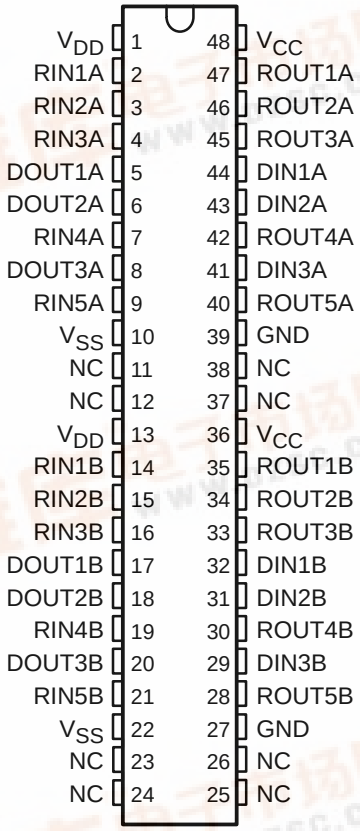
SN752232
DUAL RS-232 PORT

SLLS507 – JUNE 2001

- **Single Chip With Easy Interface Between UART and Two Serial-Port Connectors of IBM™ PC/AT™ and Compatibles**
- **Meets or Exceeds the Requirements of TIA/EIA-232-F and ITU Recommendation V.28**
- **Supports Data Rates up to 120 kbit/s**
- **Package Options Include Plastic Thin Shrink Small-Outline (DGG) and Shrink Small-Outline (DL) Packages**

DGG OR DL PACKAGE
(TOP VIEW)



description

The SN752232 consists of dual ports, each containing three drivers and five receivers, which reduce board space and allow easy interconnection of the UART and two serial-port connectors of an IBM™ PC/AT™ and compatibles. The bipolar circuits and processing of this "dual GD75232" provide, a rugged, low-cost solution for this function.

The SN752232 complies with the requirements of the TIA/EIA-232-F and ITU V.28 standards. These standards are for data interchange between a host computer and a peripheral at signaling rates up to 20 kbit/s. The device supports data rates up to 120 kbit/s with lower capacitive loads (shorter cables). Interoperability at the higher signaling rates cannot be expected unless the designer has design control of the cable and the interface circuits at both ends. For interoperability at signaling rates up to 120 kbit/s, use of TIA/EIA-423-B (ITU V.10) and TIA/EIA-422-B (ITU V.11) standards is recommended.

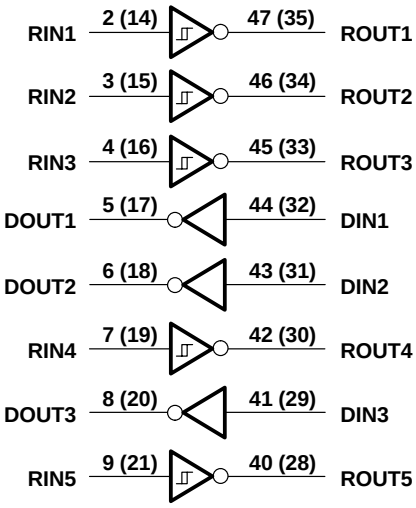
The SN752232 is characterized for operation over the temperature range of 0°C to 70°C.

AVAILABLE OPTIONS

T_A	PACKAGED DEVICES	
	PLASTIC SHRINK SMALL OUTLINE (DL)	PLASTIC THIN SHRINK SMALL OUTLINE (DGG)
0°C to 70°C	SN752232DL	SN752232DGG

