DS36C280 Slew Rate Controlled CMOS EIA-RS-485 Transceiver

Check for Samples: DS36C280

FEATURES

- **100% RS-485 Compliant**
  - **Guaranteed RS-485 Device Interoperation**
- **Low Power CMOS Design: I_{CC} 500 µA max**
- **Adjustable Slew Rate Control**
  - **Minimizes EMI Effects**
- **Built-In Power Up/Down Glitch-Free Circuitry**
  - **Permits Live Transceiver Insertion/Displacement**
- **SOIC Packages**
- **Industrial Temperature Range: −40°C to +85°C**
- **On-board Thermal Shutdown Circuitry**
  - **Prevents Damage to the Device in the Event of Excessive Power Dissipation**
- **Wide Common Mode Range: −7V to +12V**
- **Receiver Open Input Fail-safe (1)**
- **¼ unit load (DS36C280): ≥128 nodes**
- **½ unit load (DS36C280T): ≥64 nodes**
- **ESD (human body model): ≥2 kV**

(1) Non-terminated, Open Inputs only

DESCRIPTION

The DS36C280 is a low power differential bus/line transceiver designed to meet the requirements of RS-485 Standard for multipoint data transmission. In addition, it is compatible with TIA/EIA-422-B.

The slew rate control feature allows the user to set the driver rise and fall times by using an external resistor. Controlled edge rates can reduce switching EMI.

The CMOS design offers significant power savings over its bipolar and ALS counterparts without sacrificing ruggedness against ESD damage. The device is ideal for use in battery powered or power conscious applications. I_{CC} is specified at 500 µA maximum.

The driver and receiver outputs feature TRI-STATE capability. The driver outputs operate over the entire common mode range of −7V to +12V. Bus contention or fault situations are handled by a thermal shutdown circuit, which forces the driver outputs into the high impedance state.

The receiver incorporates a fail safe circuit which guarantees a high output state when the inputs are left open (1).

Connection and Logic Diagram

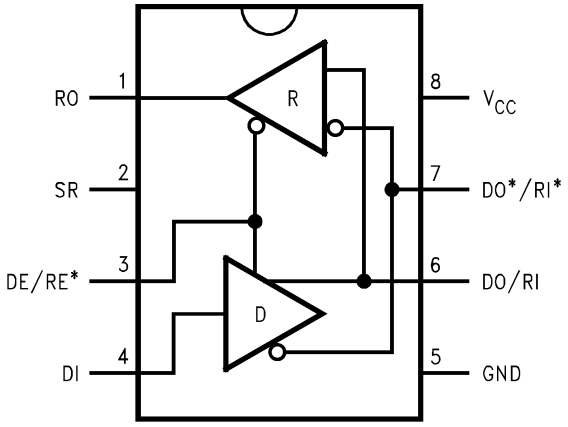


Figure 1. See Package Number D (R-PDSO-G8)

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.

All trademarks are the property of their respective owners.

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

Copyright © 2000–2013, Texas Instruments Incorporated

Truth Table(1)

DRIVER SECTION			
DE/RE*	**DI**	**DO/RI**	**DO*/RI***
H	H	H	L
H	L	L	H
L	X	Z	Z
RECEIVER SECTION			
DE/RE*	**RI-RI***		**RO**
L	≥+0.2V		H
L	≤−0.2V		L
H	X		Z
L	OPEN (1)		H

(1) Non-terminated, Open Inputs only

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})	+12V
Input Voltage (DE/RE*, & DI)	−0.5V to (V_{CC} +0.5V)
Common Mode (V_{CM})	
Driver Output/Receiver Input	±15V
Input Voltage (DO/RI, DO*/RI*)	±14V
Receiver Output Voltage	−0.5V to (V_{CC} +0.5V)
Maximum Package Power Dissipation @ +25°C	
M Package 1190 mV, derate	9.5 mW/°C above +25°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature	+260°C
(Soldering 4 sec.)	

(1) "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. 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 TI Sales Office/Distributors for availability and specifications.

Recommended Operating Conditions

	Min	**Typ**	**Max**	**Units**
Supply Voltage (V_{CC})	+4.75	+5.0	+5.25	V
Bus Voltage	−7		+12	V
Operating Free Air Temperature (T_A)				
DS36C280T	−40	+25	+85	°C
DS36C280	0	+25	+70	°C

Copyright © 2000–2013, Texas Instruments Incorporated

Electrical Characteristics[1][2]

