High-stability Isolated Error Amplifier

Preliminary
Technical Data

ADuM3190

FEATURES

- Stable Over Time and Temperature
  - 0.5% initial accuracy
  - 1% accuracy over the full temp range
- For Type II or Type III compensation networks
- Reference voltage 1.225V
- Compatible with DOSA
- Low power operation: <7 mA total
- Wide Supply Voltage Range
  - V_{DD1} – 3V to 20V
  - V_{DD2} - 3V to 20V
- Bandwidth – 400kHz
- Isolation Voltage
  - 2.5kVrms
- Wide temperature range:
  - -40°C to 125°C ambient operation
  - 150°C maximum junction temperature

APPLICATIONS

- Linear Power Supplies
- Inverters
- UPS
- DOSA Compatible Modules
- Voltage Monitor

GENERAL DESCRIPTION

The ADuM3190 is an isolated error amplifier based on Analog Devices, Inc. *i*Coupler® technology. The ADuM3190 is ideal for linear feedback power supplies with primary side controllers enabling improvements in transient response, power density and stability as compared to commonly used optocoupler and shunt regulator solutions.

Unlike optocoupler-based solutions, which have an uncertain current-transfer-ratio over lifetime and at high temperatures, the ADuM3190 transfer function does not change over lifetime and is stable over a wide temperature range of -40°C to 125C°.

Included is a wide band operational amplifier which can be used to set up a variety of commonly used power supply loop compensation techniques. The ADuM3190 is fast enough to allow a feedback loop to react to fast transient conditions and over current conditions. Also, included is a high accuracy 1.225V reference to compare with the supply output set point.

The ADuM3190 is packaged in a small QSOP-16 package for 2.5kVrms. The ADuM4190 is packaged in a wide body SO-16 package for reinforced 5kVrms isolation rating.

FUNCTIONAL BLOCK DIAGRAM

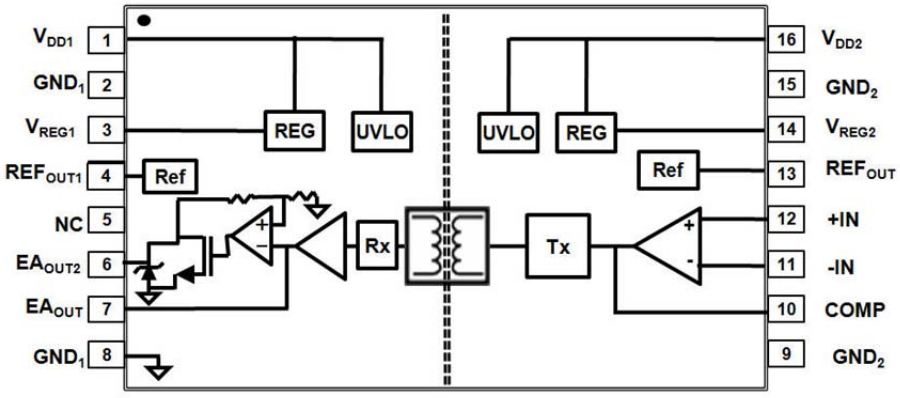


Figure 1. ADuM3190

[1] Protected by U.S. Patents 5,952,849, 6,873,065 and 7,075,329. Other patents pending.

Rev. Pr January 22, 2013
Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otheRQise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113
©2010 Analog Devices, Inc. All rights reserved.

TABLE OF CONTENTS

Features 1
Applications 1
General Description 1
Functional Block Diagram 1
Figure 1. ADuM3190 1
Specifications with V_{DD1} = V_{DD2} = 3 V to 20 V, T_a = -40 to 125°C 3
Package Characteristics 6
Regulatory Information 6
Insulation and Safety-Related Specifications 7
Recommended Operating Conditions 7
Absolute Maximum Ratings 8
ESD Caution 8
Pin Configurations and Function Descriptions 9
Outline Dimensions 10
Ordering Guide 10
Revision History

Rev. Pr
Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otheRQise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113 ©2010 Analog Devices, Inc. All rights reserved.

SPECIFICATIONS WITH V_{DD1} = V_{DD2} = 3 V TO 20 V, T_A = -40 TO 125°C

Table 1. All typical specifications are at T_A = 25°C, V_{DD1} = V_{DD2} = 5V.