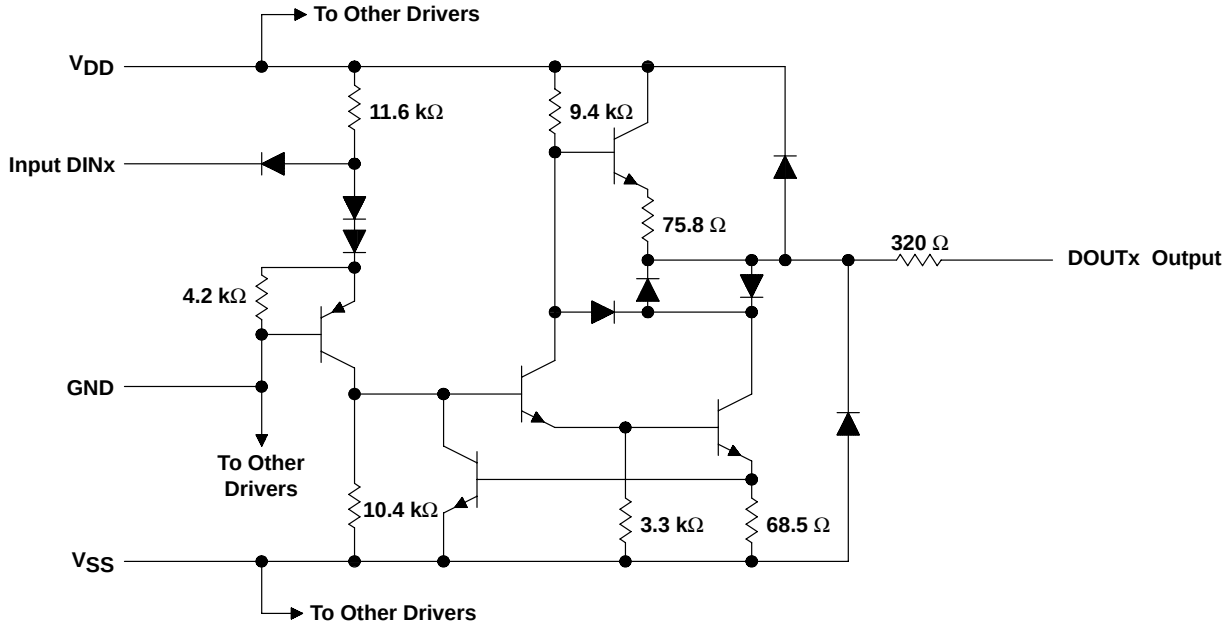
The DL package also is available taped and reeled. Add the suffix R to the device type (e.g., SN752232DLR). The DGG package is only available taped and reeled.

logic diagram (positive logic)



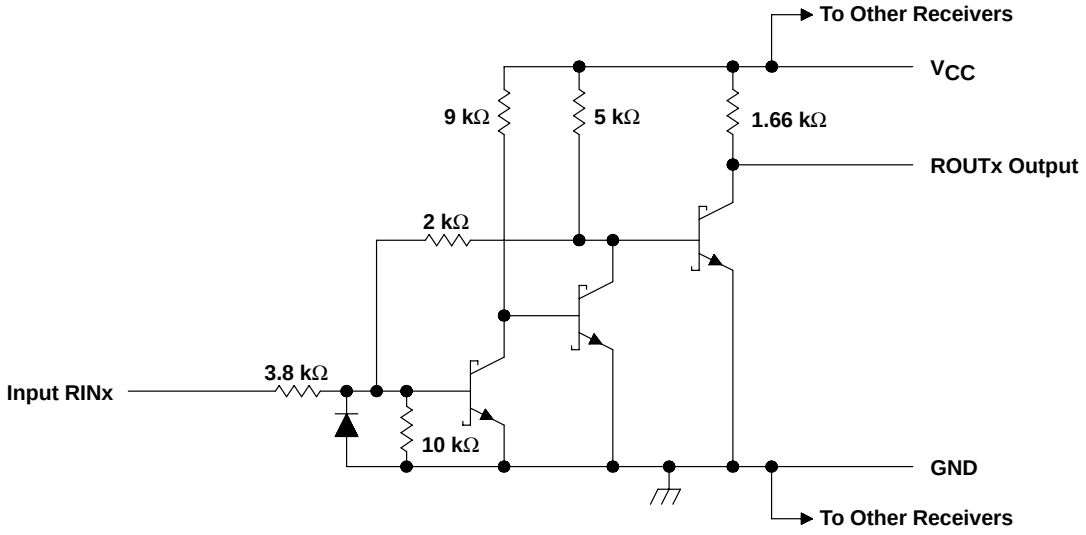
NOTE A: Numbers in parentheses are for B section.

schematic (each driver)



NOTE A: Resistor values shown are nominal.

schematic (each receiver)



NOTE A: Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage (see Note 1): V_{CC}	10 V
V_{DD}	15 V
V_{SS}	–15 V
Input voltage range, V_I: Driver	–15 V to 7 V
Receiver	–30 V to 30 V
Driver output voltage range, V_O	–15 V to 15 V
Receiver low-level output current, I_{OL}	20 mA
Package thermal impedance, θ_{JA} (see Note 2): DGG package	70°C/W
DL package	63°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, T_{stg}	–65°C to 150°C

† 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. All voltages are with respect to network GND.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

