National Semiconductor

DM7544/DM8544 TRI-STATE® Quad Switch Debouncers

General Description

These circuits are for use in front panels, and similar applications where contact bounce must be eliminated. Within the single package, these circuits do the job of four R-S latches plus pull-up resistors. A strobe is also available which permits sampling of the switch information at a predetermined time. TRI-STATE outputs are also provided for direct connections to the switch line bus.

Features

■ Replaces SN54279/74279
■ Eliminates push-button noise
■ Allows clocked devices to be operated from switches
■ Maximum power dissipation 250 mW
■ Bus-line connectable
■ TRI-STATE outputs
■ Typical propagation delay 18 ns

Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Storage Temperature Range	−65°C to 150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device can not be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Connection Diagram

Dual-In-Line Package

TL/F/6586-1

7544 (J)   8544 (N)
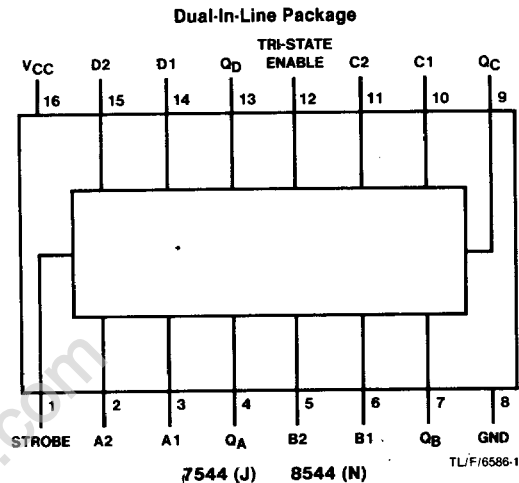
Function Table

A1	A2	TRI-STATE Enable	Strobe	$Q_{A(t)}$
X	X	H	X	Hi-Z
X	X	L	L	$Q_{A(t-1)}$
L	L	L	⌐⌐	Indeterminate
L	H	L	H	L
H	L	L	H	H
H	H	L	H	$Q_{A(t)}$

Recommended Operating Conditions

Symbol	Parameter	DM7544			DM8544			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.8			0.8	V
I_{OH}	High Level Output Current			−2			−5.2	mA
I_{OL}	Low Level Output Current			16			16	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −12 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max V_{IL} = Max, V_{IH} = Min		2.4			V
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max V_{IH} = Min, V_{IL} = Max				0.4	V
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 5.5V				1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.4V				40	µA
I_{IL}	Low Level Input current	V_{CC} = Max V_I = 0.4V	Data			−2.5	mA
			Other			−1.6	
I_{OZH}	Off-State Output Current with High Level Output Voltage Applied	V_{CC} = Max, V_O = 2.4V V_{IH} = Min, V_{IL} = Max				40	µA
I_{OZL}	Off-State Output Current with Low Level Output Voltage Applied	V_{CC} = Max, V_O = 0.4V V_{IH} = Min, V_{IL} = Max				−40	µA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	DM75	−18		−55	mA
			DM85	−18		−55	
I_{CC}	Supply Current	V_{CC} = Max				50	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.
Note 2: Not more than one output should be shorted at a time.

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Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25°C$ (See Section 1 for Test Waveforms and Output Load)

Parameter	From (Input) To (Output)	$R_L = 400\Omega$						Units
		$C_L = 5$ pF			$C_L = 50$ pF			
		Min	Typ	Max	Min	Typ	Max	
t_{PLH} Propagation Delay Time Low to High Level Output	Data to Output					20	36	ns
t_{PHL} Propagation Delay Time High to Low Level Output	Data to Output					17	30	ns
t_{PZH} Output Enable Time to High Level Output	Enable to Q					15	25	ns
t_{PZL} Output Enable Time to Low Level Output	Enable to Q					12	24	ns
t_{PHZ} Output Disable Time from High Level Output	Enable to Q		5	10				ns
t_{PLZ} Output Disable Time from Low Level Output	Enable to Q		10	20				ns

Logic Diagram

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