

V_{DSS}	250V
$R_{DS(on)}(Max.)$	1300mΩ
I_D	±4A
P_D	29W

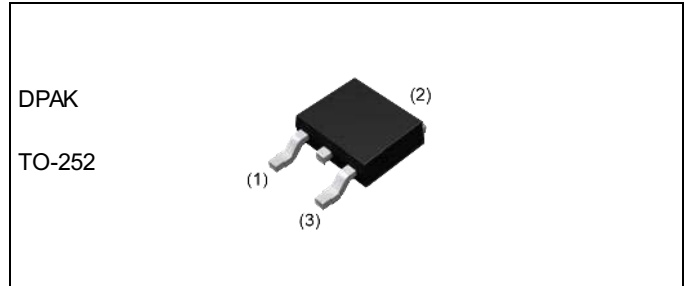
●Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Drive circuits can be simple
- 4) Parallel use is easy
- 5) Pb-free plating ; RoHS compliant

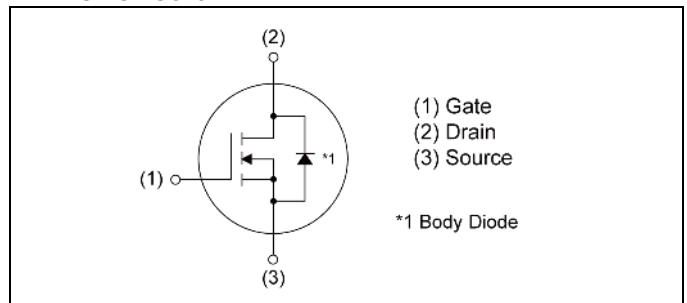
●Application

Switching Power Supply

●Outline



●Inner circuit



●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	330
	Tape width (mm)	16
	Basic ordering unit (pcs)	2500
	Taping code	TL1
	Marking	RD3U040CN

●Absolute maximum ratings ($T_a = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit	
Drain - Source voltage	V_{DSS}	250	V	
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	±4	A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	±2.2	A
Pulsed drain current	I_{DP}^{*2}	±16	A	
Gate - Source voltage	V_{GSS}	±30	V	
Avalanche energy, single pulse	E_{AS}^{*3}	1.61	mJ	
Avalanche current, single pulse	I_{AS}^{*3}	2	A	
Power dissipation ($T_c = 25^\circ\text{C}$)	P_D	29	W	
Junction temperature	T_j	150	°C	
Operating junction and storage temperature range	T_{stg}	-55 to +150	°C	

● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	-	4.30	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

● Electrical characteristics ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	250	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 250V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	10	μA
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	3.5	-	5.5	V
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = 10V, I_D = 2A$	-	930	1300	m Ω
Forward Transfer Admittance	$ Y_{fs} ^{*4}$	$V_{DS} = 10V, I_D = 2A$	1.1	-	-	S

*1 Limited only by maximum temperature allowed.

*2 $P_w \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*3 $L \approx 500\mu\text{H}$, $V_{DD} = 50V$, $R_G = 25\Omega$, starting $T_j = 25^\circ\text{C}$

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C _{iss}	V _{GS} = 0V	-	350	-	pF
Output capacitance	C _{oss}	V _{DS} = 25V	-	30	-	
Reverse transfer capacitance	C _{rss}	f = 1MHz	-	15	-	
Turn - on delay time	t _{d(on)} ^{*4}	V _{DD} ≈ 125V, V _{GS} = 10V	-	15	-	ns
Rise time	t _r ^{*4}	I _D = 2A	-	14	-	
Turn - off delay time	t _{d(off)} ^{*4}	R _L ≈ 62Ω	-	18	-	
Fall time	t _f ^{*4}	R _G = 10Ω	-	15	-	

●Gate charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q _g ^{*4}	V _{DD} ≈ 125V	-	8.5	-	nC
Gate - Source charge	Q _{gs} ^{*4}	I _D = 4A	-	3.5	-	
Gate - Drain charge	Q _{gd} ^{*4}	V _{GS} = 10V	-	3.5	-	
Gate plateau voltage	V _(plateau)	V _{DD} ≈ 125V, I _D = 4A	-	7.8	-	V

●Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous forward current	I _S ^{*1}	T _C = 25°C	-	-	4	A
Pulse forward current	I _{SP} ^{*2}		-	-	16	A
Forward voltage	V _{SD} ^{*4}	V _{GS} = 0V, I _S = 4A	-	-	1.5	V
Reverse recovery time	t _{rr} ^{*4}	I _S = 4A di/dt = 100A/μs	-	80	-	ns
Reverse recovery charge	Q _{rr} ^{*4}		-	200	-	nC

