

$V_{DSS}$	-20V
$R_{DS(on)}(Max.)$	68mΩ
$I_D$	±2.5A
$P_D$	1.25W

## ●Features

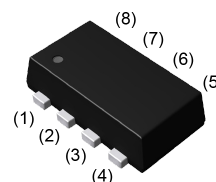
- 1) Low on - resistance.
- 2) -1.5V Drive.
- 3) Built-in G-S Protection Diode.
- 4) Small Surface Mount Package (TSST8).
- 5) Pb-free lead plating ; RoHS compliant

## ●Application

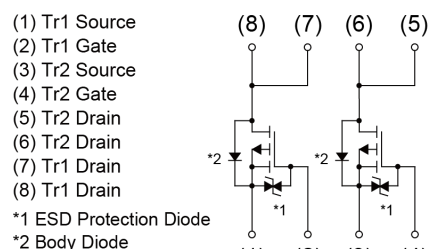
Switching

## ●Outline

TSST8



## ●Inner circuit



## ●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3000
	Taping code	TR
	Marking	J21

## ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ ) <It is the same ratings for the Tr1 and Tr2>

Parameter		Symbol	Value	Unit
Drain - Source voltage		$V_{DSS}$	-20	V
Continuous drain current		$I_D$	±2.5	A
Pulsed drain current		$I_{D,pulse}^{*1}$	±10	A
Gate - Source voltage		$V_{GSS}$	±10	V
Power dissipation	total	$P_D^{*2}$	1.25	W
	element		1.0	
	total	$P_D^{*3}$	0.6	
Junction temperature		$T_j$	150	°C
Range of storage temperature		$T_{stg}$	-55 to +150	°C

### ● Thermal resistance

Parameter		Symbol	Values			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction - ambient	total	$R_{thJA}^{*2}$	-	-	100	°C/W
	element		-	-	125	
	total	$R_{thJA}^{*3}$	-	-	208	

### ● Electrical characteristics ( $T_a = 25^\circ\text{C}$ ) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -1mA$	-20	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	$I_D = -1mA$ referenced to $25^\circ\text{C}$	-	-21.9	-	mV/°C
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = -20V, V_{GS} = 0V$	-	-	-1	μA
Gate - Source leakage current	$I_{GSS}$	$V_{DS} = 0V, V_{GS} = \pm 10V$	-	-	±10	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = -10V, I_D = -1mA$	-0.3	-	-1.0	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	$I_D = -1mA$ referenced to $25^\circ\text{C}$	-	2.4	-	mV/°C
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = -4.5V, I_D = -2.5A$	-	49	68	mΩ
		$V_{GS} = -2.5V, I_D = -1.2A$	-	68	95	
		$V_{GS} = -1.8V, I_D = -1.2A$	-	100	150	
		$V_{GS} = -1.5V, I_D = -0.5A$	-	140	280	
Gate input resistance	$R_G$	$f = 1MHz, \text{open drain}$	-	12	-	Ω
Forward Transfer Admittance	$ Y_{fs} ^{*4}$	$V_{DS} = -10V, I_D = -2.5A$	2.5	-	-	S

**●Electrical characteristics** ( $T_a = 25^\circ\text{C}$ ) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$V_{GS} = 0V$	-	1270	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = -10V$	-	100	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	90	-	
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} \approx -10V, V_{GS} = -4.5V$	-	9	-	ns
Rise time	$t_r^{*4}$	$I_D = -1.2A$	-	30	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 8.3\Omega$	-	120	-	
Fall time	$t_f^{*4}$	$R_G = 10\Omega$	-	85	-	

**●Gate charge characteristics** ( $T_a = 25^\circ\text{C}$ ) <It is the same characteristics for the Tr1 and Tr2>

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*4}$	$V_{DD} \approx -10V$	-	12	-	nC
Gate - Source charge	$Q_{gs}^{*4}$	$I_D = -2.5A$	-	2.5	-	
Gate - Drain charge	$Q_{gd}^{*4}$	$V_{GS} = -4.5V$	-	2.0	-	

**●Body diode electrical characteristics** (Source-Drain) ( $T_a = 25^\circ\text{C}$ )

&lt;It is the same characteristics for the Tr1 and Tr2&gt;

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	$I_S$	$T_a = 25^\circ\text{C}$	-	-	-0.8	A
Body diode pulse current	$I_{SP}^{*1}$		-	-	-10	
Forward voltage	$V_{SD}^{*4}$	$V_{GS} = 0V, I_S = -2.5A$	-	-	-1.2	V

 \*1  $P_w \leq 10\mu\text{s}$ , Duty cycle  $\leq 1\%$ 

\*2 Mounted on a ceramic board (30×30×0.8mm)

\*3 Mounted on a FR4 (20×20×0.8mm)

