SiC

Silicon Carbide Diode

5th Generation thinQ!™

650V SiC Schottky Diode

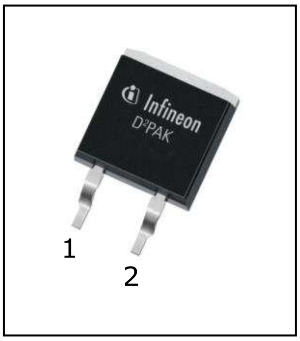
IDK02G65C5

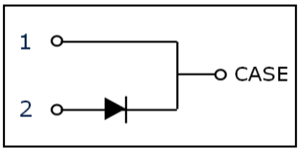
Final Data Sheet

Rev. 2.1, 2017-08-11

Power Management & Multimarket

5th Generation thinQ!™ SiC Schottky Diode IDK02G65C5





1 Description

ThinQ!™ Generation 5 represents Infineon leading edge technology for the SiC Schottky Barrier diodes. The Infineon proprietary diffusion soldering process, already introduced with G3 is now combined with a new, more compact design and thin-wafer technology. The result is a new family of products showing improved efficiency over all load conditions, resulting from both the improved thermal characteristics and a lower figure of merit (Qc x Vf).
The new thinQ!™ Generation 5 has been designed to complement our 650V CoolMOS™ families: this ensures meeting the most stringent application requirements in this voltage range.

Features

- Revolutionary semiconductor material - Silicon Carbide
- Benchmark switching behavior
- No reverse recovery/ No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC[1)] for target applications
- Breakdown voltage tested at 4.5 mA[2)]
- Optimized for high temperature operation

Benefits

- System efficiency improvement over Si diodes
- System cost / size savings due to reduced cooling requirements
- Enabling higher frequency / increased power density solutions
- Higher system reliability due to lower operating temperatures
- Reduced EMI

Applications

- Switch mode power supply
- Power factor correction
- Solar inverter
- Uninterruptible power supply

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DC}	650	V
Q_C (V_R = 400 V)	4	nC
E_C (V_R = 400 V)	0.7	µJ
I_F (T_C < 155°C)	2	A

Table 2 Pin Definition

Pin 1	Pin 2	Pin 3
C	A	n.a.

Type / ordering Code	Package	Marking	Related links
IDK02G65C5	PG-TO263-2	D0265C5	www.infineon.com/sic

1) J-STD20 and JESD22
2) All devices tested under avalanche conditions for a time period of 10 ms

Table of Contents

2 Maximum ratings

Table 3 Maximum ratings

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Continuous forward current	I_F	–	–	2	A	$T_C < 155°C$, $D = 1$
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	–	–	23		$T_C = 25°C$, $t_p = 10$ ms
		–	–	22		$T_C = 150°C$, $t_p = 10$ ms
Non-repetitive peak forward current	$I_{F,max}$	–	–	138		$T_C = 25°C$, $t_p = 10$ µs
i²t value	$\int i^2 dt$	–	–	2.6	A²s	$T_C = 25°C$, $t_p = 10$ ms
		–	–	2.5		$T_C = 150°C$, $t_p = 10$ ms
Repetitive peak reverse voltage	V_{RRM}	–	–	650	V	$T_j = 25°C$
Diode dv/dt ruggedness	dv/dt	–	–	100	V/ns	$V_R = 0..480$ V
Power dissipation	P_{tot}	–	–	36	W	$T_C = 25°C$
Operating and storage temperature	$T_j; T_{stg}$	-55	–	175	°C	–

3 Thermal characteristics

Table 4 Thermal characteristics TO-263-2

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction-case	R_{thJC}	–	2.6	4.2	K/W	–
Thermal resistance, junction-ambient [1)]	R_{thJA}	–	–	62		SMD version, device on PCB, minimal footprint
		–	35	–		SMD version, device on PCB, 6 cm² cooling area[1)]

1) Device on 40 mm * 40 mm * 1.5 mm one layer epoxy PCB FR4 with 6 cm² copper area (thickness 70 µm) for cathode connection, PCB is vertical without air stream cooling.