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

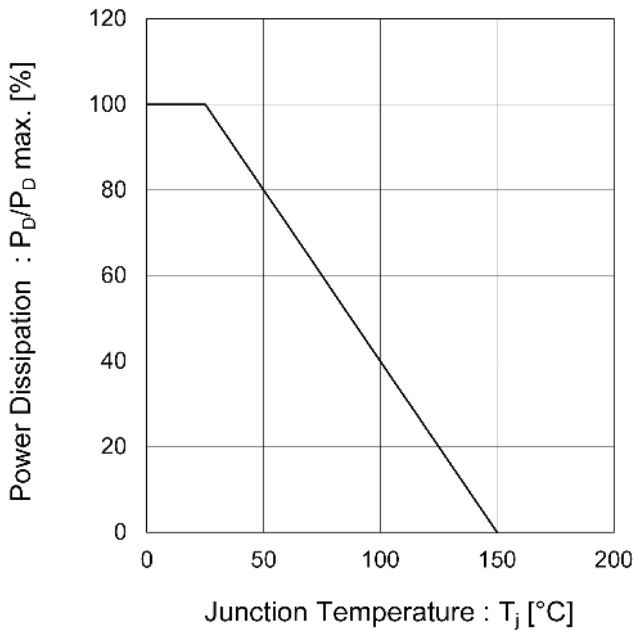


Fig.2 Maximum Safe Operating Area

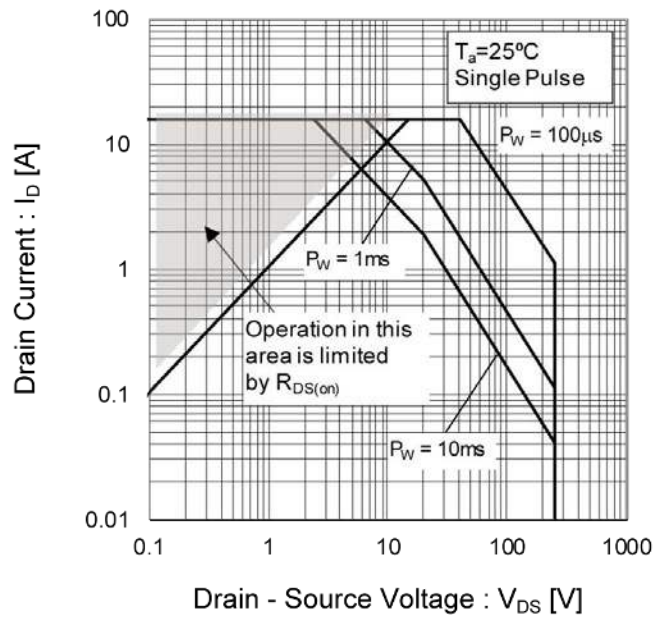
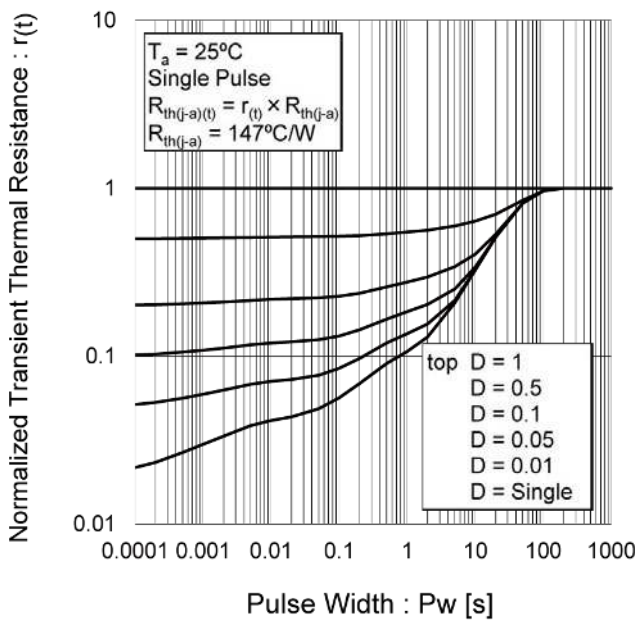


