



National
Semiconductor
Corporation

DM54LS465/DM74LS465, DM54LS466/DM74LS466, DM54LS467/DM74LS467, DM54LS468/DM74LS468 (DM71LS95A/DM81LS95A, DM71LS96A/DM81LS96A, DM71LS97A/DM81LS97A, DM71LS98A/DM81LS98A) TRI-STATE® Octal Buffers

General Description

These devices provide eight, two-input buffers in each package. All employ the newest low-power-Schottky TTL technology. One of the two inputs to each buffer is used as a control line to gate the output into the high-impedance state, while the other input passes the data through the buffer. The LS465 and LS467 present true data at the outputs, while the LS466 and LS468 are inverting. On the LS465 and LS466 versions, all eight TRI-STATE enable lines are common, with access through a 2-input NOR gate. On the LS467 and LS468 versions, four buffers are enabled from one common line, and the other four buffers are enabled from another common line. In all cases the outputs are placed in the TRI-STATE condition by applying a high logic level to the enable pins. These devices represent octal, low power-Schottky versions of the very popular DM54/74365,

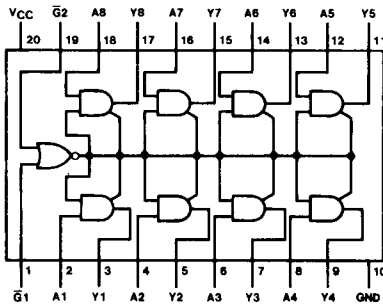
366, 367, and 368 (DM70/8095, 96, 97, and 98) TRI-STATE hex buffers.

Features

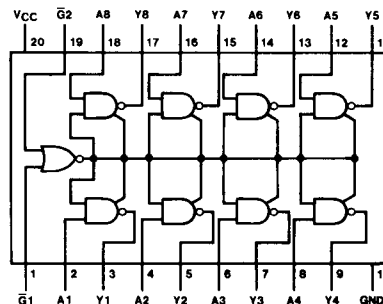
- Octal versions of popular DM54/74365, 366, 367, and 368 (DM70/8095, 96, 97 and 98)
- Typical power dissipation
DM54/74LS465, 467 80 mW
DM54/74LS466, 468 65 mW
- Typical propagation delay
DM54/74LS465, 467 15 ns
DM54/74LS466, 468 10 ns
- Low power-Schottky, TRI-STATE technology

Connection Diagrams

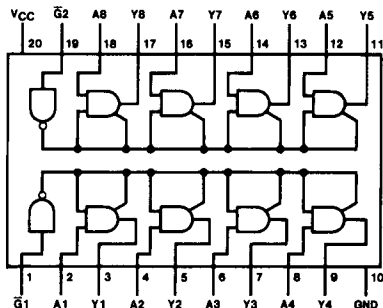
Dual-In-Line Packages



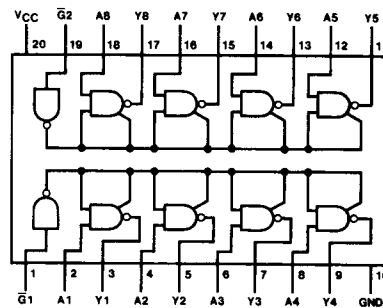
TL/F/6435-1



TL/F/6435-2



TL/F/6435-3



TL/F/6435-4

Order Numbers DM54LS465J, DM54LS466J, DM54LS467J, DM54LS468J, DM74LS465N,
DM74LS465WM, DM74LS466N, DM74LS466WM, DM74LS467N, DM74LS467WM,
DM74LS468N or DM74LS468WM. See NS Package Number J20A, M20B or N20A

DM54/74LS465, 466, 467, 468 (DM71/81LS95A, 96A, 97A, 98A)

Absolute Maximum Ratings (Note)

Specifications for Military/Aerospace products are not contained in this datasheet. Refer to the associated reliability electrical test specifications document.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS	-55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	-65°C to +150°C

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot 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.

