DSV14196 +3.3V Supply EIA/TIA-232 5 Driver x 3 Receiver

Check for Samples: DSV14196

FEATURES

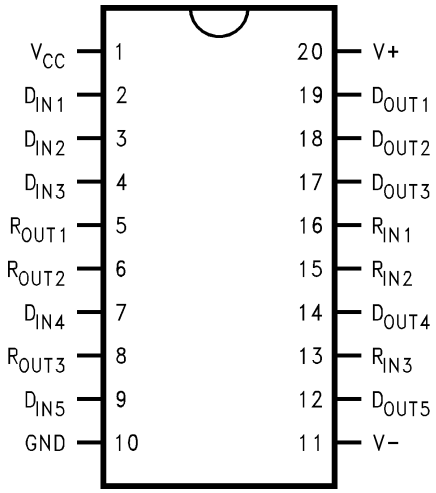
- **Conforms to EIA/TIA-232-E and ITU-T V.28**
- **5 Drivers and 3 Receivers**
- **Flow-Through Pinout**
- **Failsafe Receiver Outputs High when Inputs Open**
- **20-Pin Wide SOIC Package**
- **LapLink® Compatible—230.4 kbps Data Tate**
- **+3.3V Logic Interface**
- **Commercial Temperature Range Option DSV14196 (0°C to 70°C)**
- **Industrial Temperature Range Option DSV14196T**
  - **(−40°C to +85°C)**

DESCRIPTION

The DSV14196/DSV14196T is a five driver, three receiver device which conforms to the EIA/TIA-232-E and the ITU-T V.28 standards.

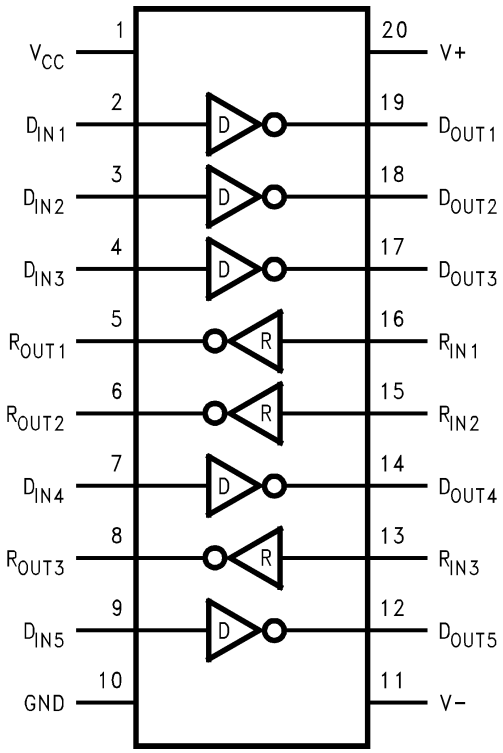
The flow-through pinout facilitates simple non-crossover board layout. The DSV14196/DSV14196T provides a peripheral side one-chip solution for the common 9-pin serial RS-232 interface between data terminals and data communications equipment.

Connection Diagram



SOIC
See Package Number DW

Functional Diagram



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings(1)(2)

Supply Voltage (V_{CC})		+7V
Supply Voltage (V^+)		+15V
Supply Voltage (V^-)		−15V
Driver Input Voltage		0V to V_{CC}
Driver Output Voltage (Power Off)		±15V
Receiver Input Voltage		±25V
Receiver Output Voltage (R_{OUT})		0V to V_{CC}
Maximum Power Package Dissipation @ +25°C	DW Package	1524 mW
	Derate DW Package	12.2 mW/°C above 25°C
Storage Temperature Range		−65°C to +150°C
Lead Temperature Range (Soldering, 4 sec.)		+260°C
ESD Ratings (HBM. 1.5 kΩ, 100 pF)		≥1.5 kV

(1) Absolute Maximum Ratings are those values beyond which the safety of the device cannot be ensured. They are not meant to imply that the devices should be operated at these limits. The table of Electrical Characteristics specifies conditions of device operation.

