RND030N20

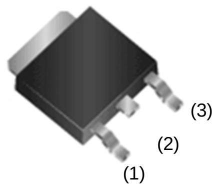
Nch 200V 3.0A Power MOSFET

Datasheet

V_{DSS}	200V
$R_{DS(on)}$ (Max.)	870mΩ
I_D	3.0A
P_D	20W

●Outline

CPT3
(SC-63)
<SOT-428>



●Features

1) Low on-resistance.

2) Fast switching speed.

3) Drive circuits can be simple.

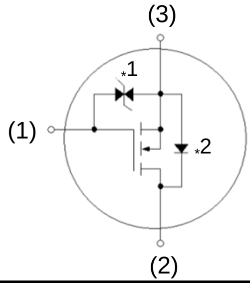
4) Parallel use is easy.

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	N03N20

●Absolute maximum ratings(T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	200	V
Continuous drain current	T_c = 25°C	I_D *1	±3.0	A
	T_c = 100°C	I_D *1	±1.6	A
Pulsed drain current		$I_{D,pulse}$ *2	±6.0	A
Gate - Source voltage		V_{GSS}	±30	V
Avalanche energy, single pulse		E_{AS} *3	0.73	mJ
Avalanche current		I_{AR} *3	1.5	A
Power dissipation	T_c = 25°C	P_D	20	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 - case	R_{thJC}	-	-	6.25	°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	200	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 200V, V_{GS} = 0V T_j = 25°C	-	-	10	μA
		V_{DS} = 200V, V_{GS} = 0V T_j = 125°C	-	-	100	
Gate - Source leakage current	I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V	-	-	±10	nA
Gate threshold voltage	$V_{GS (th)}$	V_{DS} = 10V, I_D = 1mA	3.2	-	5.2	V
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = 10V, I_D = 1.5A	-	620	870	mΩ
		V_{GS} = 10V, I_D = 1.5A T_j = 125°C	-	1150	1610	
Forward transfer admittance	g_{fs}	V_{DS} = 10V, I_D = 1.5A	0.75	1.50	-	S

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	270	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	30	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	10	-	
Turn - on delay time	$t_{d(on)}$ *5	V_{DD} ≃ 100V, V_{GS} = 10V	-	13	-	ns
Rise time	t_r *5	I_D = 1.5A	-	13	-	
Turn - off delay time	$t_{d(off)}$ *5	R_L = 12Ω	-	18	-	
Fall time	t_f *5	R_G = 10Ω	-	17	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	V_{DD} ≃ 100V	-	6.7	-	nC
Gate - Source charge	Q_{gs} *5	I_D = 3.0A	-	2.7	-	
Gate - Drain charge	Q_{gd} *5	V_{GS} = 10V	-	2.4	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} ≃ 100V, I_D = 3A	-	7.2	-	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	-	-	3.0	A
Pulsed source current	I_{SM} *2		-	-	6.0	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = 3.0A	-	-	1.5	V
Reverse recovery time	t_{rr} *5	I_S = 1.5A, di/dt = 100A/μs	-	55	-	ns
Reverse recovery charge	Q_{rr} *5		-	11	-	nC

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L ≃ 500μH, V_{DD} = 50V, Rg = 25Ω, 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

