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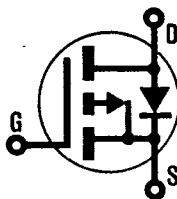
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HEXFET® TRANSISTORS

P-CHANNEL HEXDIP™

1-WATT RATED POWER MOSFETs IN A 4-PIN, DUAL-IN-LINE PACKAGE



IRFD9010

IRFD9012

-50 Volt, 0.50 Ohm, 1-Watt HEXDIP

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and extreme device ruggedness.

The P-Channel HEXFETs are designed for application which require the convenience of reverse polarity operation. They retain all of the features of the more common N-Channel HEXFETs such as voltage control, very fast switching, ease of paralleling, and excellent temperature stability.

P-Channels HEXFETs are intended for use in power stages where complementary symmetry with N-channel devices offers circuit simplification. They are also very useful in drive stages because of the circuit versatility offered by the reverse polarity connection. Applications include motor control, audio amplifiers, switched mode converters, control circuits and pulse amplifiers.

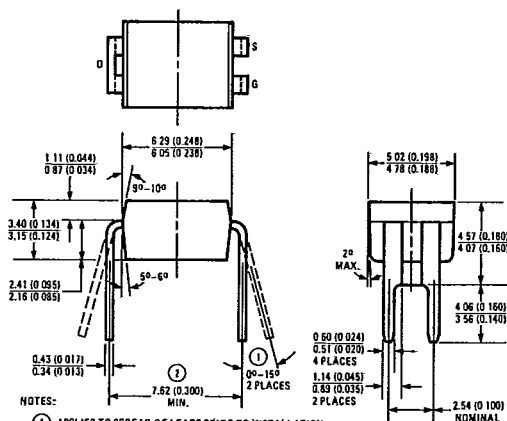
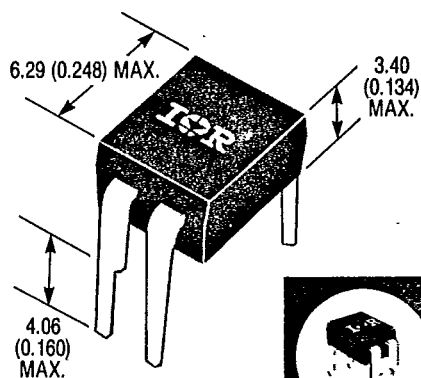
Features

- For Automatic Insertion
- Compact, End Stackable
- Fast Switching
- Low Drive Current
- Easily Paralleled
- Excellent Temperature Stability
- P-Channel Versatility

Product Summary

Part Number	V _{DS}	R _{DS(on)}	I _D
IRFD9010	-50V	0.50Ω	-1.1
IRFD9012	-50V	0.70Ω	-0.91

CASE STYLE AND DIMENSIONS



- ① APPLIES TO SPREAD OF LEADS PRIOR TO INSTALLATION.
② APPLIES TO INSTALLED LEAD CENTERS.

Case Style HD-1 (Similar to JEDEC Outline MO-001AN)
Dimensions in Millimeters and (Inches)

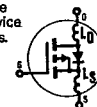
Absolute Maximum Ratings

Parameter	IRFD9010	IRFD9012	Units
V_{DS} Drain - Source Voltage ①	-50	-50	V
V_{DGR} Drain - Gate Voltage ($R_{GS} = 20\text{ K}\Omega$) ①	-50	-50	V
I_D @ $T_C = 25^\circ\text{C}$ Continuous Drain Current	-1.1	-0.91	A
I_D @ $T_C = 100^\circ\text{C}$ Continuous Drain Current	-0.68	-0.58	A
I_{DM} Pulsed Drain Current ②	-8.8	-7.3	A
V_{GS} Gate - Source Voltage	± 20		V
P_D @ $T_C = 25^\circ\text{C}$ Max. Power Dissipation	1		W
Linear Derating Factor	0.01		W/K ③
I_{LM} Inductive Current, Clamped	-8.8	-7.3	A
(See Fig. 14) $L = 100\mu\text{H}$			
I_L Unclamped Inductive Current (Avalanche Current) ④	(See Fig. 15) -1.5		A
T_J Operating Junction and Storage Temperature Range	-55 to 150		$^\circ\text{C}$
T_{stg} Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)		$^\circ\text{C}$

