μPG2422TK

Data Sheet

GaAs Integrated Circuit
SPDT Switch for 0.05 GHz to 6.0 GHz

R09DS0013EJ0100
Rev.1.00
Jan 20, 2011

DESCRIPTION

The μPG2422TK is a GaAs MMIC SPDT (Single Pole Double Throw) switch which was designed for 0.05 GHz to 6.0 GHz applications, including dual-band wireless LAN.
This device operates with dual control switching voltages of 1.8 to 5.3 V and can operate at frequencies from 0.05 GHz to 6.0 GHz, having the low insertion loss and high isolation.
This device is housed in a 6-pin lead-less minimold package (1511 PKG) and is suitable for high-density surface mounting.

FEATURES

- Switch control voltage : $V_{cont\ (H)}$ = 3.0 V TYP.
  : $V_{cont\ (L)}$ = 0 V TYP.
- Low insertion loss : L_{ins} = 0.35 dB TYP. @ f = 2.5 GHz
  : L_{ins} = 0.55 dB TYP. @ f = 6.0 GHz
- High isolation : ISL = 28 dB TYP. @ f = 2.5 GHz
  : ISL = 24 dB TYP. @ f = 6.0 GHz
- Handling power : $P_{in\ (0.1\ dB)}$ = +28 dBm TYP. @ f = 2.0 to 6.0 GHz
- High-density surface mounting : 6-pin lead-less minimold package (1.5 × 1.1 × 0.55 mm)

APPLICATIONS

- Wireless LAN (IEEE802.11a/b/g/n), etc.

ORDERING INFORMATION

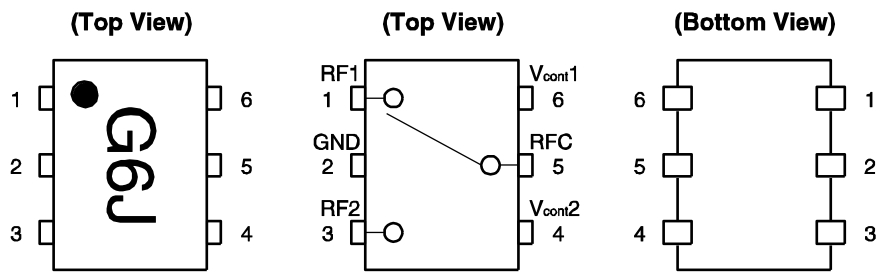
Part Number	Order Number	Package	Marking	Supplying Form
μPG2422TK-E2	μPG2422TK-E2-A	6-pin lead-less minimold (1511 PKG) (Pb-Free)	G6J	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPG2422TK-A

CAUTION

Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	RF1
2	GND
3	RF2
4	$V_{cont}2$
5	RFC
6	$V_{cont}1$

SW TRUTH TABLE

ON Path	$V_{cont}1$	$V_{cont}2$
RFC-RF1	High	Low
RFC-RF2	Low	High

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V_{cont}	+6.0 Note	V
Input Power ($V_{cont\,(H)}$ = 1.8 V)	P_{in}	+29.0	dBm
Input Power ($V_{cont\,(H)}$ = 3.0 V)	P_{in}	+32.0	dBm
Input Power ($V_{cont\,(H)}$ = 5.0 V)	P_{in}	+33.0	dBm
Power Dissipation (average)	P_D	150	mW
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note: $|V_{cont}1 - V_{cont}2| \leq 6.0$ V

RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f	0.05	–	6.0	GHz
Switch Control Voltage (H)	$V_{cont\,(H)}$	1.8	3.0	5.3	V
Switch Control Voltage (L)	$V_{cont\,(L)}$	–0.2	0	0.2	V
Control Voltage Difference	$\Delta V_{cont\,(H)}$, $\Delta V_{cont\,(L)}$ Note	–0.1	0	0.1	V

Note: $\Delta V_{cont\,(H)} = V_{cont}1_{(H)} - V_{cont}2_{(H)}$
$\Delta V_{cont\,(L)} = V_{cont}1_{(L)} - V_{cont}2_{(L)}$