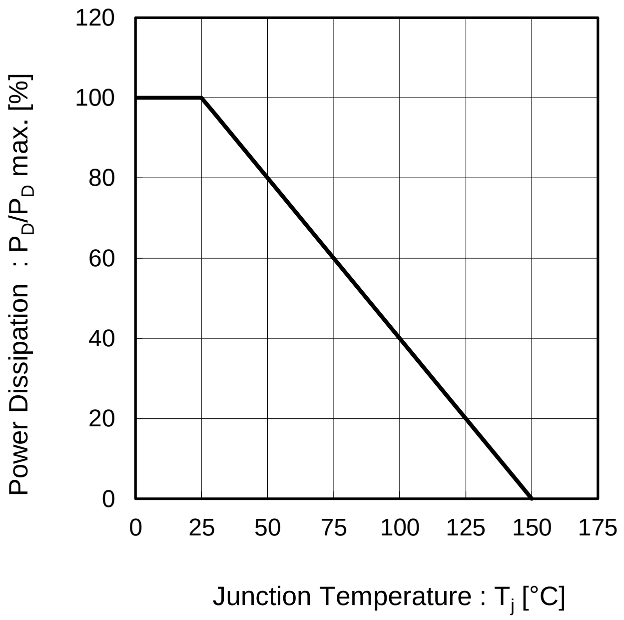


Fig.2 Maximum Safe Operating Area

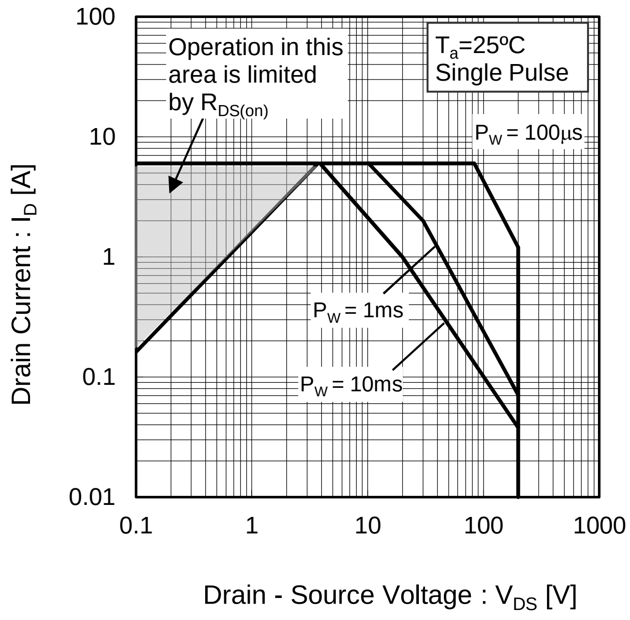
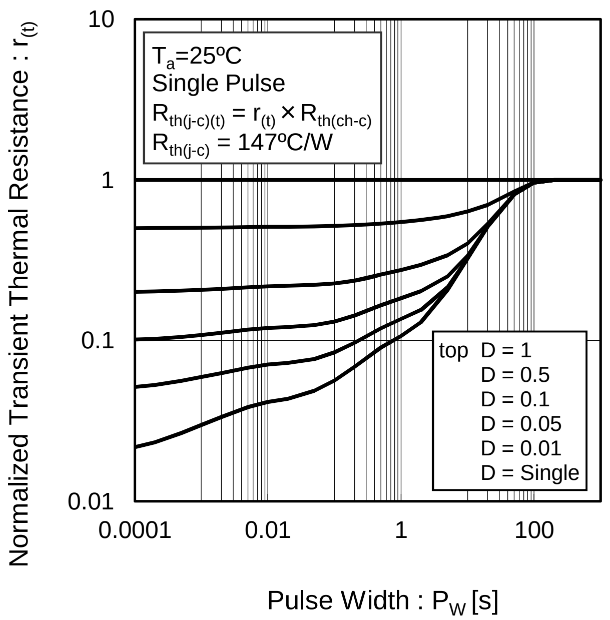