(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.

Recommended Operating Conditions

	Min	Nom	Max	Units
Supply Voltage (V_{CC})	+3.0	+3.3	+3.6	V
Supply Voltage (V^+)	+9.0	+12.0	+13.2	V
Supply Voltage (V^-)	−13.2	−12.0	−9.0	V
Operating Free Air				
Temperature (T_A)				
DSV14196	0	+25	+70	°C
DSV14196T	−40	+25	+85	°C

Electrical Characteristics[1][2]
DSV14196

Over recommended operating supply and temperature ranges unless otherwise specified

Symbol	Parameter	Conditions		Min	Typ	Max	Units
DEVICE CHARACTERISTICS							
I_{CC}	V_{CC} Supply Current	No Load, All Inputs at +3.3V			8	16	mA
I^+	V^+ Supply Current	No Load, All Driver Inputs at 0.8V or +2V. All Receiver Inputs at 0.7V or 2.4V.	V^+ = +9V, V^- = −9V		16	26	mA
			V^+ = +13.2V, V^- = −13.2V		23	36	mA
I^-	V^- Supply Current		V^+ = +9V, V^- = −9V		−18	−26	mA
			V^+ = +13.2V, V^- = −13.2V		−25	−36	mA
DRIVER CHARACTERISTICS							
V_{IH}	High Level Input Voltage			2.0			V
V_{IL}	Low Level Input Voltage					0.8	V
I_{IH}	High Level Input Current	V_{IN} = 3.3V				10	µA
I_{IL}	Low Level Input Current	V_{IN} = 0V			−1.1	−1.5	mA
V_{OH}	High Level Output Voltage	R_L = 3 kΩ, V_{IN} = 0.8V, V^+ = +9V, V^- = −9V		6	7		V
		R_L = 3 kΩ, V_{IN} = 0.8V, V^+ = +12V, V^- = −12V		8	9		V
		R_L = 7 kΩ, V_{IN} = 0.8V, V^+ = +13.2V, V^- = −13.2V		10	11.5		V
V_{OL}	Low Level Output Voltage	R_L = 3 kΩ, V_{IN} = 2V, V^+ = +9V, V^- = −9V			−7	−6	V
		R_L = 3 kΩ, V_{IN} = 2V, V^+ = +12V, V^- = −12V			−10	−8	V
		R_L = 7 kΩ, V_{IN} = 2V, V^+ = +13.2V, V^- = −13.2V			−11.5	−10	V
I_{OS}+	Output High Short Circuit Current[3]	V_{OUT} = 0V, V_{IN} = 0.8V		−6	−12	−18	mA
I_{OS}−	Output Low Short Circuit Current[3]	V_{OUT} = 0V, V_{IN} = 2.0V		6	12	18	mA
R_O	Output Resistance	−2V ≤ V_{OUT} ≤ +2V, V^+ = V^- = V_{CC} = 0V		300			Ω
		−2V ≤ V_{OUT} ≤ +2V, V^+ = V^- = V_{CC} = Open Circuit		300			Ω
RECEIVER CHARACTERISTICS							
V_{TH}	Input High Threshold (Recognized as a High Signal)	V_{OUT} ≤ 0.4V, I_O = 3.2 mA		1.5	1.85	2.4	V
V_{TL}	Input Low Threshold (Recognized as a Low Signal)	V_{OUT} ≥ 1.7V, I_O = −0.5 mA		0.7	0.9	1.3	V
R_{IN}	Input Resistance	V_{IN} = ±3V to ±15V		3.0	3.8	7.0	kΩ
I_{IN}	Input Current	V_{IN} = +15V		2.1	4.0	5.0	mA
		V_{IN} = +3V		0.43	0.7	1.0	mA
		V_{IN} = −15V		−2.1	−4.0	−5.0	mA
		V_{IN} = −3V		−0.43	−0.7	−1.0	mA
V_{OH}	High Level Output Voltage[4]	I_{OH} = −0.5 mA, V_{IN} = −3V		1.7	2.4		V
		I_{OH} = −10 µA, V_{IN} = −3V		2.7	3.2		V
		I_{OH} = −0.5 mA, V_{IN} = Open Circuit		1.7	2.4		V
		I_{OH} = −10 µA, V_{IN} = Open Circuit		2.7	3.2		V
V_{OL}	Low Level Output Voltage	I_{OL} = 3.2 mA, V_{IN} = +3V			0.2	0.4	V
I_{OSR}	Short Circuit Current	V_{OUT} = 0V, V_{IN} = 0V[3]		−0.6	−1.8	−3.0	mA