Parameter	Conditions	Min	Typ	Max	Unit
Accuracy	= (1.225V - EA_{OUT})/1.225V Refer to Figure 2				
Initial Error	at 25°C		0.25%	0.5%	V/V
Total Error	-40° to 125°C		0.5%	1%	V/V
Op Amp					
Offset Error		-5	+/-2.5	5	mV
Open Loop Gain		66	80		dB
Input Common-mode Range		0.35		1.5	V
Gain Bandwidth Product			10		MHz
Common-mode rejection			72		dB
Input Capacitance			2		pF
Output Voltage Range	COMP pin	0.2		2.7	V
Input bias current			0.01		µA
Reference					
Output Voltage	at 25°C, 0 to 1mA load, C_{REFOUT} = 15pF	1.220	1.225	1.230	V
	-40° to 125°C , 0 to 1mA load, C_{REFOUT} = 15pF	1.215	1.225	1.235	V
Output Current	C_{REFOUT} = 15pF	2.0			mA
UVLO					
Positive Going Threshold			2.8		V
Negative Going Threshold			2.6		V
EA_{OUT} Impedance	V_{DD2} < UVLO threshold or V_{DD1} < UVLO threshold		High Z		Ohms
OUTPUT CHARACTERISTICS					
Output Gain	From Comp to EA_{OUT}, DC, 0.3 to 2.4V	0.9	1.0	1.1	V/V
	From Comp to EA_{OUT2}, DC, 0.4 to 5.0V	0.9	1.0	1.1	V/V
Output -3dB Bandwidth	From Comp to EA_{OUT}, 0.3 to 2.4V, +/- 3mA				
A and S Grade	From Comp to EA_{OUT2}, 0.4 to 5.0V, +/- 1mA	50	100		kHz
B and T Grade		250	400		kHz
Output Voltage, EA_{OUT} Low	+/- 3mA output			0.3	V
Output Voltage, EA_{OUT} High	+/- 3mA output	2.4	2.5		V
Output Voltage, EA_{OUT2} Low	VDD1 = 4.5V to 5.5V, +/- 1mA output		0.2	0.4	V
Output Voltage, EA_{OUT2} High	VDD1 = 4.5V to 5.5V, +/- 1mA output	4.8	4.9		V
Output Voltage, EA_{OUT2} Low	VDD1 = 10 to 20V, +/- 1mA output		0.2	0.4	V
Output Voltage, EA_{OUT2} High	VDD1 = 10 to 20V, +/- 1mA output	5.0	5.4		V
Output Voltage Noise			TBD		uV_{RMS}
POWER SUPPLY					
Operating Range	V_{DD1}	3.0		20	V
Operating Range	V_{DD2}	3.0		20	V
Power Supply Rejection	DC , V_{DD1} = V_{DD2} = 3V to 20V	60			dB
Supply Current	I_{DD1}		0.9	1.8	mA
	I_{DD2}		3.0	5.0	mA