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

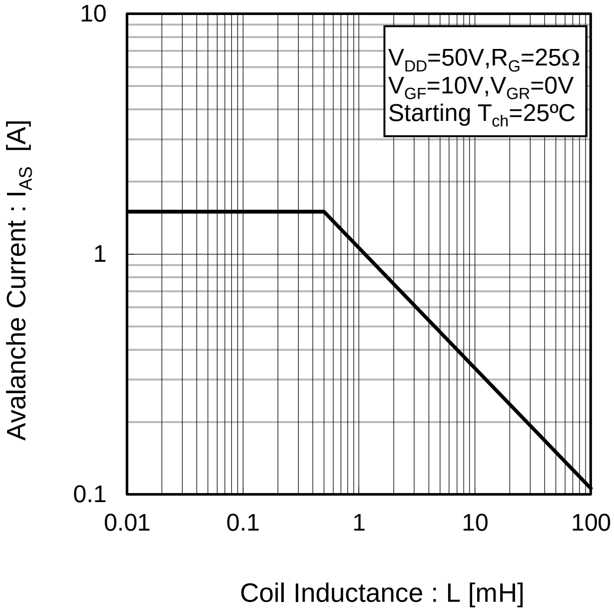


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

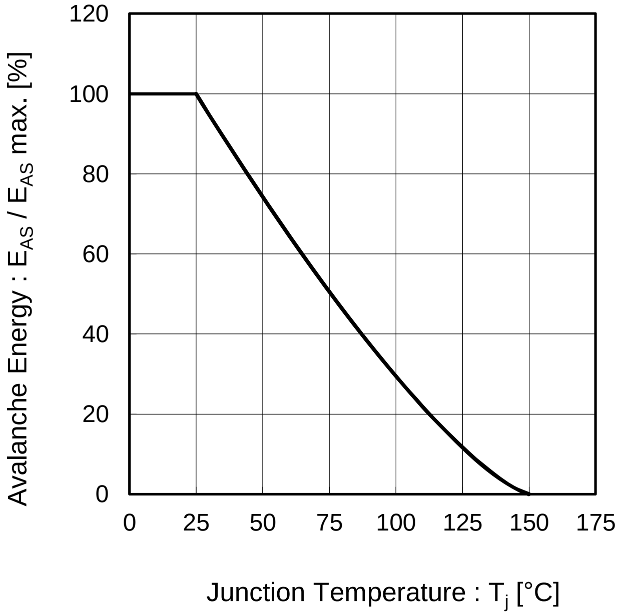


Fig.6 Typical Output Characteristics(I)

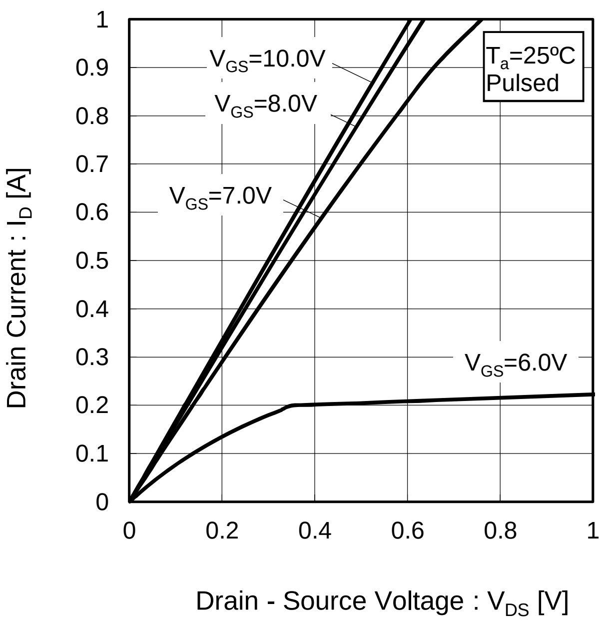
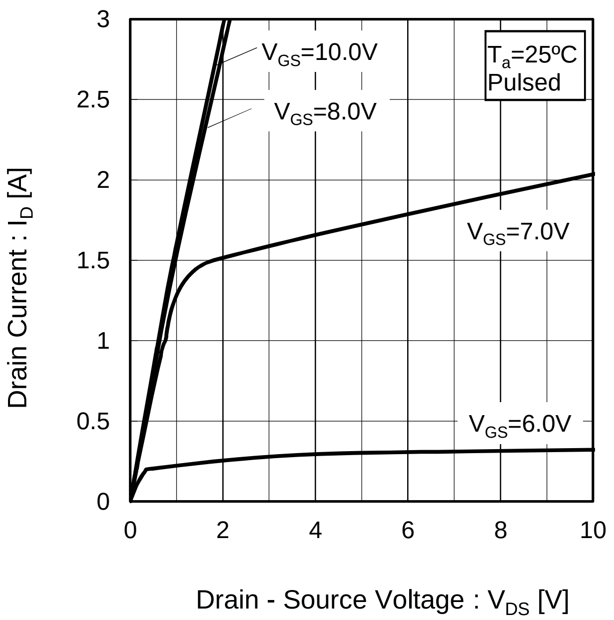


