RSD046P05

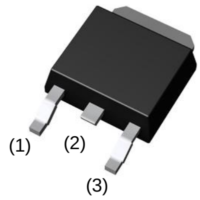
Pch 45V 4.5A Power MOSFET

Datasheet

V_{DSS}	–45V
$R_{DS(on)}$ (Max.)	155mΩ
I_D	–4.5A
P_D	15W

●Outline

CPT3
(SC-63)
<SOT-428>



●Features

1) Low on-resistance.

2) Fast switching speed.

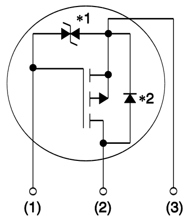
3) Drive circuits can be simple.

4) Parallel use is easy.

5) Pb-free lead plating ; RoHS compliant

6) 100% Avalanche tested

●Inner circuit



(1) Gate
(2) Drain
(3) Source

∗1 ESD PROTECTION DIODE
∗2 BODY DIODE

●Application

Switching Power Supply

Automotive Motor Drive

Automotive Solenoid Drive

●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	330
	Tape width (mm)	16
	Basic ordering unit (pcs)	2,500
	Taping code	TL
	Marking	046P05

●Absolute maximum ratings(T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	–45	V
Continuous drain current	T_c = 25°C	I_D *1	±4.5	A
	T_c = 100°C	I_D *1	±2.4	A
Pulsed drain current		$I_{D,pulse}$ *2	±9.0	A
Gate - Source voltage		V_{GSS}	±20	V
Avalanche energy, single pulse		E_{AS} *3	14.3	mJ
Avalanche current		I_{AR} *3	–4.5	A
Power dissipation	T_c = 25°C	P_D	15	W
	T_a = 25°C *4	P_D	0.85	W
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	R_{thJC}	-	-	8.33	°C/W
Thermal resistance, junction - ambient [*4]	R_{thJA}	-	-	147	°C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	°C

●Electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = –1mA	–45	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = –45V, V_{GS} = 0V T_j = 25°C	-	-	–1	μA
		V_{DS} = –45V, V_{GS} = 0V T_j = 125°C	-	-	–100	
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±10	μA
Gate threshold voltage	$V_{GS\,(th)}$	V_{DS} = –10V, I_D = –1mA	–1	-	–3	V
Static drain - source on - state resistance	$R_{DS(on)}$ [*5]	V_{GS} = –10V, I_D = –4.5A	-	110	155	mΩ
		V_{GS} = –4.5V, I_D = –4.5A	-	160	225	
		V_{GS} = –4.0V, I_D = –4.5A	-	185	260	
		V_{GS} = –10V, I_D = –4.5A T_j = 125°C	-	180	250	
Forward transfer admittance	g_{fs}	V_{DS} = –10V, I_D = –4.5A	3	6	-	S

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	550	-	pF
Output capacitance	C_{oss}	V_{DS} = –10V	-	100	-	pF
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	50	-	pF
Turn - on delay time	$t_{d(on)}$ *5	$V_{DD} \simeq$ –25V, V_{GS} = –10V	-	8	-	ns
Rise time	t_r *5	I_D = –2.0A	-	8	-	ns
Turn - off delay time	$t_{d(off)}$ *5	R_L = 12Ω	-	35	-	ns
Fall time	t_f *5	R_G = 10Ω	-	8	-	ns

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	$V_{DD} \simeq$ –25V	-	12	-	nC
Gate - Source charge	Q_{gs} *5	I_D = –4.5A	-	2.2	-	nC
Gate - Drain charge	Q_{gd} *5	V_{GS} = –5V	-	2.2	-	nC
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \simeq$ –30V, I_D = –4.5A	-	-3.4	-	V

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous source current	I_S *1	T_c = 25°C	-	6	–4.5	A
Pulsed source current	I_{SM} *2	T_c = 25°C	-	-	–9	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = –4.5A	-	-	–1.2	V
Reverse recovery time	t_{rr} *5	I_S = –4.5A, di/dt = –100A/μs	-	40	-	ns
Reverse recovery charge	Q_{rr} *5	I_S = –4.5A, di/dt = –100A/μs	-	60	-	μC

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L $\simeq$ 1mH, V_{DD} = –25V, Rg = 10Ω, starting T_j = 25°C

*4 Mounted on a epoxy PCB FR4 (20mm × 30mm × 0.8mm)