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



● Electrical characteristic curves

Fig.4 Avalanche Current vs. Inductive Load

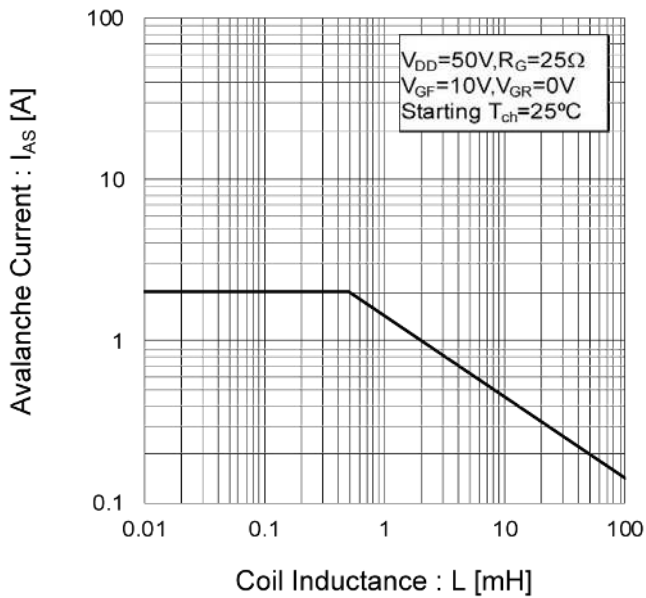


Fig.5 Avalanche Energy Derating Curve vs. Junction Temperature

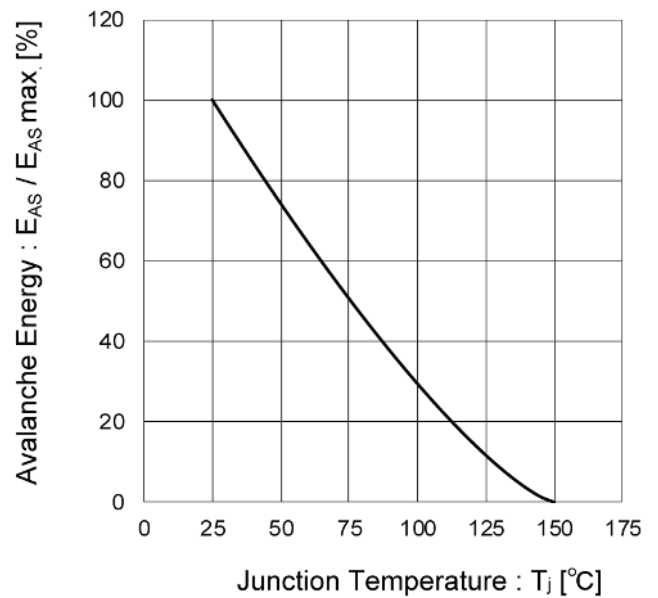


Fig.6 Typical Output Characteristics(I)

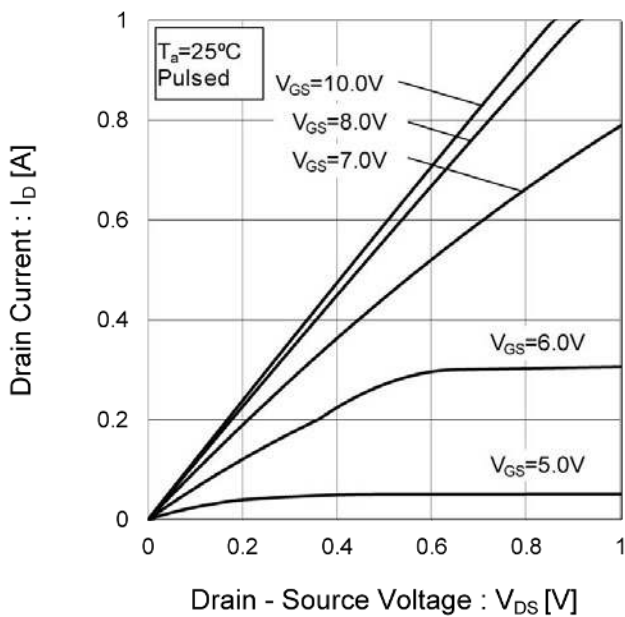
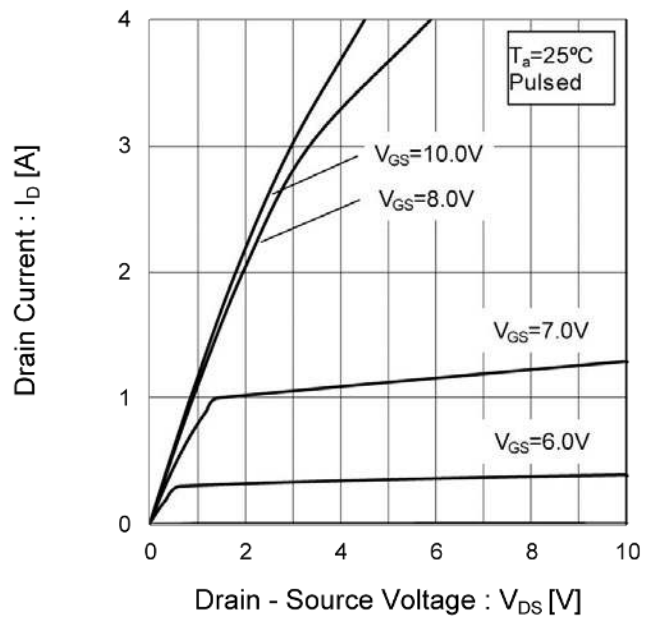


Fig.7 Typical Output Characteristics(II)



● Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

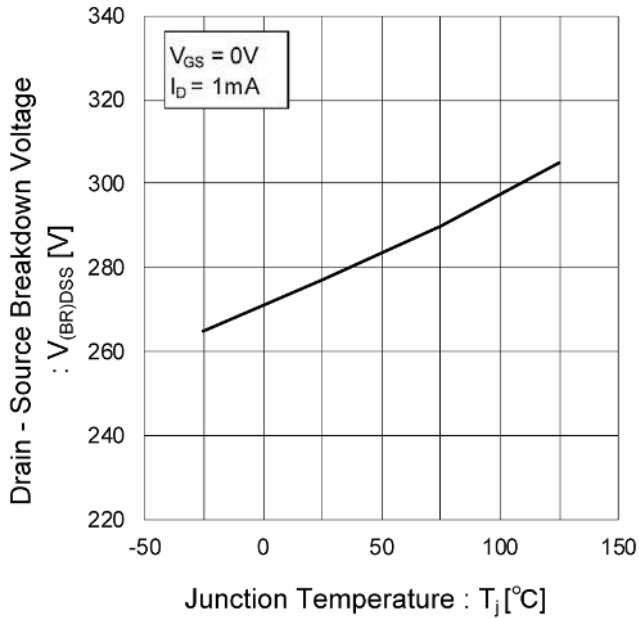


Fig.9 Typical Transfer Characteristics

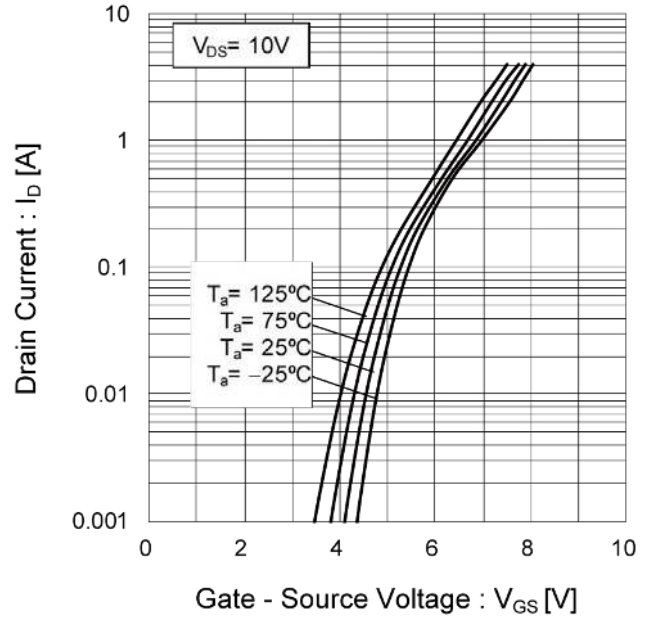


Fig.10 Gate Threshold Voltage vs. Junction Temperature

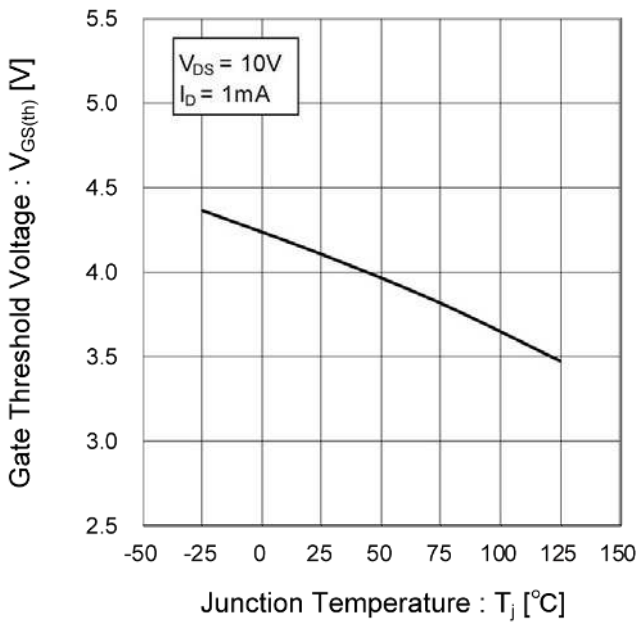
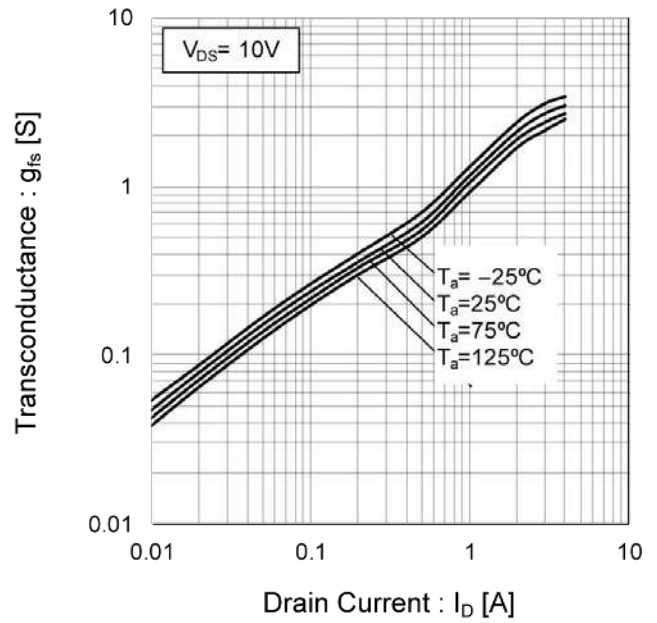