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

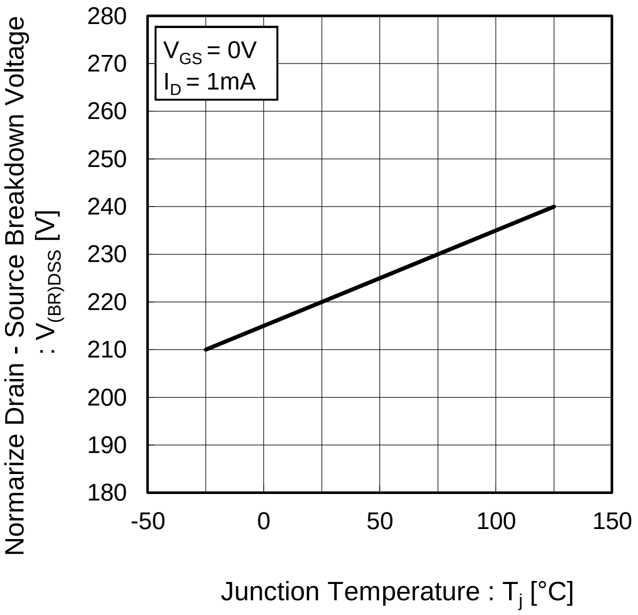


Fig.8 Breakdown Voltage vs. Junction Temperature

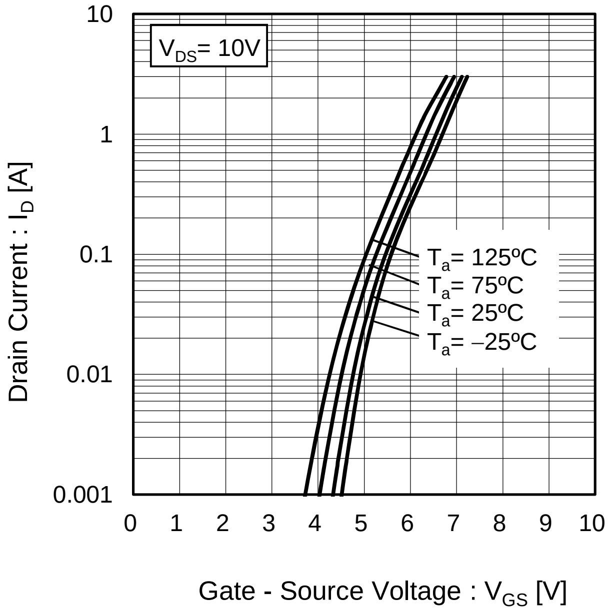


Fig.9 Typical Transfer Characteristics

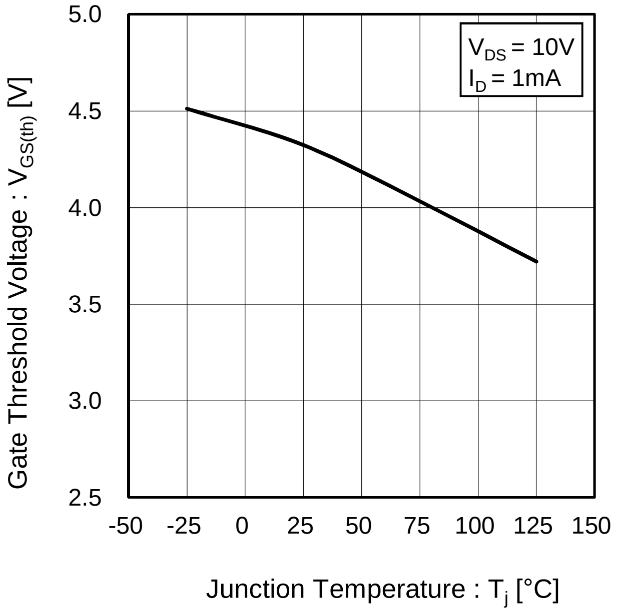


Fig.10 Gate Threshold Voltage vs. Junction Temperature