(1) Current into device pins is defined as positive. Current out of the device pins is defined as negative. All voltages are referenced to ground unless otherwise specified. For current, minimum and maximum values are specified as an absolute value and the sign is used to indicate direction. For voltage logic levels, the more positive value is designated as maximum. For example, if −6V is a maximum, the typical value −6.8V is more negative.
(2) All typicals are given for: V_{CC} = +3.3V, V^+ = +12V, V^- = −12V, T_A = +25°C.
(3) Only one driver output shorted at a time.
(4) If receiver inputs are unconnected, receiver output is a logic high.

Electrical Characteristics[1][2]
DSV14196T

Over recommended operating supply and temperature ranges unless otherwise specified

Symbol	Parameter	Conditions		Min	Typ	Max	Units
DEVICE CHARACTERISTICS							
I_{CC}	V_{CC} Supply Current	No Load, All Inputs at +3.3V			8	16	mA
I^+	V^+ Supply Current	No Load, All Driver Inputs at 0.8V or +2V. All Receiver Inputs at 0.7V or 2.4V.	V^+ = +9V, V^- = −9V		16	26	mA
			V^+ = +13.2V, V^- = −13.2V		23	36	mA
I^-	V^- Supply Current		V^+ = +9V, V^- = −9V		−18	−26	mA
			V^+ = +13.2V, V^- = −13.2V		−25	−36	mA
DRIVER CHARACTERISTICS							
V_{IH}	High Level Input Voltage			2.0			V
V_{IL}	Low Level Input Voltage					0.8	V
I_{IH}	High Level Input Current	V_{IN} = 3.3V				10	µA
I_{IL}	Low Level Input Current	V_{IN} = 0V			−1.1	−1.9	mA
V_{OH}	High Level Output Voltage	R_L = 3 kΩ, V_{IN} = 0.8V, V^+ = +9V, V^- = −9V		5.5	7		V
		R_L = 3 kΩ, V_{IN} = 0.8V, V^+ = +12V, V^- = −12V		7.5	9		V
		R_L = 7 kΩ, V_{IN} = 0.8V, V^+ = +13.2V, V^- = −13.2V		9	11.5		V
V_{OL}	Low Level Output Voltage	R_L = 3 kΩ, V_{IN} = 2V, V^+ = +9V, V^- = −9V			−7	−5.5	V
		R_L = 3 kΩ, V_{IN} = 2V, V^+ = +12V, V^- = −12V			−10	−7.5	V
		R_L = 7 kΩ, V_{IN} = 2V, V^+ = +13.2V, V^- = −13.2V			−11.5	−9	V
I_{OS}+	Output High Short Circuit Current[3]	V_{OUT} = 0V, V_{IN} = 0.8V		−4	−12	−22	mA
I_{OS}−	Output Low Short Circuit Current[3]	V_{OUT} = 0V, V_{IN} = 2.0V		4	12	22	mA
R_O	Output Resistance	−2V ≤ V_{OUT} ≤ +2V, V^+ = V^- = V_{CC} = 0V		300			Ω
		−2V ≤ V_{OUT} ≤ +2V, V^+ = V^- = V_{CC} = Open Circuit		300			Ω
RECEIVER CHARACTERISTICS							
V_{TH}	Input High Threshold (Recognized as a High Signal)	V_{OUT} ≤ 0.5V, I_O = 3.2 mA		1.4	1.85	2.8	V
V_{TL}	Input Low Threshold (Recognized as a Low Signal)	V_{OUT} ≥ 1.7V, I_O = −0.5 mA		0.5	0.9	1.4	V
R_{IN}	Input Resistance	V_{IN} = ±3V to ±15V, TA = 0°C to 70°C		3.0	3.8	7.0	kΩ
I_{IN}	Input Current	V_{IN} = +15V, TA = 0°C to +70°C		2.1	4.0	5.0	mA
		V_{IN} = +3V, TA = 0°C to +70°C		0.43	0.7	1.0	mA
		V_{IN} = −15V, TA = 0°C to +70°C		−2.1	−4.0	−5.0	mA
		V_{IN} = −3V, TA = 0°C to +70°C		−0.43	−0.7	−1.0	mA
V_{OH}	High Level Output Voltage[4]	I_{OH} = −0.5 mA, V_{IN} = −3V, V_{CC} = 3.3V		1.8	2.4		V
		I_{OH} = −10 µA, V_{IN} = −3V, V_{CC} = 3.3V		3.0	3.2		V
		I_{OH} = −0.5 mA, V_{IN} = Open Circuit, V_{CC} = 3.3V		1.8	2.4		V
		I_{OH} = −10 µA, V_{IN} = Open Circuit, V_{CC} = 3.3V		3.0	3.2		V
V_{OL}	Low Level Output Voltage	I_{OL} = 3.2 mA, V_{IN} = +3V			0.2	0.5	V
I_{OSR}	Short Circuit Current	V_{OUT} = 0V, V_{IN} = 0V [3]		−0.4	−1.8	−3.2	mA