Recommended Operating Conditions

Symbol	Parameter	DM54LS465, 466, 467, 468			DM74LS465, 466, 467, 468			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			0.7			0.8	V
I _{OH}	High Level Output Current			-2.6			-5.2	mA
I _{OL}	Low Level Output Current			12			24	mA
T _A	Free Air Operating Temperature	-55		125	0		70	°C

'LS465 and 'LS467 Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -18 mA			-1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	DM54	2.5		V
			DM74	2.7		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IL} = Max, V _{IH} = Min	DM54		0.4	V
			DM74		0.5	
			I _{OL} = 12 mA, V _{CC} = Min	DM74		
I _I	Input Current @Max Input Voltage	V _{CC} = Max, V _I = 7V			0.1	mA
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.7V			20	μA
I _{IL}	Low Level Input Current	V _{CC} = Max	V _I = 0.5V	A (Note 3)	-20	μA
			V _I = 0.4V	A (Note 4)	-50	
				\bar{G}	-50	
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			20	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			-20	μA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54	-20	-100	mA
			DM74	-20	-100	
I _{CC}	Supply Current	V _{CC} = Max (Note 3)		16	26	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, and the duration should not exceed one second.

Note 3: Both \bar{G} inputs are at 2V.

Note 4: Both \bar{G} inputs are at 0.4V.

'LS465 and 'LS467 Switching Characteristics

at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	$R_L = 667\Omega$				Units
		$C_L = 50\text{ pF}$		$C_L = 150\text{ pF}$		
		Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output		16		25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		28		40	ns
t_{PZH}	Output Enable Time to High Level Output		25		30	ns
t_{PZL}	Output Enable Time to Low Level Output		30		42	ns
t_{PHZ}	Output Disable Time from High Level Output (Note 1)		20			ns
t_{PLZ}	Output Disable Time from Low Level Output (Note 1)		27			ns

Note 1: $C_L = 5\text{ pF}$.

'LS466 and 'LS468 Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units	
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18\text{ mA}$			-1.5	V	
V_{OH}	High Level Output Voltage	$V_{CC} = \text{Min}, I_{OH} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	DM54	2.5		V	
			DM74	2.7			
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	DM54		0.4	V	
			DM74		0.5		
			DM74		0.4		
I_I	Input Current @Max Input Voltage	$V_{CC} = \text{Max}, V_I = 7V$			0.1	mA	
I_{IH}	High Level Input Current	$V_{CC} = \text{Max}, V_I = 2.7V$			20	μA	
I_{IL}	Low Level Input Current	$V_{CC} = \text{Max}$	$V_I = 0.5V$	A (Note 4)		-20	μA
			$V_I = 0.4V$	A (Note 5)		-50	
			\bar{G}			-50	
I_{OZH}	Off-State Output Current with High Level Output Voltage Applied	$V_{CC} = \text{Max}, V_O = 2.4V$ $V_{IH} = \text{Min}, V_{IL} = \text{Max}$			20	μA	
I_{OZL}	Off-State Output Current with Low Level Output Voltage Applied	$V_{CC} = \text{Max}, V_O = 0.4V$ $V_{IH} = \text{Min}, V_{IL} = \text{Max}$			-20	μA	
I_{OS}	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 3)	DM54	-20	-100	mA	
			DM74	-20	-100		
I_{CC}	Supply Current	$V_{CC} = \text{Max}$ (Note 5)		13	21	mA	

Note 2: All typicals are at $V_{CC} = 5V, T_A = 25^\circ C$.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 4: Both \bar{G} inputs are at 2V.

Note 5: Both \bar{G} inputs are at 0.4V.

'LS466 and 'LS468 Switching Characteristics

at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	$R_L = 667\Omega$				Units
		$C_L = 50\text{ pF}$		$C_L = 150\text{ pF}$		
		Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output		10		16	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		17		30	ns
t_{PZH}	Output Enable Time to High Level Output		15		30	ns
t_{PZL}	Output Enable Time to Low Level Output		35		45	ns
t_{PHZ}	Output Disable Time from High Level Output (Note 1)		20			ns
t_{PLZ}	Output Disable Time from Low Level Output (Note 1)		27			ns

Note 1: $C_L = 5\text{ pF}$.

Function Tables

LS465

Inputs			Output Y
$\bar{G}1$	$\bar{G}2$	A	
H	X	X	Hi-Z
X	H	X	Hi-Z
L	L	H	H
L	L	L	L

LS466

Inputs			Output Y
$\bar{G}1$	$\bar{G}2$	A	
H	X	X	Hi-Z
X	H	X	Hi-Z
L	L	H	L
L	L	L	H

LS467

Inputs		Output Y
\bar{G}	A	
H	X	Hi-Z
L	H	H
L	L	L

LS468

Inputs		Output Y
\bar{G}	A	
H	X	Hi-Z
L	H	L
L	L	H

H = High Logic Level

L = Low Logic Level

X = Either High or Low Logic Level

Hi-Z = High Impedance (Off) State