Fig.11 Transconductance vs. Drain Current



● Electrical characteristic curves

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

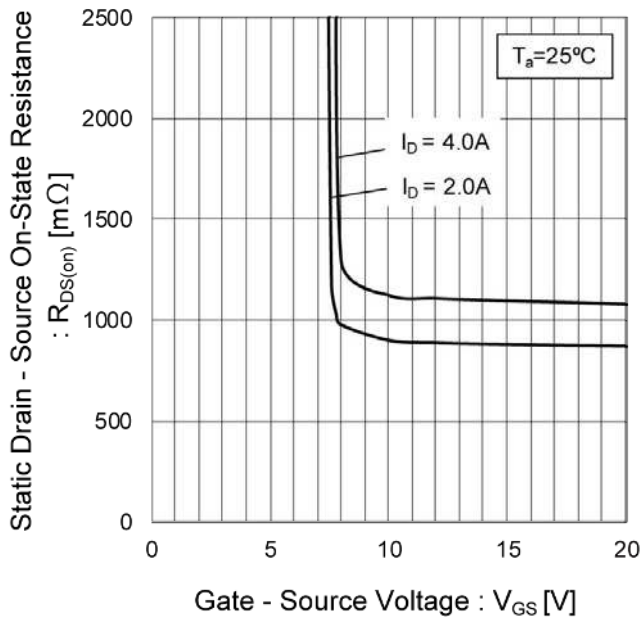


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current (I)

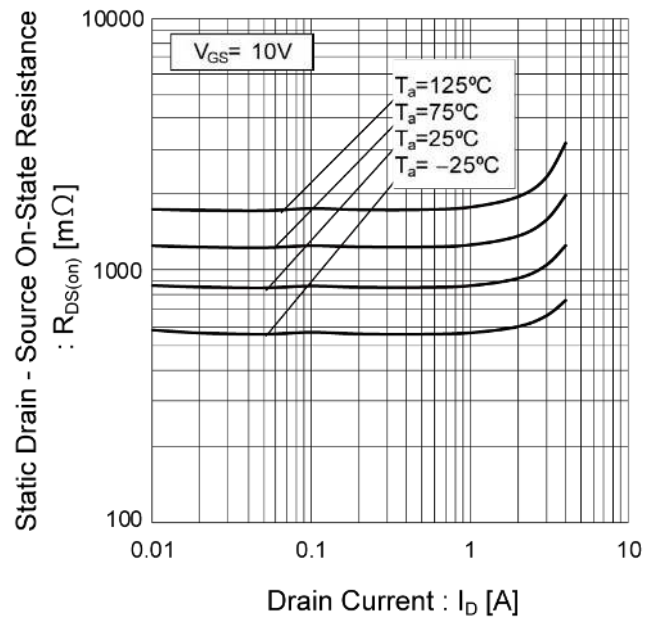
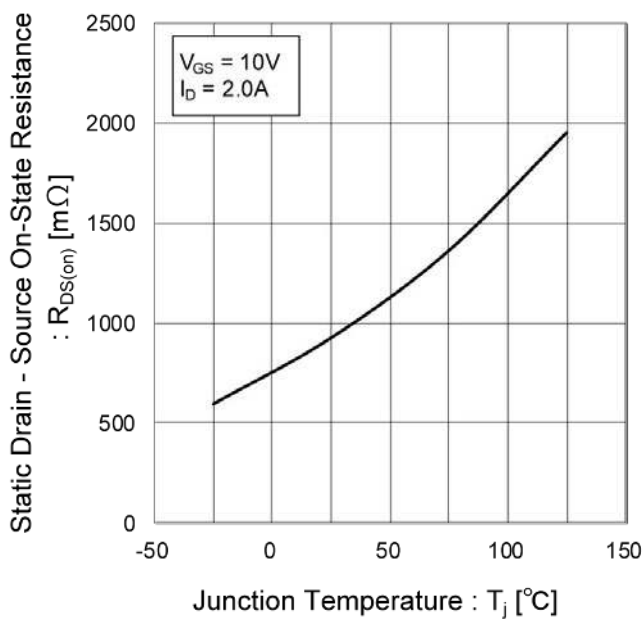