(1) Current into device pins is defined as positive. Current out of the device pins is defined as negative. All voltages are referenced to ground unless otherwise specified. For current, minimum and maximum values are specified as an absolute value and the sign is used to indicate direction. For voltage logic levels, the more positive value is designated as maximum. For example, if −6V is a maximum, the typical value −6.8V is more negative.
(2) All typicals are given for: V_{CC} = +3.3V, V^+ = +12V, V^- = −12V, T_A = +25°C.
(3) Only one driver output shorted at a time.
(4) If receiver inputs are unconnected, receiver output is a logic high.

Switching Characteristics[1][2][3]
DSV14196 & DSV14196T

T_A = +25°C

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DRIVER CHARACTERISTICS						
t_{PHL}	Propagation Delay High to Low	R_L = 3 kΩ, C_L = 50 pF (See Figure 1 and Figure 3)		60	350	ns
t_{PLH}	Propagation Delay Low to High			240	350	ns
t_r, t_f	Rise/Fall Time[4]			40		ns
RECEIVER CHARACTERISTICS						
t_{PHL}	Propagation Delay High to Low	R_L = 1.5 kΩ, C_L = 15 pF (includes fixture plus probe), (See Figure 2 and Figure 4)		150	350	ns
t_{PLH}	Propagation Delay Low to High			240	350	ns
t_r	Rise Time			40	175	ns
t_f	Fall Time			40	100	ns

(1) All typicals are given for: V_{CC} = +3.3V, V^+ = +12V, V^- = −12V, T_A = +25°C.
(2) Generator characteristics for driver input: f = 64 kHz (128 kbps), t_r = t_f < 10 ns, V_{IH} = 3V, V_{IL} = 0V, duty cycle = 50%.
(3) Generator characteristics for receiver input: f = 64 kHz (128 kbps), t_r = t_f = 200 ns, V_{IH} = 3V, V_{IL} = −3V, duty cycle = 50%.
(4) Refer to Typical Performance Characteristics. Driver output slew rate is measured from the +3V to the −3V level on the output waveform. Inputs not under test are connected to V_{CC} or GND. Slew rate is determined by load capacitance. To comply with a 30 V/µs maximum slew rate, a minimum load capacitance of 390 pF for DSV14196 or 620 pF for DSV14196T is recommended.