\*4 Pulsed

## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

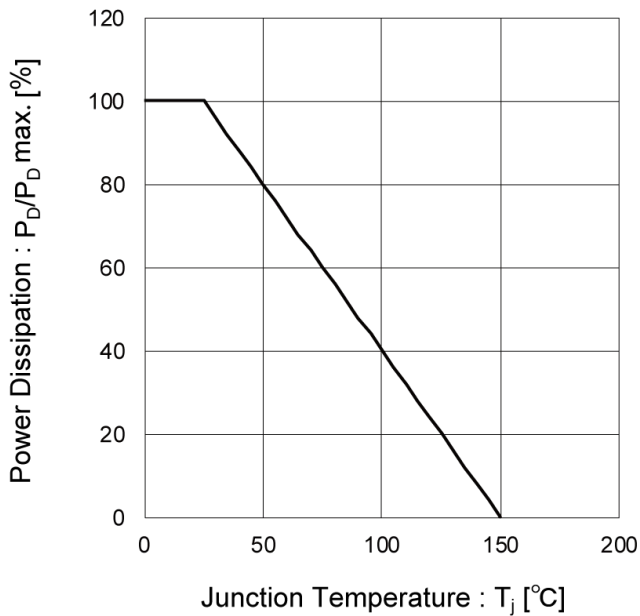


Fig.2 Maximum Safe Operating Area

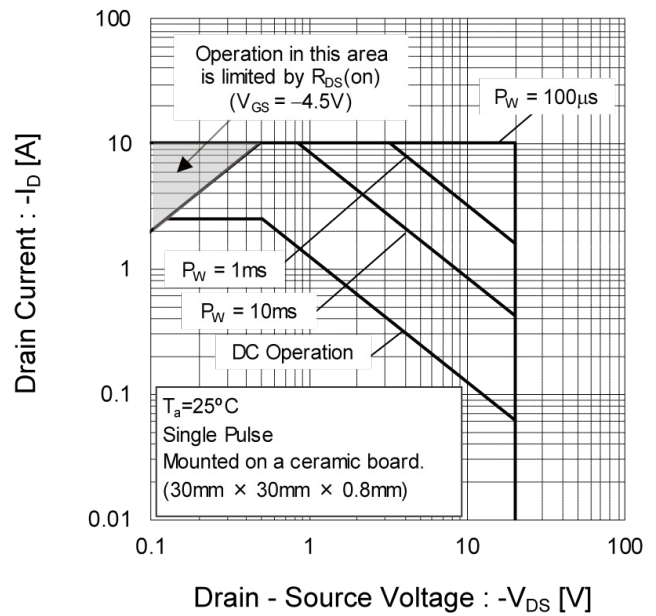


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

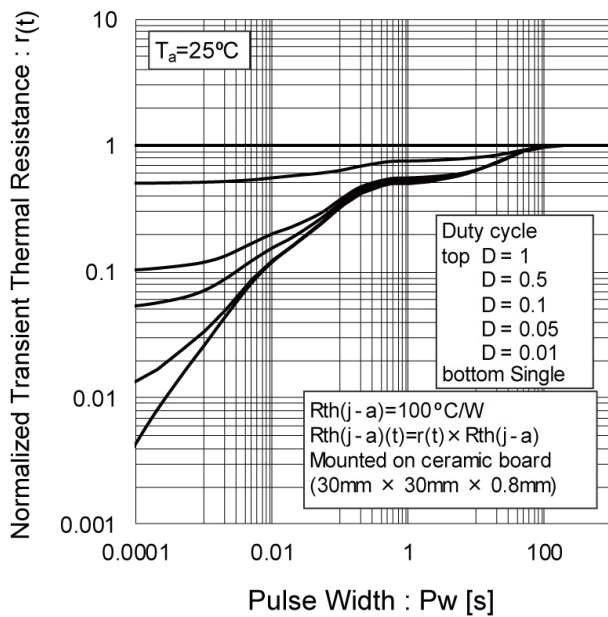
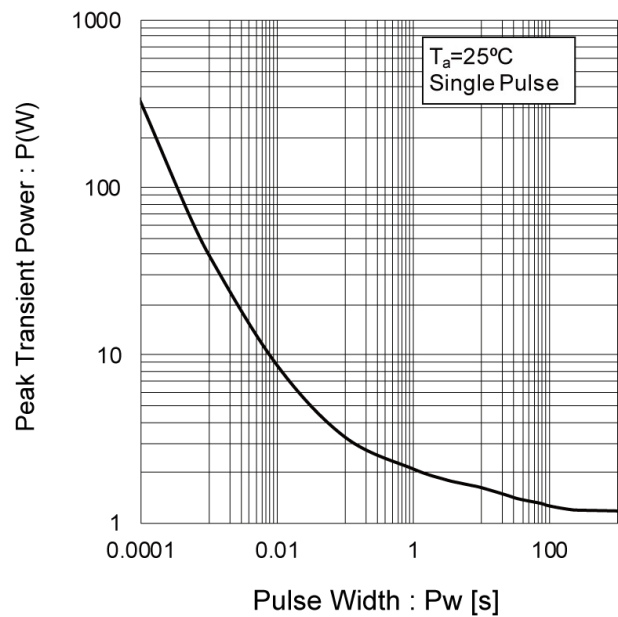