Parameter	Conditions	Min	Typ	Max	Unit

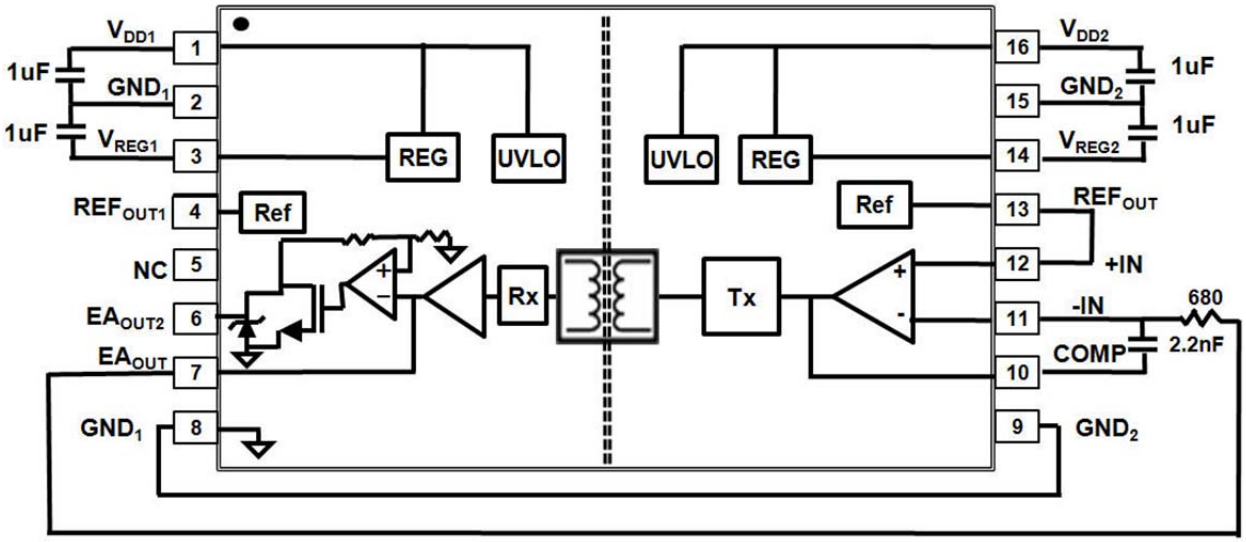


Figure 2. ADuM3190 Test Circuit 1

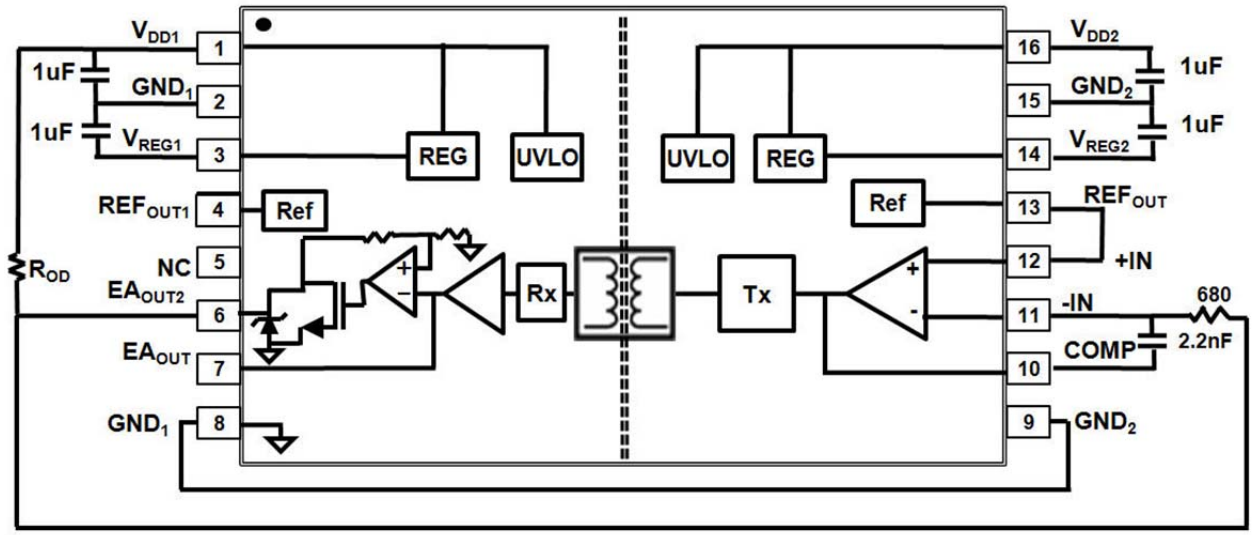


Figure 3. ADuM3190 Test Circuit 2

PACKAGE CHARACTERISTICS

Table 2.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Resistance (Input-to-Output)[1]	R_{I-O}		10^{13}		Ω	
Capacitance (Input-to-Output)[1]	C_{I-O}		2.2		pF	f = 1 MHz
Input Capacitance[2]	C_I		4.0		pF	
IC Junction-to-Ambient Thermal Resistance						Thermocouple located at center of package underside
16-Lead QSOP	θ_{JA}		76		°C/W	

[1] The device is considered a 2-terminal device; Pin 1 through Pin 8 are shorted together, and Pin 9 through Pin 16 are shorted together.
[2] Input capacitance is from any input data pin to ground.

REGULATORY INFORMATION

The ADuM3190 will be approved by the organizations listed in Table 3. See Table 3 and the section for recommended maximum working voltages for specific cross-isolation waveforms and insulation levels.

Table 3.