			MIN	NOM	MAX	UNIT
V_{DD}	Supply voltage		7.5	9	15	V
V_{SS}	Supply voltage		–7.5	–9	–15	V
V_{CC}	Supply voltage		4.5	5	5.5	V
V_{IH}	High-level input voltage (driver only)		1.9			V
V_{IL}	Low-level input voltage (driver only)				0.8	V
I_{OH}	High-level output current	Driver			–6	mA
		Receiver			–0.5	
I_{OL}	Low-level output current	Driver			6	mA
		Receiver			16	
T_A	Operating free-air temperature		0		70	°C

supply currents over recommended operating free-air temperature range

PARAMETER		TEST CONDITIONS			MIN	MAX	UNIT
I_{DD}	Supply current from V_{DD}	All inputs at 1.9 V,	No load	V_{DD} = 9 V, V_{SS} = –9 V		30	mA
				V_{DD} = 12 V, V_{SS} = –12 V		38	
				V_{DD} = 15 V, V_{SS} = –15 V		50	
		All inputs at 0.8 V,	No load	V_{DD} = 9 V, V_{SS} = –9 V		9	
				V_{DD} = 12 V, V_{SS} = –12 V		11	
				V_{DD} = 15 V, V_{SS} = –15 V		18	
I_{SS}	Supply current from V_{SS}	All inputs at 1.9 V,	No load	V_{DD} = 9 V, V_{SS} = –9 V		–30	mA
				V_{DD} = 12 V, V_{SS} = –12 V		–38	
				V_{DD} = 15 V, V_{SS} = –15 V		–50	
		All inputs at 0.8 V,	No load	V_{DD} = 9 V, V_{SS} = –9 V		–6.4	
				V_{DD} = 12 V, V_{SS} = –12 V		–6.4	
				V_{DD} = 15 V, V_{SS} = –15 V		–6.4	
I_{CC}	Supply current from V_{CC}	V_{CC} = 5 V,	All inputs at 5 V,	No load		60	mA

DRIVER SECTION

electrical characteristics over recommended operating free-air temperature range, V_{DD} = 9 V, V_{SS} = –9 V, V_{CC} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	V_{IL} = 0.8 V,	R_L = 3 kΩ,	See Figure 1	6	7.5		V
V_{OL}	Low-level output voltage (see Note 3)	V_{IH} = 1.9 V,	R_L = 3 kΩ,	See Figure 1		–7.5	–6	V
I_{IH}	High-level input current	V_I = 5 V,	See Figure 2				10	µA
I_{IL}	Low-level input current	V_I = 0,	See Figure 2				–1.6	mA
$I_{OS(H)}$	High-level short-circuit output current (see Note 4)	V_{IL} = 0.8 V,	V_O = 0,	See Figure 1	–4.5	–12	–19.5	mA
$I_{OS(L)}$	Low-level short-circuit output current	V_{IH} = 2 V,	V_O = 0,	See Figure 1	4.5	12	19.5	mA
r_O	Output resistance (see Note 5)	V_{CC} = V_{DD} = V_{SS} = 0,	V_O = –2 V to 2 V		300			Ω

NOTES: 3. The algebraic convention, where the more positive (less negative) limit is designated as maximum, is used in this data sheet for logic levels only (e.g., if –10 V is maximum, the typical value is a more negative voltage).
4. Output short-circuit conditions must maintain the total power dissipation below absolute maximum ratings.
5. Test conditions are those specified by TIA/EIA-232-F and as listed above.

switching characteristics, V_{CC} = 5 V, V_{DD} = 12 V, V_{SS} = –12 V, T_A = 25°C (see Figure 3)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	R_L = 3 kΩ to 7 kΩ,	C_L = 15 pF		315	500	ns
t_{PHL}	Propagation delay time, high- to low-level output	R_L = 3 kΩ to 7 kΩ,	C_L = 15 pF		75	175	ns
t_{TLH}	Transition time, low- to high-level output	R_L = 3 kΩ to 7 kΩ	C_L = 15 pF		60	100	ns
			C_L = 2500 pF, See Note 6		1.7	2.5	µs
t_{THL}	Transition time, high- to low-level output	R_L = 3 kΩ to 7 kΩ	C_L = 15 pF		40	75	ns
			C_L = 2500 pF, See Note 6		1.5	2.5	µs

NOTE 6: Measured between ±3-V and ±3-V points of the output waveform (TIA/EIA-232-F conditions), all unused inputs are tied either high or low.