Fig.4 Single Pulse Maximum Power dissipation



# ●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

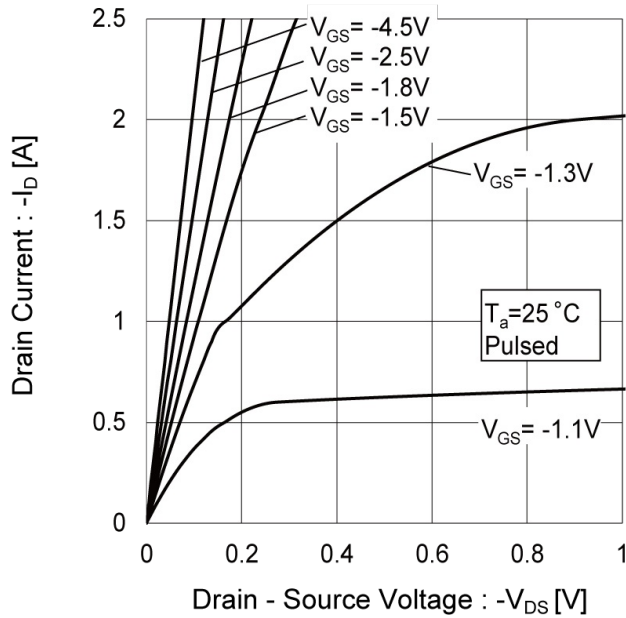


Fig.6 Typical Output Characteristics(II)

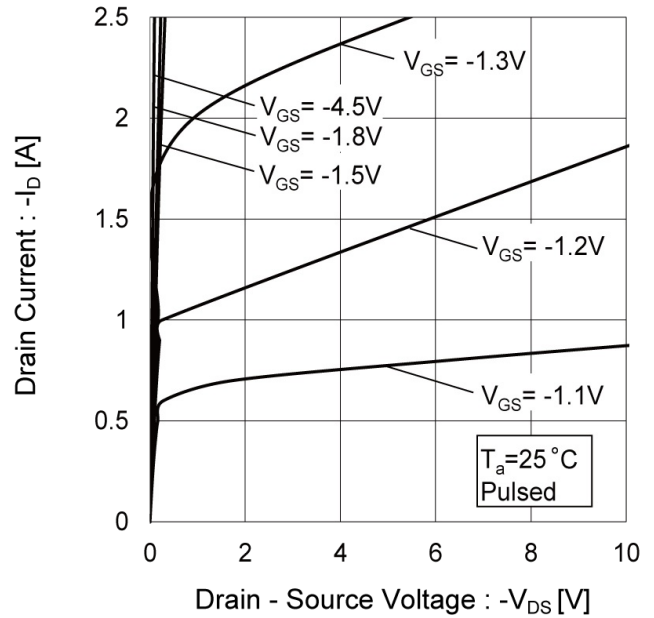


Fig.7 Breakdown Voltage vs. Junction Temperature

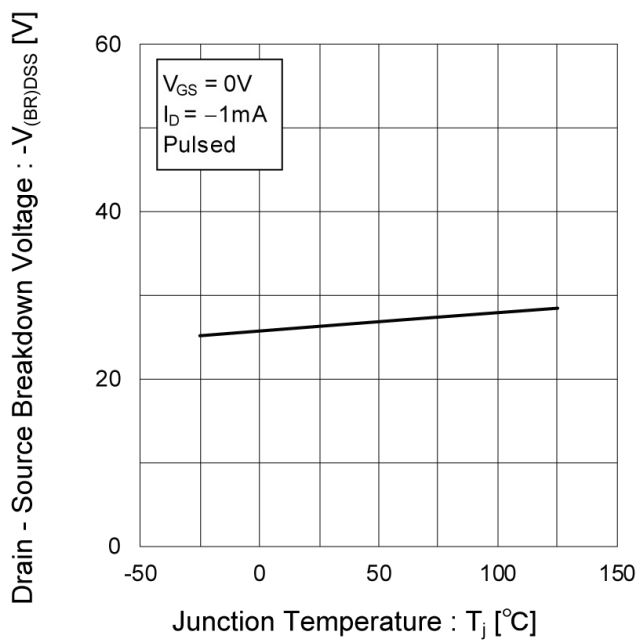
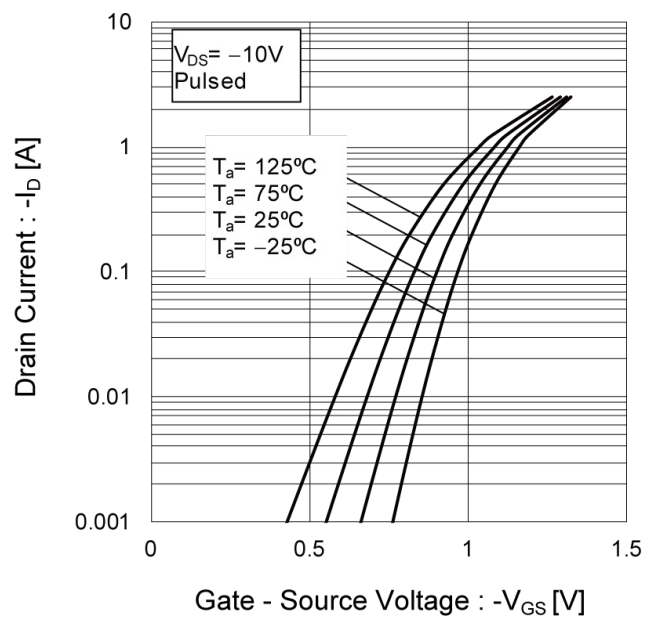