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

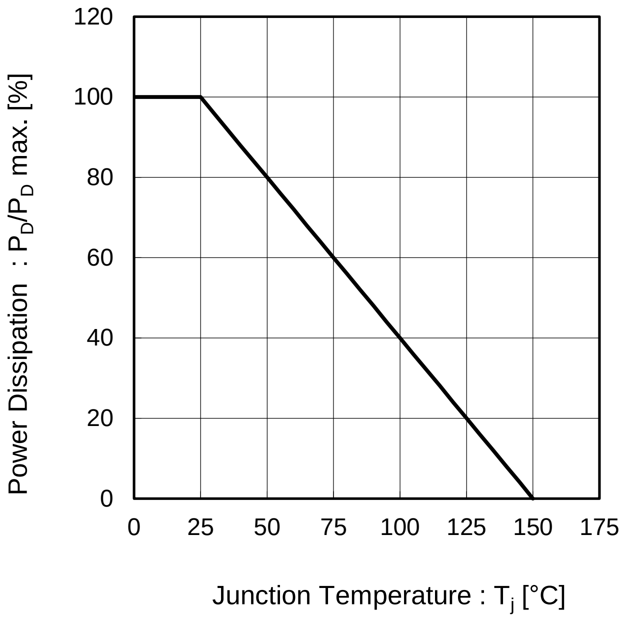


Fig.2 Maximum Safe Operating Area

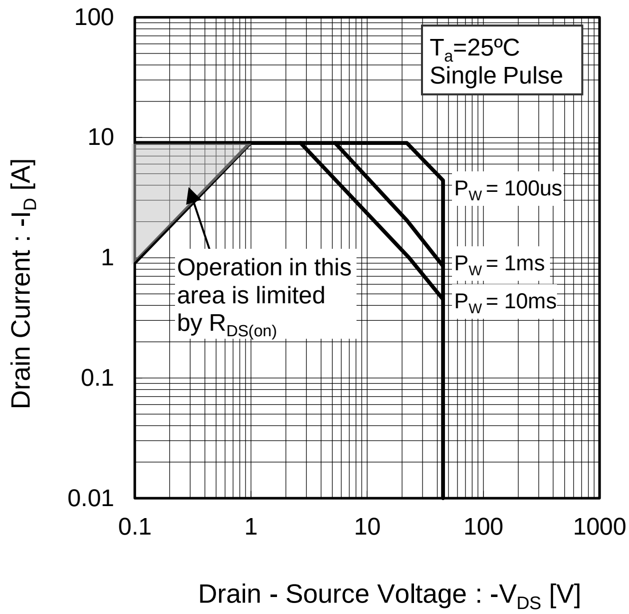
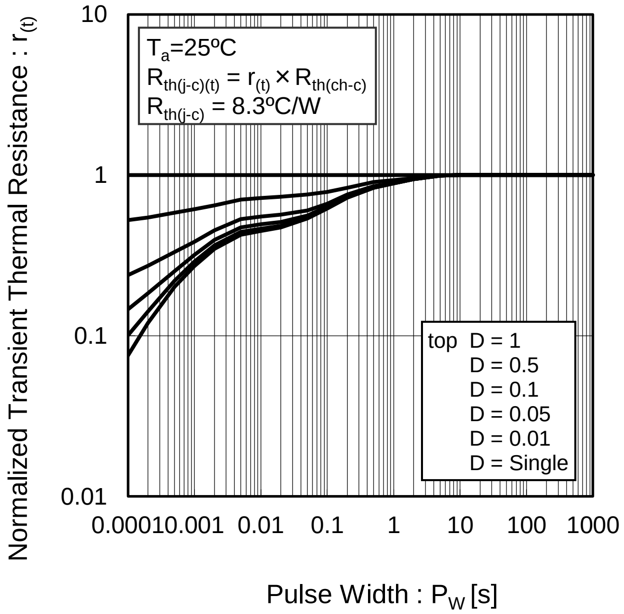


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

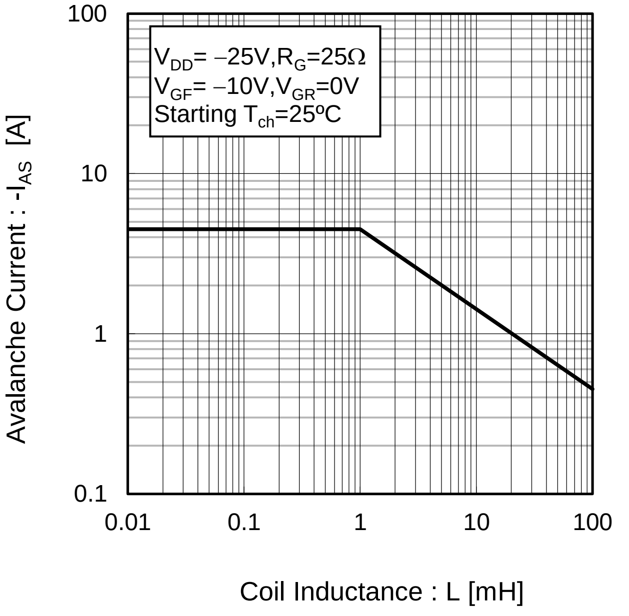


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

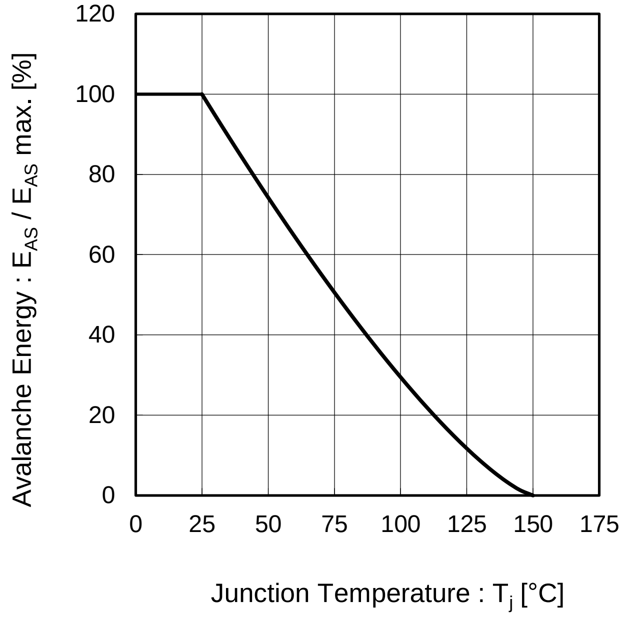


Fig.6 Typical Output Characteristics(I)