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

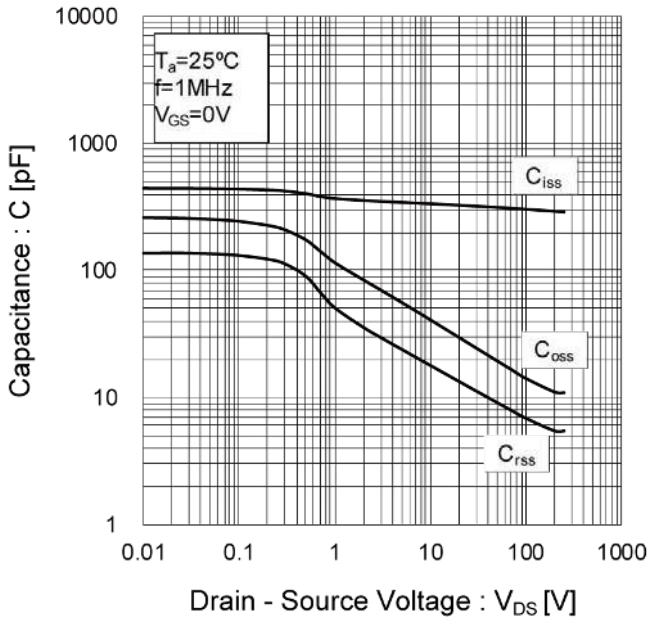


Fig.16 Switching Characteristics

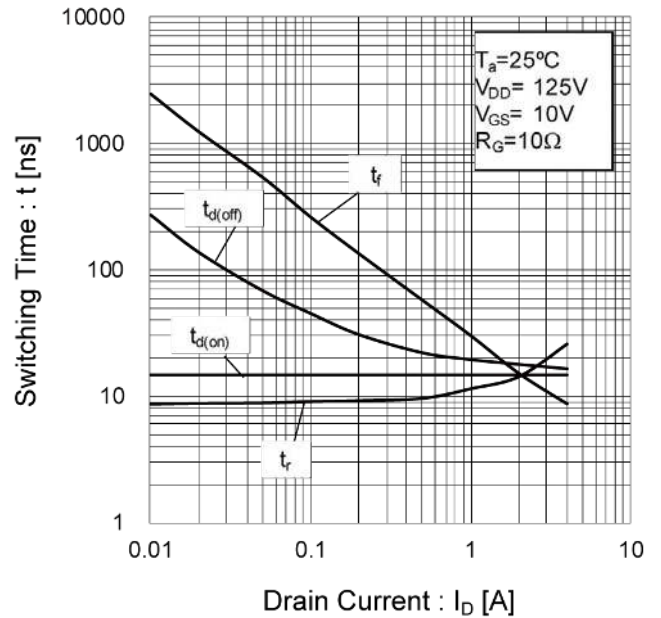
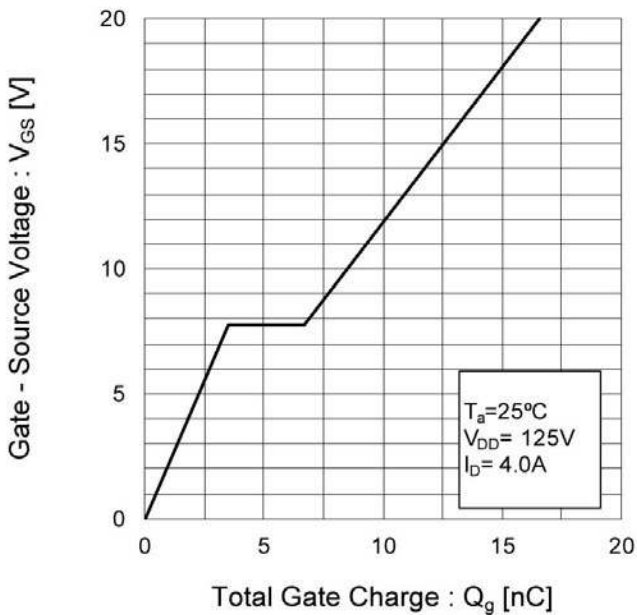


