

N0412N

R07DS0554EJ0100

Rev.1.00

Nov 07, 2011

N-CHANNEL MOSFET FOR SWITCHING

Description

The N0412N is N-channel MOS Field Effect Transistor designed for high current switching applications.

Features

- Low on-state resistance

$$R_{DS(on)} = 3.7 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 50 \text{ A)}$$

- Low input capacitance

$$C_{iss} = 5550 \text{ pF TYP. (} V_{DS} = 25 \text{ V, } V_{GS} = 0 \text{ V)}$$

- High current

$$I_{D(DC)} = \pm 100 \text{ A}$$

- RoHS Compliant

Ordering Information

Part No.	Lead Plating	Packing	Package
N0412N-S19-AY *1	Pure Sn (Tin)	Tube 50 p/tube	TO-220 1.9 g TYP.

Note: *1. Pb-free (This product does not contain Pb in the external electrode.)

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$, all terminals are connected)

Item	Symbol	Ratings	Unit
Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	40	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC)	$I_{D(DC)}$	± 100	A
Drain Current (pulse) *1	$I_{D(pulse)}$	± 400	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	119	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	$-55 \text{ to } +150$	$^\circ\text{C}$
Single Avalanche Current *2	I_{AS}	55	A
Single Avalanche Energy *2	E_{AS}	300	mJ

Thermal Resistance

Channel to Case (Drain) Thermal Resistance	$R_{th(ch-C)}$	1.05	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance *2	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

Notes: *1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

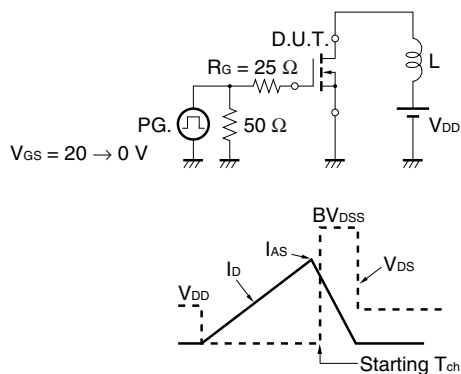
*2. Starting $T_{ch} = 25^\circ\text{C}$, $R_G = 25 \Omega$, $V_{DD} = 25 \text{ V}$, $V_{GS} = 20 \rightarrow 0 \text{ V}$, $L = 100 \mu\text{H}$

Electrical Characteristics (T_A = 25°C, all terminals are connected)

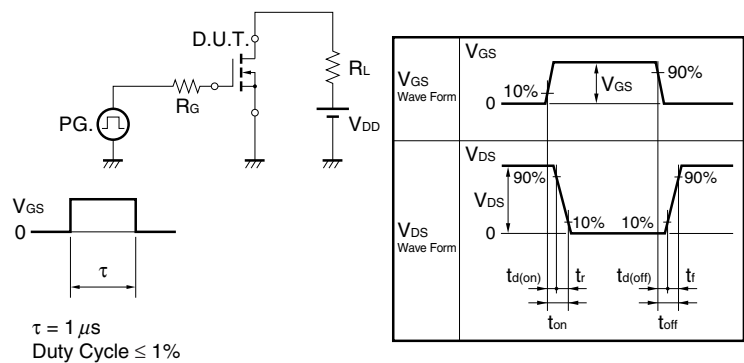
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I _{DSS}			1	μA	V _{DS} = 40 V, V _{GS} = 0 V
Gate Leakage Current	I _{GSS}			±100	nA	V _{GS} = ±20 V, V _{DS} = 0 V
Gate to Source Cut-off Voltage	V _{GS(off)}	2.0		4.0	V	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance ^{*1}	y _{fs}	26			S	V _{DS} = 10 V, I _D = 50 A
Drain to Source On-state Resistance ^{*1}	R _{DS(on)}		2.7	3.7	mΩ	V _{GS} = 10 V, I _D = 50 A
Input Capacitance	C _{iss}		5550		pF	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz
Output Capacitance	C _{oss}		580		pF	
Reverse Transfer Capacitance	C _{rss}		320		pF	
Turn-on Delay Time	t _{d(on)}		29.0		ns	V _{DD} = 20 V, I _D = 50 A, V _{GS} = 10 V, R _G = 0 Ω
Rise Time	t _r		15.0		ns	
Turn-off Delay Time	t _{d(off)}		64.0		ns	
Fall Time	t _f		13.0		ns	
Total Gate Charge	Q _G		100		nC	V _{DD} = 32 V, V _{GS} = 10 V, I _D = 100 A
Gate to Source Charge	Q _{GS}		26		nC	
Gate to Drain Charge	Q _{GD}		32		nC	
Body Diode Forward Voltage ^{*1}	V _{F(S-D)}			1.5	V	I _F = 100 A, V _{GS} = 0 V
Reverse Recovery Time	t _{rr}		40		ns	I _F = 50 A, V _{GS} = 0 V,
Reverse Recovery Charge	Q _{rr}		44		nC	di/dt = 100 A/μs