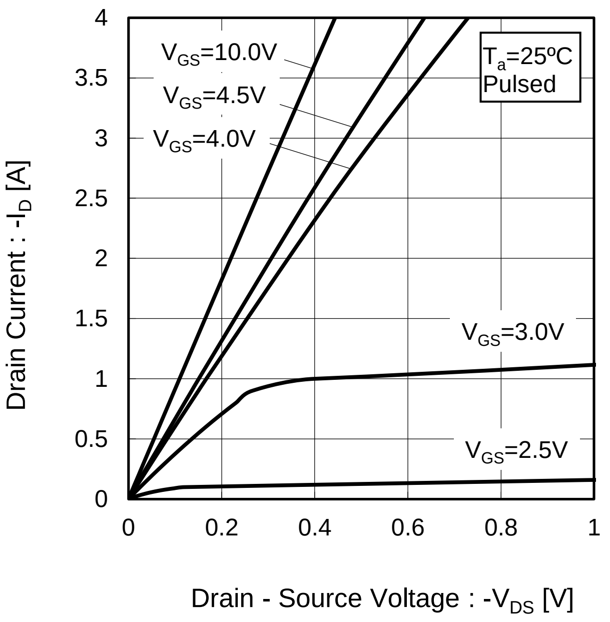
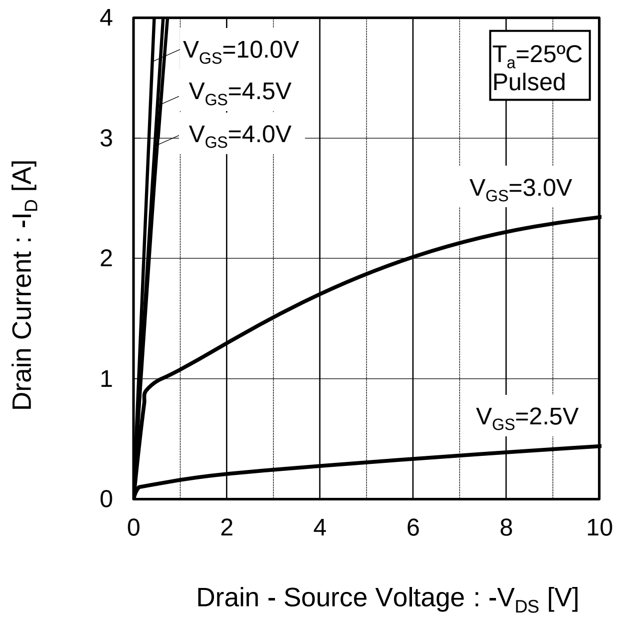