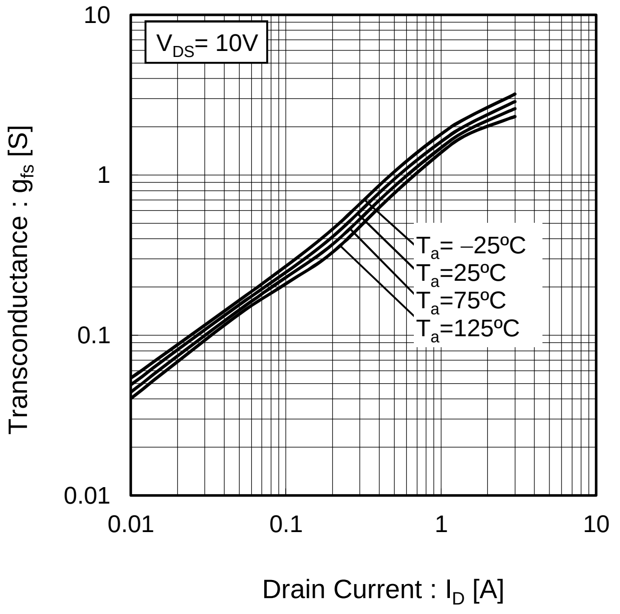


Fig.11 Transconductance vs. Drain Current

●Electrical characteristic curves

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

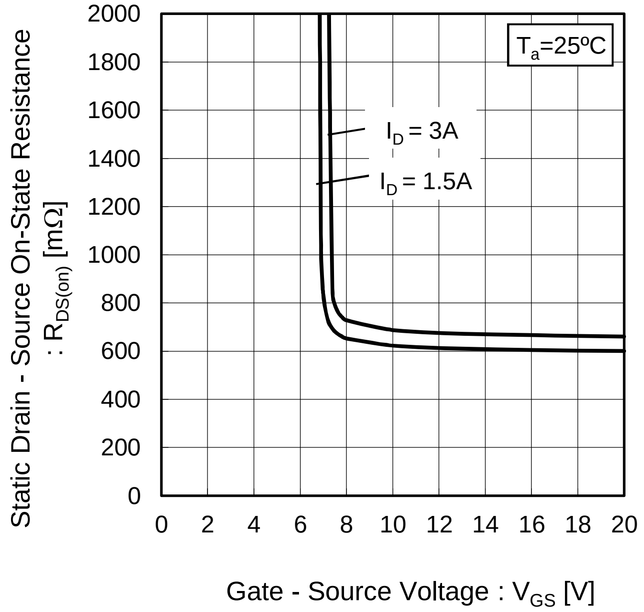


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