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified

Symbol	Parameter	Conditions		Reference		Min	Typ	Max	Units
DIFFERENTIAL DRIVER CHARACTERISTICS									
V_{OD1}	Differential Output Voltage	I_O = 0 mA (No Load)		(422) (485)		1.5		5.0	V
V_{OD0}	Output Voltage	I_O = 0 mA				0		5.0	V
V_{OD0*}	Output Voltage	(Output to GND)				0		5.0	V
V_{OD2}	Differential Output Voltage (Termination Load)	R_L = 50Ω		(422)	Figure 2	2.0	2.8		V
		R_L = 27Ω		(485)		1.5	2.3	5.0	V
ΔV_{OD2}	Balance of V_{OD2}	R_L = 27Ω or 50Ω		[3]		−0.2	0.1	+0.2	V
	$\lvert V_{OD2} - V_{OD2*} \rvert$			(422, 485)					
V_{OD3}	Differential Output Voltage (Full Load)	R1 = 54Ω, R2 = 375Ω		*Figure 3*		1.5	2.0	5.0	V
		V_{TEST} = −7V to +12V							
V_{OC}	Driver Common Mode Output Voltage	R_L = 27Ω		(485)	*Figure 2*	0		3.0	V
		R_L = 50Ω		(422)		0		3.0	V
ΔV_{OC}	Balance of V_{OC}	R_L = 27Ω or		[3]		−0.2		+0.2	V
	$\lvert V_{OC} - V_{OC*} \rvert$	R_L = 50Ω		(422, 485)					
I_{OSD}	Driver Output Short-Circuit Current	V_O = +12V		(485)			200	+250	mA
		V_O = −7V		(485)			−190	−250	mA
RECEIVER CHARACTERISTICS									
V_{TH}	Differential Input High Threshold Voltage	$V_O = V_{OH}$, I_O = −0.4 mA		[4] (422, 485)			+0.035	+0.2	V
		−7V ≤ V_{CM} ≤ +12V							
V_{TL}	Differential Input Low Threshold Voltage	$V_O = V_{OL}$, I_O = 0.4 mA				−0.2	−0.035		V
		−7V ≤ V_{CM} ≤ +12V							
V_{HST}	Hysteresis[5]	V_{CM} = 0V					70		mV
R_{IN}	Input Resistance	−7V ≤ V_{CM} ≤ +12V		DS36C280T		24	68		kΩ
R_{IN}	Input Resistance	−7V ≤ V_{CM} ≤ +12V		DS36C280		48	68		kΩ
I_{IN}	Line Input Current [6]	Other Input = 0V	DS36C280	V_{IN} = +12V		0	0.19	0.25	mA
		DE = V_{IL}, RE* = V_{IL}		V_{IN} = −7V		0	−0.1	−0.2	mA
		V_{CC} = 4.75 to 5.25	DS36C280T	V_{IN} = +12V		0	0.19	0.5	mA
		or 0V		V_{IN} = −7V		0	−0.1	−0.4	mA
I_{ING}	Line Input Current Glitch [6]	Other Input = 0V	DS36C280	V_{IN} = +12V		0	0.19	0.25	mA
		DE = V_{IL}, RE* = V_{IL}		V_{IN} = −7V		0	−0.1	−0.2	mA
		V_{CC} = +3.0V	DS36C280T	V_{IN} = +12V		0	0.19	0.5	mA
		or 0V T_A = 25°C		V_{IN} = −7V		0	−0.1	−0.4	mA
I_B	Input Balance Test	RS = 500Ω		(422) [7]				±400	mV
V_{OH}	High Level Output Voltage	I_{OH} = −4 mA, V_{ID} = +0.2V		RO *Figure 12*		3.5	4.6		V
V_{OL}	Low Level Output Voltage	I_{OL} = +4 mA, V_{ID} = −0.2V					0.3	0.5	V
I_{OSR}	Short Circuit Current	V_O = GND		RO		7	35	85	mA
I_{OZR}	TRI-STATE Leakage Current	V_O = 0.4V to 2.4V						±1	µA
DEVICE CHARACTERISTICS									

(1) Current into device pins is defined as positive. Current out of device pins is defined as negative. All voltages are referenced to ground except V_{OD1} and V_{OD2}.
(2) All typicals are given for: V_{CC} = +5.0V, T_A = + 25°C.
(3) Delta $\lvert V_{OD2} \rvert$ and Delta $\lvert V_{OC} \rvert$ are changes in magnitude of V_{OD2} and V_{OC}, respectively, that occur when input changes state.
(4) Threshold parameter limits specified as an algebraic value rather than by magnitude.
(5) Hysteresis defined as $V_{HST} = V_{TH} - V_{TL}$.
(6) I_{IN} includes the receiver input current and driver TRI-STATE leakage current.
(7) For complete details of test, see RS-485.