4 Electrical characteristics

Table 5 Static characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
DC blocking voltage	V_{DC}	650	–	–	V	$I_R = 0.035$ mA, $T_j = 25°C$
Diode forward voltage	V_F	–	1.5	1.8		$I_F = 2$ A, $T_j = 25°C$
		–	1.8	2.2		$I_F = 2$ A, $T_j = 150°C$
Reverse current	I_R	–	0.1	35	µA	$V_R = 650$ V, $T_j = 25°C$
		–	0.02	12		$V_R = 600$ V, $T_j = 25°C$
		–	0.4	240		$V_R = 650$ V, $T_j = 150°C$

Table 6 AC characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Total capacitive charge	Q_c	–	4	–	nC	$V_R = 400$ V, $di/dt = 200$A/µs $I_F \leq I_{F,MAX}$, $T_j = 150°C$
Total Capacitance	C	–	70	–	pF	$V_R = 1$ V, $f = 1$ MHz
		–	9.1	–		$V_R = 300$ V, $f = 1$ MHz
		–	8.9	–		$V_R = 600$ V, $f = 1$ MHz

5 Electrical characteristics diagrams

Table 7

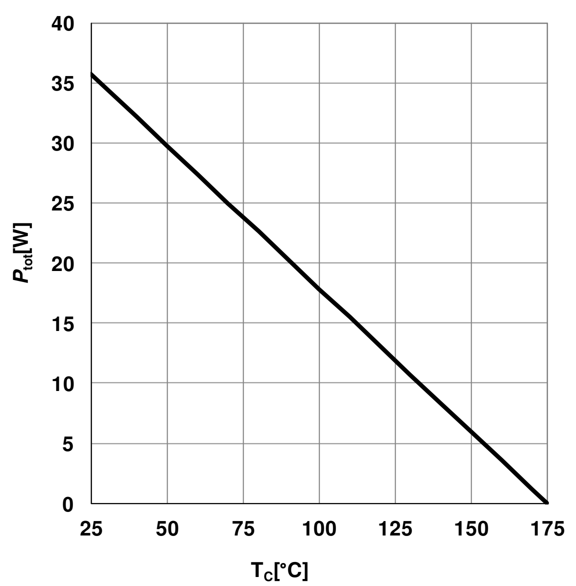
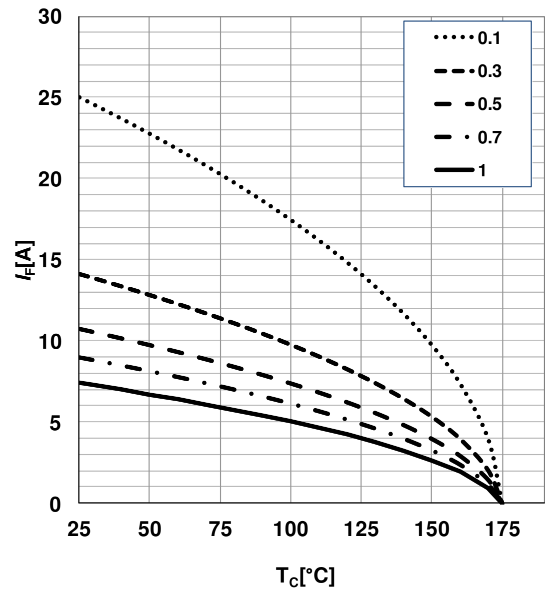
Power dissipation	**Maximal diode forward current**
	
P_{tot}= f(T_C); $R_{thJC,max}$	I_F = f(T_C); $R_{thJC,max}$; $T_j \leq$ 175°C; Parameter: D = duty cycle