Note: *1. Pulsed

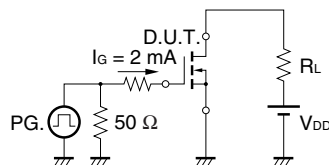
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

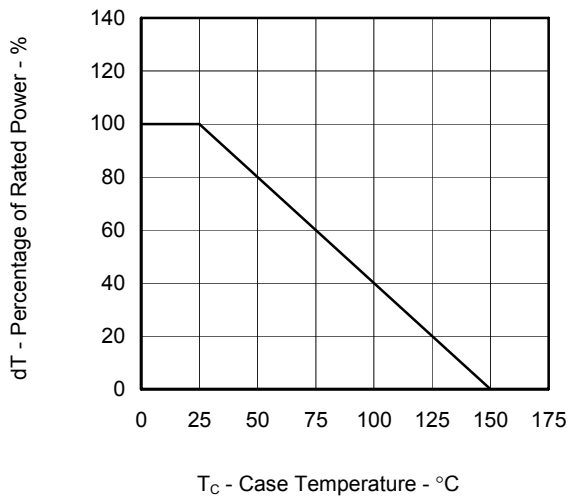


TEST CIRCUIT 3 GATE CHARGE

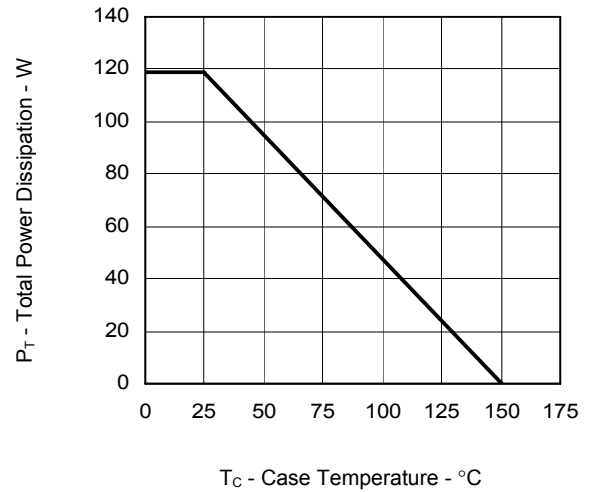


Typical Characteristics ($T_A = 25^\circ\text{C}$)

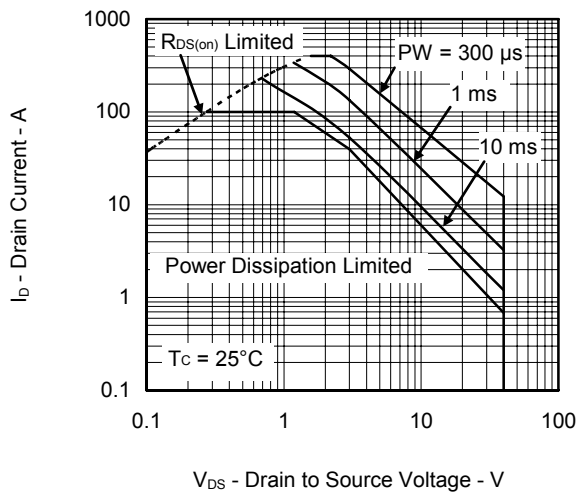
DERATING FACTOR OF FORWARD BIAS SAFE
OPERATING AREA