Copyright © 2000–2013, Texas Instruments Incorporated

Electrical Characteristics[1][2] (continued)

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified

Symbol	Parameter	Conditions		Reference	Min	Typ	Max	Units
V_{IH}	High Level Input Voltage			DE/RE*, DI	2.0		V_{CC}	V
V_{IL}	Low Level Input Voltage				GND		0.8	V
I_{IH}	High Level Input Current	$V_{IH} = V_{CC}$					2	µA
I_{IL}	Low Level Input Current	V_{CC} = 5.0V	V_{IL} = 0V				−2	µA
		V_{CC} = +3.0V					−2	µA
		SR = 0V		SR			−1	mA
I_{CCR}	Power Supply Current (No Load)	Driver OFF, Receiver ON		V_{CC}		200	500	µA
I_{CCD}		Driver ON, Receiver OFF				200	500	µA

Switching Characteristics[1][2][3]

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified

Symbol	Parameter	Conditions	Reference	Min	Typ	Max	Units
DRIVER CHARACTERISTICS							
t_{PHLD}	Differential Propagation Delay High to Low	R_L = 54Ω, C_L = 100 pF	Figure 6, Figure 7	10	399	1000	ns
t_{PLHD}	Differential Propagation Delay Low to High			10	400	1000	ns
t_{SKD}	Differential Skew $\lvert t_{PHLD} - t_{PLHD} \rvert$			0	1	10	ns
t_r	Rise Time	SR = Open			2870		ns
t_f	Fall Time				3070		ns
t_r	Rise Time	SR = 100 kΩ			1590		ns
t_f	Fall Time				1640		ns
t_r	Rise Time	SR = Short		100	337	1000	ns
t_f	Fall Time			100	348	1000	ns
t_{PHZ}	Disable Time High to Z	C_L = 15 pF	Figure 8, Figure 9		1100	2000	ns
t_{PLZ}	Disable Time Low to Z		Figure 10, Figure 11		500	800	ns
t_{PZH}	Enable Time Z to High	C_L = 100 pF	Figure 8, Figure 9		300	500	ns
t_{PZL}	Enable Time Z to Low		Figure 10, Figure 11		300	500	ns
RECEIVER CHARACTERISTICS							
t_{PHL}	Propagation Delay High to Low	C_L = 15 pF	Figure 13, Figure 14	30	210	400	ns
t_{PLH}	Propagation Delay Low to High			30	190	400	ns
t_{SK}	Skew, $\lvert t_{PHL} - t_{PLH} \rvert$			0	20	50	ns
t_{PLZ}	Output Disable Time	C_L = 15 pF	Figure 15, Figure 16, Figure 17		50	150	ns
t_{PHZ}					55	150	ns
t_{PZL}	Output Enable Time				40	150	ns
t_{PZH}					45	150	ns

(1) All typicals are given for: V_{CC} = +5.0V, T_A = + 25°C.
(2) C_L includes probe and jig capacitance.
(3) SR = GND for all Switching Characteristics unless otherwise specified.

Copyright © 2000–2013, Texas Instruments Incorporated

PARAMETER MEASUREMENT INFORMATION

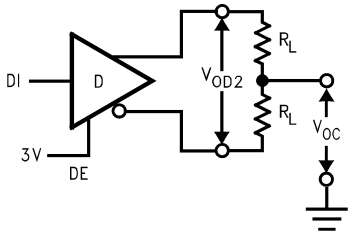


Figure 2. Driver V_{OD2} and V_{OC}

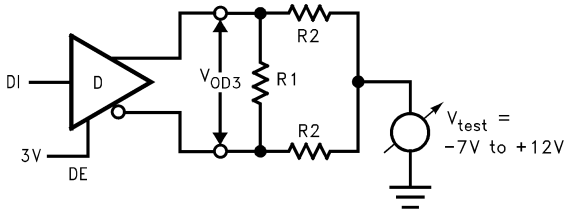


Figure 3. Driver V_{OD3}

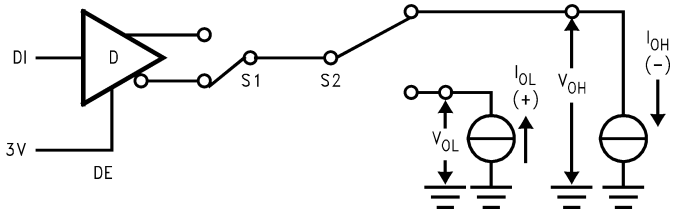
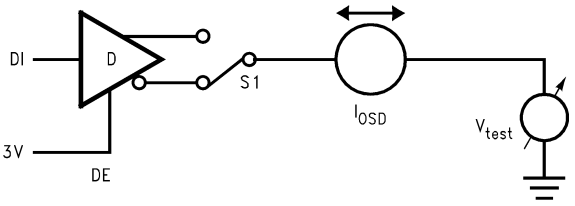


