

CD4015BM/CD4015BC Dual 4-Bit Static Shift Register

General Description

The CD4015BM/CD4015BC contains two identical, 4-stage, serial-input/parallel-output registers with independent "Data", "Clock," and "Reset" inputs. The logic level present at the input of each stage is transferred to the output of that stage at each positive-going clock transition. A logic high on the "Reset" input resets all four stages covered by that input. All inputs are protected from static discharge by a series resistor and diode clamps to V_{DD} and V_{SS} .

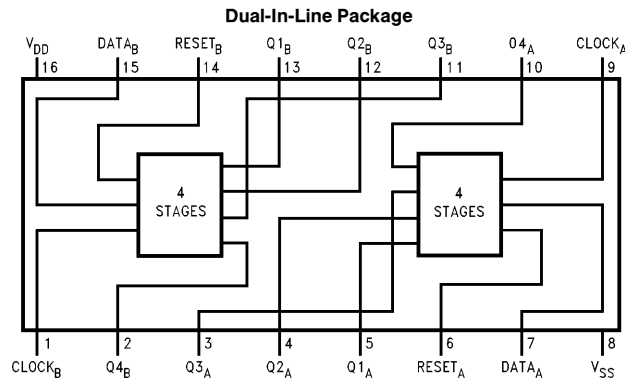
Features

- Wide supply voltage range 3.0V to 18V
- High noise immunity 0.45 V_{DD} (typ.)
- Low power TTL compatibility Fan out of 2 driving 74L or 1 driving 74LS
- Medium speed operation 8 MHz (typ.) clock rate
- Fully static design @ $V_{DD} - V_{SS} = 10V$

Applications

- Serial-input/parallel-output data queueing
- Serial to parallel data conversion
- General purpose register

Connection Diagram and Truth Table



TL/F/5948-1

CL▲	D	R	Q ₁	Q _n
	0	0	0	Q _{n-1}
	1	0	1	Q _{n-1}
	X	0	Q ₁	Q _n
X	X	1	0	0

(No change)

▲ Level change

X = Don't care case

Order Number CD4015B

Absolute Maximum Ratings (Notes 1 & 2)

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

DC Supply Voltage (V_{DD})	−0.5 to +18 V_{DC}
Input Voltage (V_{IN})	−0.5 to V_{DD} + 0.5 V_{DC}
Storage Temperature Range (T_S)	−65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature (T_L)	
(Soldering, 10 seconds)	260°C

Recommended Operating Conditions

DC Supply Voltage (V_{DD})	+3 to +15 V_{DC}
Input Voltage (V_{IN})	0 to V_{DD} V_{DC}
Operating Temperature Range (T_A)	
CD4015BM	−55°C to +125°C
CD4015BC	−40°C to +85°C

DC Electrical Characteristics CD4015BM (Note 2)