ELECTRICAL CHARACTERISTICS 1
(T_A = +25°C, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 0.05 to 0.5 GHz Note 1	–	0.30	–	dB
Insertion Loss 2	$L_{ins}2$	f = 0.5 to 2.0 GHz Note 2	–	0.30	0.50	dB
Insertion Loss 3	$L_{ins}3$	f = 2.0 to 2.5 GHz	–	0.35	0.55	dB
Insertion Loss 4	$L_{ins}4$	f = 2.5 to 3.8 GHz	–	0.45	0.65	dB
Insertion Loss 5	$L_{ins}5$	f = 3.8 to 6.0 GHz	–	0.55	0.75	dB
Isolation 1 (RFC-OFF Port)	ISL1	f = 0.05 to 0.5 GHz Note 1	–	35	–	dB
Isolation 2 (RFC-OFF Port)	ISL2	f = 0.5 to 2.0 GHz Note 2	25	28	–	dB
Isolation 3 (RFC-OFF Port)	ISL3	f = 2.0 to 2.5 GHz	25	28	–	dB
Isolation 4 (RFC-OFF Port)	ISL4	f = 2.5 to 3.8 GHz	25	28	–	dB
Isolation 5 (RFC-OFF Port)	ISL5	f = 3.8 to 6.0 GHz	20	24	–	dB
Isolation 6 (RF1-RF2)	ISL6	f = 0.05 to 0.5 GHz Note 1	–	35	–	dB
Isolation 7 (RF1-RF2)	ISL7	f = 0.5 to 2.0 GHz Note 2	25	28	–	dB
Isolation 8 (RF1-RF2)	ISL8	f = 2.0 to 2.5 GHz	25	28	–	dB
Isolation 9 (RF1-RF2)	ISL9	f = 2.5 to 3.8 GHz	25	28	–	dB
Isolation 10 (RF1-RF2)	ISL10	f = 3.8 to 6.0 GHz	25	28	–	dB
Return Loss 1	RL1	f = 0.05 to 0.5 GHz Note 1	–	25	–	dB
Return Loss 2	RL2	f = 0.5 to 2.0 GHz Note 2	15	20	–	dB
Return Loss 3	RL3	f = 2.0 to 2.5 GHz	15	20	–	dB
Return Loss 4	RL4	f = 2.5 to 6.0 GHz	10	15	–	dB
0.1 dB Loss Compression Input Power Note 3	$P_{in\ (0.1\ dB)}$	f = 0.05 to 0.5 GHz Note 1	–	28	–	dBm
		f = 0.5 to 2.0 GHz Note 2	–	29	–	dBm
		f = 2.0 to 6.0 GHz	–	28	–	dBm
		f = 0.05 to 0.5 GHz Note 1, $V_{cont\ (H)}$ = 5.0 V	–	32	–	dBm
		f = 0.5 to 2.0 GHz Note 2, $V_{cont\ (H)}$ = 5.0 V	–	32	–	dBm
		f = 2.0 to 6.0 GHz, $V_{cont\ (H)}$ = 5.0 V	–	32	–	dBm
1 dB Loss Compression Input Power Note 4	$P_{in\ (1\ dB)}$	f = 0.05 to 0.5 GHz Note 1	–	32	–	dBm
		f = 0.5 to 2.0 GHz Note 2	–	32	–	dBm
		f = 2.0 to 6.0 GHz	–	31	–	dBm
Input 3rd Order Intercept Point	IIP_3	f = 2.5 GHz, P_{in} = +20 dBm	–	57	–	dBm
2nd Harmonics	2f0	f = 2.5 GHz, P_{in} = +20 dBm	–	80	–	dBc
3rd Harmonics	3f0	f = 2.5 GHz, P_{in} = +20 dBm	–	80	–	dBc
Switch Control Current	I_{cont}	No RF input	–	0.1	5	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	40	100	ns

Notes
1. DC blocking capacitors = 1 000 pF at f = 0.05 to 0.5 GHz
2. DC blocking capacitors = 56 pF at f = 0.5 to 2.0 GHz
3. $P_{in\ (0.1\ dB)}$ is the measured input power level when the insertion loss increases 0.1 dB more than that of the linear range.
4. $P_{in\ (1\ dB)}$ is the measured input power level when the insertion loss increases 1 dB more than that of the linear range.

CAUTION

It is necessary to use DC blocking capacitors with this device.
The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

ELECTRICAL CHARACTERISTICS 2
(T_A = +25°C, $V_{cont (H)}$ = 1.8 V, $V_{cont (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)

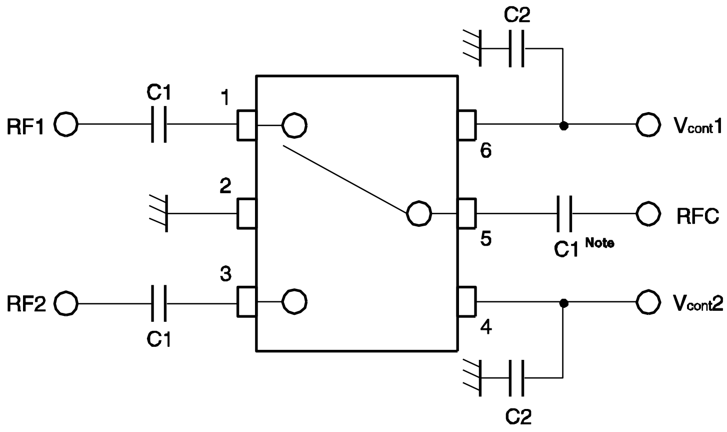
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 0.05 to 0.5 GHz Note 1	–	0.30	–	dB
Insertion Loss 2	$L_{ins}2$	f = 0.5 to 2.0 GHz Note 2	–	0.30	0.55	dB
Insertion Loss 3	$L_{ins}3$	f = 2.0 to 2.5 GHz	–	0.35	0.60	dB
Insertion Loss 4	$L_{ins}4$	f = 2.5 to 3.8 GHz	–	0.45	0.70	dB
Insertion Loss 5	$L_{ins}5$	f = 3.8 to 6.0 GHz	–	0.55	0.80	dB
Isolation 1 (RFC-OFF Port)	ISL1	f = 0.05 to 0.5 GHz Note 1	–	35	–	dB
Isolation 2 (RFC-OFF Port)	ISL2	f = 0.5 to 2.0 GHz Note 2	24	28	–	dB
Isolation 3 (RFC-OFF Port)	ISL3	f = 2.0 to 2.5 GHz	24	28	–	dB
Isolation 4 (RFC-OFF Port)	ISL4	f = 2.5 to 3.8 GHz	24	28	–	dB
Isolation 5 (RFC-OFF Port)	ISL5	f = 3.8 to 6.0 GHz	19	24	–	dB
Isolation 6 (RF1-RF2)	ISL6	f = 0.05 to 0.5 GHz Note 1	–	35	–	dB
Isolation 7 (RF1-RF2)	ISL7	f = 0.5 to 2.0 GHz Note 2	24	28	–	dB
Isolation 8 (RF1-RF2)	ISL8	f = 2.0 to 2.5 GHz	24	28	–	dB
Isolation 9 (RF1-RF2)	ISL9	f = 2.5 to 3.8 GHz	24	28	–	dB
Isolation 10 (RF1-RF2)	ISL10	f = 3.8 to 6.0 GHz	24	28	–	dB
Return Loss 1	RL1	f = 0.05 to 0.5 GHz Note 1	–	25	–	dB
Return Loss 2	RL2	f = 0.5 to 2.0 GHz Note 2	15	20	–	dB
Return Loss 3	RL3	f = 2.0 to 2.5 GHz	15	20	–	dB
Return Loss 4	RL4	f = 2.5 to 6.0 GHz	10	15	–	dB
0.1 dB Loss Compression Input Power Note 3	$P_{in (0.1 dB)}$	f = 0.05 to 0.5 GHz Note 1	–	22	–	dBm
		f = 0.5 to 2.0 GHz Note 2	–	22	–	dBm
		f = 2.0 to 6.0 GHz	–	21	–	dBm
1 dB Loss Compression Input Power Note 4	$P_{in (1 dB)}$	f = 0.05 to 0.5 GHz Note 1	–	28	–	dBm
		f = 0.5 to 2.0 GHz Note 2	–	27	–	dBm
		f = 2.0 to 6.0 GHz	–	24	–	dBm
2nd Harmonics	2f0	f = 2.5 GHz, P_{in} = +15 dBm	–	80	–	dBc
3rd Harmonics	3f0	f = 2.5 GHz, P_{in} = +15 dBm	–	80	–	dBc
Switch Control Current	I_{cont}	No RF input	–	0.1	5	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	60	150	ns