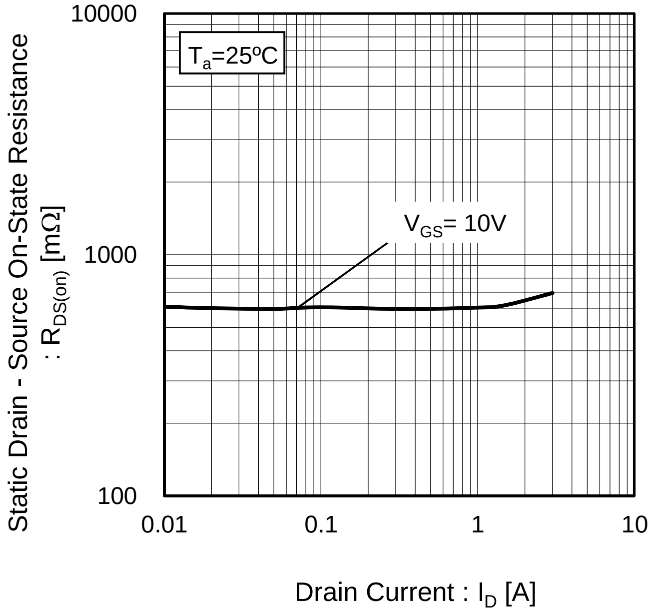
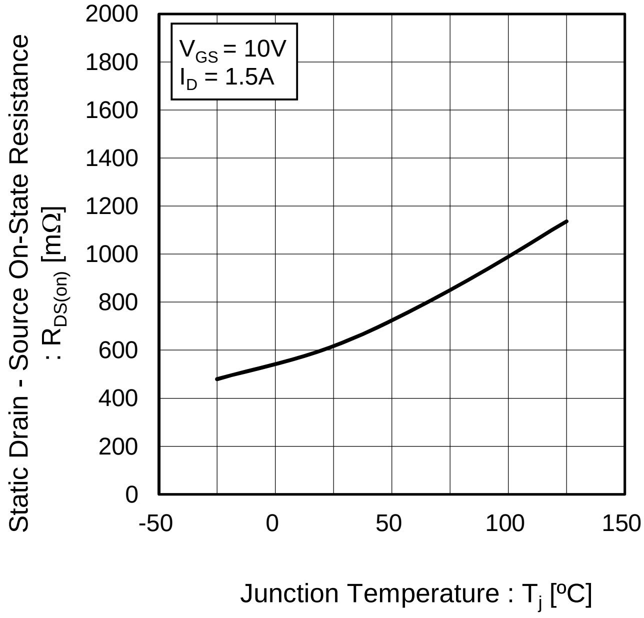


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



● **Electrical characteristic curves**

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

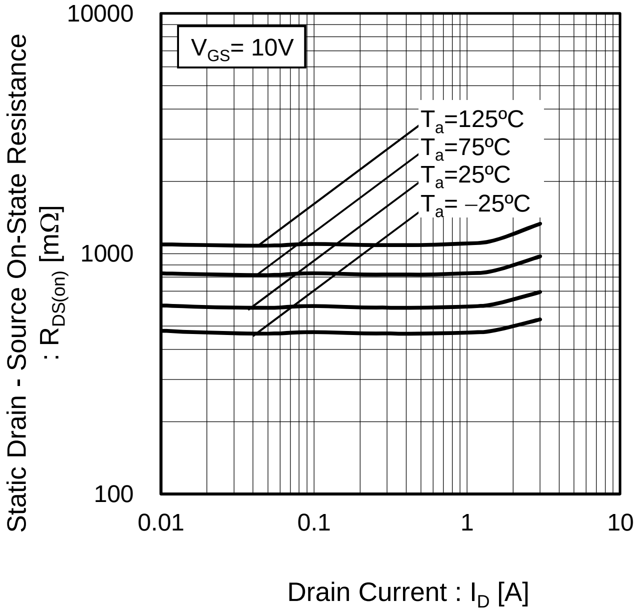
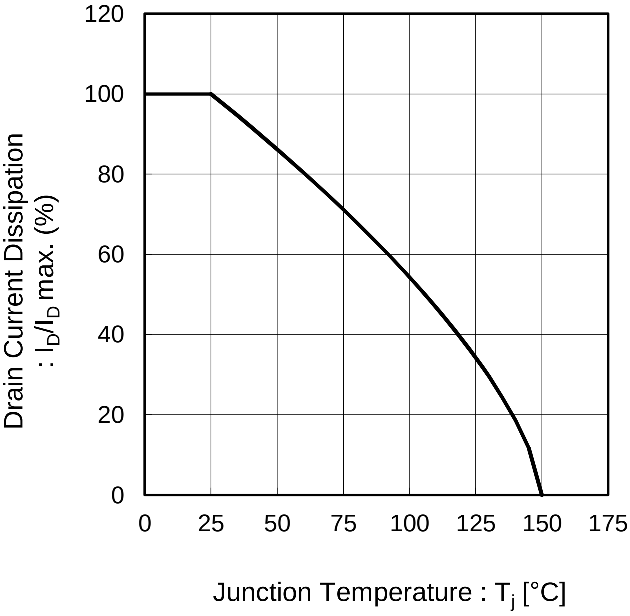