Symbol	Parameter	Conditions	−55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V, V_{IN} = V_{DD}$ or V_{SS}		5		0.005	5		150	μA
		$V_{DD} = 10V, V_{IN} = V_{DD}$ or V_{SS}		10		0.010	10		300	μA
		$V_{DD} = 15V, V_{IN} = V_{DD}$ or V_{SS}		20		0.015	20		600	μA
V_{OL}	Low Level Output Voltage	$V_{DD} = 5V$ } $ I_O < 1 \mu A$		0.05		0	0.05		0.05	V
		$V_{DD} = 10V$ }		0.05		0	0.05		0.05	V
		$V_{DD} = 15V$ }		0.05		0	0.05		0.05	V
V_{OH}	High Level Output Voltage	$V_{DD} = 5V$ } $ I_O < 1 \mu A$	4.95		4.95	5		4.95		V
		$V_{DD} = 10V$ }	9.95		9.95	10		9.95		V
		$V_{DD} = 15V$ }	14.95		14.95	15		14.95		V
V_{IL}	Low Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V$ or $4.5V$		1.5		2.25	1.5		1.5	V
		$V_{DD} = 10V, V_O = 1.0V$ or $9.0V$		3.0		4.50	3.0		3.0	V
		$V_{DD} = 15V, V_O = 1.5V$ or $13.5V$		4.0		6.75	4.0		4.0	V
V_{IH}	High Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V$ or $4.5V$	3.5		3.5	2.75		3.5		V
		$V_{DD} = 10V, V_O = 1.0V$ or $9.0V$	7.0		7.0	5.50		7.0		V
		$V_{DD} = 15V, V_O = 1.5V$ or $13.5V$	11.0		11.0	8.25		11.0		V
I_{OL}	Low Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 0.4V$	0.64		0.51	0.88		0.36		mA
		$V_{DD} = 10V, V_O = 0.5V$	1.6		1.3	2.25		0.9		mA
		$V_{DD} = 15V, V_O = 1.5V$	4.2		3.4	8.8		2.4		mA
I_{OH}	High Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 4.6V$	−0.64		−0.51	−0.88		−0.36		mA
		$V_{DD} = 10V, V_O = 9.5V$	−1.6		−1.3	−2.25		−0.9		mA
		$V_{DD} = 15V, V_O = 13.5V$	−4.2		−3.4	−8.8		−2.4		mA
I_{IN}	Input Current	$V_{DD} = 15V, V_{IN} = 0V$		−0.1		-10^{-5}	−0.1		−1.0	μA
		$V_{DD} = 15V, V_{IN} = 15V$		0.1		10^{-5}	0.1		1.0	μA

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

Note 2: $V_{SS} = 0V$ unless otherwise specified.

Note 3: I_{OH} and I_{OL} are tested one output at a time.

DC Electrical Characteristics CD4015BC (Note 2)

Symbol	Parameter	Conditions	− 55°C		+ 25°C			+ 125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V, V_{IN} = V_{DD} \text{ or } V_{SS}$ $V_{DD} = 10V, V_{IN} = V_{DD} \text{ or } V_{SS}$ $V_{DD} = 15V, V_{IN} = V_{DD} \text{ or } V_{SS}$		20 40 80		0.005 0.010 0.015	20 40 80		150 300 600	μA μA μA
V_{OL}	Low Level Output Voltage	$V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$		0.05 0.05 0.05		0 0 0	0.05 0.05 0.05		0.05 0.05 0.05	V V V
V_{OH}	High Level Output Voltage	$V_{DD} = 5V$ $V_{DD} = 10V$ $V_{DD} = 15V$	4.95 9.95 14.95		4.95 9.95 14.95	5 10 15		4.95 9.95 14.95		V V V
V_{IL}	Low Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$ $V_{DD} = 10V, V_O = 1.0V \text{ or } 9.0V$ $V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$		1.5 3.0 4.0		2.25 4.50 6.75	1.5 3.0 4.0		1.5 3.0 4.0	V V V
V_{IH}	High Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V \text{ or } 4.5V$ $V_{DD} = 10V, V_O = 1.0V \text{ or } 9.0V$ $V_{DD} = 15V, V_O = 1.5V \text{ or } 13.5V$	3.5 7.0 11.0		3.5 7.0 11.0	2.75 5.50 8.25		3.5 7.0 11.0		V V V
I_{OL}	Low Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 0.4V$ $V_{DD} = 10V, V_O = 0.5V$ $V_{DD} = 15V, V_O = 1.5V$	0.52 1.3 3.6		0.44 1.1 3.0	0.88 2.25 8.8		0.36 0.9 2.4		mA mA mA
I_{OH}	High Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 4.6V$ $V_{DD} = 10V, V_O = 9.5V$ $V_{DD} = 15V, V_O = 13.5V$	−0.52 −1.3 −3.6		−0.44 −1.1 −3.0	−0.88 −2.25 −8.8		−0.36 −0.9 −2.4		mA mA mA
I_{IN}	Input Current	$V_{DD} = 15V, V_{IN} = 0V$ $V_{DD} = 15V, V_{IN} = 15V$		−0.3 0.3		-10^{-5} 10^{-5}	−0.3 0.3		−1.0 1.0	μA μA

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

Note 2: $V_{SS} = 0V$ unless otherwise specified.