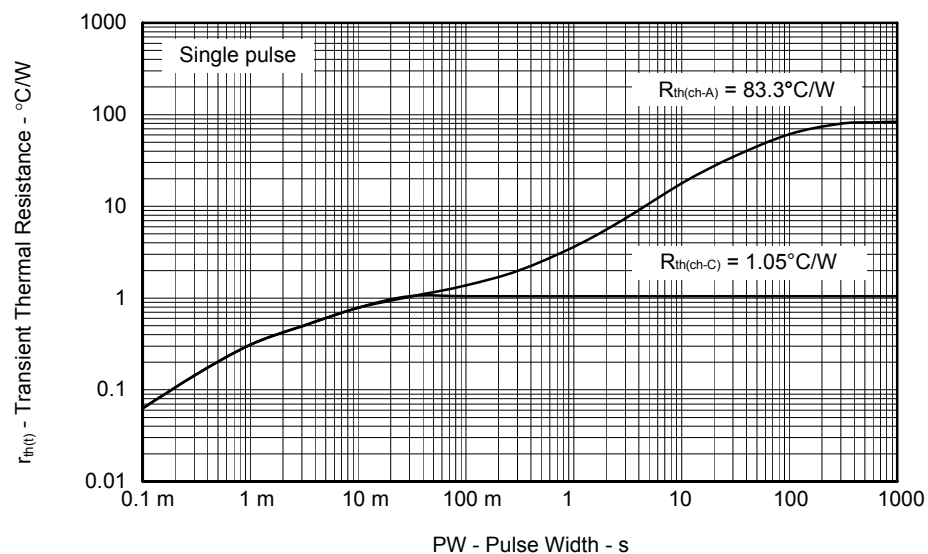
TOTAL POWER DISSIPATION vs.
CASE TEMPERATURE