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

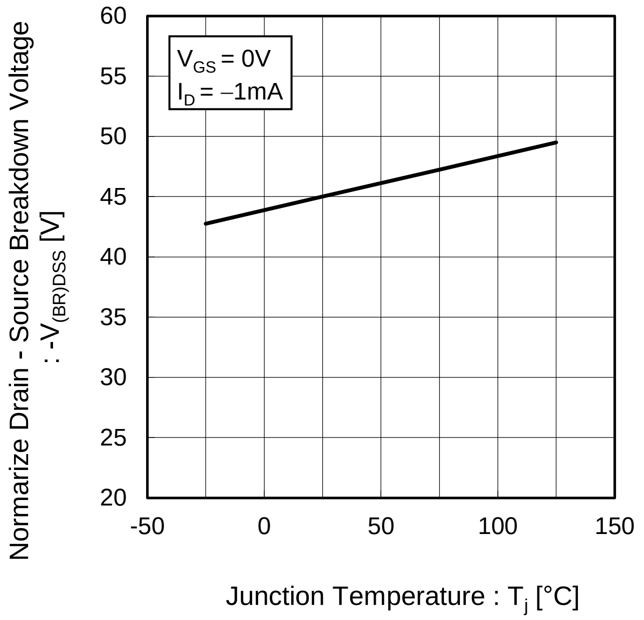


Fig.9 Typical Transfer Characteristics

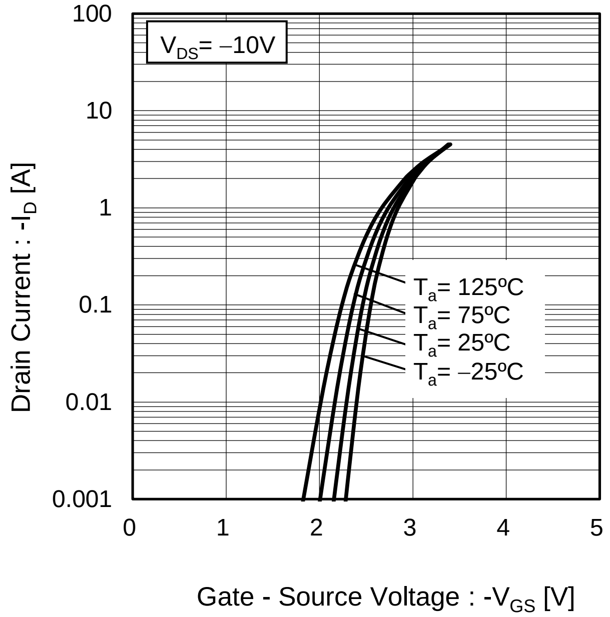


Fig.10 Gate Threshold Voltage vs. Junction Temperature

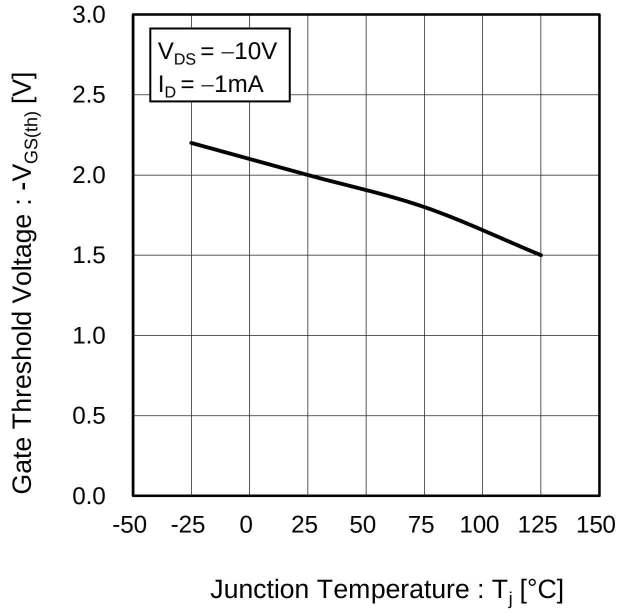
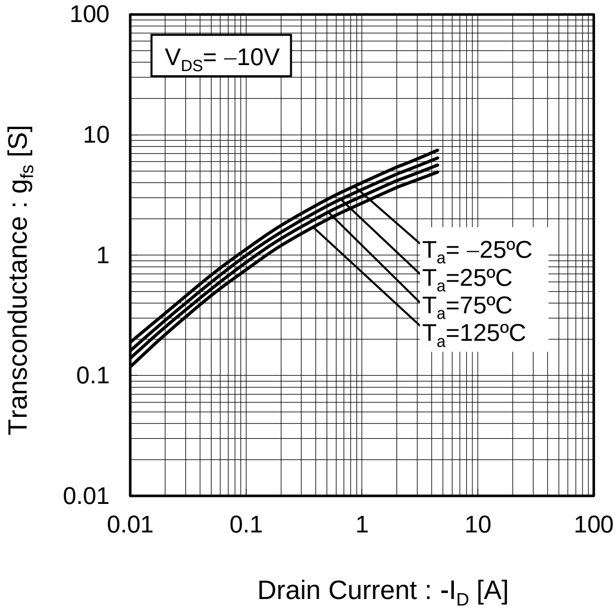