Note 3: I_{OH} and I_{OL} are tested one output at a time.

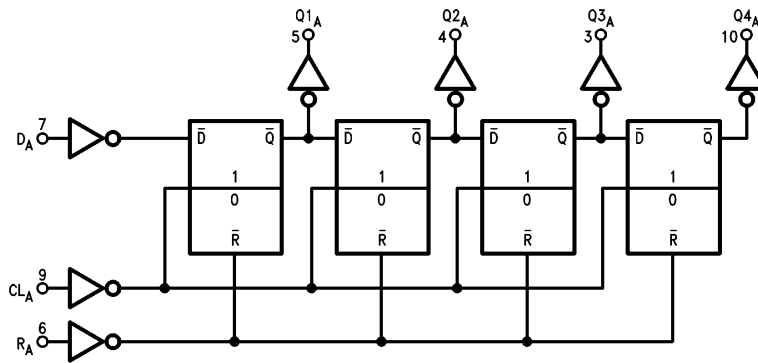
AC Electrical Characteristics*

$T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}\Omega$, $t_r = t_f = 20\text{ ns}$, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CLOCK OPERATION						
$t_{\text{PHL}}, t_{\text{PLH}}$	Propagation Delay Time	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$		230 80 60	350 160 120	ns
$t_{\text{THL}}, t_{\text{TLH}}$	Transition Time	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$		100 50 40	200 100 80	ns
$t_{\text{WL}}, t_{\text{WM}}$	Minimum Clock Pulse-Width	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$		160 60 50	250 110 85	ns
$t_{\text{rCL}}, t_{\text{fCL}}$	Clock Rise and Fall Time	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$			15 15 15	μs
t_{SU}	Minimum Data Set-Up Time	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$		50 20 15	100 40 30	μs
f_{CL}	Maximum Clock Frequency	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$	2 4.5 6	3.5 8 11		MHz
C_{IN}	Input Capacitance	Clock Input Other Inputs		7.5 5	10 7.5	pF
RESET OPERATION						
$t_{\text{PHL(R)}}$	Propagation Delay Time	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$		200 100 80	400 200 160	ns
$t_{\text{WH(R)}}$	Minimum Reset Pulse Width	$V_{\text{DD}} = 5\text{V}$ $V_{\text{DD}} = 10\text{V}$ $V_{\text{DD}} = 15\text{V}$		135 40 30	250 80 60	ns

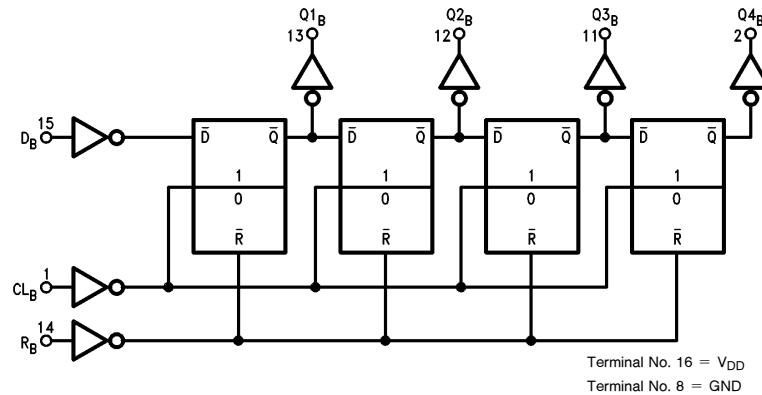
*AC Parameters are guaranteed by DC correlated testing.