Electrical Characteristics @ $T_C = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS} Drain - Source Breakdown Voltage	IRFD9010	-50	—	—	V	$V_{GS} = 0\text{V}$
	IRFD9012	-50	—	—	V	$I_D = -250\mu\text{A}$
$V_{GS(th)}$ Gate Threshold Voltage	ALL	-2.0	—	-4.0	V	$V_{DS} = V_{GS}$, $I_D = -250\mu\text{A}$
I_{GSS} Gate-Source Leakage Forward	ALL	—	—	-500	nA	$V_{GS} = -20\text{V}$
I_{GSS} Gate-Source Leakage Reverse	ALL	—	—	500	nA	$V_{GS} = 20\text{V}$
I_{DSS} Zero Gate Voltage Drain Current	ALL	—	—	-250	μA	$V_{DS} = \text{Max. Rating}$, $V_{GS} = 0\text{V}$
		—	—	-1000	μA	$V_{DS} = \text{Max. Rating} \times 0.8$, $V_{GS} = 0\text{V}$, $T_C = 125^\circ\text{C}$
$I_{D(on)}$ On-State Drain Current ④	IRFD9010	-1.1	—	—	A	$V_{DS} > I_{D(on)} \times R_{DS(on)}$ max., $V_{GS} = 10\text{V}$
	IRFD9012	-0.91	—	—	A	
$R_{DS(on)}$ Static Drain-Source On-State Resistance ④	IRFD9010	—	0.35	0.50	Ω	$V_{GS} = -10\text{V}$, $I_D = -0.58\text{A}$
	IRFD9012	—	0.50	0.70	Ω	
g_{fs} Forward Transconductance ④	ALL	1.7	2.5	—	S(V)	$V_{DS} = 2 \times V_{GS}$, $I_{DS} = -2.4\text{A}$
C_{iss} Input Capacitance	ALL	—	240	—	pF	$V_{GS} = 0\text{V}$, $V_{DS} = -25\text{V}$, $f = 1.0\text{ MHz}$
C_{oss} Output Capacitance	ALL	—	160	—	pF	See Fig. 10
C_{rss} Reverse Transfer Capacitance	ALL	—	30	—	pF	
$t_{d(on)}$ Turn-On Delay Time	ALL	—	6.1	9.2	ns	$V_{DD} = -25\text{V}$, $I_D = -4.7\text{A}$, $R_G = 24\Omega$, $R_D = 5.6\Omega$ See Fig. 16 (MOSFET switching times are essentially independent of operating temperature.)
t_r Rise Time	ALL	—	47	71	ns	
$t_{d(off)}$ Turn-Off Delay Time	ALL	—	13	20	ns	
t_f Fall Time	ALL	—	39	59	ns	
Q_g Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	—	7.2	11	nC	$V_{GS} = -10\text{V}$, $I_D = -4.7\text{A}$, $V_{DS} = 0.8$ Max. Rating. See Fig. 17 for test circuit. (Gate charge is essentially independent of operating temperature.)
Q_{gs} Gate-Source Charge	ALL	—	2.5	3.8	nC	
Q_{gd} Gate-Drain ("Miller") Charge	ALL	—	2.7	4.1	nC	
L_D Internal Drain Inductance	ALL	—	4.0	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.
L_S Internal Source Inductance	ALL	—	6.0	—	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.

Modified MOSFET symbol showing the internal device inductances.