Figure 4. Driver V_{OH} and V_{OL}



Vtest = −7V to +12V

Figure 5. Driver I_{OSD}

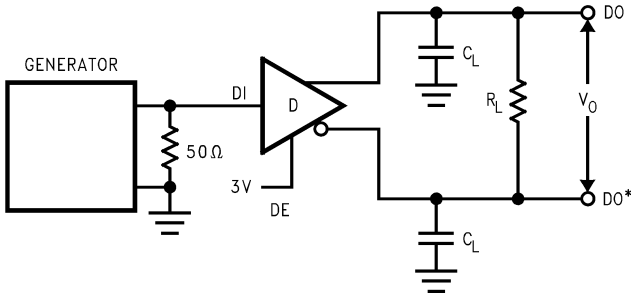


Figure 6. Driver Differential Propagation Delay Test Circuit

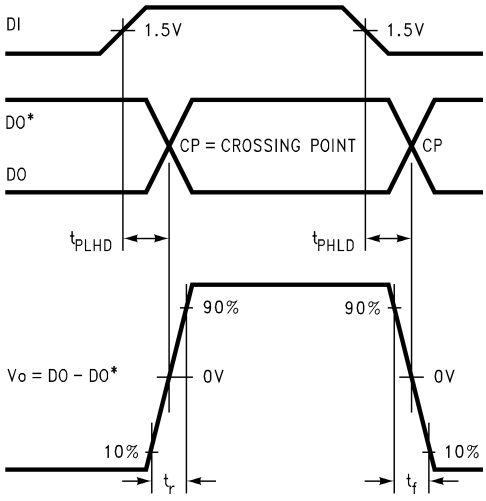


Figure 7. Driver Differential Propagation Delays and Differential Rise and Fall Times

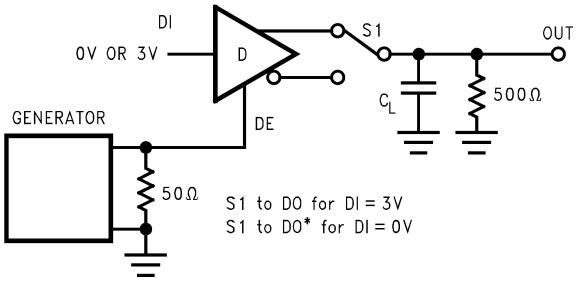


Figure 8. TRI-STATE Test Circuit (t_{PZH} , t_{PHZ})

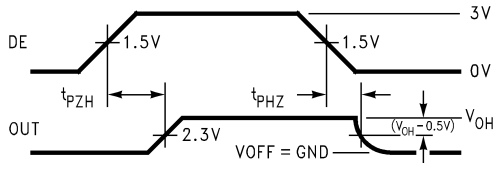


Figure 9. TRI-STATE Waveforms (t_{PZH}, t_{PHZ})

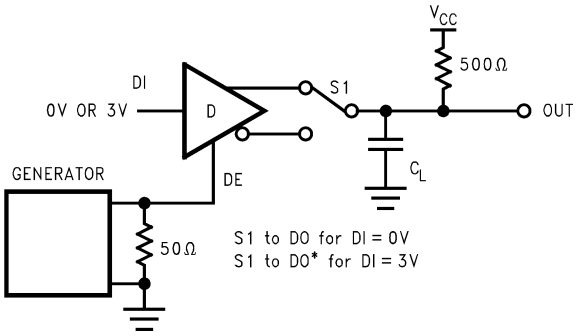


Figure 10. TRI-STATE Test Circuit (t_{PZL}, t_{PLZ})

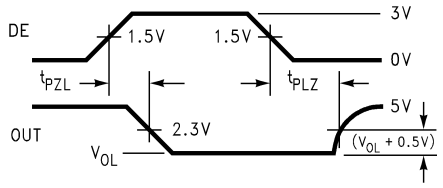


Figure 11. TRI-STATE Waveforms (t_{PZL}, t_{PLZ})