Fig.17 Dynamic Input Characteristics



● Electrical characteristic curves

Fig.18 Source Current vs. Source-Drain Voltage

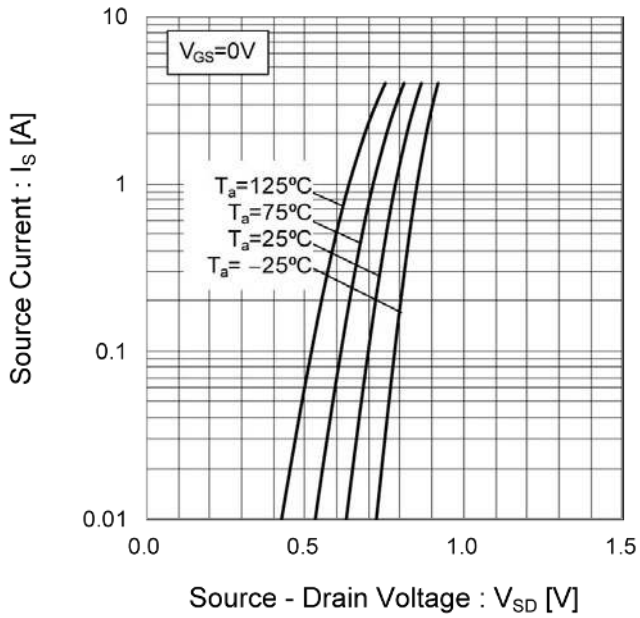
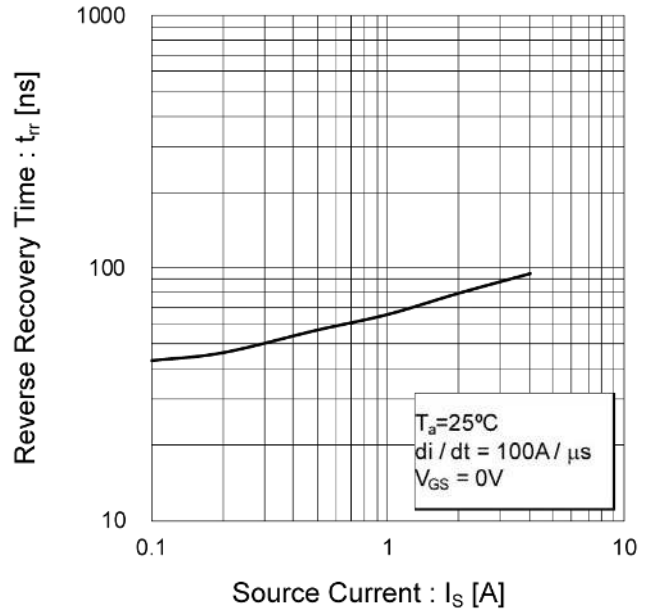