Thermal Resistance

R_{thJA} Junction-to-Ambient	ALL	—	—	120	K/W ⑤	Typical socket mount
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Source-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	IRFD9010	—	—	-1.1	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
		IRFD9012	—	—	-0.91	A	
I_{SM}	Pulse Source Current (Body Diode) ③	IRFD9010	—	—	-8.8	A	
		IRFD9012	—	—	-7.3	A	
V_{SD}	Diode Forward Voltage ②	ALL	—	—	-5.5	V	$T_C = 25^\circ\text{C}$, $I_S = -1.1\text{A}$, $V_{GS} = 0\text{V}$
t_{rr}	Reverse Recovery Time	ALL	33	75	160	ns	$T_J = 25^\circ\text{C}$, $I_F = -4.7\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$
Q_{RR}	Reverse Recovered Charge	ALL	0.090	0.22	0.52	μC	$T_J = 25^\circ\text{C}$, $I_F = -4.7\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$
t_{on}	Forward Turn-on Time	ALL	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.				

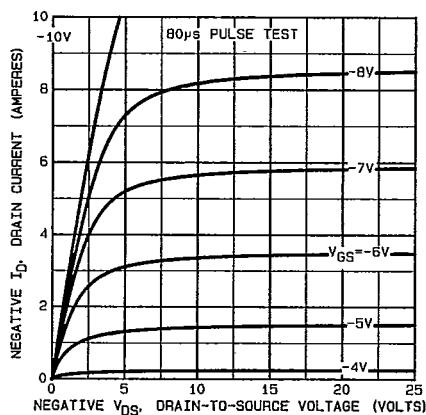
① $T_J = 25^\circ\text{C}$ to 150°C ② Repetitive Rating: Pulse width limited by
max. junction temperature. See Transient
Thermal Impedance Curve (Fig. 5).③ @ $V_{dd} = -25\text{V}$, $T_J = 25^\circ\text{C}$
 $L = 100\text{ }\mu\text{H}$, $R_G = 25\Omega$ ④ Pulse Test: Pulse width $\leq 300\text{ }\mu\text{s}$
Duty Cycle $\leq 2\%$ ⑤ $K/W = ^\circ\text{C}/\text{W}$
 $W/K = \text{W}/^\circ\text{C}$ 

