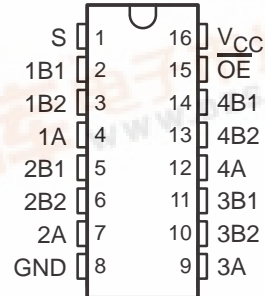


# LOW-VOLTAGE 4-BIT 1-OF-2 FET MULTIPLEXER/DEMULTIPLEXER

SCDS040D – DECEMBER 1997 – REVISED NOVEMBER 1999

- Functionally Equivalent to QS3257
- 5-Ω Switch Connection Between Two Ports
- Isolation Under Power-Off Conditions
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- Package Options Include Thin Very Small-Outline (DGV), Small-Outline (D), Shrink Small-Outline (DBQ), and Thin Shrink Small-Outline (PW) Packages

D, DBQ, DGV, OR PW PACKAGE  
(TOP VIEW)



## description

The SN74CBTLV3257 is a 4-bit 1-of-2 high-speed FET multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The select (S) input controls the data flow. The FET multiplexers/demultiplexers are disabled when the output-enable ( $\overline{OE}$ ) input is high.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN74CBTLV3257 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE

INPUTS		FUNCTION
$\overline{OE}$	S	
L	L	A port = B1 port
L	H	A port = B2 port
H	X	Disconnect

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

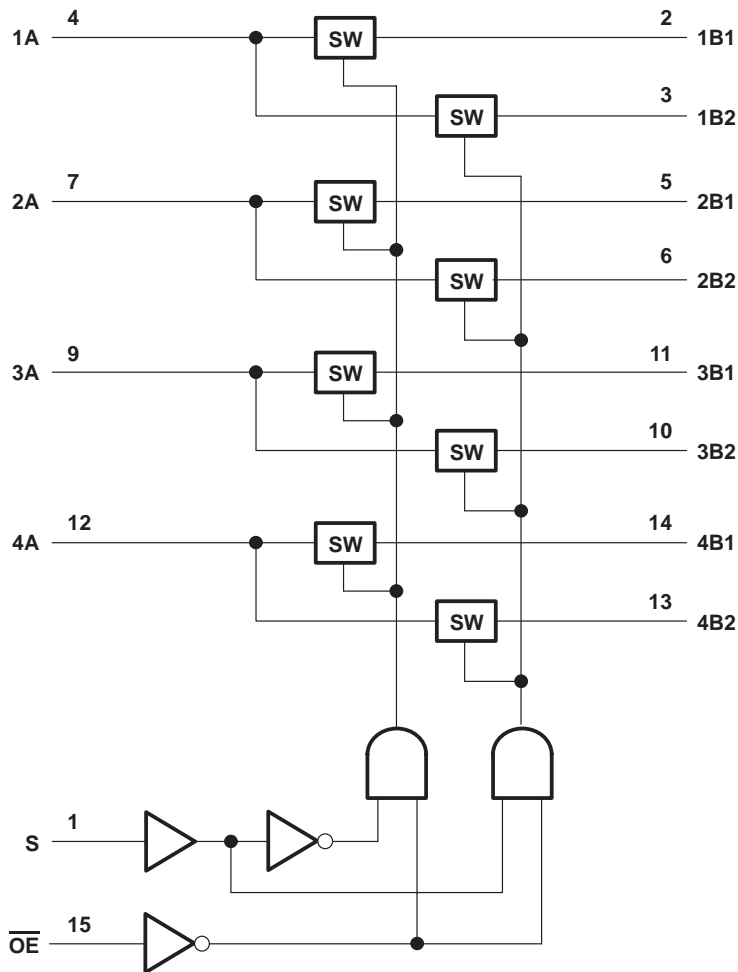


PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

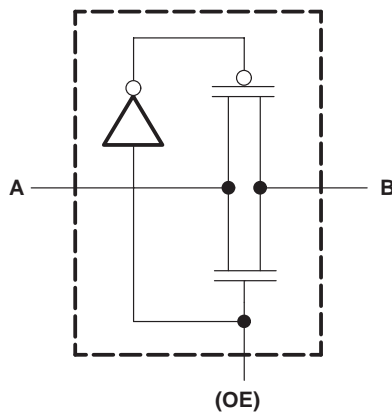
# SN74CBTLV3257 LOW-VOLTAGE 4-BIT 1-OF-2 FET MULTIPLEXER/DEMULTIPLEXER