Notes 1. DC blocking capacitors = 1 000 pF at f = 0.05 to 0.5 GHz
2. DC blocking capacitors = 56 pF at f = 0.5 to 2.0 GHz
3. $P_{in (0.1 dB)}$ is the measured input power level when the insertion loss increases 0.1 dB more than that of the linear range.
4. $P_{in (1 dB)}$ is the measured input power level when the insertion loss increases 1 dB more than that of the linear range.

CAUTION

It is necessary to use DC blocking capacitors with this device.
The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

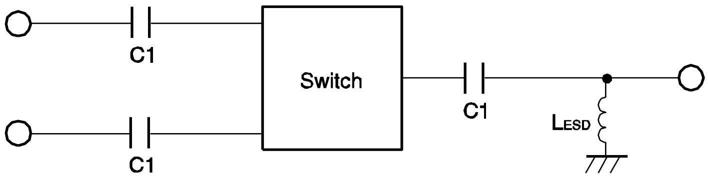
EVALUATION CIRCUIT



Note C1 : 0.05 to 0.5 GHz 1 000 pF
: 0.5 to 2.0 GHz 56 pF
: 2.0 to 6.0 GHz 8 pF
C2 : 1 000 pF

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

APPLICATION INFORMATION

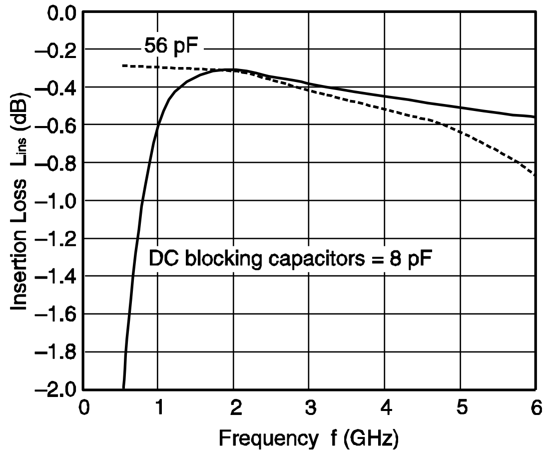


- C1 are DC blocking capacitors external to the device.
  The value may be tailored to provide specific electrical responses.
- The RF ground connections should be kept as short as possible and connected to directly to a good RF ground for best performance.
- L_{ESD} provides a means to increase the ESD protection on a specific RF port, typically the port attached to the antenna.

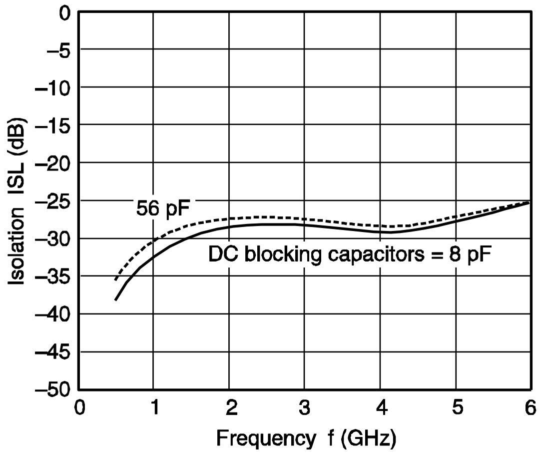
TYPICAL CHARACTERISTICS

(T_A = +25°C, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)

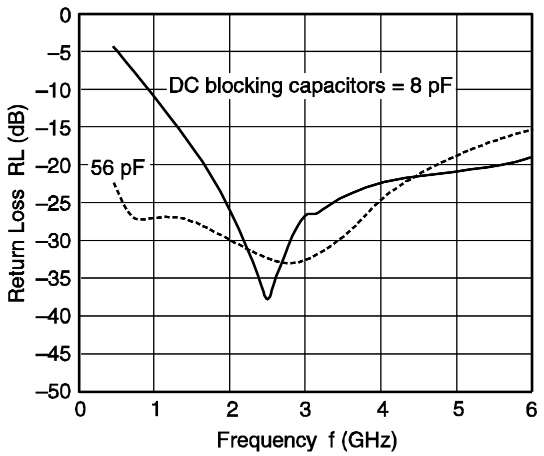
RFC-RF1/RF2
INSERTION LOSS vs. FREQUENCY