PARAMETER MEASUREMENT INFORMATION

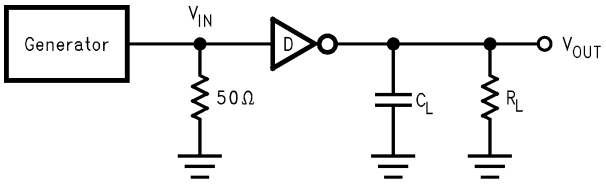


Figure 1. Driver Propagation Delay and Transition Time Test Circuit (5)

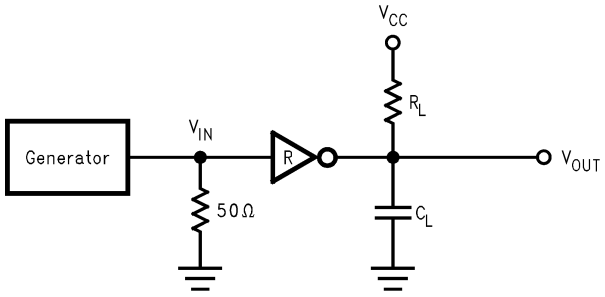


Figure 2. Receiver Propagation Delay and Transition Time Test Circuit(6)

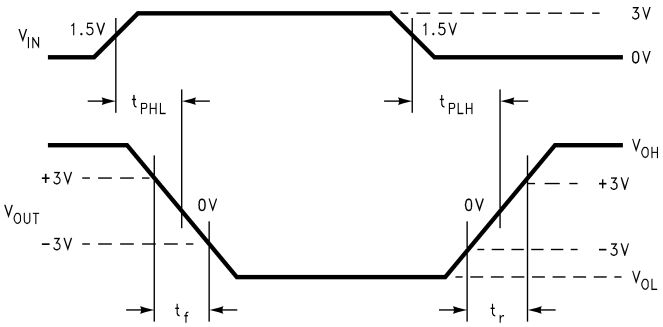


Figure 3. Driver Propagation Delay and Transition Time Waveforms Slew Rate (SR) = 6V/(t_r or t_f)

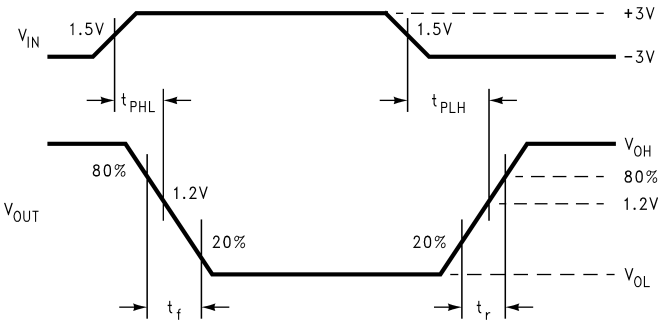


Figure 4. Receiver Propagation Delay and Transition Time Waveform

(5) Generator characteristics for driver input: f = 64 kHz (128 kbps), $t_r = t_f < 10$ ns, $V_{IH} = 3V$, $V_{IL} = 0V$, duty cycle = 50%.
(6) Generator characteristics for receiver input: f = 64 kHz (128 kbps), $t_r = t_f = 200$ ns, $V_{IH} = 3V$, $V_{IL} = -3V$, duty cycle = 50%.

PIN DESCRIPTIONS

Pin #	Pin Name	Description
2, 3, 4, 7, 9	D_{IN}	Driver Input Pins
12, 14, 17, 18, 19	D_{OUT}	Driver Output Pins, RS-232 Levels
13, 15, 16	R_{IN}	Receiver Input Pins, RS-232 Levels
5, 6, 8	R_{OUT}	Receiver Output Pins
10	GND	Ground
20	V^+	Positive Power Supply Pin ($+9.0 \le V^+ \le +13.2$)
11	V^-	Negative Power Supply Pin ($-9.0 \le V^- \le -13.2$)
1	V_{CC}	Positive Power Supply Pin (+3.3V ±10%)

APPLICATION INFORMATION

In a typical Data Terminal Equipment (DTE) to Data Circuit-Terminating Equipment (DCE) 9-pin de-facto interface implementation, 2 data lines and 6 control lines are required. The data lines are TXD and RXD. The control lines are RTS, DTR, DSR, DCD, CTS and RI.