Logic Diagrams



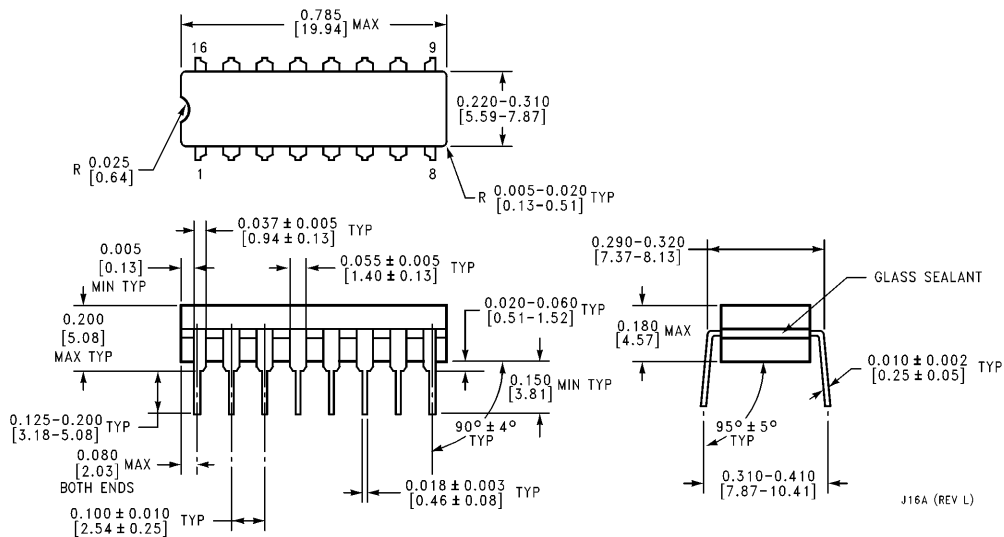
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Logic Diagrams (Continued)

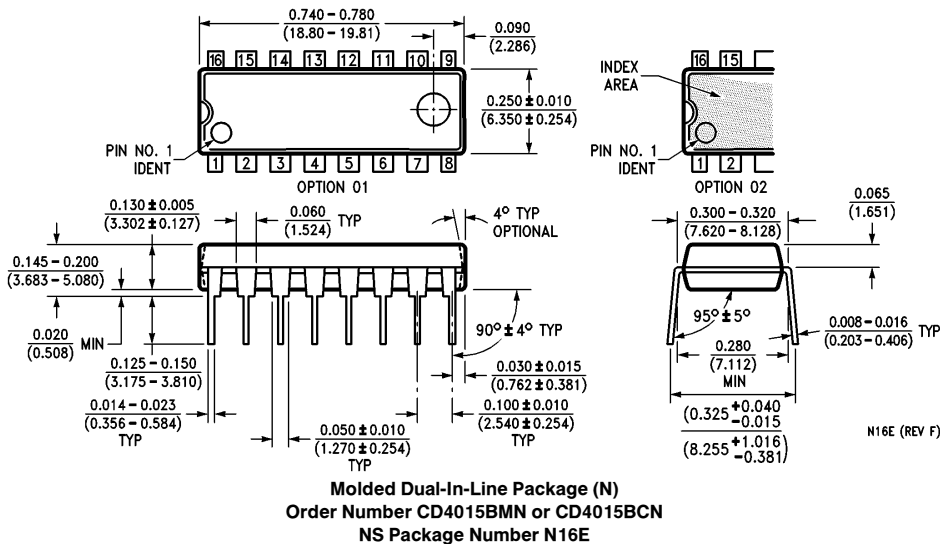


TL/F/5948-3

Physical Dimensions inches (millimeters) unless otherwise noted



Ceramic Dual-In-Line Package (J)
Order Number CD4015BMJ or CD4015BCJ
NS Package Number J16A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)**LIFE SUPPORT POLICY**

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