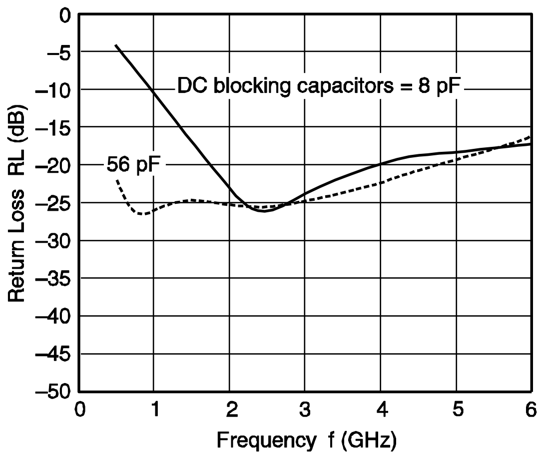
RFC-RF1/RF2
ISOLATION vs. FREQUENCY



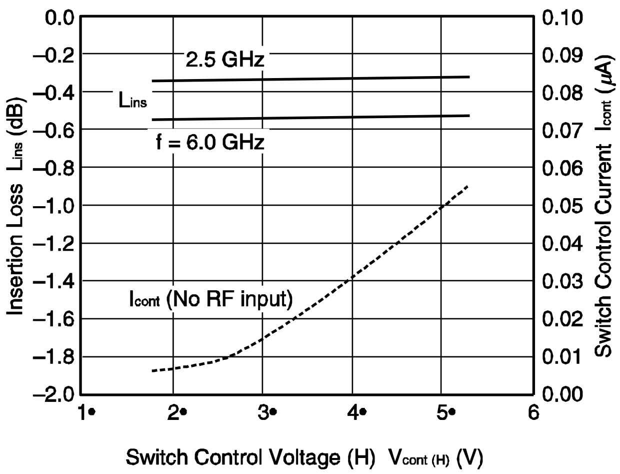
RFC RETURN LOSS vs. FREQUENCY



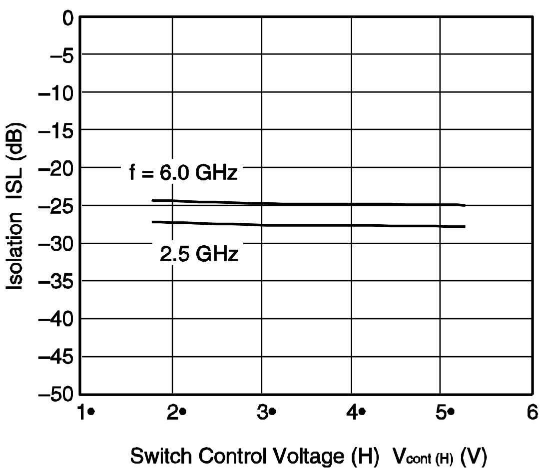
RF1/RF2 RETURN LOSS vs. FREQUENCY



RFC-RF1/RF2 INSERTION LOSS, I_{cont}
vs. SWITCH CONTROL VOLTAGE (H)

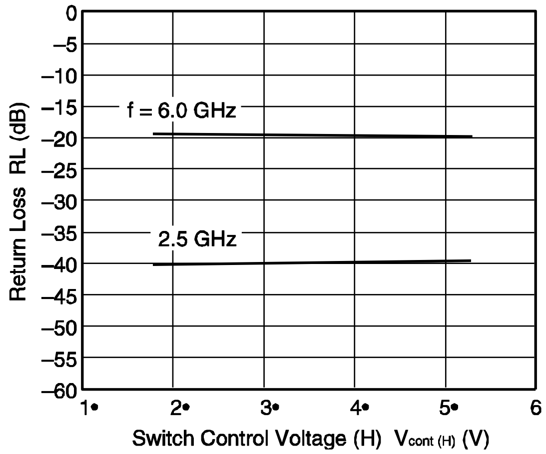


RFC-RF1/RF2 ISOLATION
vs. SWITCH CONTROL VOLTAGE (H)

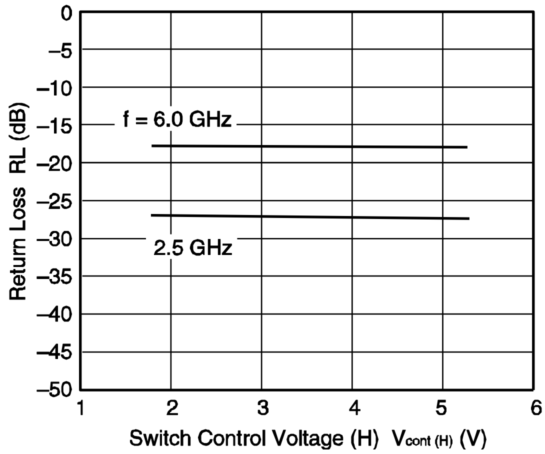


Remark The graphs indicate nominal characteristics.