SCDS040D – DECEMBER 1997 – REVISED NOVEMBER 1999

## logic diagram (positive logic)



## simplified schematic, each FET switch



# SN74CBTLV3257

## LOW-VOLTAGE 4-BIT 1-OF-2 FET MULTIPLEXER/DEMULTIPLEXER

SCDS040D – DECEMBER 1997 – REVISED NOVEMBER 1999

### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage range, $V_{CC}$ .....	–0.5 V to 4.6 V
Input voltage range, $V_I$ (see Note 1) .....	–0.5 V to 4.6 V
Continuous channel current .....	128 mA
Input clamp current, $I_{IK}$ ( $V_{I/O} < 0$ ) .....	–50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): D package .....	73°C/W
DBQ package .....	90°C/W
DGV package .....	120°C/W
PW package .....	108°C/W
Storage temperature range, $T_{stg}$ .....	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
 2. The package thermal impedance is calculated in accordance with JESD 51.

### recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	2.3	3.6	V
$V_{IH}$	High-level control input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2	
$V_{IL}$	Low-level control input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	0.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	0.8	
$T_A$	Operating free-air temperature	–40	85	°C

NOTE 3: All unused control inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP <sup>‡</sup>	MAX	UNIT
$V_{IK}$		$V_{CC} = 3 \text{ V}$ ,	$I_I = -18 \text{ mA}$			–1.2	V
$I_I$		$V_{CC} = 3.6 \text{ V}$ ,	$V_I = V_{CC}$ or GND			±1	µA
$I_{off}$		$V_{CC} = 0$ ,	$V_I$ or $V_O = 0$ to 4.5 V			10	µA
$I_{CC}$		$V_{CC} = 3.6 \text{ V}$ ,	$I_O = 0$ , $V_I = V_{CC}$ or GND			10	µA
$\Delta I_{CC}$ <sup>§</sup>	Control inputs	$V_{CC} = 3.6 \text{ V}$ ,	One input at 3 V, Other inputs at $V_{CC}$ or GND			300	µA
$C_i$	Control inputs	$V_I = 3 \text{ V}$ or 0				3	pF
$C_{io(OFF)}$	A port	$V_O = 3 \text{ V}$ or 0,	$\overline{OE} = V_{CC}$			5.5	pF
	B port					10.5	
$r_{on}$ <sup>¶</sup>	$V_{CC} = 2.3 \text{ V}$ , TYP at $V_{CC} = 2.5 \text{ V}$	$V_I = 0$	$I_I = 64 \text{ mA}$			5	Ω
			$I_I = 24 \text{ mA}$			5	
	$V_{CC} = 3 \text{ V}$	$V_I = 0$	$I_I = 15 \text{ mA}$			27	
			$I_I = 64 \text{ mA}$			5	
			$I_I = 24 \text{ mA}$			5	
			$I_I = 15 \text{ mA}$			10	

<sup>‡</sup> All typical values are at  $V_{CC} = 3.3 \text{ V}$  (unless otherwise noted),  $T_A = 25^\circ\text{C}$ .

<sup>§</sup> This is the increase in supply current for each input that is at the specified voltage level rather than  $V_{CC}$  or GND.

<sup>¶</sup> Measured by the voltage drop between the A and the B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

# SN74CBTLV3257 LOW-VOLTAGE 4-BIT 1-OF-2 FET MULTIPLEXER/DEMULTIPLEXER

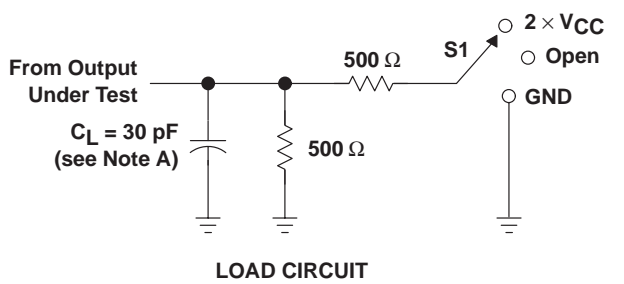
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switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figures 1 and 2)