UL (pending)	CSA (pending)	VDE (pending)
Recognized Under 1577 Component Recognition Program[1]	Approved under CSA Component Acceptance Notice #5A	Certified according to DIN V VDE V 0884-10 (VDE V 0884-10): 2006-12[2]
Single Protection, 2500Vrms isolation Voltage QSOP-16	Basic insulation per CSA 60950-1-03 and IEC 60950-1, 400 V rms (565 V peak) maximum working voltage	Reinforced insulation, 560 V peak
File E214400	File 205078	File 2471900-4880-0001

[1] In accordance with UL1577, each ADuM3190 is proof tested by applying an insulation test voltage ≥1200 V rms for 1 sec (current leakage detection limit = 5 μA).
[2] In accordance with DIN V VDE V 0884-10, each ADuM3190 is proof tested by applying an insulation test voltage ≥525 V peak for 1 second (partial discharge detection limit = 5 pC). The asterisk (*) marked on the component designates DIN V VDE V 0884-10 approval.

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otheRQise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113
©2010 Analog Devices, Inc. All rights reserved.

INSULATION AND SAFETY-RELATED SPECIFICATIONS

Table 4. ADuM3190.

Parameter	Symbol	Value	Unit	Conditions
Rated Dielectric Insulation Voltage		2500	V rms	1-minute duration
Minimum External Air Gap (Clearance)	L(I01)	3.8 min	mm	Measured from input terminals to output terminals, shortest distance through air
Minimum External Tracking (Creepage)	L(I02)	3.8 min	mm	Measured from input terminals to output terminals, shortest distance path along body
Minimum Internal Gap (Internal Clearance)		0.017min	mm	Insulation distance through insulation
Tracking Resistance (Comparative Tracking Index)	CTI	>400	V	DIN IEC 112/VDE 0303 Part 1
Isolation Group		II		Material Group (DIN VDE 0110, 1/89, Table 1)

Table 5. Maximum Continuous Working Voltage[1]

Parameter	Max	Unit	Constraint
AC Voltage, Bipolar Waveform	560	V peak	50-year minimum lifetime
AC Voltage, Unipolar Waveform	1131	V peak	50-year minimum lifetime
DC Voltage	1131	V peak	50-year minimum lifetime

[1] Refers to continuous voltage magnitude imposed across the isolation barrier. See the Applications section for more details.

RECOMMENDED OPERATING CONDITIONS

Table 6.

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A			
ADuM3190A/ADuM3190B		−40	+85	°C
ADuM3190S/ADuM3190T		−40	+125	°C
Supply Voltages[1]	V_{DD1}, V_{DD2}	3.0	20	V
Input Signal Rise and Fall Times			1.0	ms

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

Table 7.

Parameter	Rating
Storage Temperature (T_{ST}) Range	−65°C to +150°C
Ambient Operating Temperature (T_A) Range	−40°C to +125°C
Junction Temperature	−40°C to +150°C
Supply Voltages (V_{DD1}, V_{DD2})[1]	−0.5 V to +24 V
Supply Voltages (V_{REG1}, V_{REG2})[1]	−0.5 V to +5.5V
Input Voltages (+IN, -IN)	−0.5 V to V_{DD2} + 0.5 V
Output Voltages (REF_{OUT}, Comp)	−0.5 V to V_{DD1} + 0.5 V
Output Voltages (REF_{OUT1}, EA_{OUT}, EA_{OUT2}) Average Output Current per Output Pin	−11 mA to + 11 mA
Common-Mode Transients[4]	−100 kV/µs to +100 kV/µs

[1] All voltages are relative to their respective ground.
[2] V_{DDI} and V_{DDO} refer to the supply voltages on the input and output sides of a given channel, respectively. See the Applications section.
[3] See Regulatory Information for maximum rated current values for various temperatures.
[4] Refers to common-mode transients across the insulation barrier. Common-mode transients exceeding the absolute maximum ratings may cause latch-up or permanent damage.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

[1] All voltages are relative to their respective ground. See the Applications section for information on immunity to external magnetic fields.

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATIONS AND FUNCTION DESCRIPTIONS