Fig.16 Drain Current Derating Curve



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

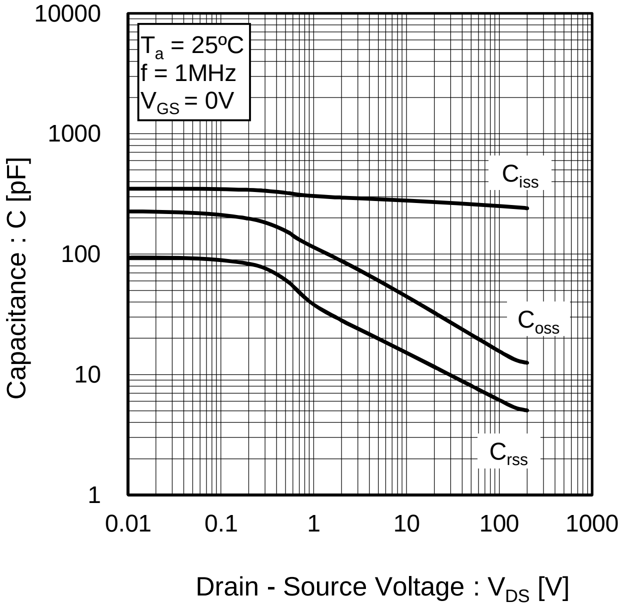


Fig.18 Switching Characteristics

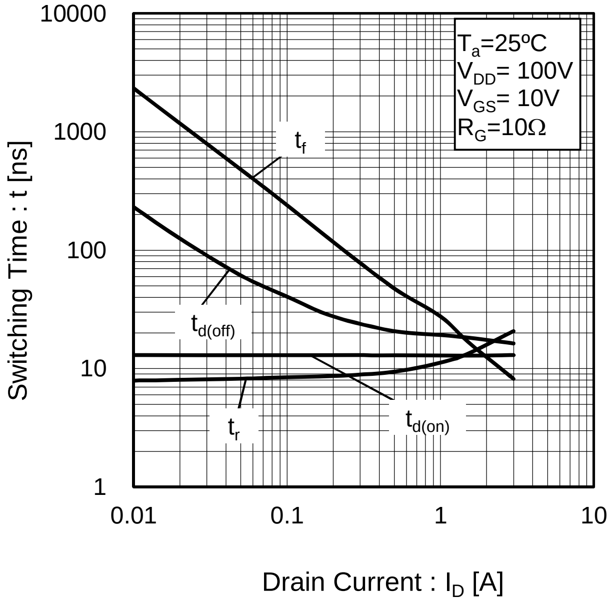
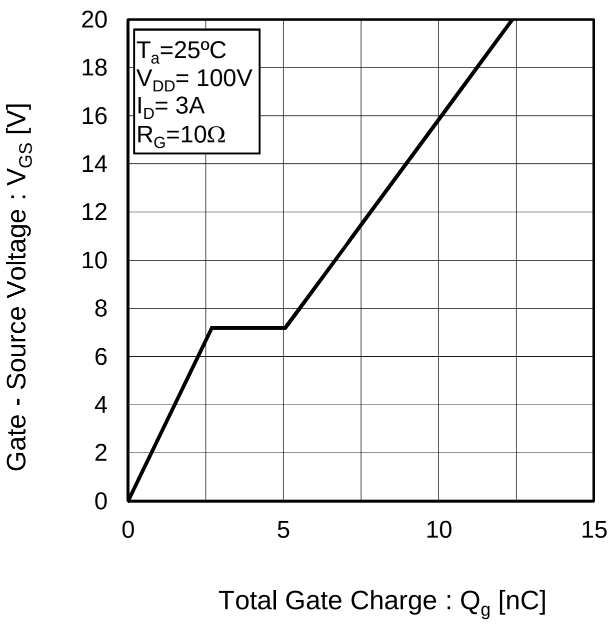