Fig.8 Typical Transfer Characteristics



## ●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs.  
Junction Temperature

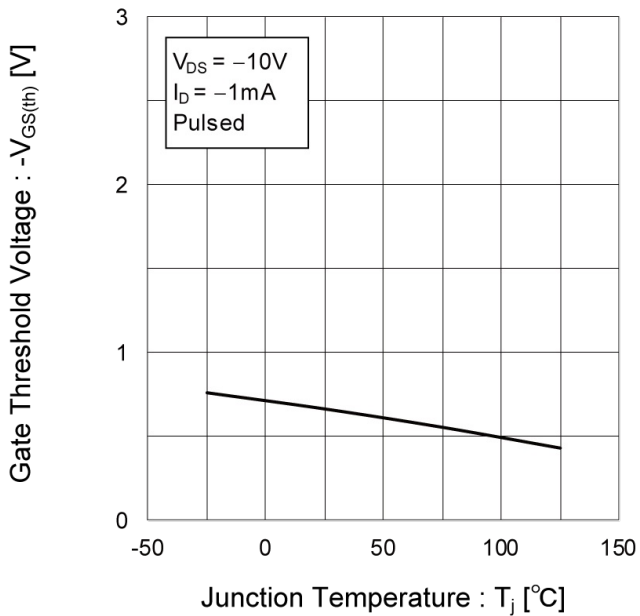


Fig.10 Forward Transfer Admittance vs.  
Drain Current

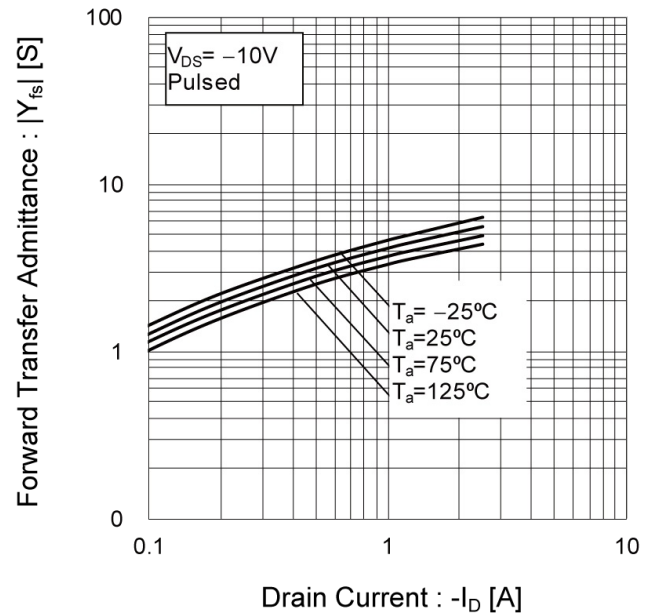


Fig.11 Drain Current Derating Curve

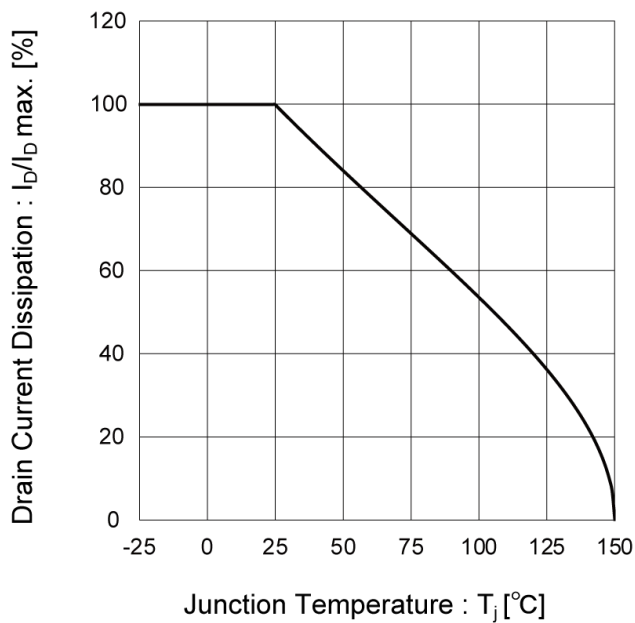
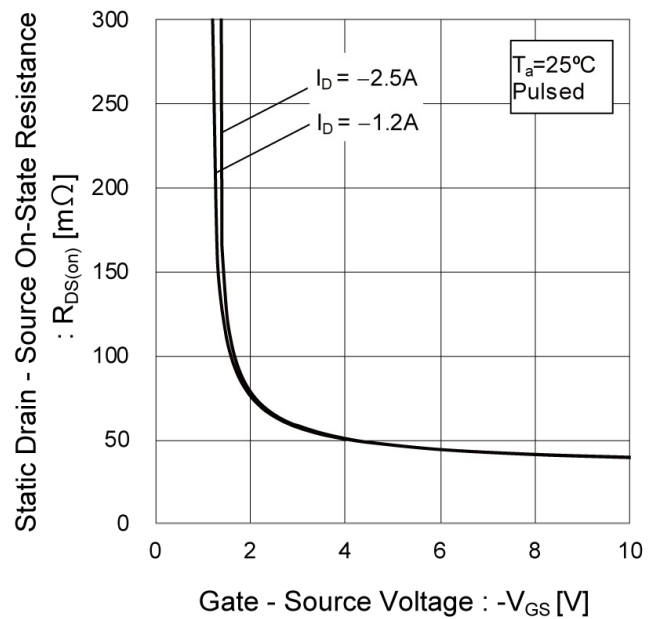