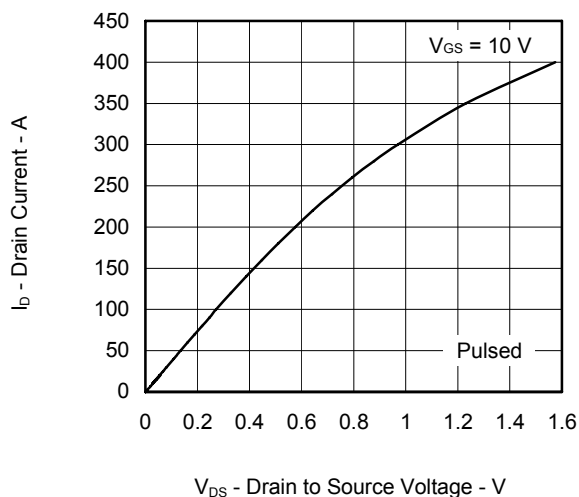


FORWARD BIAS SAFE OPERATING AREA

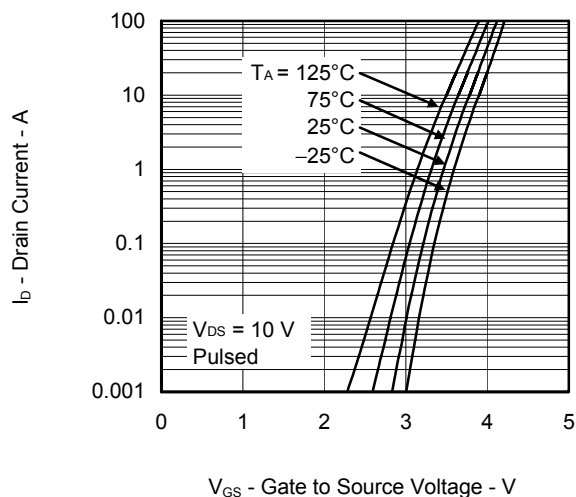
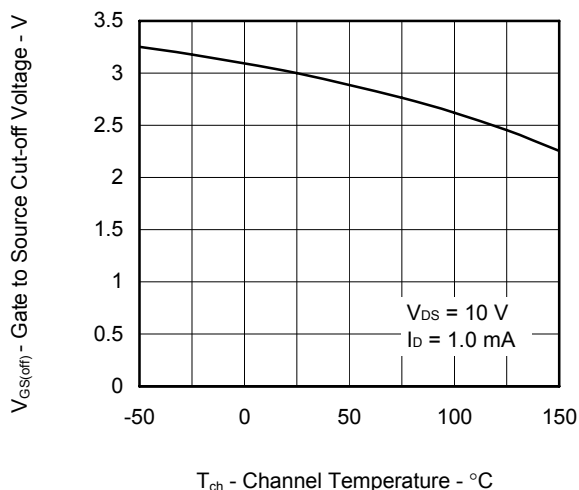
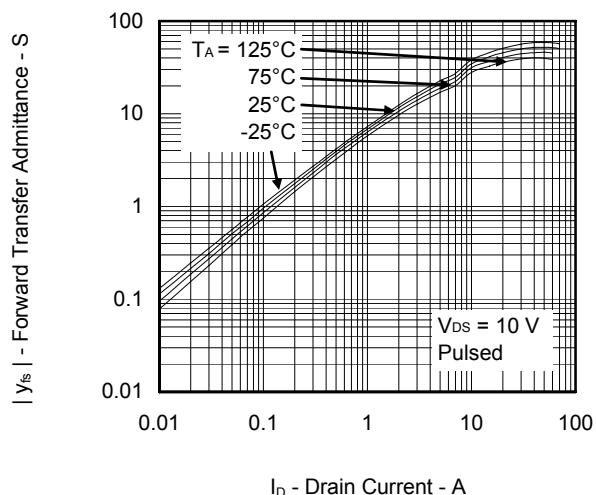
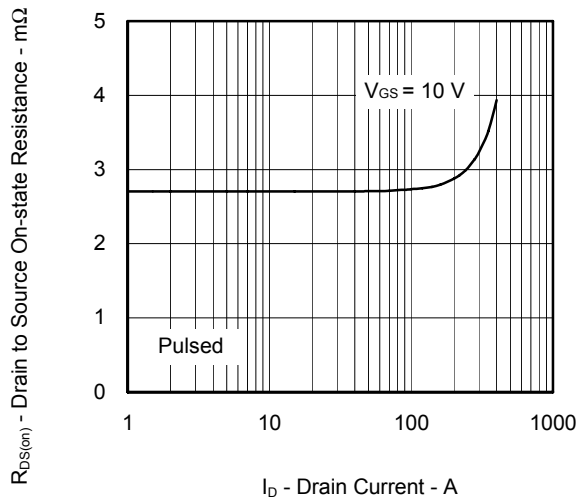
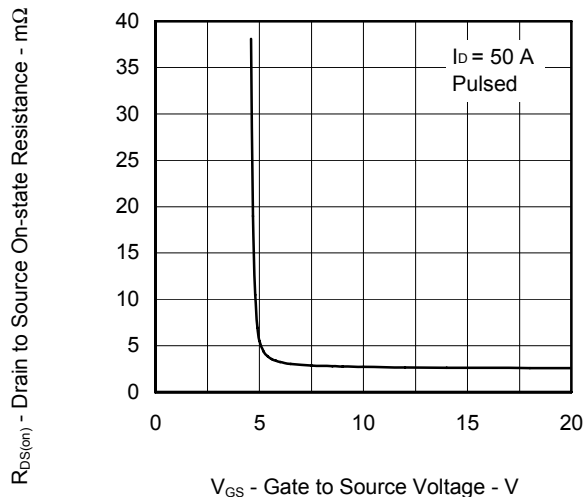


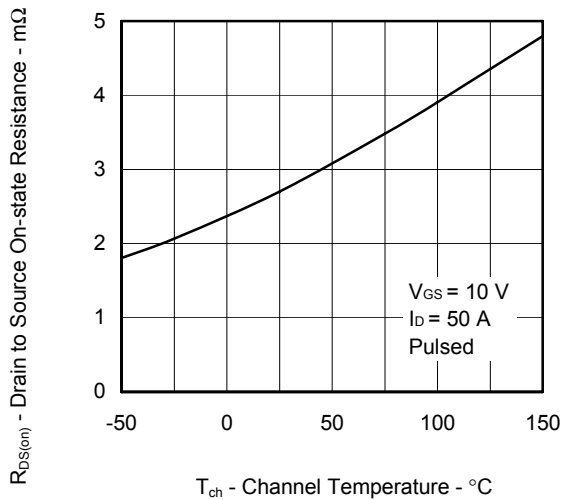
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



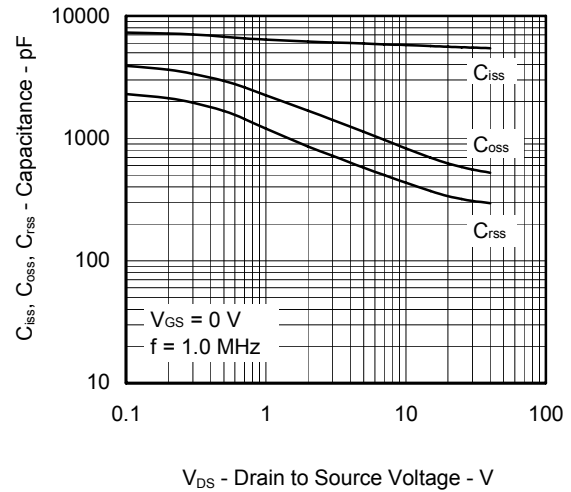
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE