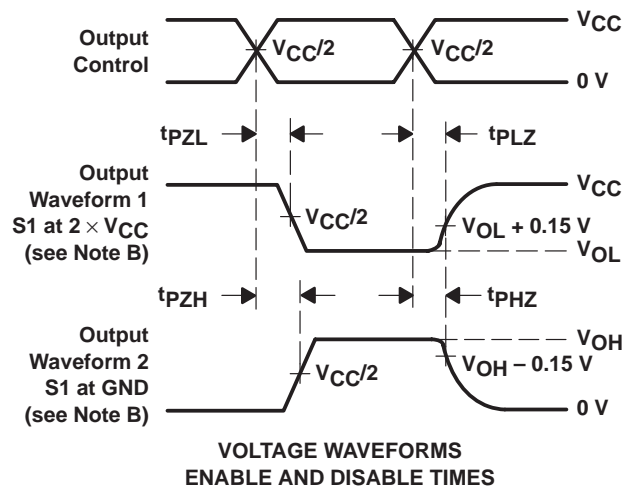
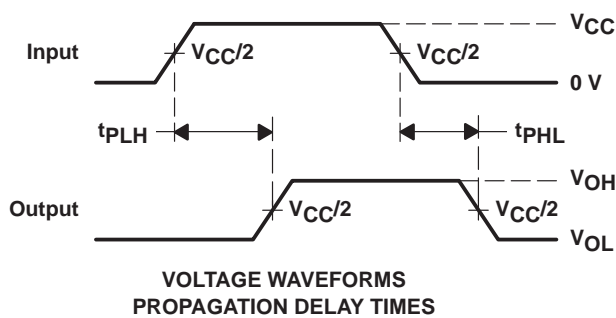
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}$	A or B†	B or A	0.35		0.25		ns
	S	A or B	1.8	6.1	1.8	5.3	
$t_{en}$	S	A or B	1.7	6.1	1.7	5.3	ns
$t_{dis}$	S	A or B	1	4.8	1	4.5	ns
$t_{en}$	$\overline{OE}$	A or B	1.9	5.6	2	5	ns
$t_{dis}$	$\overline{OE}$	A or B	1	5.5	1.6	5.5	ns

† The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

## PARAMETER MEASUREMENT INFORMATION $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$



TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	2 $\times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 2\text{ ns}$ ,  $t_f \leq 2\text{ ns}$ .
  - D. The outputs are measured one at a time with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

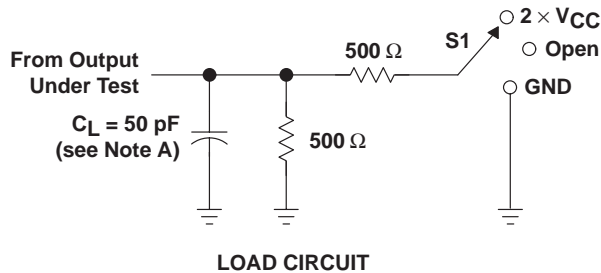
# SN74CBTLV3257

## LOW-VOLTAGE 4-BIT 1-OF-2 FET MULTIPLEXER/DEMULTIPLEXER

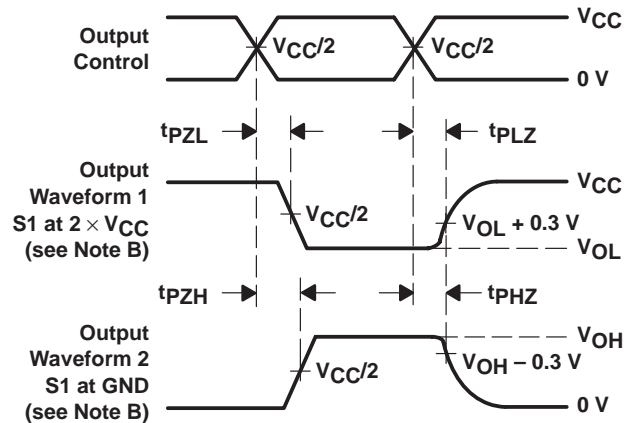
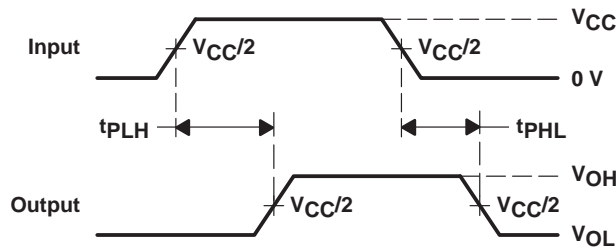
SCDS040D – DECEMBER 1997 – REVISED NOVEMBER 1999

### PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$



TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 2$  ns,  $t_f \leq 2$  ns.
  - D. The outputs are measured one at a time with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

**Figure 2. Load Circuit and Voltage Waveforms**

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