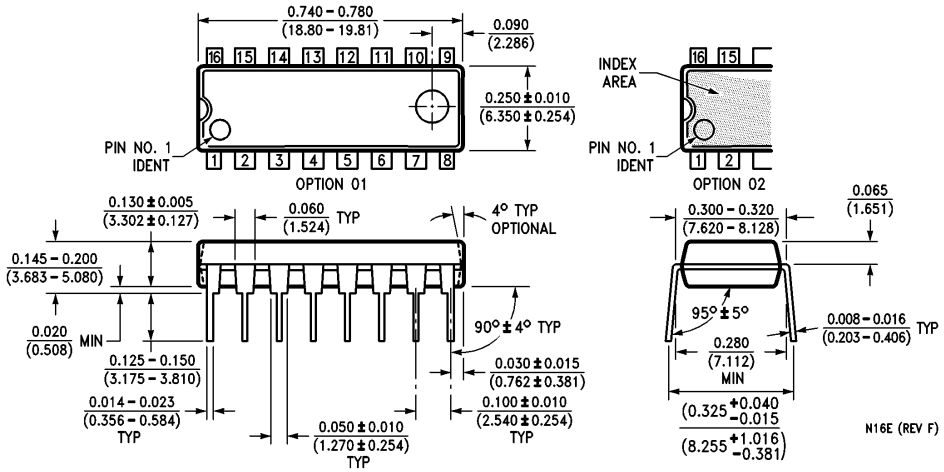


16-Lead (0.150″ Wide) Molded Small Outline Package, JEDEC
NS Package Number M16A



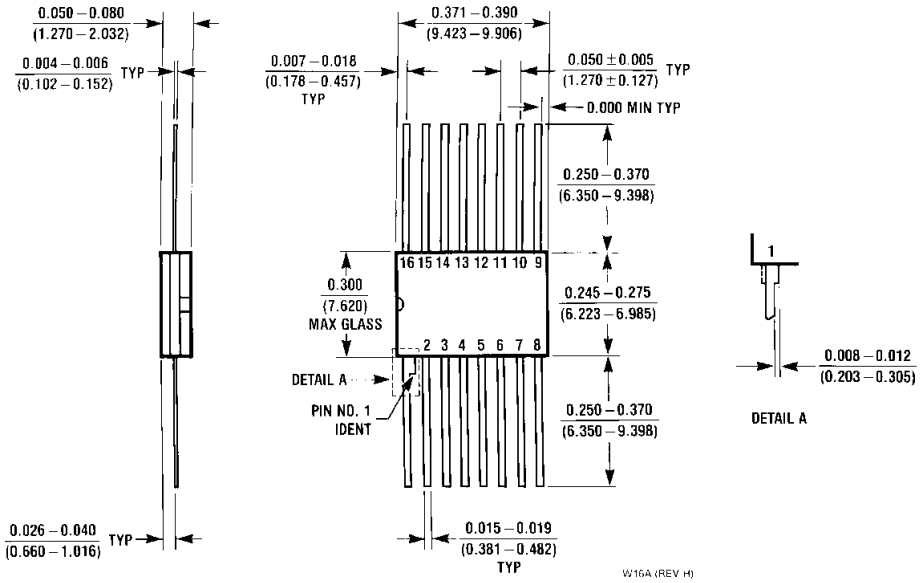
16-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M16D

Physical Dimensions inches (millimeters) (Continued)



16-Lead (0.300″ Wide) Molded Dual-In-Line Package (P)
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)



16-Lead Ceramic Flatpak (F)
NS Package Number W16A

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54F378 Parallel D Register with Enable

Contents

General Description

The 'F378 is a 6-bit register with a buffered common Enable. This device is similar to the 'F174, but with common Enable rather than common Master Reset.

Features

- 6-bit high-speed parallel register
- Positive edge-triggered D-type inputs
- Fully buffered common clock and enable inputs
- Input clamp diodes limit high-speed termination effects
- Full TTL and CMOS compatible

Datasheet

Title	Size (in Kbytes)	Date	View Online	Download	Receive via Email
54F378 Parallel D Register with Enable	166 Kbytes	9-Dec-97	View Online	Download	Receive via Email

Please use Adobe Acrobat to view PDF file(s).
If you have trouble printing, see Printing Problems.

Package Availability, Models, Samples & Pricing

Part Number	Package		Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	# pins		SPICE	IBIS		Quantity	$US each		
5962-8855501EA	Cerdip	16	Full production	N/A	N/A	.	50+	$6.0000	tube of 25	[logo]¢Z¢S¢4¢A$E 54F378DMQB /Q¢M 5962-8855501EA
5962-8855501FA	Cerpack	16	Full production	N/A	N/A	.	50+	$6.0000	tube of 19	[logo]¢Z¢S¢4¢A$E 54F378FMQB Q¢M 5962-8855501FA

[Information as of 1-Sep-2000]