The DSV14196/DSV14196T is a 5 x 3 Driver/Receiver and offers a single chip solution for this DTE interface. As shown in *Figure 5*, this interface allows for direct flow-thru interconnect. For a more conservative design, the user may wish to insert ground traces between the signal lines to minimize cross talk.

FAILSAFE RECEIVER OUTPUTS

The DSV14196/DSV14196T features failsafe receiver outputs. In failsafe mode, if the receiver input becomes zero or an open-circuit, the receiver output is pulled to a high level.

LapLink® COMPATIBILITY

The DSV14196/DSV14196T can easily provide 128 kbps data rate under maximum driver load conditions of C_L = 2500 pF and R_L = 3 kΩ, while power supplies are:

V_{CC} = +3.0V, V^+ = 10.8V, V^- = −10.8V (1)

MOUSE DRIVING

A typical mouse can be powered from the drivers. Two driver outputs connected in parallel and set to V_{OH} can be used to supply power to the V^+ pin of the mouse. The third driver output is set to V_{OL} to sink the current from the V^-terminal. Refer to typical curves of V_{OUT}/I_{OUT}.Typical mouse specifications are:

10 mA at +6V 5 mA at −6V (2)

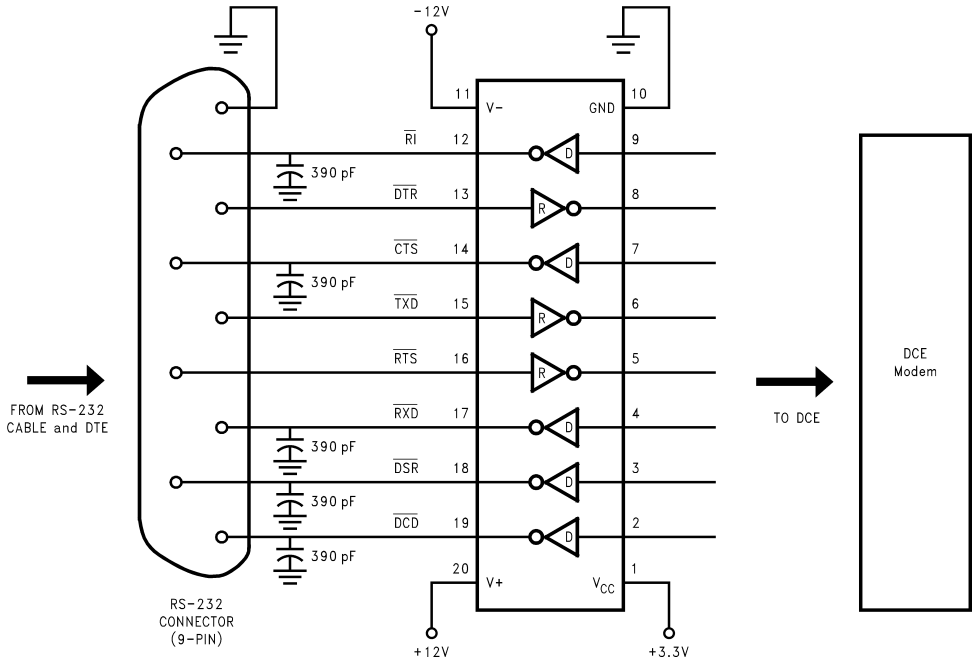


Figure 5. Typical DCE Application

Typical Performance Characteristics

Driver Output Slew Rate between +3V and −3V vs Load Capacitance
Conditions: V_{CC} = 3.3V, R_L = 5 kΩ, T_A = 25°C, f_{IN} = 64 kHz Square Wave