RECEIVER SECTION

electrical characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage	T_A = 25°C	See Figure 5	1.75	1.9	2.3	V
		T_A = 0°C to 70 °C		1.55		2.3	
$V_{IT–}$	Negative-going input threshold voltage			0.75	0.97	1.25	V
V_{hys}	Input hysteresis voltage ($V_{IT+} – V_{IT–}$)			0.5			V
V_{OH}	High-level output voltage	I_{OH} = –0.5 mA	V_{IH} = 0.75 V	2.6	4	5	V
			Inputs open	2.6			
V_{OL}	Low-level input voltage	I_{OL} = 10 mA,	V_I = 3 V		0.2	0.45	V
I_{IH}	High-level input current	V_I = 25 V,	See Figure 5	3.6		8.8	mA
		V_I = 3 V,	See Figure 5	0.43			
I_{IL}	Low-level output current	V_I = –25 V,	See Figure 5	–3.6		–8.8	mA
		V_I = –3 V,	See Figure 5	–0.43			
I_{OS}	Short-circuit output current	See Figure 4			–3.4	–12	mA

† All typical values are at T_A = 25°C, V_{CC} = 5 V, V_{DD} = 9 V, and V_{SS} = –9 V.

switching characteristics, V_{CC} = 5 V, V_{DD} = 12 V, V_{SS} = –12 V, T_A = 25°C (see Figure 6)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	C_L = 50 pF,	R_L = 5 kΩ		107	250	ns
t_{PHL}	Propagation delay time, high- to low-level output				42	150	ns
t_{TLH}	Transition time, low- to high-level output				175	350	ns
t_{THL}	Transition time, high- to low-level output				16	60	ns
t_{PLH}	Propagation delay time, low- to high-level output	C_L = 15 pF,	R_L = 1.5 kΩ		100	160	ns
t_{PHL}	Propagation delay time, high- to low-level output				60	100	ns
t_{TLH}	Transition time, low- to high-level output				90	175	ns
t_{THL}	Transition time, high- to low-level output				15	50	ns

PARAMETER MEASUREMENT INFORMATION

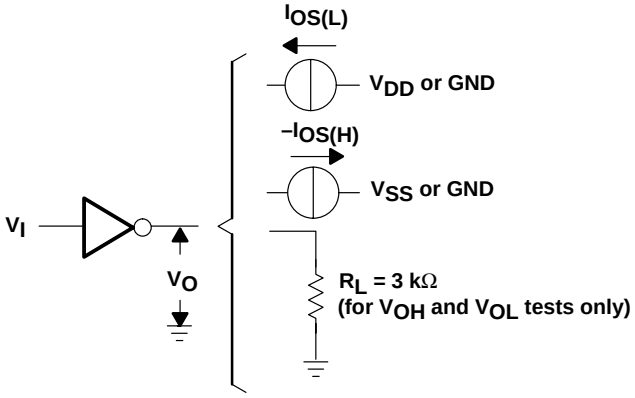


Figure 1. Driver Test Circuit for V_{OH}, V_{OL}, $I_{OS(H)}$, and $I_{OS(L)}$

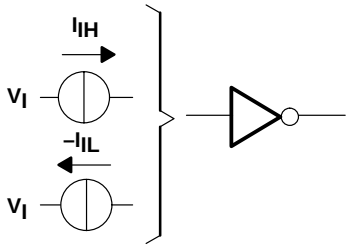
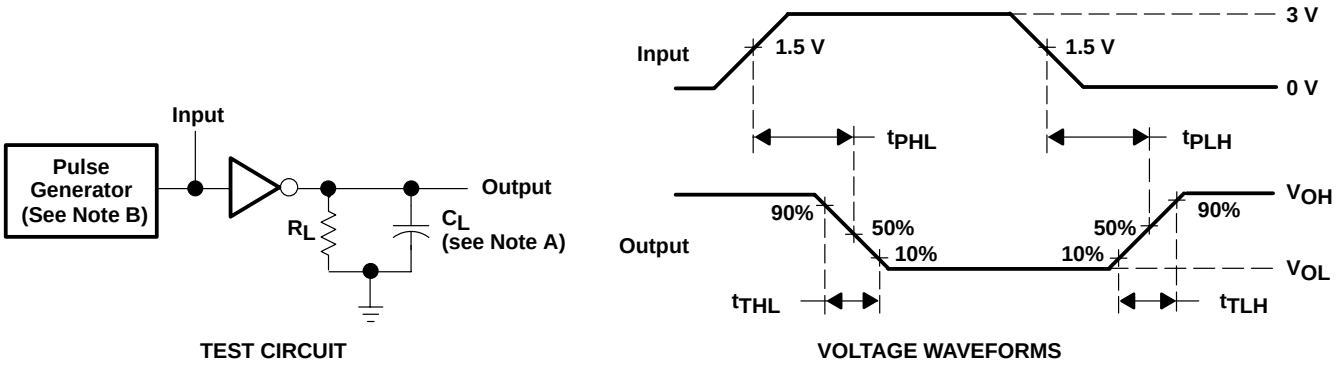