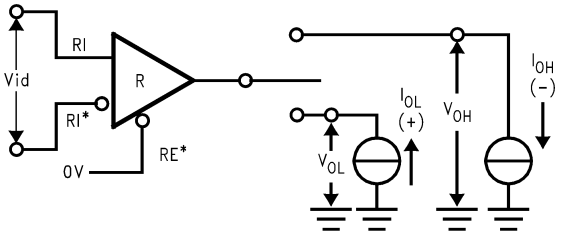


Figure 12. Receiver V_{OH} and V_{OL}

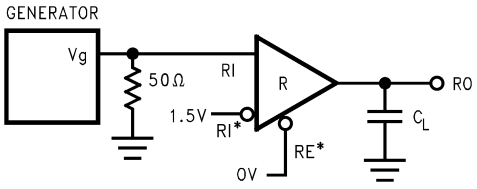


Figure 13. Receiver Differential Propagation Delay Test Circuit

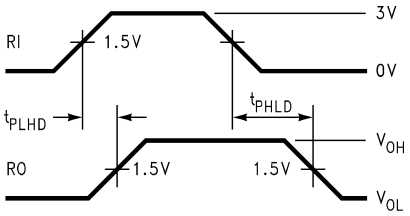


Figure 14. Receiver Differential Propagation Delay Waveforms

Copyright © 2000–2013, Texas Instruments Incorporated

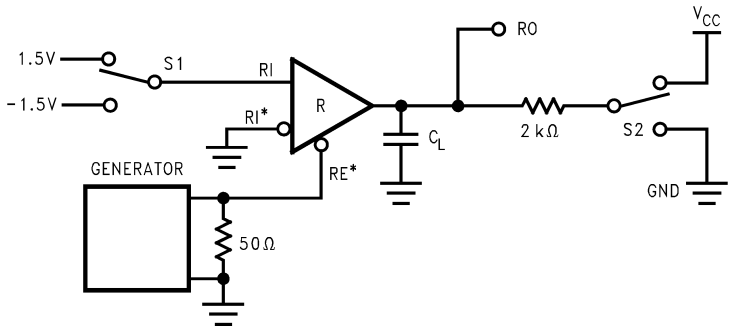


Figure 15. Receiver TRI-STATE Test Circuit

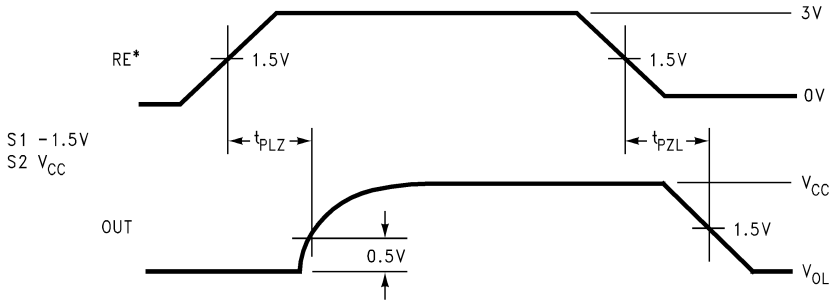


Figure 16. Receiver Enable and Disable Waveforms (t_{PLZ}, t_{PZL})

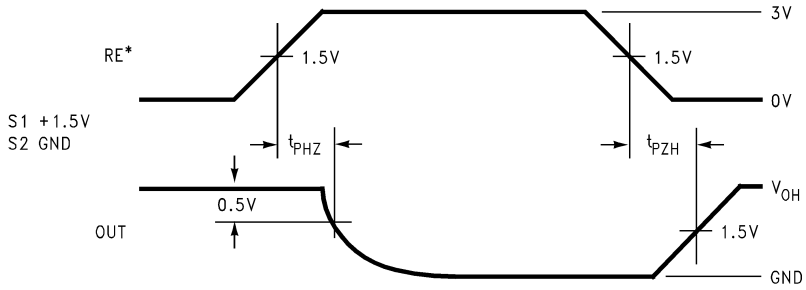


Figure 17. Receiver Enable and Disable Waveforms (t_{PHZ}, t_{PZH})