Table 8

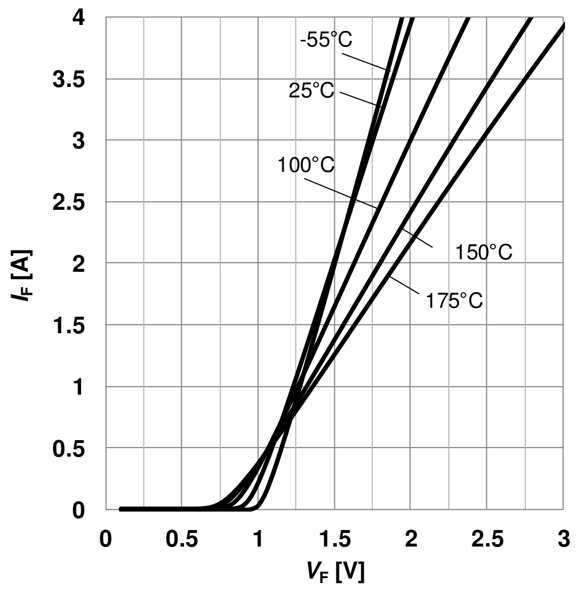
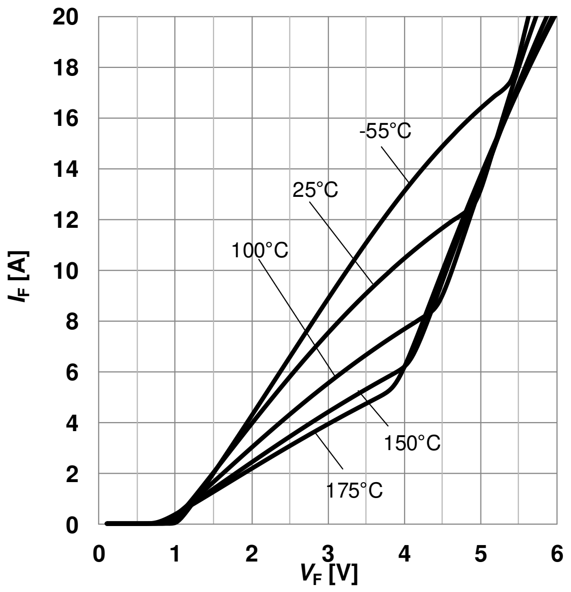
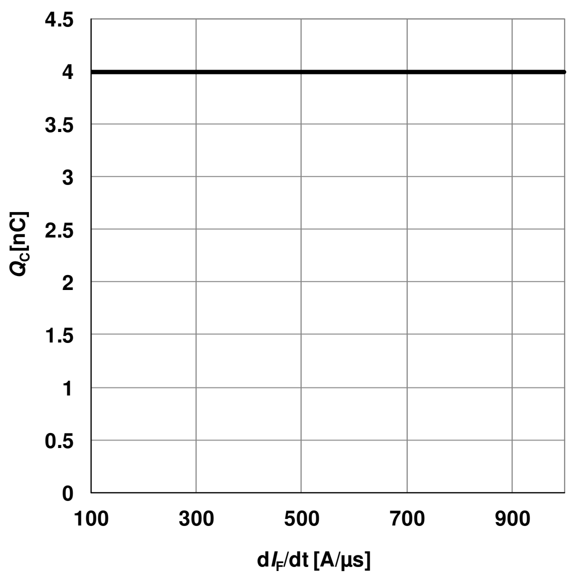
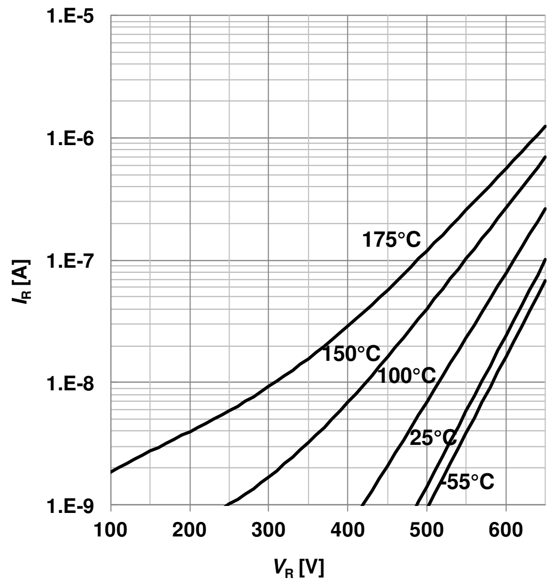
Typical forward characteristics	**Typical forward characteristics in surge current**
	
I_F = f(V_F); t_p = 200 µs; parameter: T_j	I_F = f(V_F); t_p = 200 µs; parameter: T_j

Table 9

Typ. capacitance charge vs. current slope[1)]	Typ. reverse current vs. reverse voltage
	
$Q_C = f(dI_F/dt)$; $T_j = 150°C$; $V_R = 400$ V; $I_F \leq I_{F,max}$	$I_R = f(V_R)$; parameter: T_j

1) Only capacitive charge, guaranteed by design.