Fig.12 Static Drain - Source On - State  
Resistance vs. Gate Source Voltage



# ●Electrical characteristic curves

Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

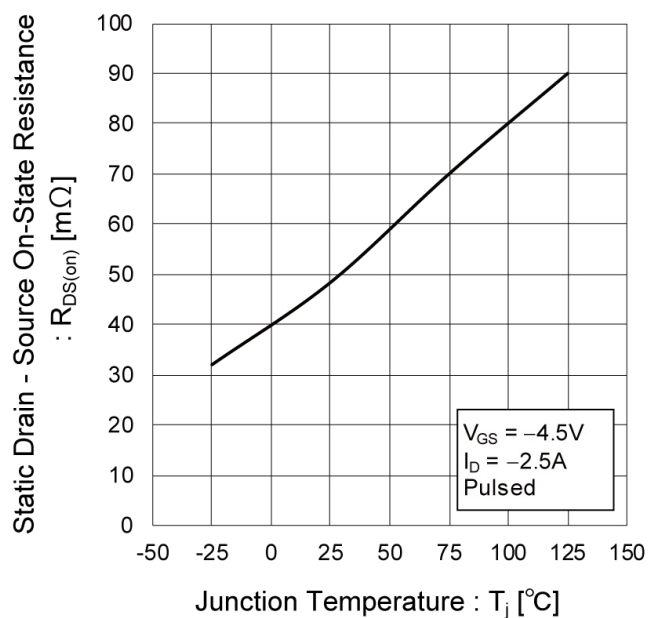
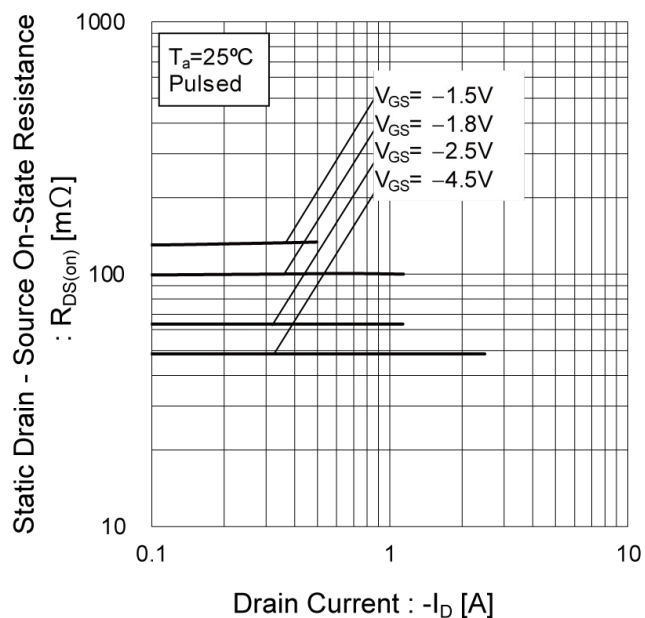


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current( $I$ )