Figure 2. Driver Test Circuit for I_{IH} and I_{IL}



NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: t_W = 25 μs, PRR = 20 kHz, Z_O = 50 Ω, $t_r = t_f$ < 50 ns.

Figure 3. Driver Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION

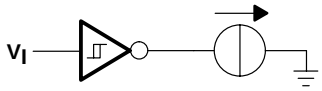


Figure 4. Receiver Test Circuit for I_{OS}

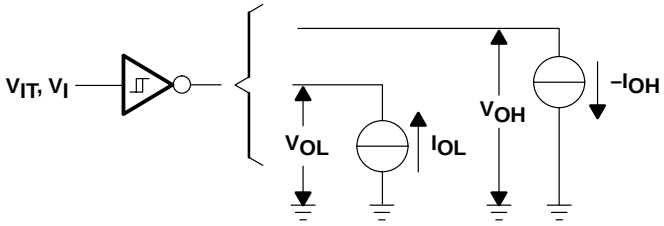
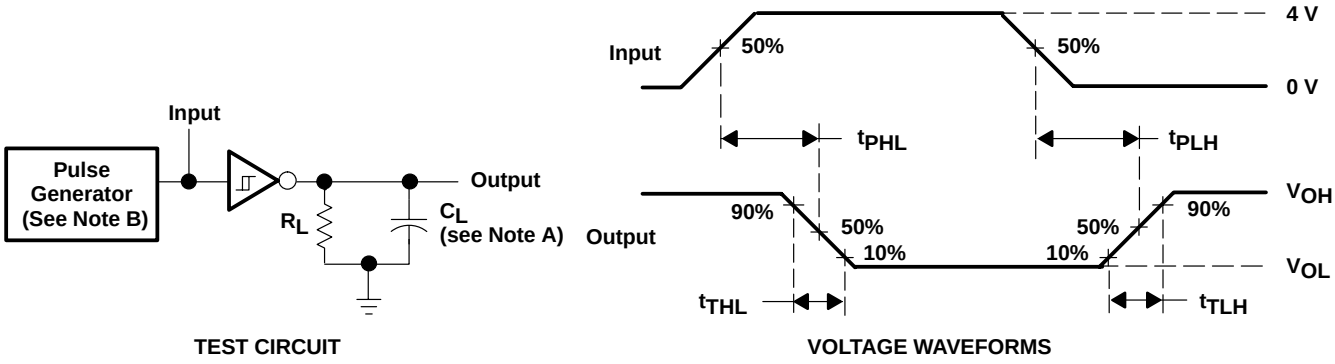


Figure 5. Receiver Test Circuit for V_{IT}, V_{OH}, and V_{OL}



NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: t_W = 25 µs, PRR = 20 kHz, Z_O = 50 Ω, $t_r = t_f$ < 50 ns.