Table 10

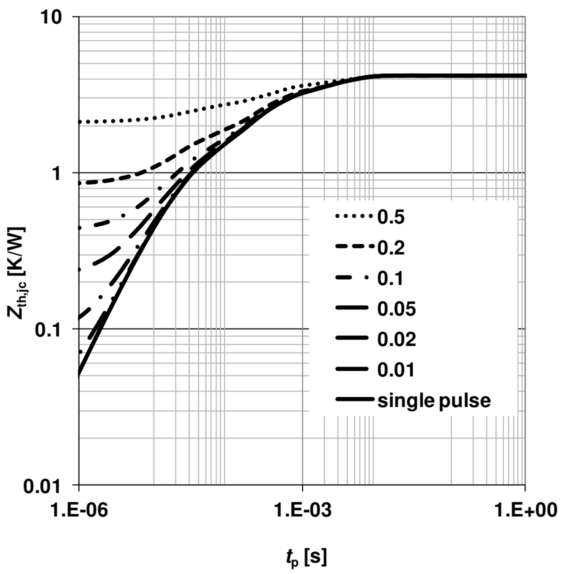
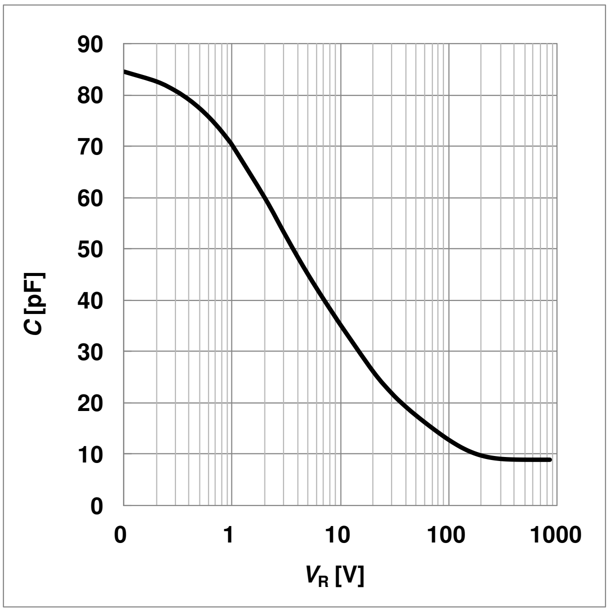
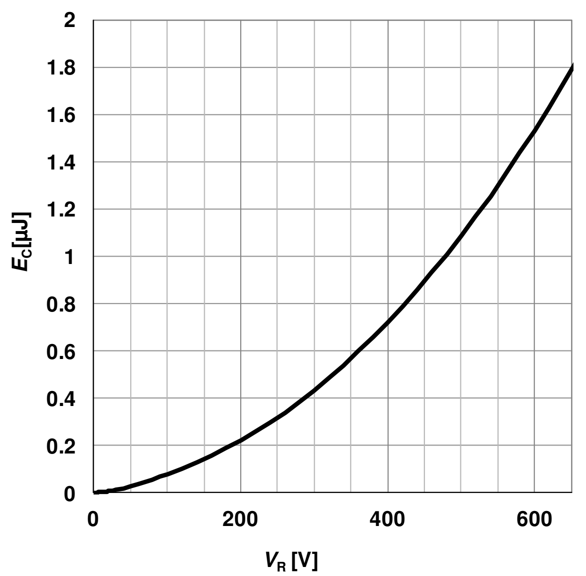
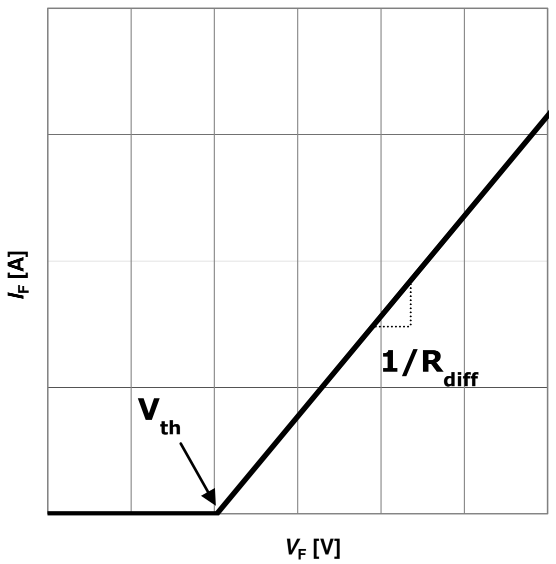
Max. transient thermal impedance	Typ. capacitance vs. reverse voltage
	
$Z_{th,jc} = f(t_P)$; parameter: $D = t_P/T$	$C = f(V_R)$; $T_j = 25°C$; $f = 1$ MHz