Typical Application Information

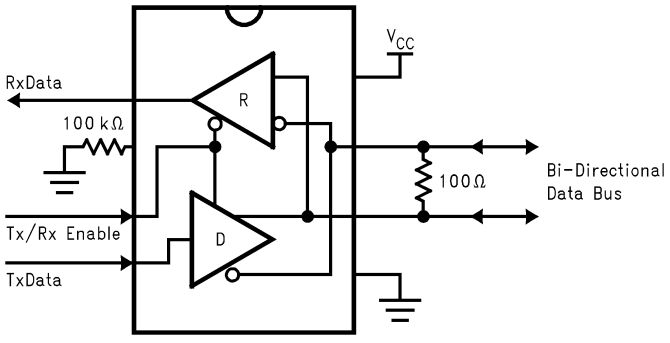


Figure 18. Typical Pin Connection

Table 1. DEVICE PIN DESCRIPTIONS

Pin #	Name	Description
1	RO	Receiver Output: When DE/RE* (Receiver Enable) is LOW, the receiver is enabled (ON), if DO/RI ≥ DO*/RI* by 200 mV, RO will be HIGH. If DO/RI ≤ DO*/RI* by 200 mV, RO will be LOW. Additionally RO will be HIGH for OPEN (Non-terminated) inputs.
2	SR	Slew Rate Control: A resistor connected to Ground controls the Driver Output rising and falling edge rates.
3	DE/RE*	Combined Driver and Receiver Output Enable: When signal is LOW the receiver output is enabled and the driver outputs are in TRI-STATE (OFF). When signal is HIGH, the receiver output is in TRI-STATE (OFF) and the driver outputs are enabled.
4	DI	Driver Input: When DE/RE* is HIGH, the driver is enabled, if DI is LOW, then DO/RI will be LOW and DO*/RI* will be HIGH. If DI is HIGH, then DO/RI is HIGH and DO*/RI* is LOW.
5	GND	Ground Connection
6	DO/RI	Driver Output/Receiver Input, 485 Bus Pin.
7	DO*/RI*	Driver Output/Receiver Input, 485 Bus Pin.
8	V_{CC}	Positive Power Supply Connection: Recommended operating range for V_{CC} is +4.75V to +5.25V.

Unit Load

A unit load for a RS-485 receiver is defined by the input current versus the input voltage curve. The gray shaded region is the defined operating range from −7V to +12V. The top border extending from −3V at 0 mA to +12V at +1 mA is defined as one unit load. Likewise, the bottom border extending from +5V at 0 mA to −7V at −0.8 mA is also defined as one unit load (see Figure 19). A RS-485 driver is capable of driving up to 32 unit loads. This allows upto 32 nodes on a single bus. Although sufficient for many applications, it is sometime desirable to have even more nodes. For example an aircraft that has 32 rows with 4 seats per row could benefit from having 128 nodes on one bus. This would allow signals to be transferred to and from each individual seat to 1 main station. Usually there is one or two less seats in the last row of the aircraft near the restrooms and food storage area. This frees the node for the main station.

The DS36C278, the DS36C279, and the DS36C280 all have ½ unit load and ¼ unit load (UL) options available. These devices will allow upto 64 nodes or 128 nodes guaranteed over temperature depending upon which option is selected. The ½ UL option is available in industrial temperature and the ¼ UL is available in commercial temperature.

First, for a ½ UL device the top and bottom borders shown in Figure 19 are scaled. Both 0 mA reference points at +5V and −3V stay the same. The other reference points are +12V at +0.5 mA for the top border and −7V at −0.4 mA for the bottom border (see Figure 19). Second, for a ¼ UL device the top and bottom borders shown in Figure 19 are scaled also. Again, both 0 mA reference points at +5V and −3V stay the same. The other reference points are +12V at +0.25 mA for the top border and −7V at −0.2 mA for the bottom border (see Figure 19).

The advantage of the ½ UL and ¼ UL devices is the increased number of nodes on one bus. In a single master multi-slave type of application were the number of slaves exceeds 32, the DS36C278/279/280 may save in the cost of extra devices like repeaters, extra media like cable, and/or extra components like resistors.

The DS36C279 and DS36C280 have addition feature which offer more advantages. The DS36C279 has an automatic sleep mode function for power conscious applications. The DS36C280 has a slew rate control for EMI conscious applications. Refer to the sleep mode and slew rate control portion of the application information section in the corresponding datasheet for more information on these features.

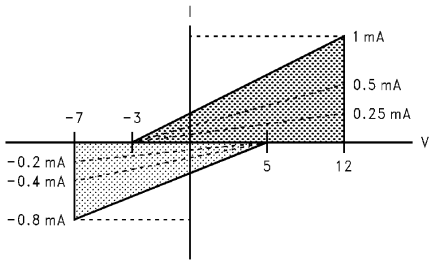


Figure 19. Input Current vs Input Voltage Operating Range

Copyright © 2000–2013, Texas Instruments Incorporated

Slew Rate Control

The DS36C280 features an adjustable slew rate control. This feature allows more control over EMI levels than tradition fixed edge rate devices. The slew rate control may be adjusted with or without any external components. The DS36C280 offers both low power (I_{CC} 500 µA max) and low EMI for an RS-485 interface.

The slew rate control is located at pin two of the device and only controls the driver output edges. The slew rate control pin (SR) may be left open or shorted to ground, with or without a resistor. When the SR pin is shorted to ground without a resistor, the driver output edges will transition typically 350 ns. When the SR pin is left open, the driver output edges will transition typically 3 µs. When the SR pin is shorted to ground with a resistor, the driver output edges will transition between 350 ns and 3 µs depending on the resistor value. Refer to the slew rate versus resistor value curve in this datasheet for determining resistor values and expected typical slew rate value. Please note, when slowing the edge rates of the device will decrease the maximum data rate also.