# ●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

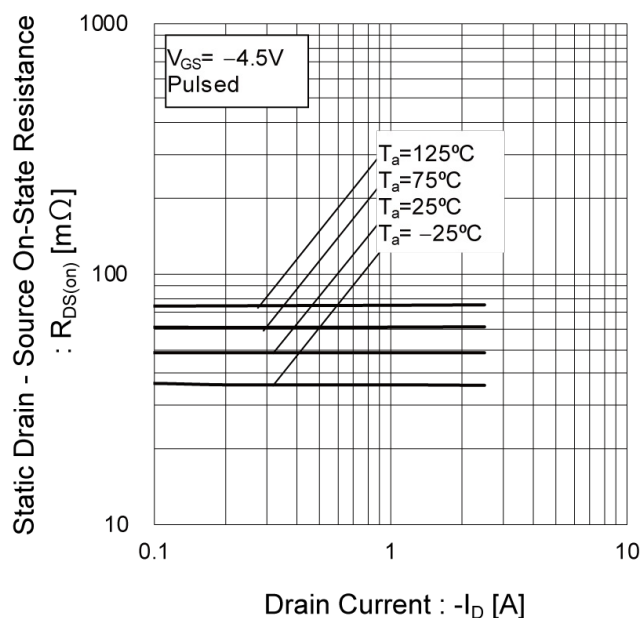


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

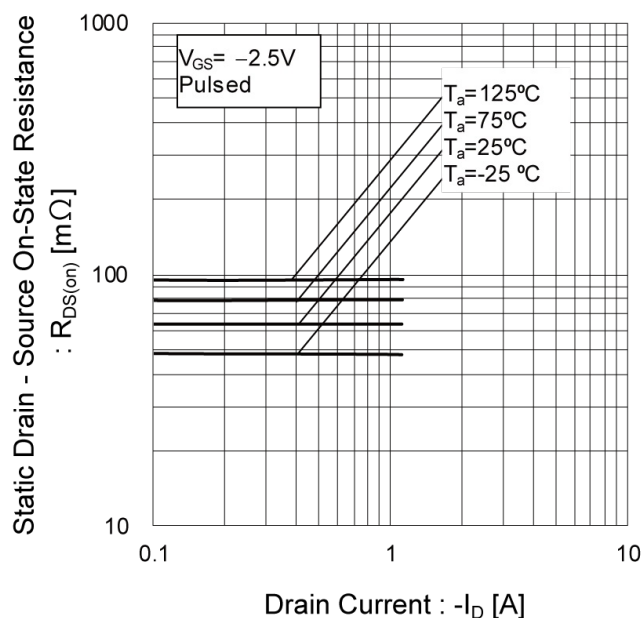


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

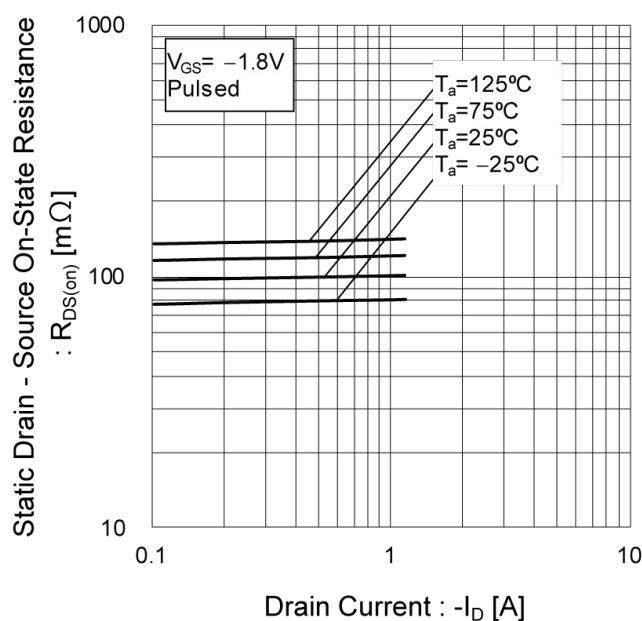
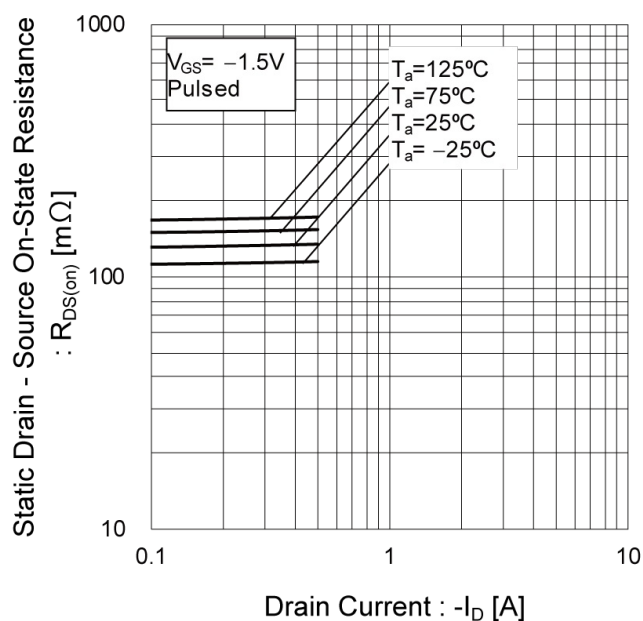


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)