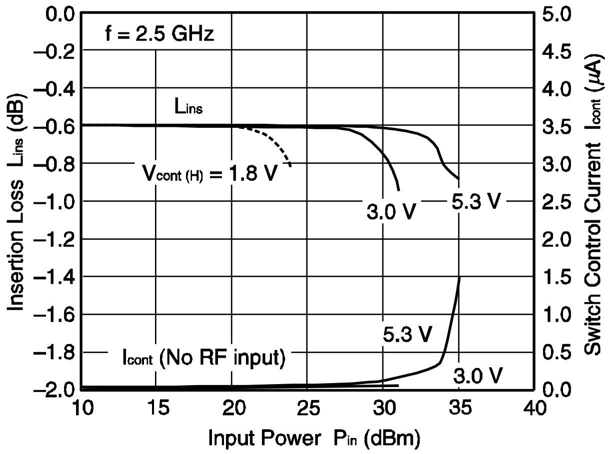
RFC RETURN LOSS vs.
SWITCH CONTROL VOLTAGE (H)



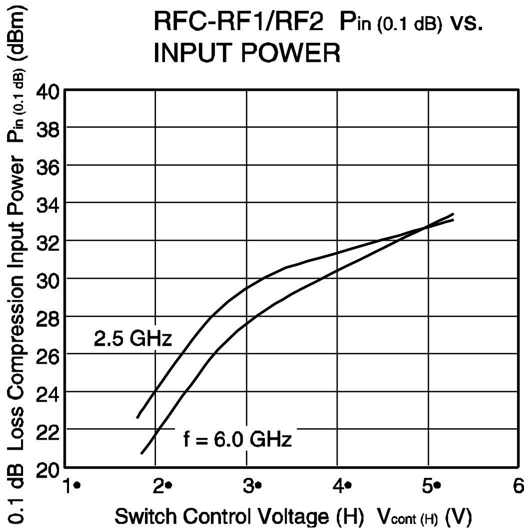
RF1/RF2 RETURN LOSS vs.
SWITCH CONTROL VOLTAGE (H)



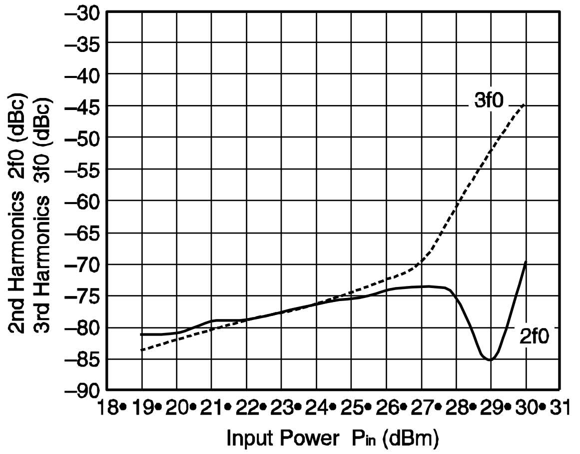
RFC-RF1/RF2 INSERTION LOSS, I_{cont}
vs. INPUT POWER



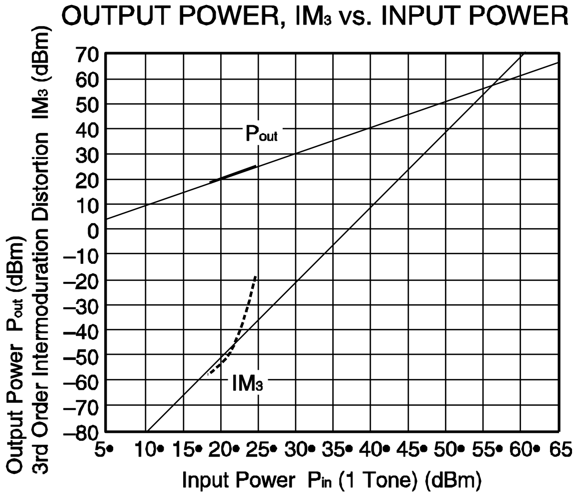
RFC-RF1/RF2 $P_{in (0.1\ dB)}$ vs.
INPUT POWER



RFC-RF1/RF2
2f0, 3f0 vs. INPUT POWER

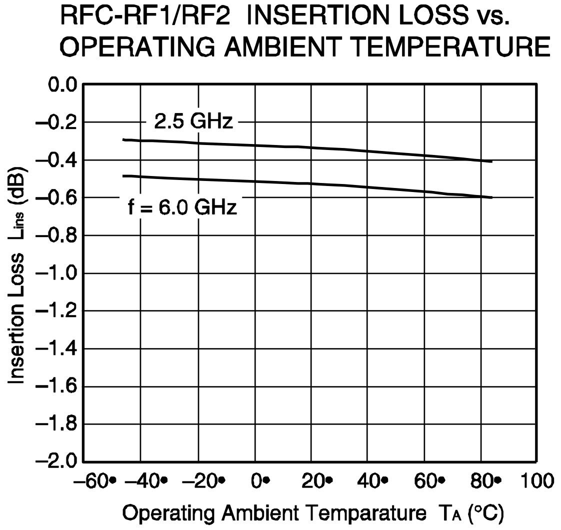


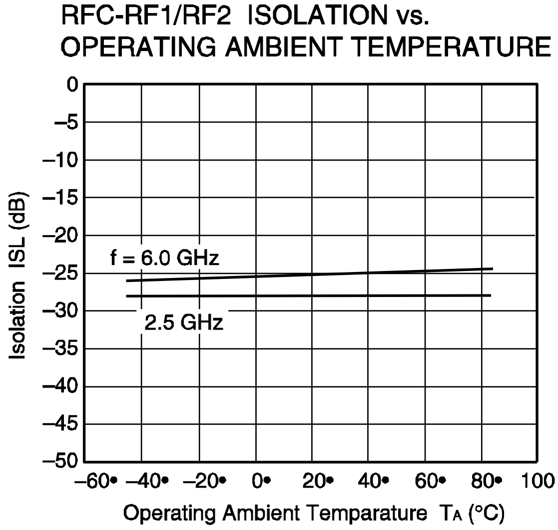
RFC-RF1/RF2
OUTPUT POWER, IM_3 vs. INPUT POWER