FORWARD TRANSFER CHARACTERISTICS

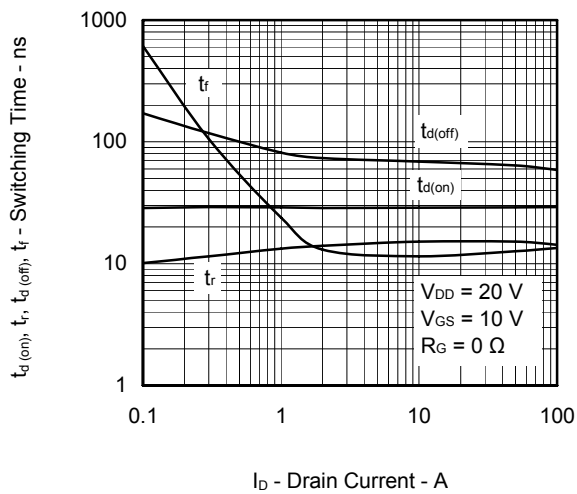
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATUREFORWARD TRANSFER ADMITTANCE vs. DRAIN
CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE

DRAIN TO SOURCE ON-STATE RESISTANCE
vs. CHANNEL TEMPERATURE

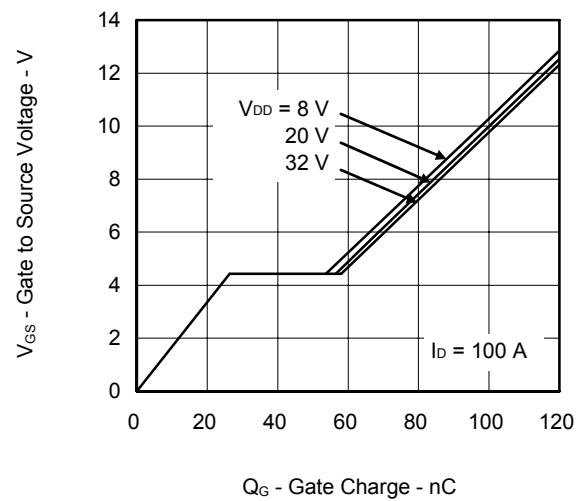
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



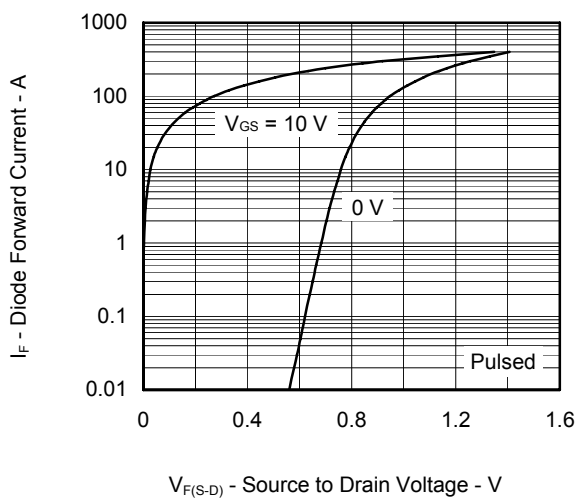
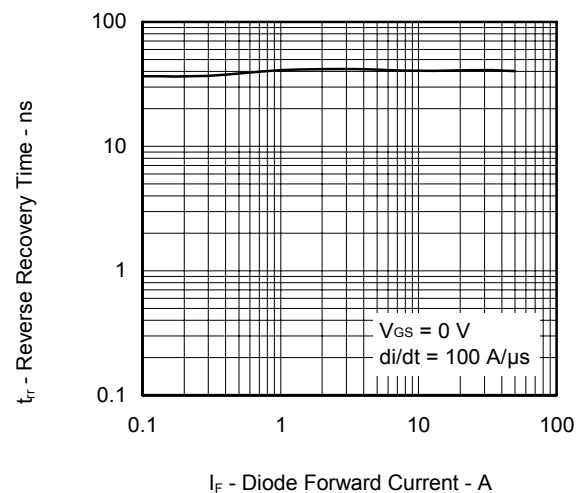
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

REVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT

Revision History	N0412N Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Nov 07, 2011	–	First Edition Issued

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2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
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Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
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Телефон: 8 (812) 309 58 32 (многоканальный)

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Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.