## ●Electrical characteristic curves

Fig.19 Typical Capacitance vs.  
Drain - Source Voltage

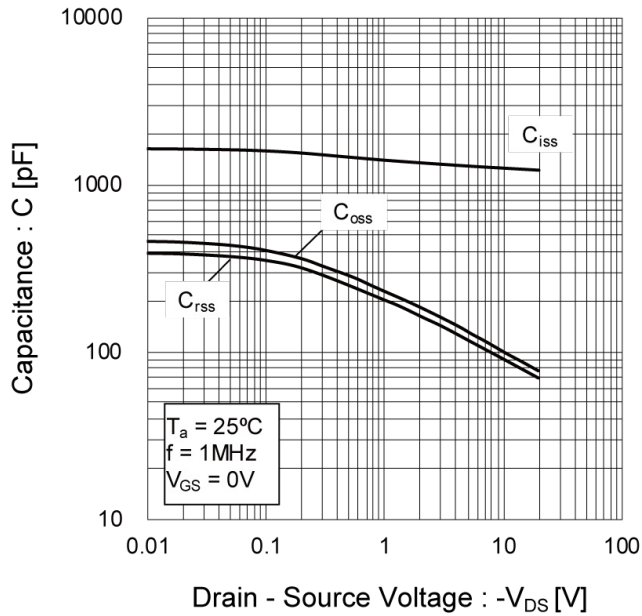


Fig.20 Switching Characteristics

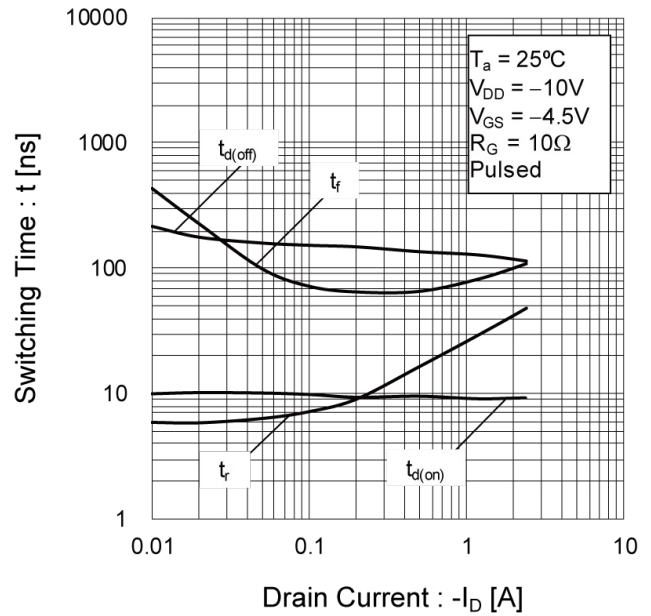


Fig.21 Dynamic Input Characteristics

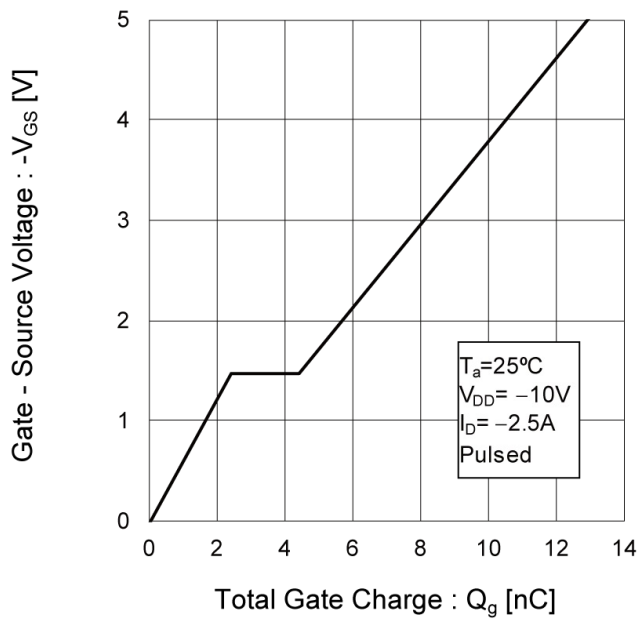
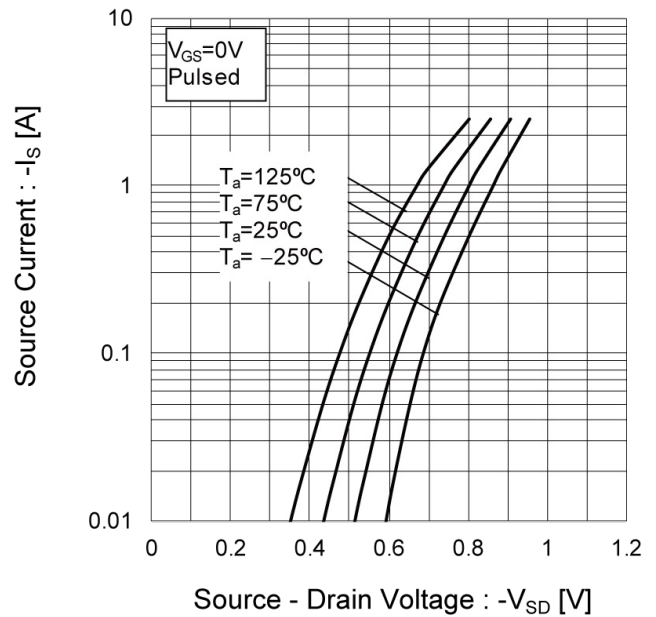


Fig.22 Source Current vs.  
Source Drain Voltage



● **Measurement circuits** <It is the same for the Tr1 and Tr2>

Fig. 1-1 SWITCHING TIME MEASUREMENT CIRCUIT

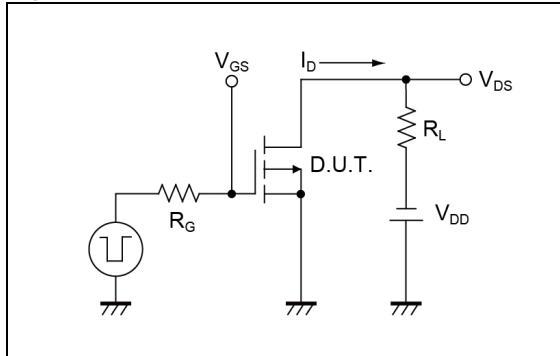


Fig. 1-2 SWITCHING WAVEFORMS

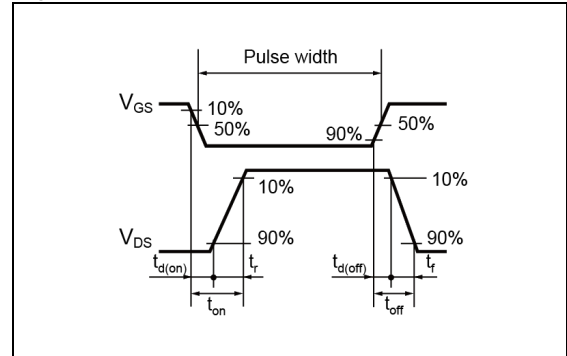


Fig. 2-1 GATE CHARGE MEASUREMENT CIRCUIT

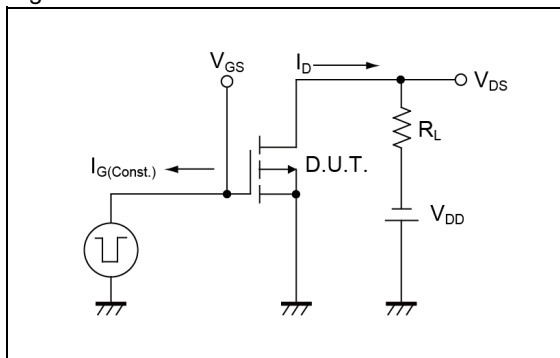
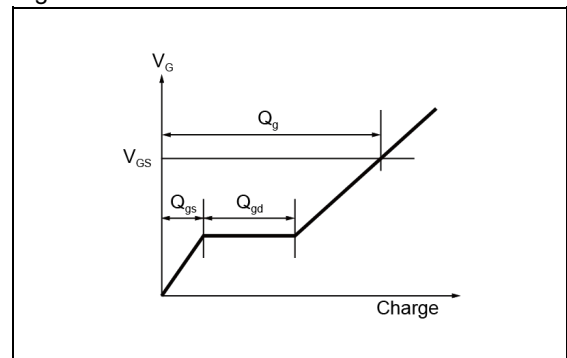