Fig. 1 — Typical Output Characteristics

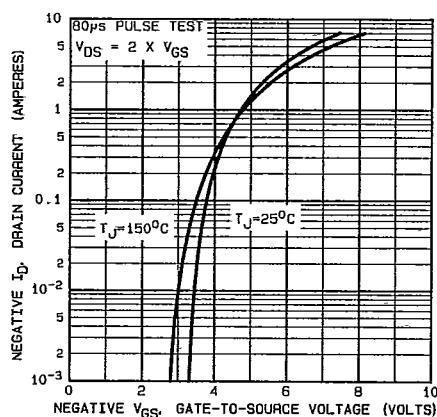


Fig. 2 — Typical Transfer Characteristics

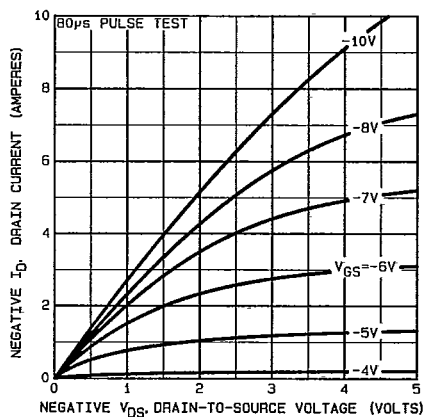


Fig. 3 — Typical Saturation Characteristics

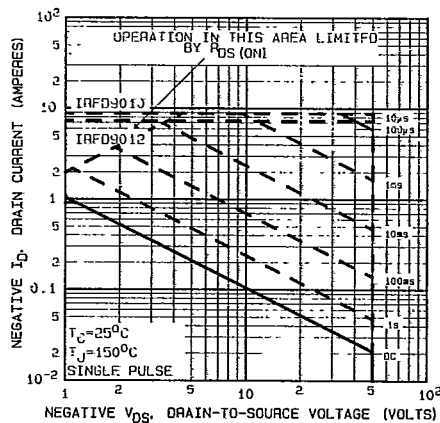


Fig. 4 — Maximum Safe Operating Area

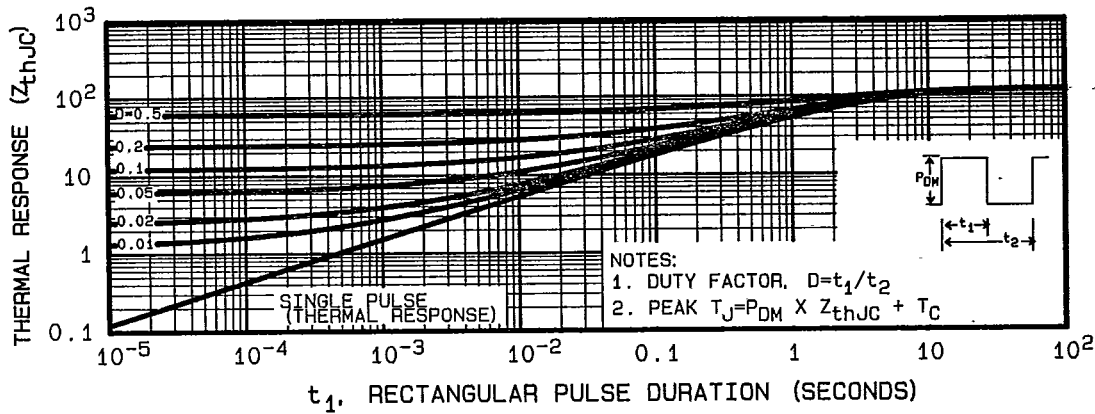


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

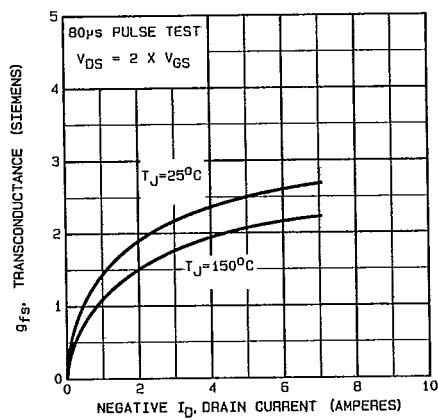


Fig. 6 — Typical Transconductance Vs. Drain Current

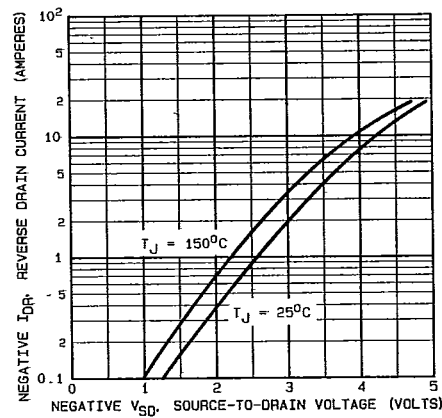


Fig. 7 — Typical Source-Drain Diode Forward Voltage

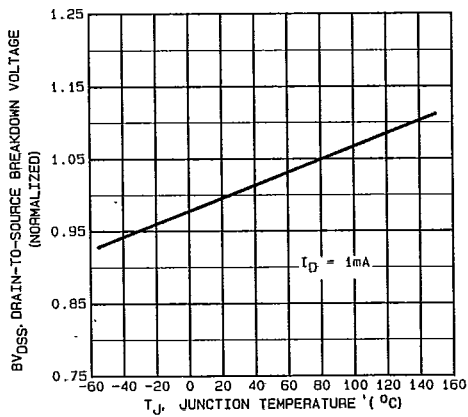


Fig. 8 — Breakdown Voltage Vs. Temperature

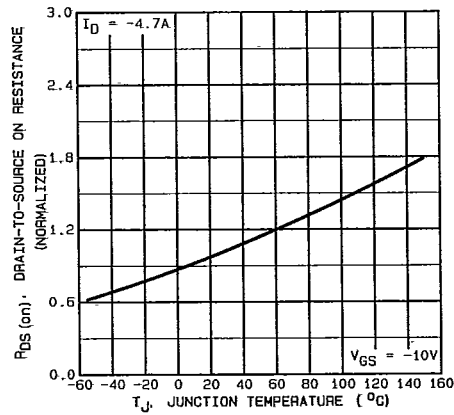