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

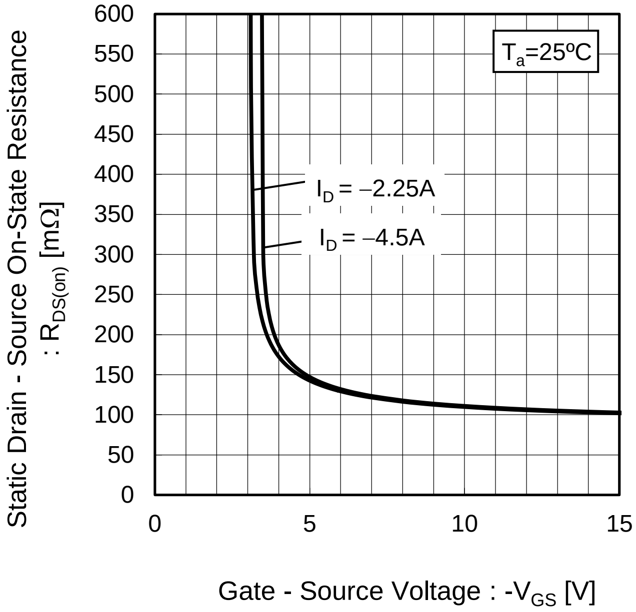


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

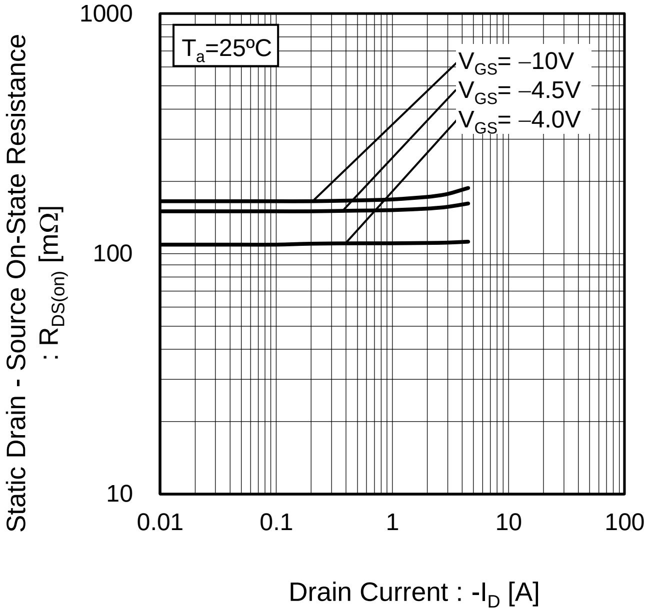
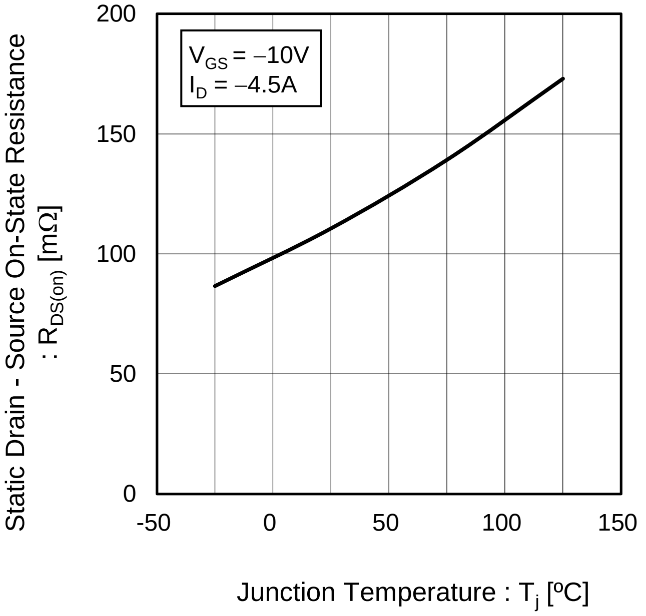