Table 11

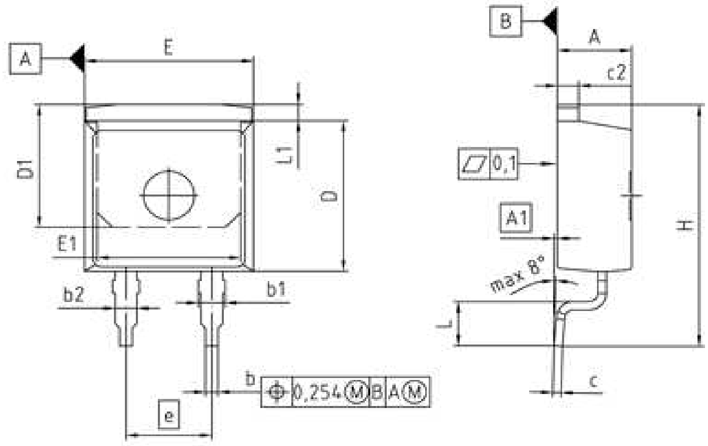
Typ. capacitance stored energy

$E_C = f(V_R)$

6 Simplified forward characteristics model

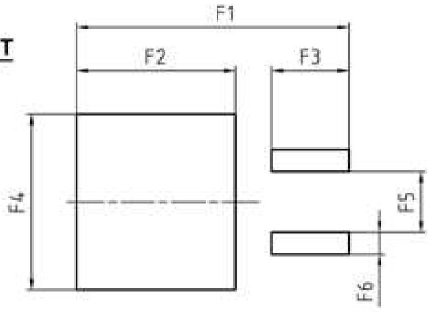
Table 12

Equivalent forward current curve	Mathematical Equation
	$V_F = V_{TH} + R_{DIFF} \cdot I_F$ $V_{TH}(T_j) = -0.001 \cdot T_j + 1.04 \quad [V]$ $R_{DIFF}(T_j) = 6.42 \cdot 10^{-6} \cdot T_j^2 + 6.42 \cdot 10^{-4} \cdot T_j + 0.232 \, [\Omega]$
$V_F = f(I_F)$	T_j [°C]; -55°C < T_j < 175°C; I_F < 4 A

7 Package outlines



FOOTPRINT

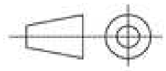


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.50	0.169	0.177
A1	0.00	0.25	0.000	0.010
b	0.65	0.85	0.026	0.033
b1	1.19	1.69	0.047	0.066
b2	1.19	1.39	0.047	0.055
c	0.40	0.60	0.016	0.024
c2	1.17	1.37	0.046	0.054
D	9.05	9.45	0.356	0.372
D1	6.90	7.65	0.272	0.301
E	9.80	10.20	0.386	0.402
E1	7.25	8.60	0.285	0.339
e	5.08 (BSC)		0.200 (BSC)	
N	2		2	
H	14.61	15.88	0.575	0.625
L	2.40	3.00	0.094	0.118
L1	0.70	1.30	0.028	0.051
F1	16.15		0.636	
F2	9.40		0.370	
F3	4.60		0.181	
F4	10.80		0.425	
F5	3.73		0.147	
F6	1.35		0.053	

DOCUMENT NO.
Z8B00163096

SCALE 0 5 0 5 7.5mm

EUROPEAN PROJECTION



ISSUE DATE
08-05-2013

REVISION
02

Figure 1 Outlines TO-263-2, dimensions in mm/inches

Revision History

IDK02G65C5

Revision: 2017-09-06, Rev. 2.1

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.1	2017-09-06	Updated IR,max values in table 5

Trademarks of Infineon Technologies AG

AURIX™, C166™, CanPAK™, CIPOS™, CoolGaN™, CoolMOS™, CoolSET™, CoolSiC™, CORECONTROL™, CROSSAVE™, DAVE™, DI-POL™, DrBlade™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, Infineon™, ISOFACE™, IsoPACK™, i-Wafer™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OPTIGA™, OptiMOS™, ORIGA™, POWERCODE™, PRIMARION™, PrimePACK™, PrimeSTACK™, PROFET™, PRO-SIL™, RASIC™, REAL3™, ReverSave™, SatRIC™, SIEGET™, SIPMOS™, SmartLEWIS™, SOLID FLASH™, SPOC™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™.

Trademarks updated August 2015

Other Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

We Listen to Your Comments
Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to:
erratum@infineon.com

Published by
Infineon Technologies AG
81726 München, Germany

Legal Disclaimer
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”) .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.
In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of Infineon Technologies in customer’s applications.
The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Information
For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (**www.infineon.com**).

Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

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.