Fig. 9 — Normalized On-Resistance Vs. Temperature

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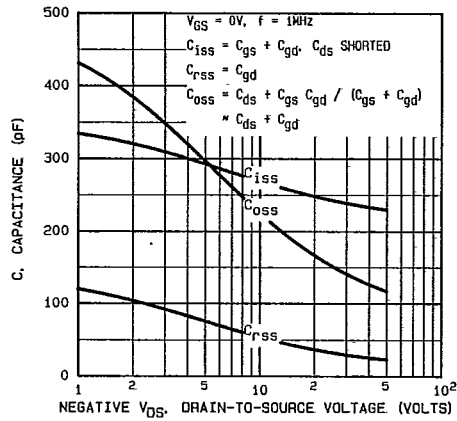


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

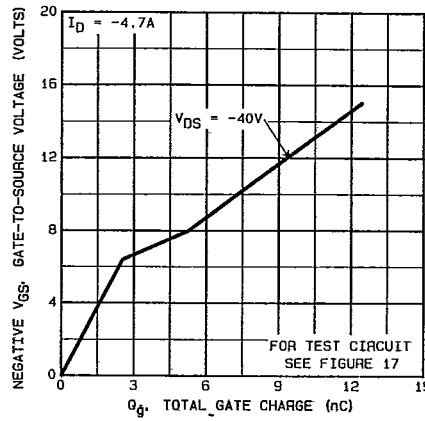


Fig. 11 — Typical Gate Charge Vs. Gate-to-Source Voltage

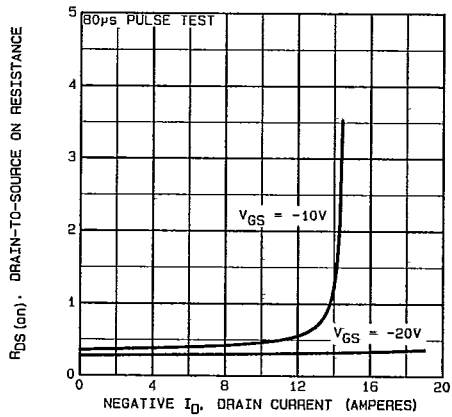


Fig. 12 — Typical On-Resistance Vs. Drain Current

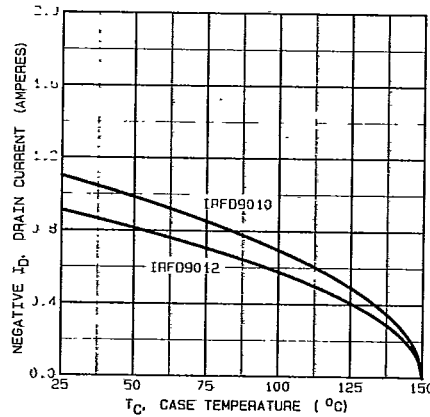


Fig. 13 — Maximum Drain Current Vs. Case Temperature

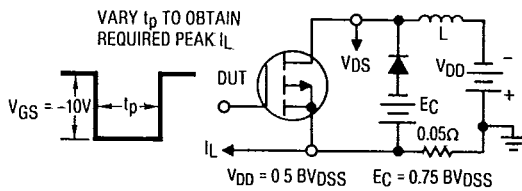


Fig. 14a — Clamped Inductive Test Circuit

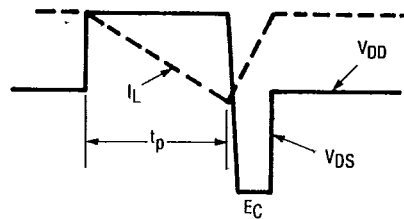


Fig. 14b — Clamped Inductive Waveforms

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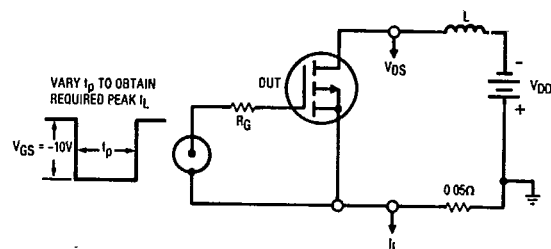