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

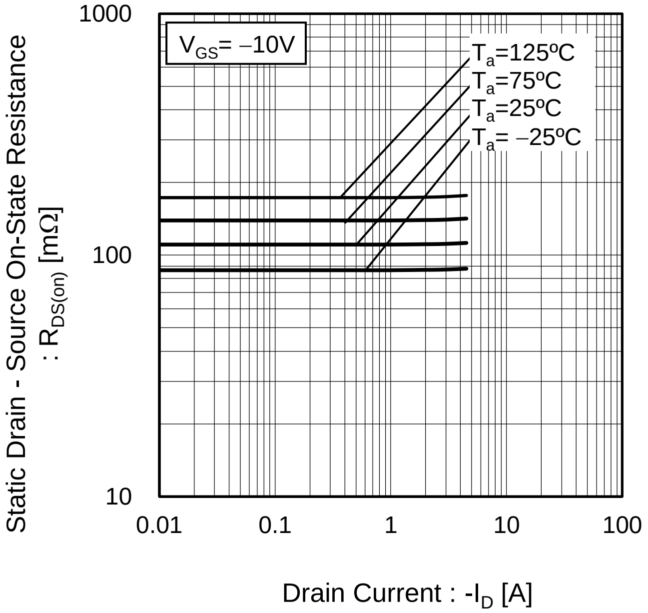


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

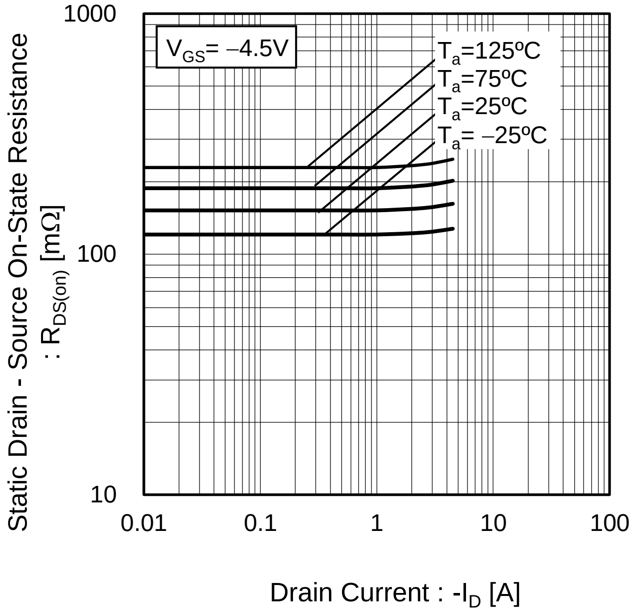


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

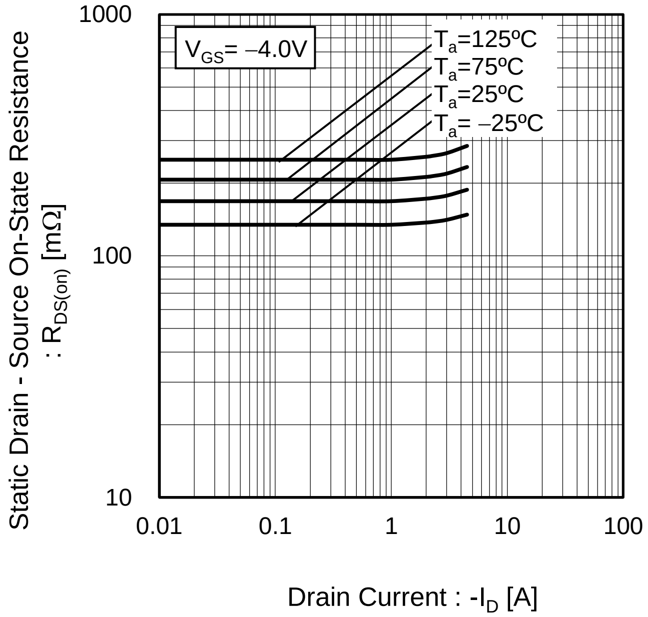
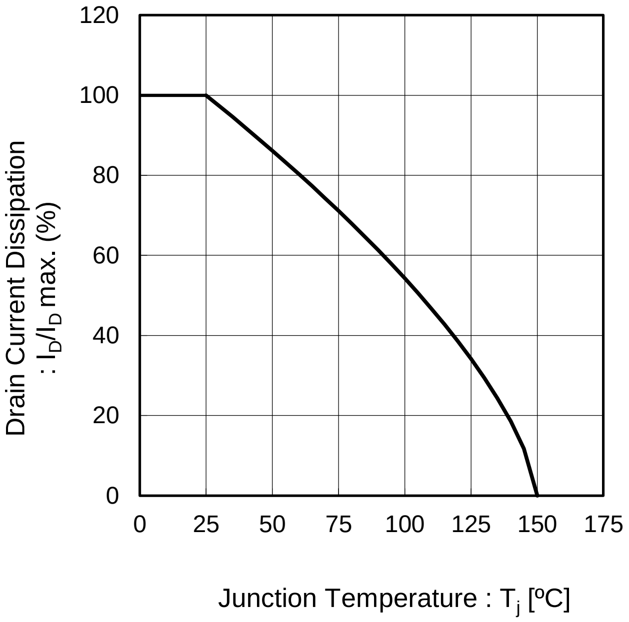