Fig. 2-2 GATE CHARGE WAVEFORM

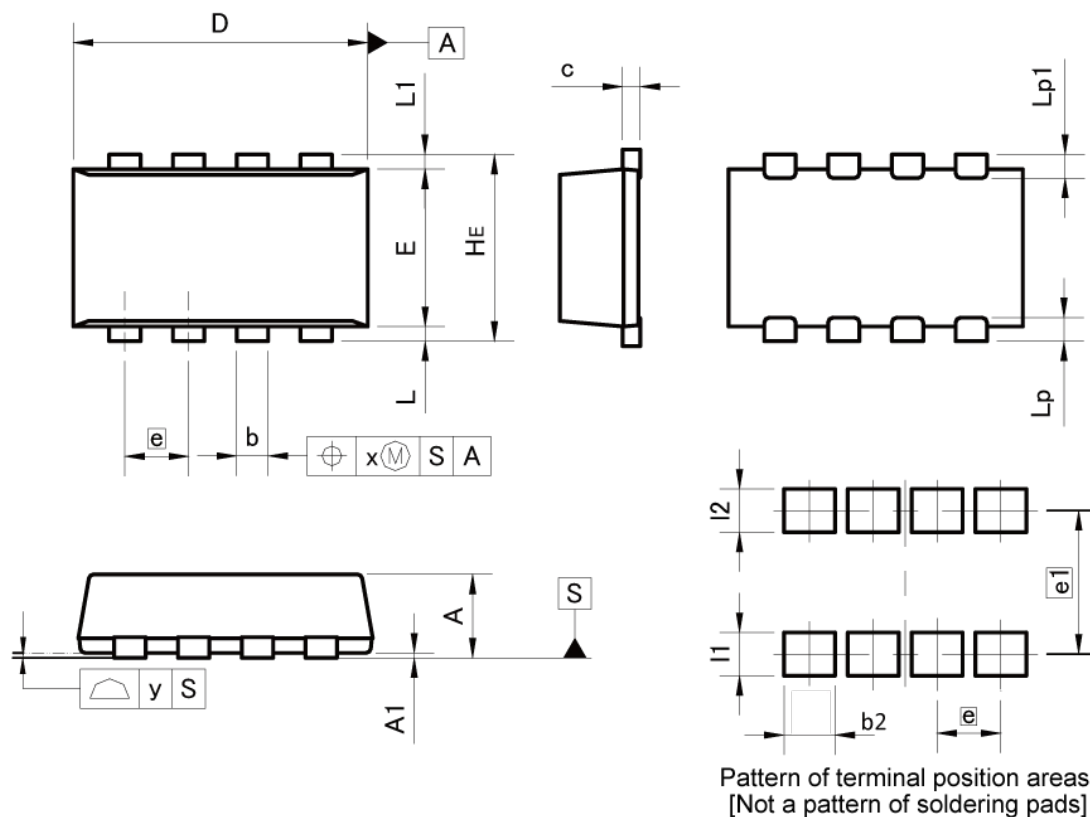


● **Notice**

This product might cause chip aging and breakdown under the large electrified environment.  
Please consider to design ESD protection circuit.

## ●Dimensions

## TSST8



DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.75	0.85	0.030	0.033
A1	0.00	0.05	0.000	0.002
b	0.22	0.42	0.009	0.017
c	0.12	0.22	0.005	0.009
D	2.90	3.10	0.114	0.122
E	1.50	1.70	0.059	0.067
e	0.65		0.026	
HE	1.80	2.00	0.071	0.079
L	0.05	0.25	0.002	0.010
L1	0.05	0.25	0.002	0.010
Lp	0.15	0.34	0.006	0.013
Lp1	0.15	0.34	0.006	0.013
x	-	0.10	-	0.004
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.52	-	0.020
e1	1.46		0.057	
l1	-	0.44	-	0.017
l2	-	0.44	-	0.017

Dimension in mm/inches

# Notice

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(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASS III	CLASS III	CLASS II b	CLASS III
CLASS IV		CLASS III	

- ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
  - Installation of protection circuits or other protective devices to improve system safety
  - Installation of redundant circuits to reduce the impact of single or multiple circuit failure
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  - Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
  - Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
  - Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
  - Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
  - Sealing or coating our Products with resin or other coating materials
  - Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
  - Use of the Products in places subject to dew condensation
- The Products are not subject to radiation-proof design.
- Please verify and confirm characteristics of the final or mounted products in using the Products.
- In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.
- Confirm that operation temperature is within the specified range described in the product specification.
- ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

## Precaution for Mounting / Circuit board design

- When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

## Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

## Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of ionizer, friction prevention and temperature / humidity control).

## Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
  - [a] the Products are exposed to sea winds or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - [b] the temperature or humidity exceeds those recommended by ROHM
  - [c] the Products are exposed to direct sunshine or condensation
  - [d] the Products are exposed to high Electrostatic
2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

## Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

## Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

## Precaution for Foreign Exchange and Foreign Trade act

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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;
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- 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.);

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- 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

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**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

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