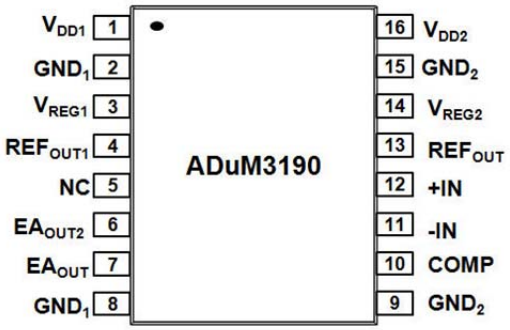


Figure 4. ADuM3190 Pin Configuration

Table 8. ADuM3190 / ADuM4190 Pin Functional Descriptions

Pin No.	Mnemonic	Description
1	V_{DD1}	Supply Voltage for Side 1 (3.0V to 20 V)
2	GND_1	Ground Reference for Side 1
3	V_{REG1}	Internal Supply Voltage for Side 1. Connect a 1uF capacitor between V_{DD1} and GND_1.
4	REF_{OUT1}	Reference Output Voltage for Side 1, maximum $C_{REFOUT1}$ = 15pF.
5	NC	No Connection, connect to GND_1, do not leave floating.
6	EA_{OUT2}	Isolated Output Voltage, Open Drain Output, select pull-up resistor for up to 1mA current.
7	EA_{OUT}	Isolated Output Voltage
8	GND_1	Ground Reference for Side 1
9	GND_2	Ground Reference for Side 2
10	COMP	Output of the Op Amp. Loop compensation network may be connected between COMP and -IN pins.
11	-IN	Inverting Op Amp input. Connection for the power supply set point and compensation network.
12	+IN	Non-Inverting Op Amp input. May be used as reference Input.
13	REF_{OUT}	Reference Output Voltage for Side 2, maximum C_{REFOUT} = 15pF.
14	V_{REG2}	Internal Supply Voltage for Side 2. Connect a1uF capacitor between V_{DD2} and GND_2.
15	GND_2	Ground Reference for Side 2
16	V_{DD2}	Supply Voltage for Side 2 (3.0V to 20 V)

OUTLINE DIMENSIONS

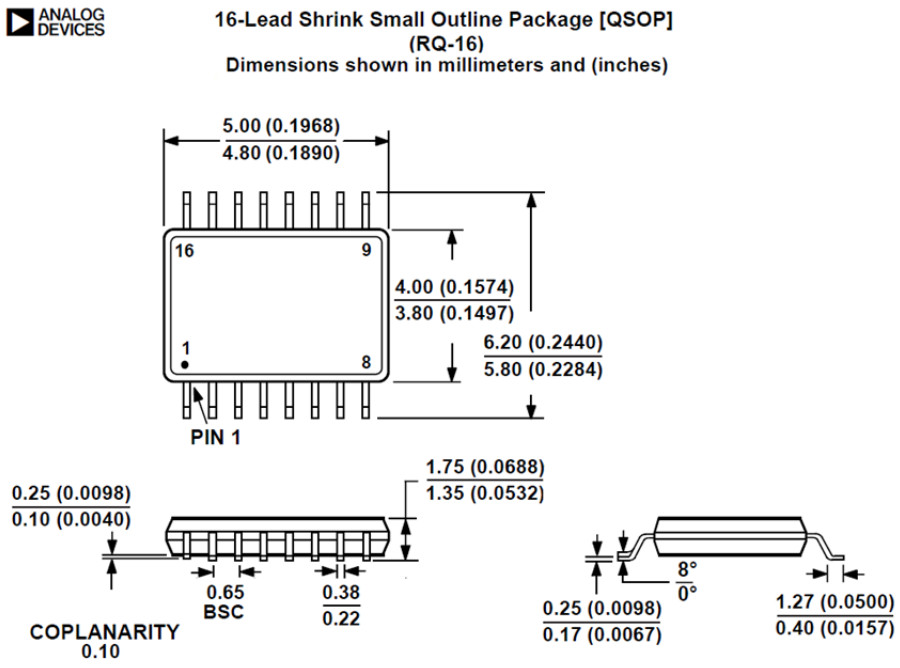


Figure 5. 16-lead Standard Package [QSOP], (RQ-16)
Dimensions shown in millimeters in millimeters and (inches)

ORDERING GUIDE

Model	Temperature Range	Bandwidth (typical)	Package Description	Package Option
ADuM3190ARQZ	−40°C to +85°C	100kHz	16-Lead QSOP	RQ-16
ADuM3190BRQZ	−40°C to +85°C	400kHz	16-Lead QSOP	RQ-16
ADuM3190SRQZ	−40°C to +125°C	100kHz	16-Lead QSOP	RQ-16
ADuM3190TRQZ	−40°C to +125°C	400kHz	16-Lead QSOP	RQ-16

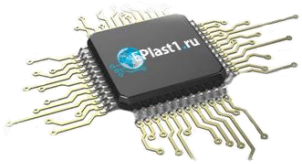
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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.