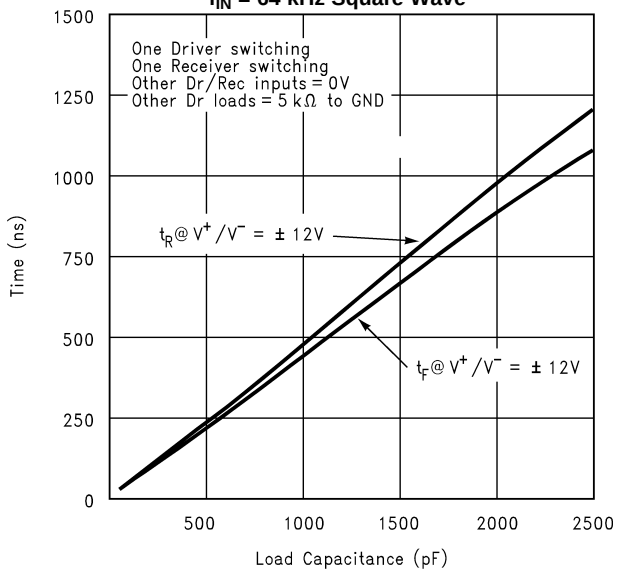


Figure 6.

Driver Output Voltage vs Frequency and C_L
Conditions: V_{CC} = 3.3V, R_L = 5 kΩ, T_A = 25°C

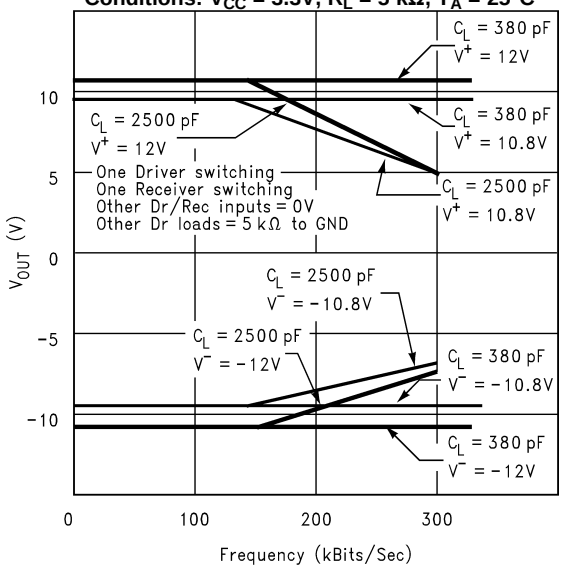


Figure 7.

Driver Output Current vs Output Voltage

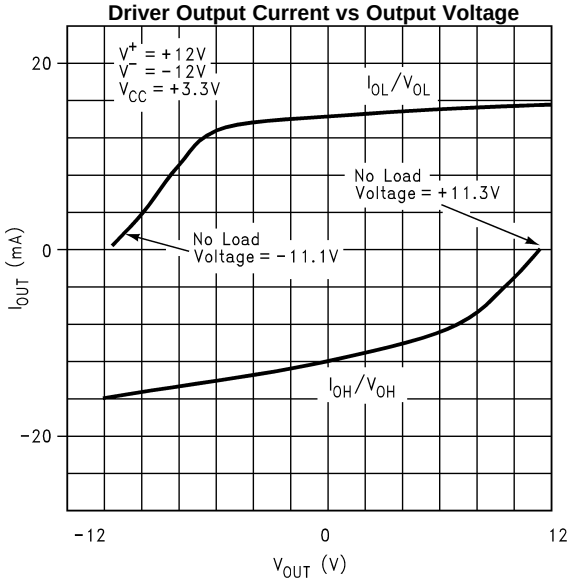


Figure 8.

REVISION HISTORY

Changes from Revision C (April 2013) to Revision D	Page
• Changed layout of National Data Sheet to TI format	9

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265