Fig.19 Source Current vs. Reverse Recovery Time



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

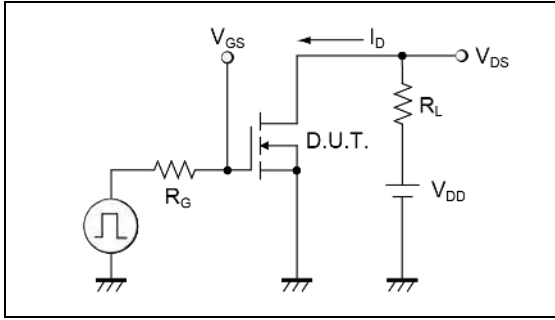


Fig.1-2 Switching Waveforms

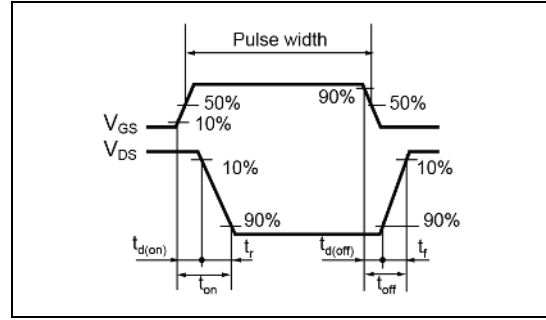


Fig.2-1 Gate Charge Measurement Circuit

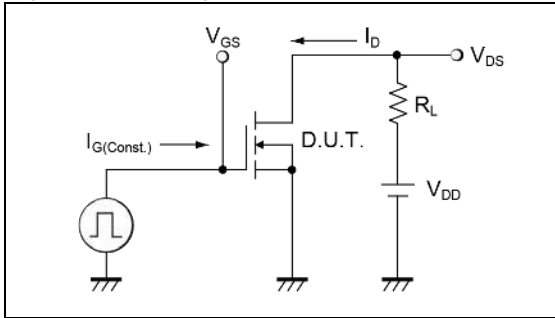


Fig.2-2 Gate Charge Waveform

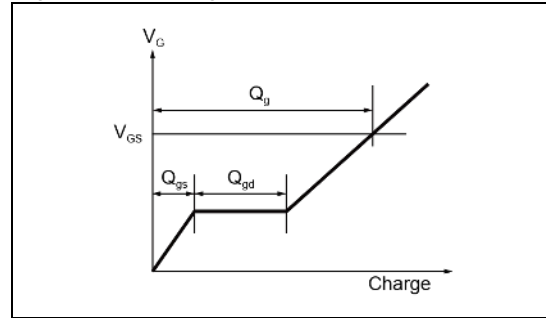


Fig.3-1 Avalanche Measurement Circuit

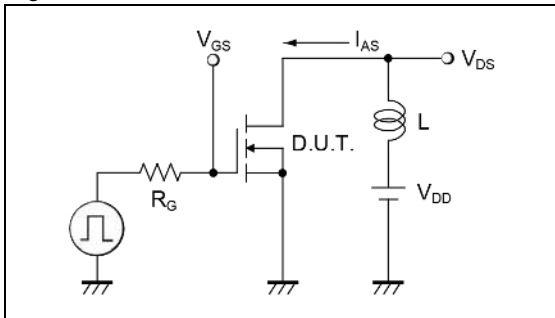
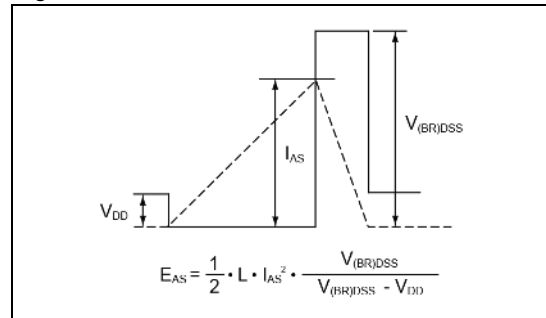
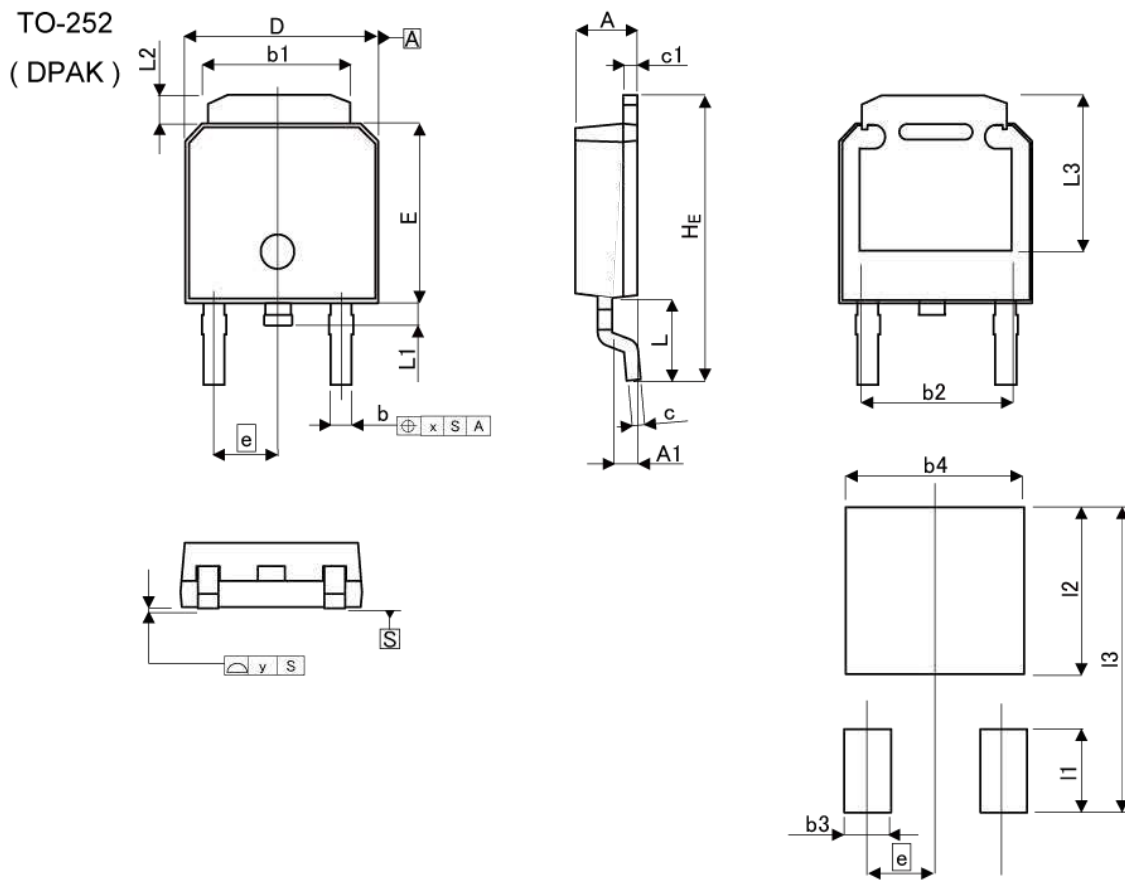


Fig.3-2 Avalanche Waveform



●Dimensions



Pattern of terminal position areas
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.40	0.087	0.094
A1	0.70	1.10	0.028	0.043
b	0.60	0.90	0.024	0.035
b1	5.20	5.50	0.205	0.217
b2	5.35		0.211	
c	0.40	0.60	0.016	0.024
c1	0.40	0.60	0.016	0.024
D	6.40	6.80	0.252	0.268
e	2.30		0.091	
E	6.00	6.40	0.236	0.252
HE	9.40	10.40	0.370	0.409
L	2.70		0.106	
L1	0.60	1.00	0.024	0.039
L2	0.70	1.30	0.028	0.051
L3	5.30		0.209	
x	-	0.25	-	0.010
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b3	-	1.15	-	0.045
b4	-	5.55	-	0.219
l1	-	2.77	-	0.109
l2	-	5.50	-	0.217
l3	-	10.40	-	0.409

Dimension in mm/inches

Notice

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

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 - 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 Cl₂, H₂S, NH₃, SO₂, and NO₂
 - 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 Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [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.

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Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

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