Fig.18 Drain Current Derating Curve



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

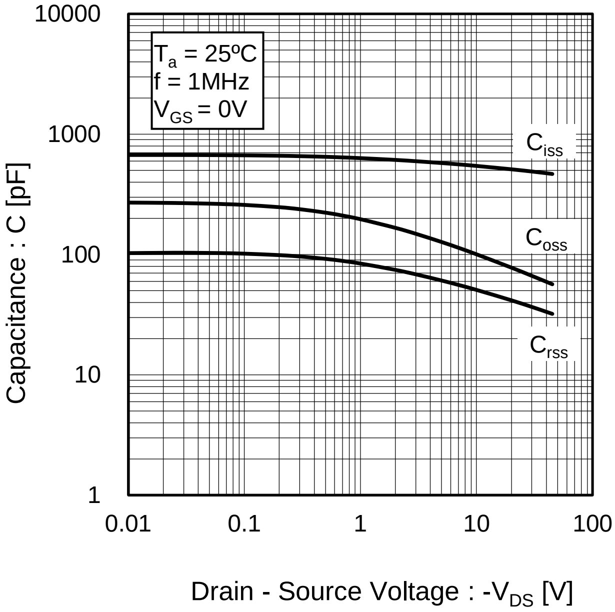


Fig.20 Switching Characteristics

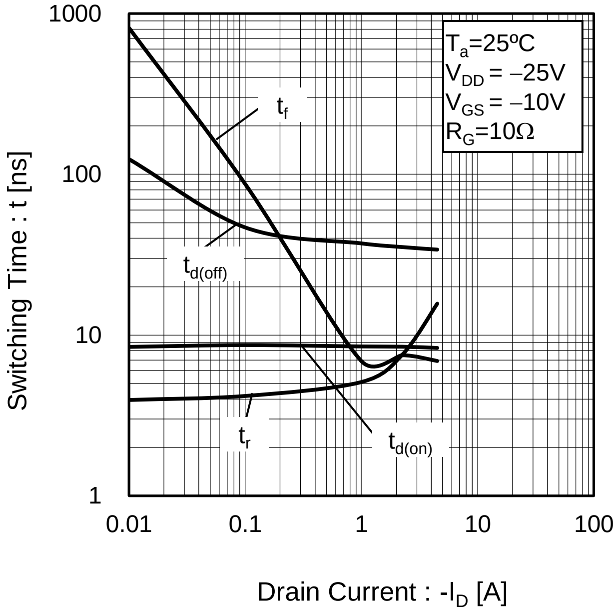


Fig.21 Dynamic Input Characteristics

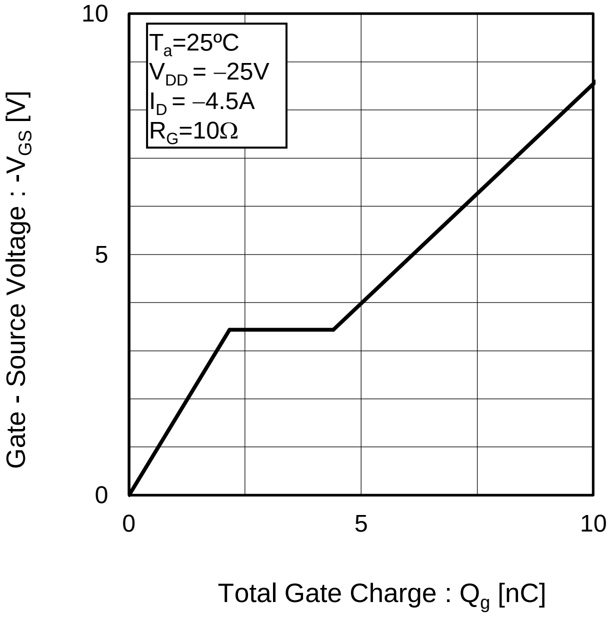
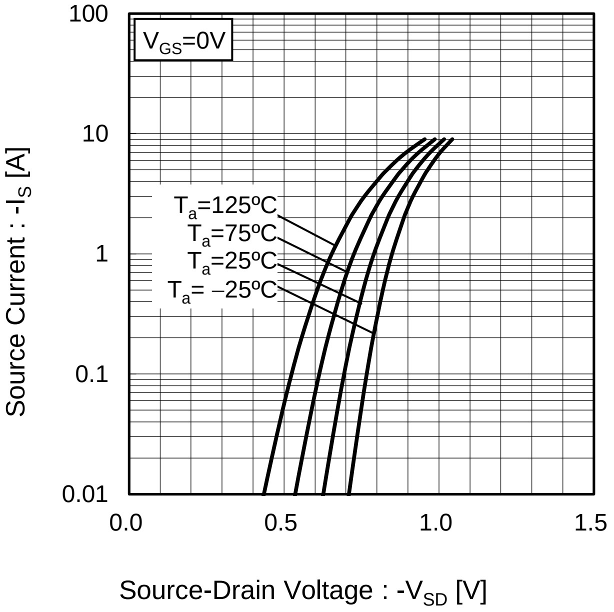
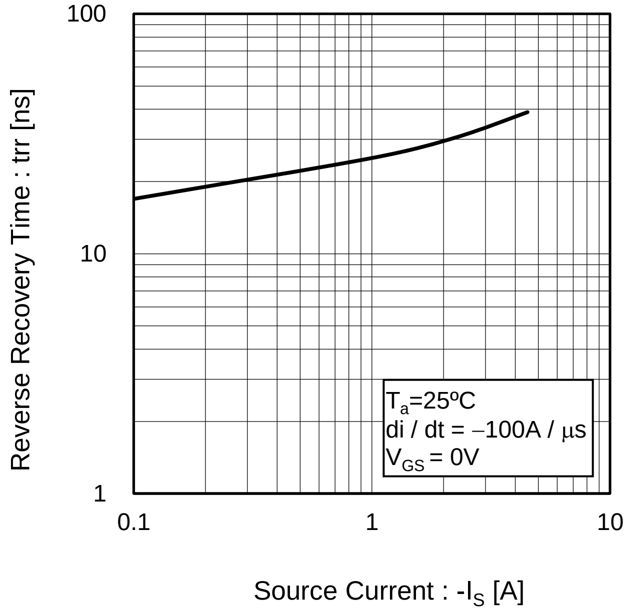


Fig.22 Source Current vs. Source - Drain Voltage



●Electrical characteristic curves

Fig23 Reverse Recovery Time
vs.Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