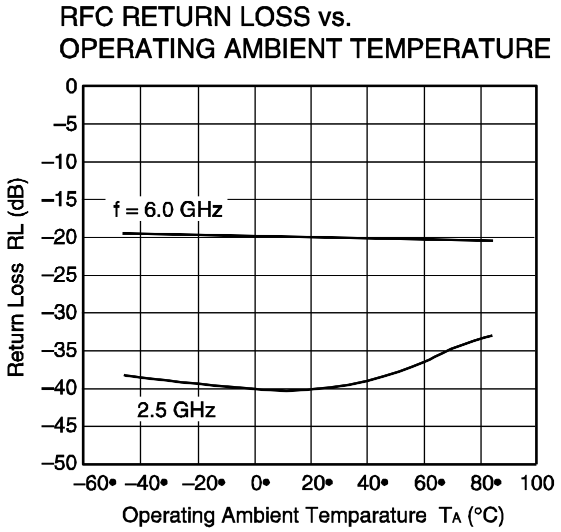


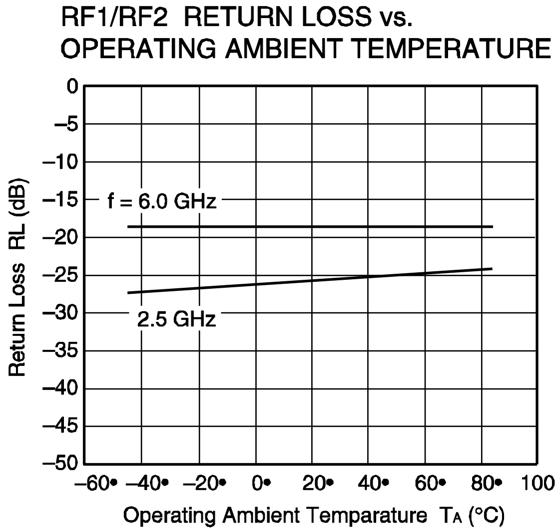
Remark The graphs indicate nominal characteristics.

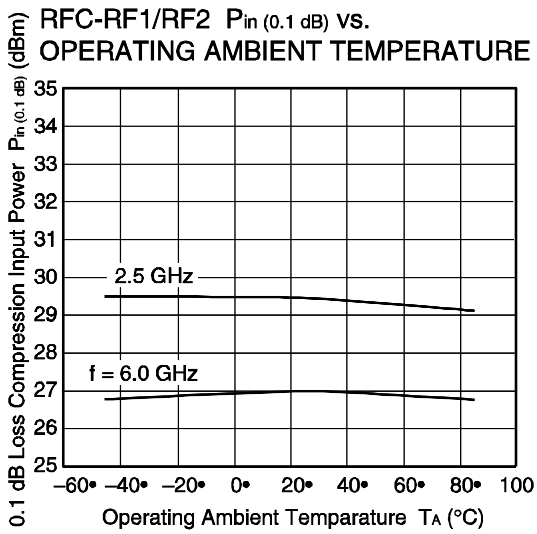
TYPICAL CHARACTERISTICS
(T_A = –45 to +85°C, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 8 pF, unless otherwise specified)











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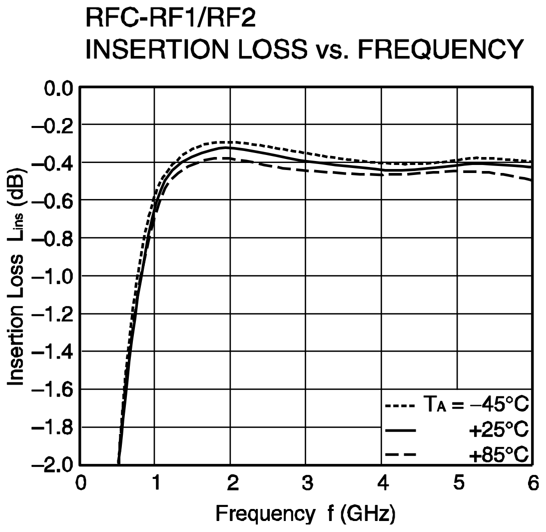
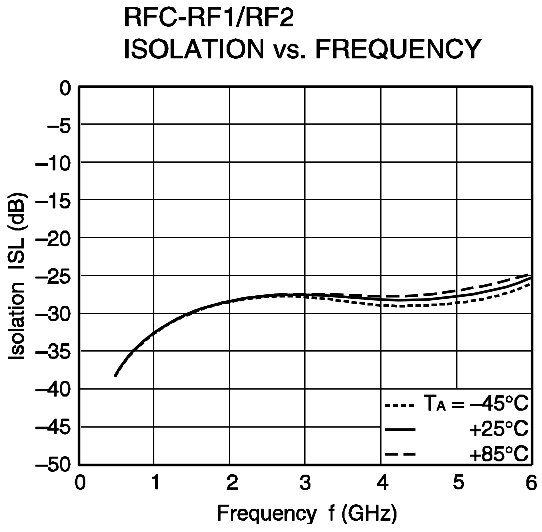
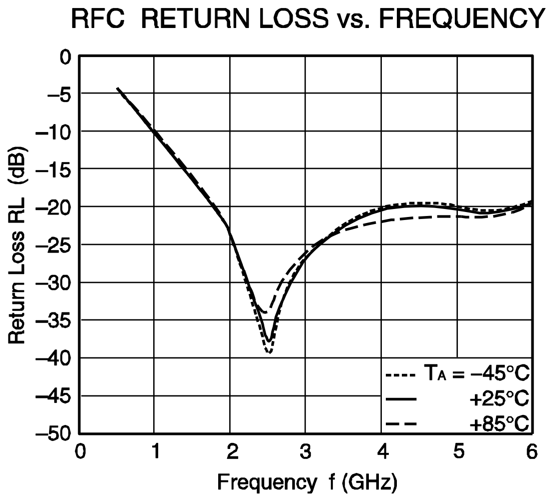
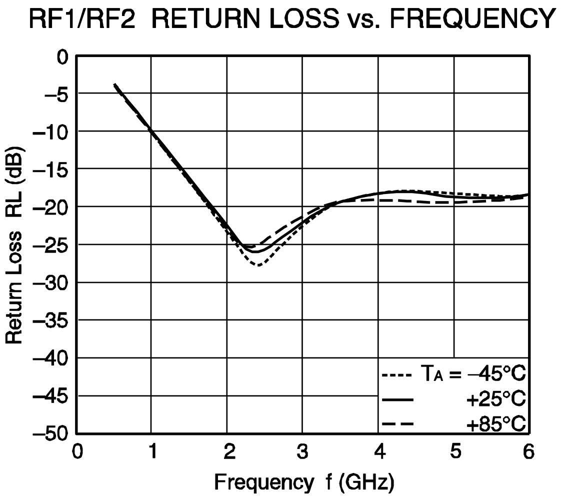