Figure 6. Receiver Propagation and Transition Times

TYPICAL CHARACTERISTICS

DRIVER SECTION

VOLTAGE TRANSFER CHARACTERISTICS

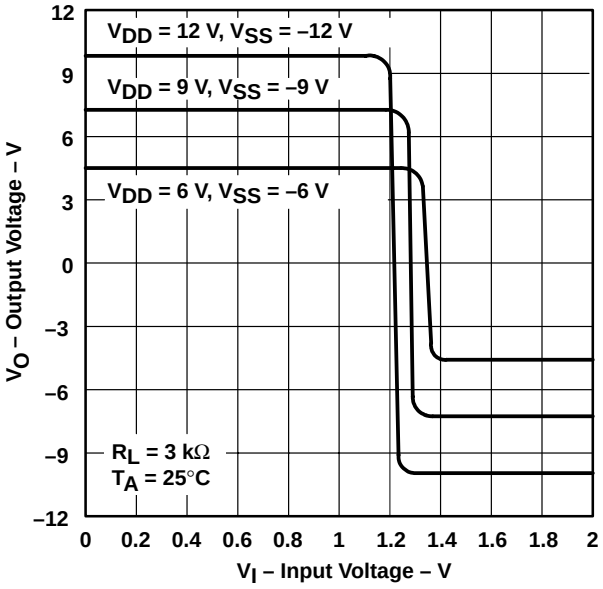


Figure 7

OUTPUT CURRENT vs OUTPUT VOLTAGE

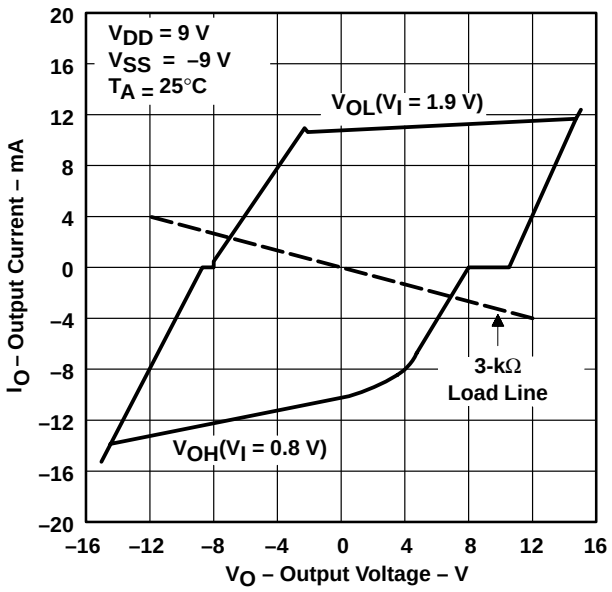


Figure 8

SHORT-CIRCUIT OUTPUT CURRENT vs FREE-AIR TEMPERATURE

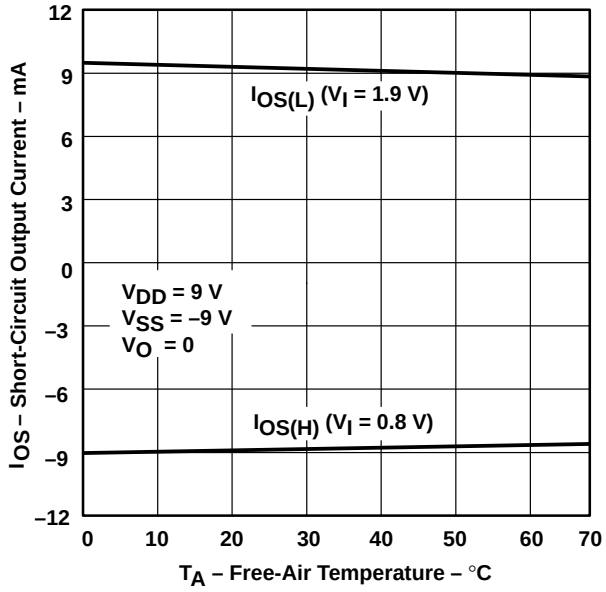


Figure 9

SLEW RATE vs LOAD CAPACITANCE

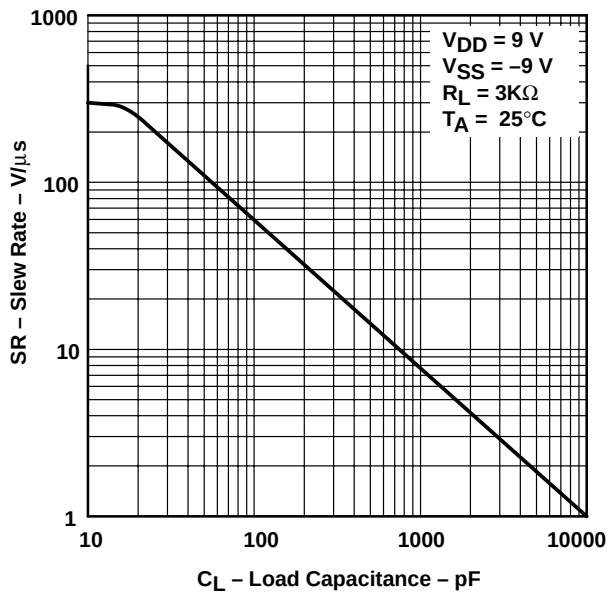