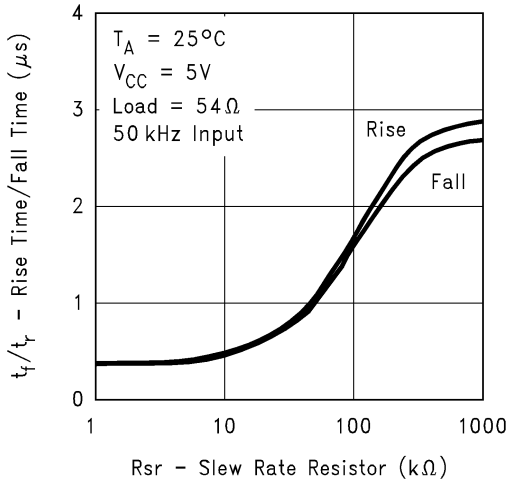


Figure 20. Slew Rate Resistor vs Differential Rise/Rise/Fall Time

Copyright © 2000–2013, Texas Instruments Incorporated

REVISION HISTORY

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

Copyright © 2000–2013, Texas Instruments Incorporated

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
DS36C280M/NOPB	ACTIVE	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	36C28 0M	Samples
DS36C280MX	ACTIVE	SOIC	D	8	2500	TBD	Call TI	Call TI	0 to 70	36C28 0M	Samples
DS36C280MX/NOPB	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	36C28 0M	Samples
DS36C280TM	ACTIVE	SOIC	D	8	95	TBD	Call TI	Call TI	0 to 70	36C28 0TM	Samples
DS36C280TM/NOPB	ACTIVE	SOIC	D	8	95	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	36C28 0TM	Samples
DS36C280TMX/NOPB	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	0 to 70	36C28 0TM	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

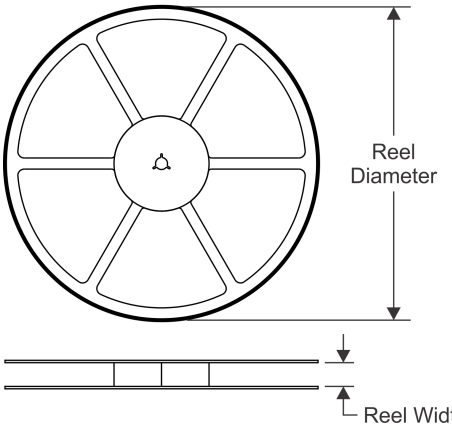
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and

continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals.
TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

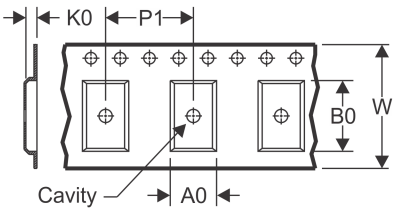
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

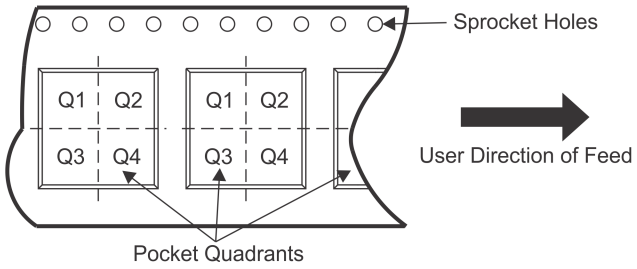


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

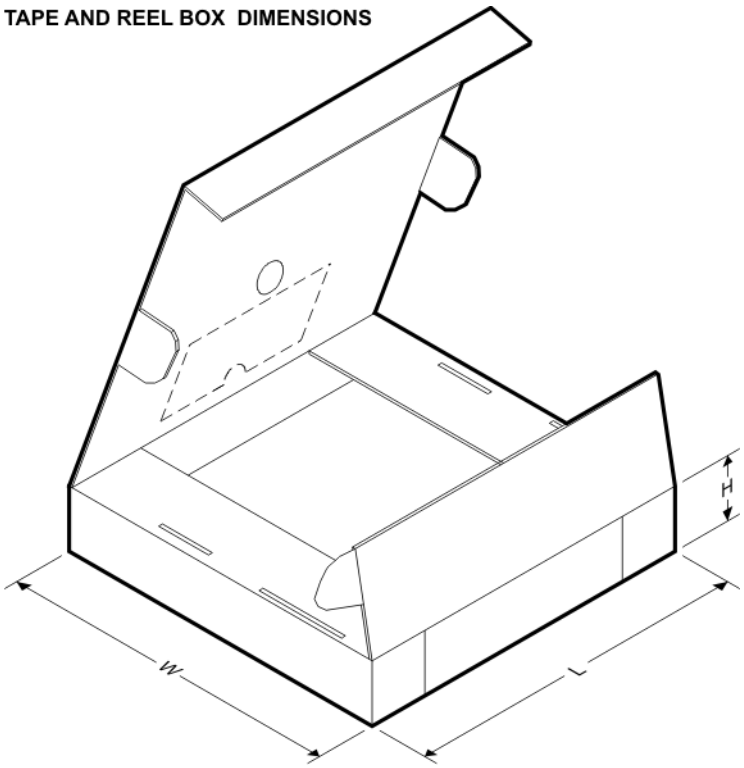
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DS36C280MX	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
DS36C280MX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
DS36C280TMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1