Fig. 15a — Unclamped Inductive Test Circuit

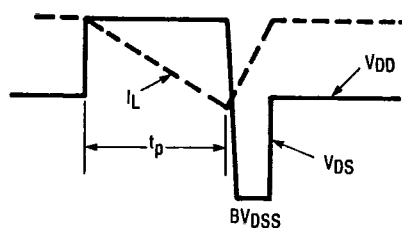


Fig. 15b — Unclamped Inductive Load Test Waveforms

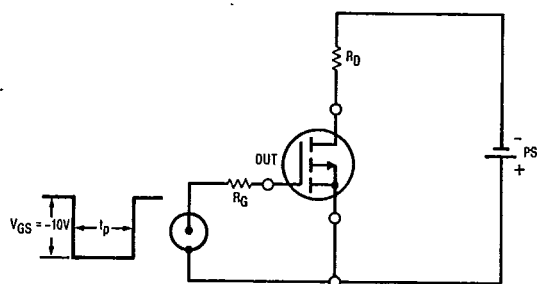


Fig. 16 — Switching Time Test Circuit

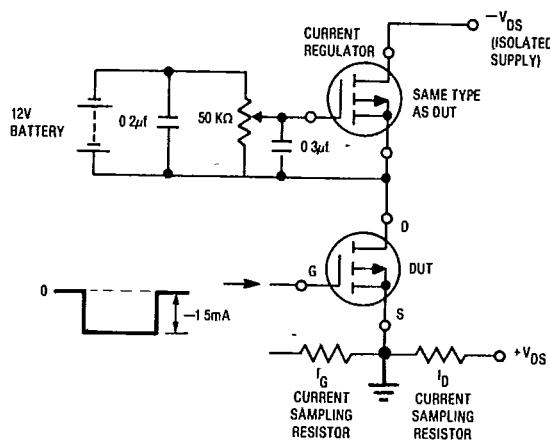
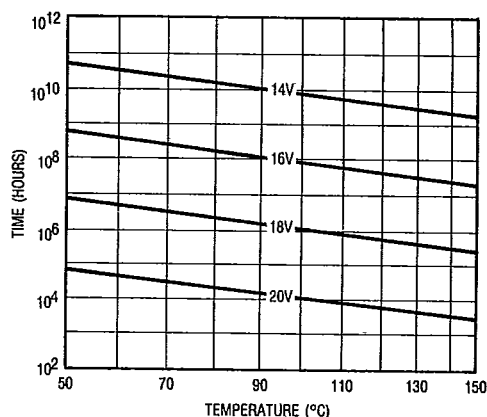
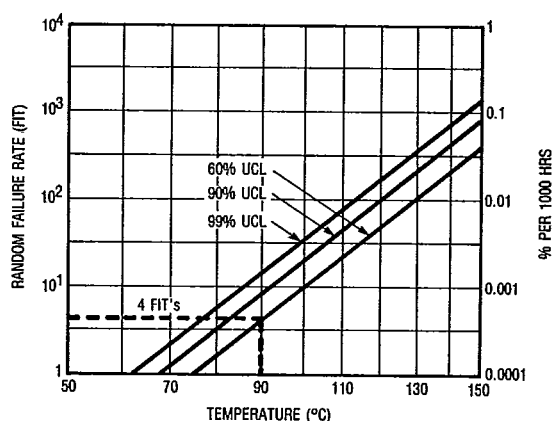


Fig. 17 — Gate Charge Test Circuit



*Fig. 18 — Typical Time to Accumulated 1% Gate Failure



*Fig. 19 — Typical High Temperature Reverse Bias (HTRB) Failure Rate

*The data shown is correct as of April 15, 1987. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

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