Figure 10

TYPICAL CHARACTERISTICS

INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE

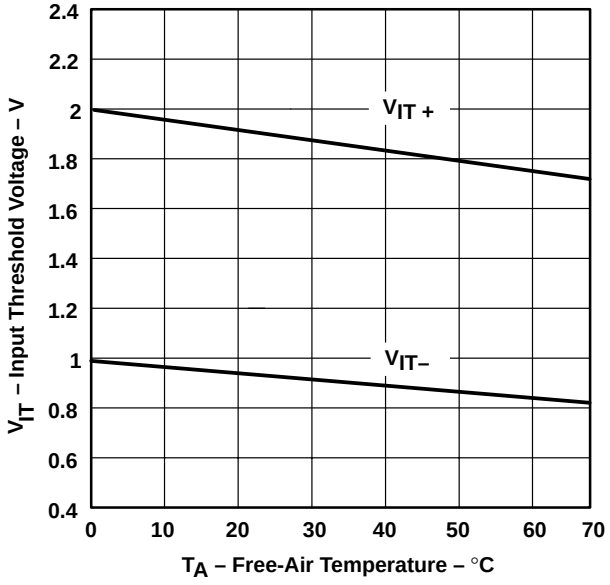


Figure 11

INPUT THRESHOLD VOLTAGE vs SUPPLY VOLTAGE

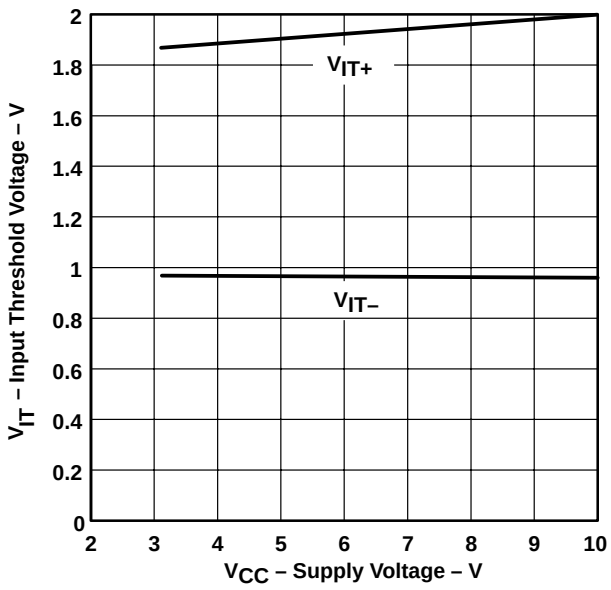
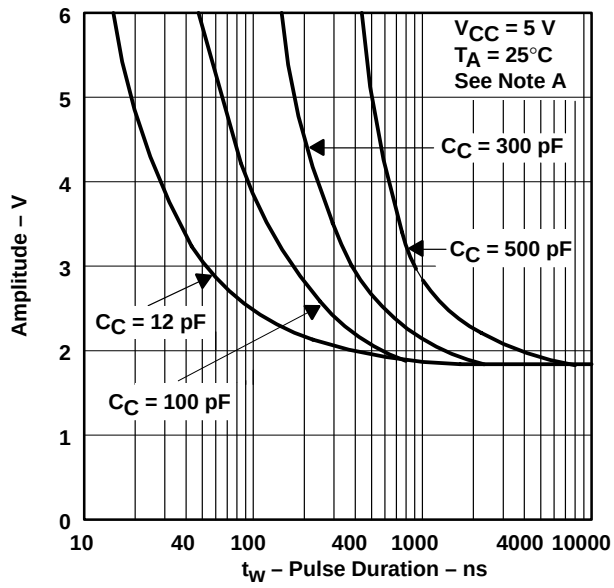


Figure 12

NOISE REJECTION



NOTE A: This figure shows the maximum amplitude of a positive-going pulse that, starting from 0 V, does not cause a change of the output level.