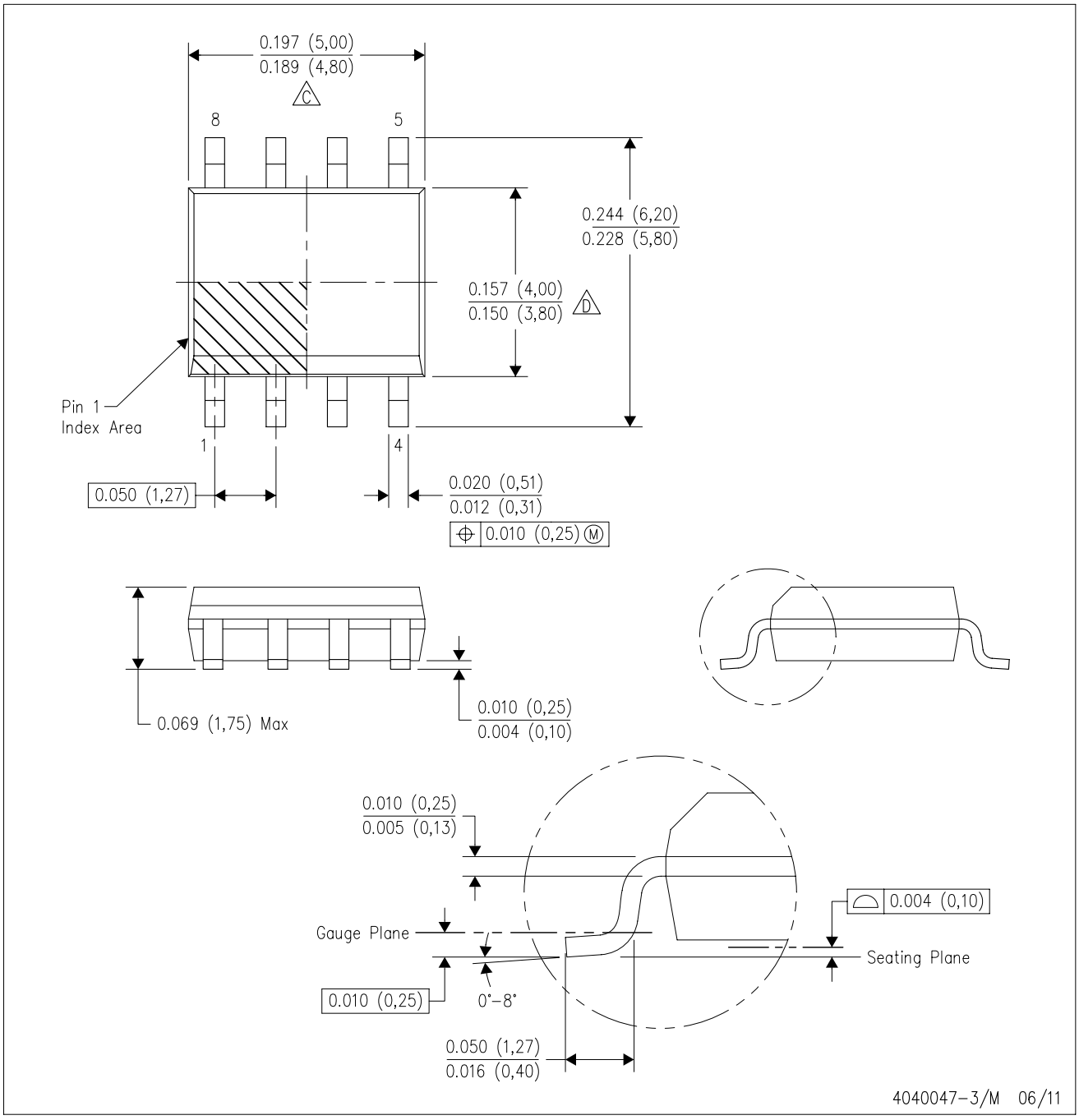
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS36C280MX	SOIC	D	8	2500	349.0	337.0	45.0
DS36C280MX/NOPB	SOIC	D	8	2500	349.0	337.0	45.0
DS36C280TMX/NOPB	SOIC	D	8	2500	349.0	337.0	45.0

D (R–PDSO–G8) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS–012 variation AA.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated

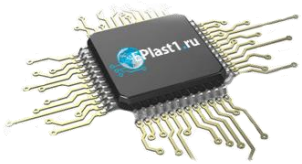
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.