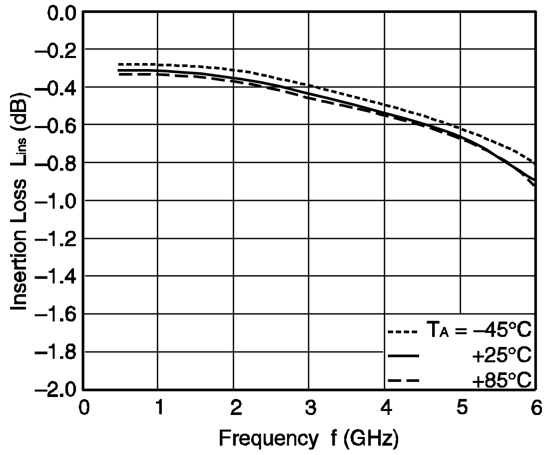




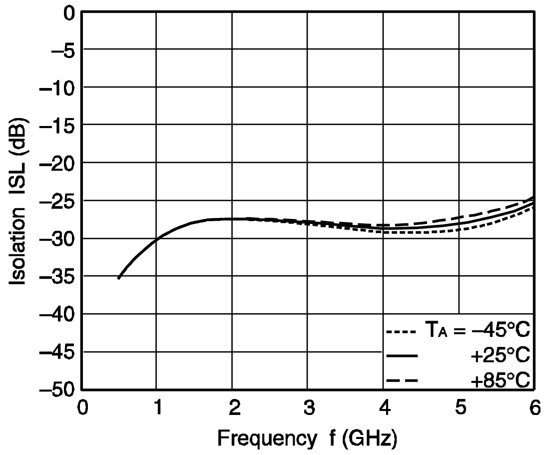
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS
($V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 56 pF, unless otherwise specified)

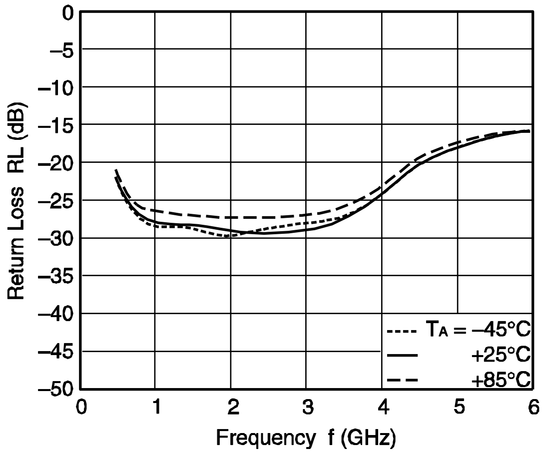
RFC-RF1/RF2
INSERTION LOSS vs. FREQUENCY