Figure 13

MAXIMUM SUPPLY VOLTAGE vs FREE-AIR TEMPERATURE

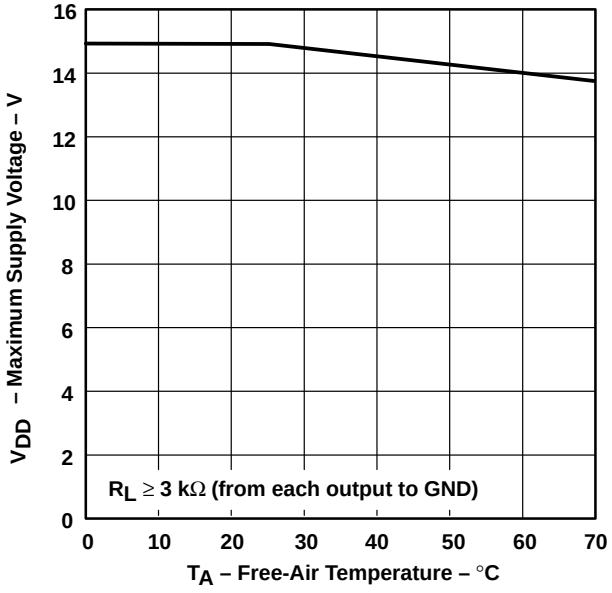


Figure 14

APPLICATION INFORMATION

Diodes placed in series with the V_{DD} and V_{SS} leads protect the SN752232 in the fault condition in which the device outputs are shorted to ±15 V, and the power supplies are at low and provide low-impedance paths to ground (see Figure 15).

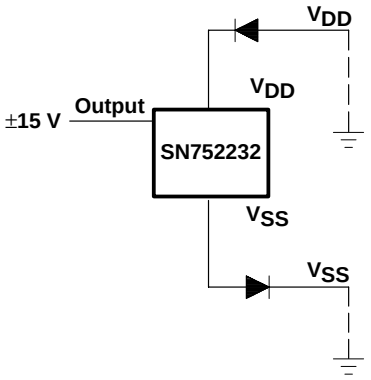
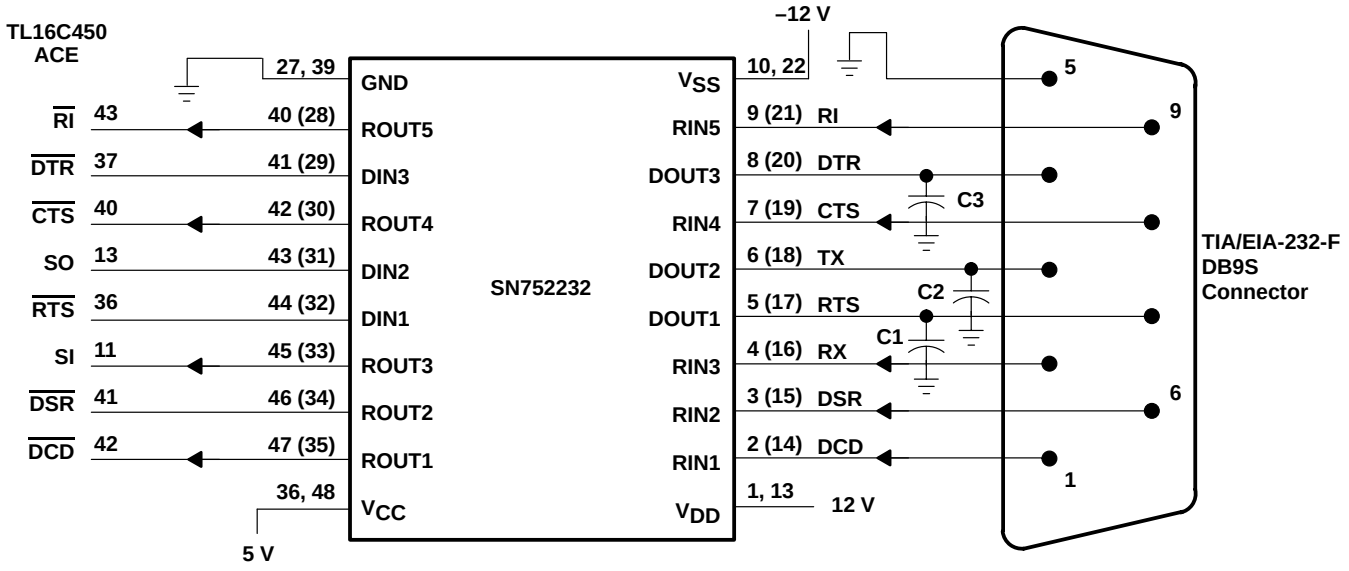


Figure 15. Power-Supply Protection to Meet Power-Off Fault Conditions of TIA/EIA-232-F



NOTE A: Numbers in parentheses are for B section.

Figure 16. Typical Connection Per Port

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Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265