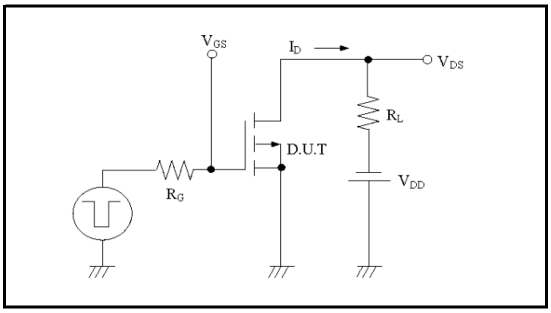


Fig.1-2 Switching Waveforms

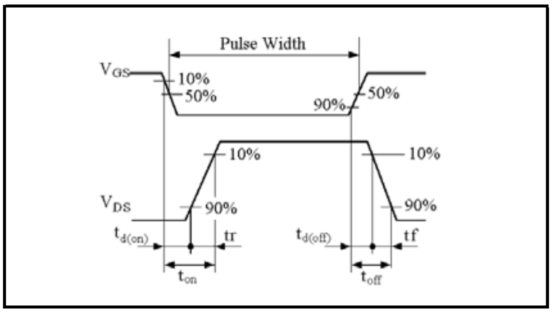


Fig.2-1 Gate Charge Measurement Circuit

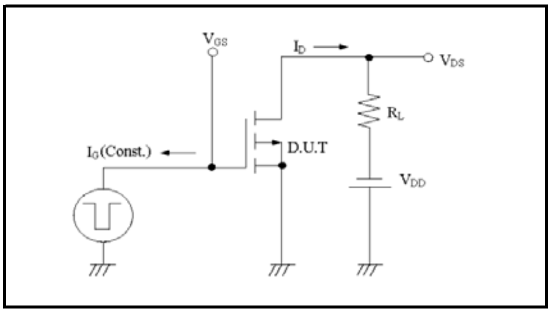


Fig.2-2 Gate Charge Waveform

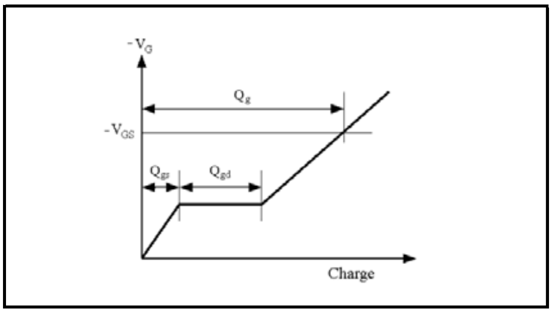


Fig.3-1 Avalanche Measurement Circuit

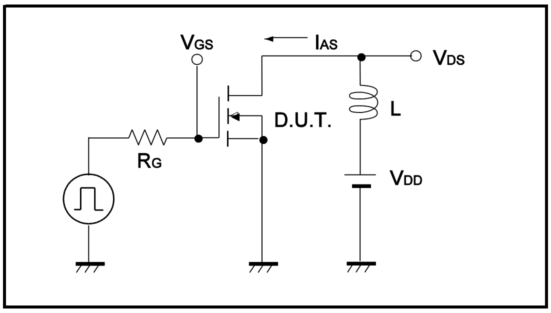
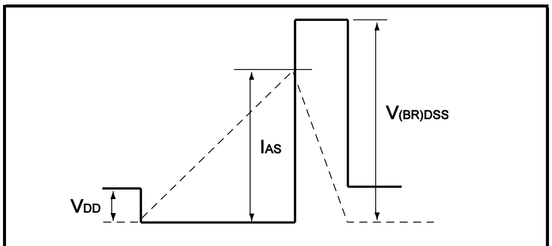


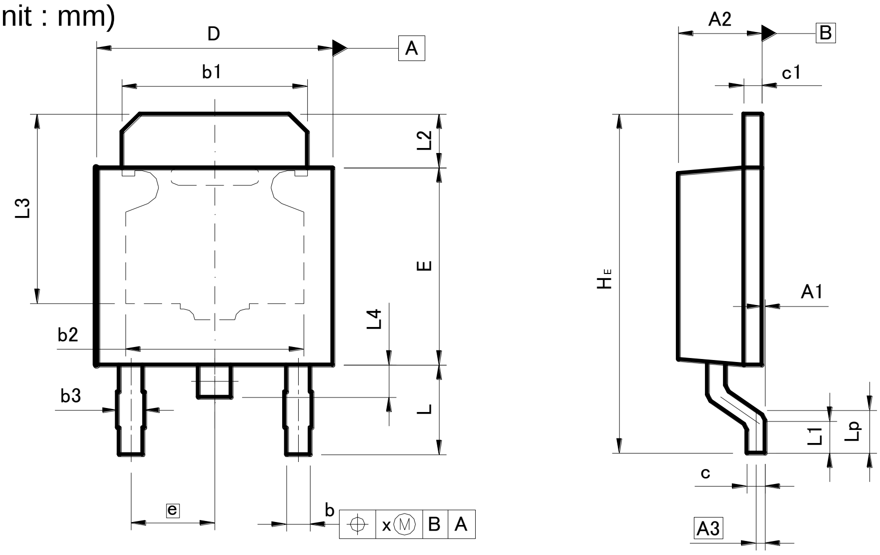
Fig.3-2 Avalanche Waveform

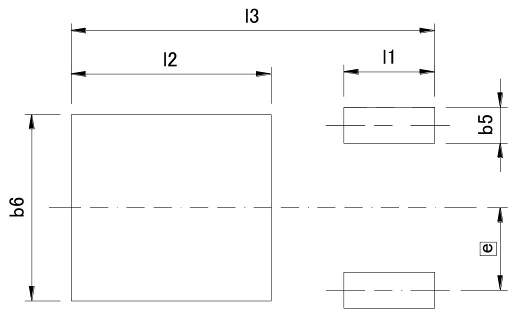


$$E_{AS} = \frac{1}{2} \cdot L \cdot I_{AS}^2 \cdot \frac{V_{(BR)DSS}}{V_{(BR)DSS} - V_{DD}}$$

●Dimensions (Unit : mm)

CPT3





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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A1	0.00	0.15	0.000	0.006
A2	2.20	2.50	0.087	0.098
A3	0.25		0.010	
b	0.55	0.75	0.022	0.030
b1	5.00	5.30	0.197	0.209
b2	5.00		0.197	
b3	0.75		0.030	
c	0.40	0.60	0.016	0.024
c1	0.40	0.60	0.016	0.024
D	6.30	6.70	0.248	0.264
E	5.40	5.80	0.213	0.228
e	2.30		0.091	
H_E	9.00	10.00	0.354	0.394
L	2.20	2.80	0.087	0.110
L1	0.80	1.40	0.031	0.055
L2	1.20	1.80	0.047	0.071
L3	5.30		0.209	
L4	0.90		0.035	
Lp	1.00	1.60	0.039	0.063
x	–	0.25	–	0.010

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b5	–	1.00	–	0.04
b6	–	5.20	–	0.205
l1	–	2.50	–	0.098
l2	–	5.50	–	0.217
l3	–	10.00	–	0.394

Dimension in mm / inches

Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

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7) The Products specified in this document are not designed to be radiation tolerant.

8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

10) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

11) ROHM has used reasonable care to ensur the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
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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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