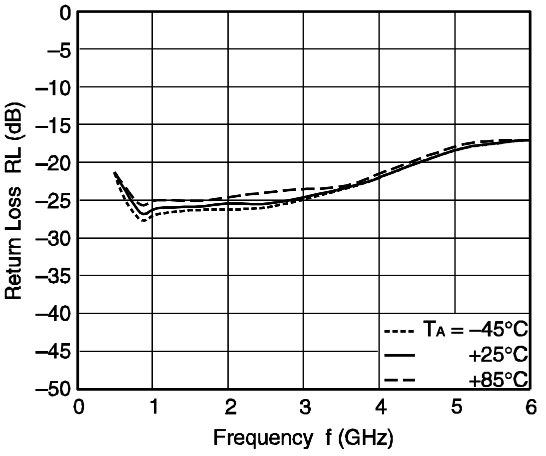
RFC-RF1/RF2
ISOLATION vs. FREQUENCY



RFC RETURN LOSS vs. FREQUENCY



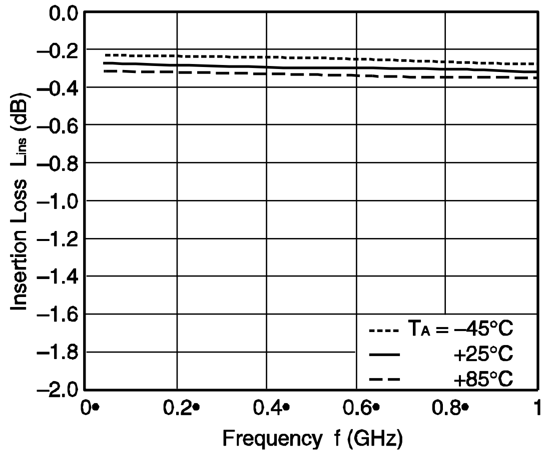
RF1/RF2 RETURN LOSS vs. FREQUENCY



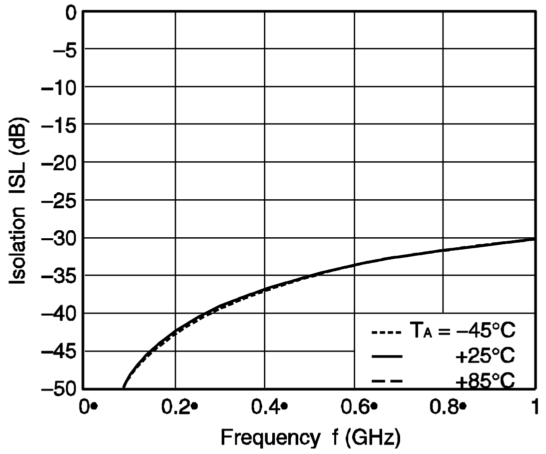
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS
($V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, Z_O = 50 Ω, DC blocking capacitors = 1 000 pF, unless otherwise specified)

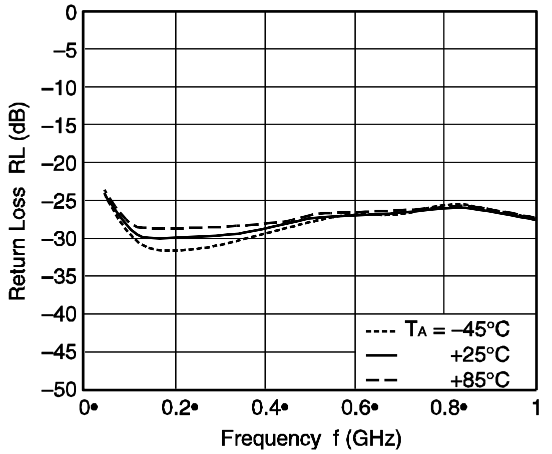
RFC-RF1/RF2
INSERTION LOSS vs. FREQUENCY



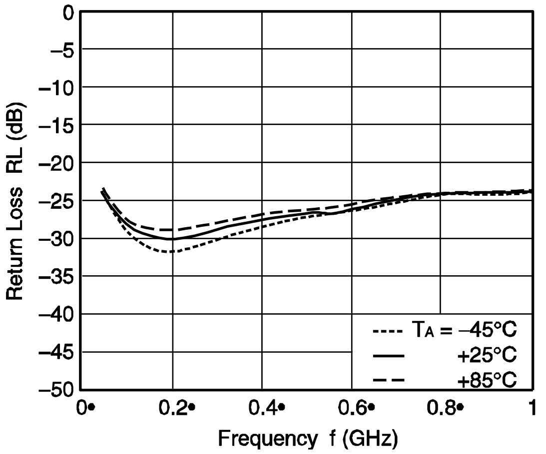
RFC-RF1/RF2
ISOLATION vs. FREQUENCY



RFC RETURN LOSS vs. FREQUENCY



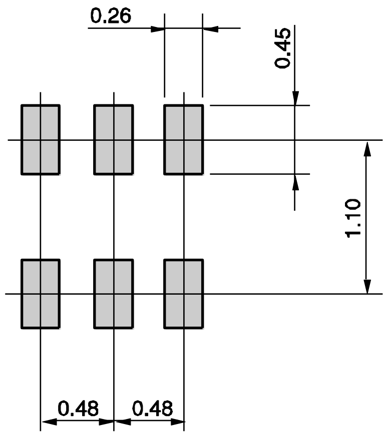
RF1/RF2 RETURN LOSS vs. FREQUENCY



Remark The graphs indicate nominal characteristics.

MOUNTING PAD LAYOUT DIMENSIONS

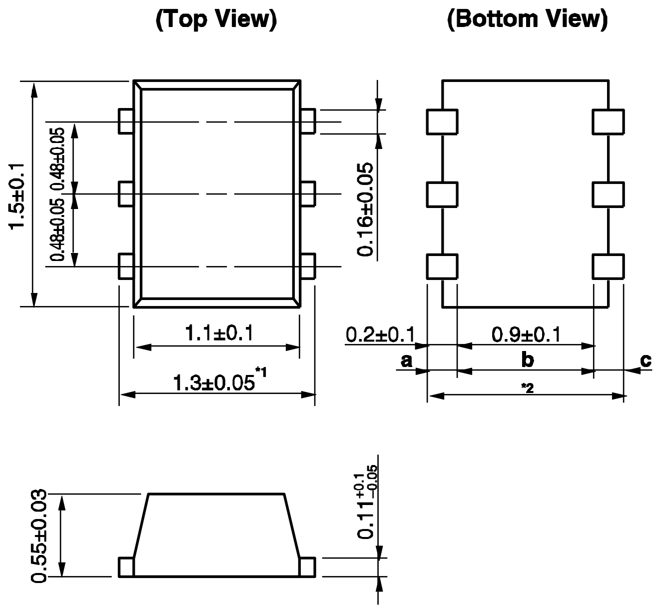
6-PIN LEAD-LESS MINIMOLD (1511 PKG) (UNIT: mm)



Remark The mounting pad layout in this document is for reference only.

PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (1511 PKG) (UNIT: mm)



Remark Dimension*1 is bigger than dimension*2 (dimension*2 = **a** + **b** + **c**).

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (terminal temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

CAUTION

Do not use different soldering methods together (except for partial heating).

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

Revision History	μPG2422TK Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	Jan 20, 2011	–	First edition issued

LifeElectronics
Живое партнерство

ООО «ЛайфЭлектроникс» "LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

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- *Специальные условия для постоянных клиентов.*
- *Подбор аналогов.*
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- *Работу по проектам и поставку образцов.*
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- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
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- *Входной контроль качества.*
- *Наличие сертификата ISO.*

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