Fig.19 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.20 Source Current vs. Source - Drain Voltage

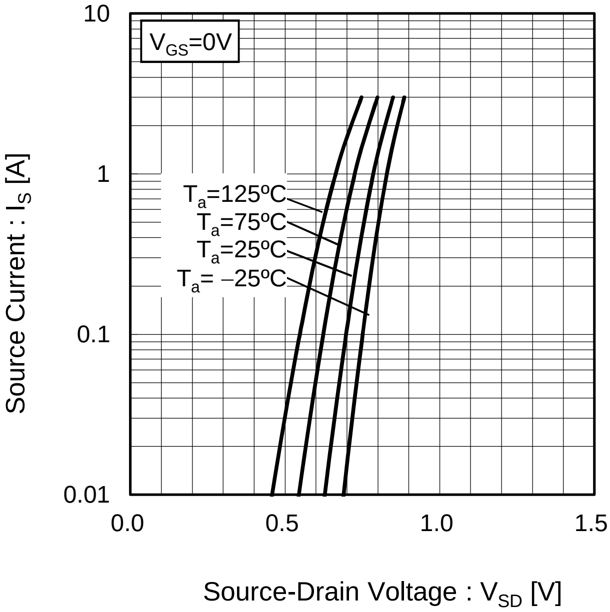
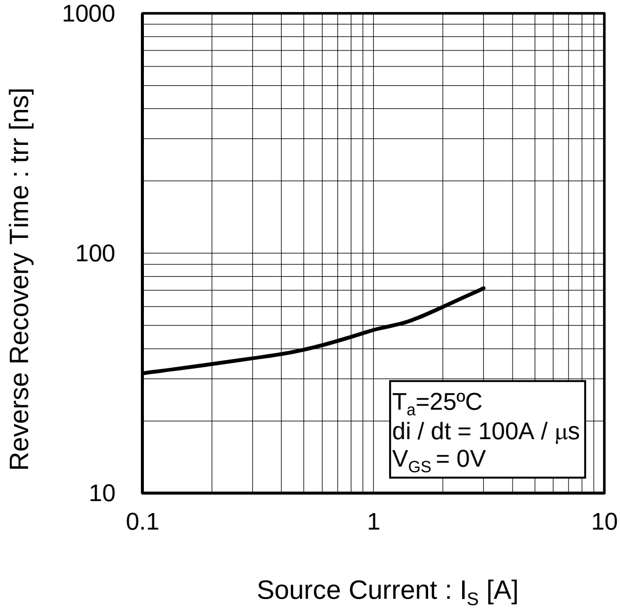


Fig21 Reverse Recovery Time vs.Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

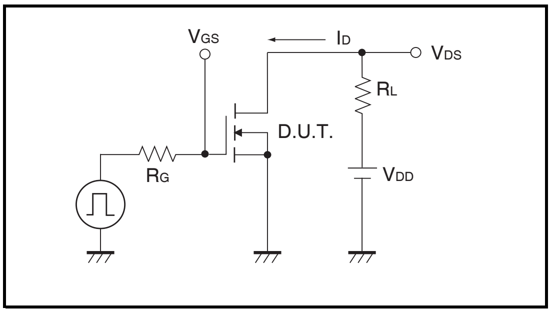


Fig.1-2 Switching Waveforms

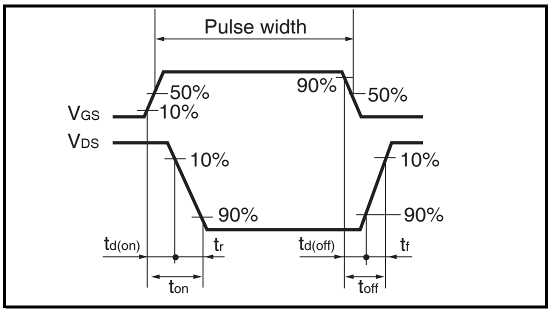


Fig.2-1 Gate Charge Measurement Circuit

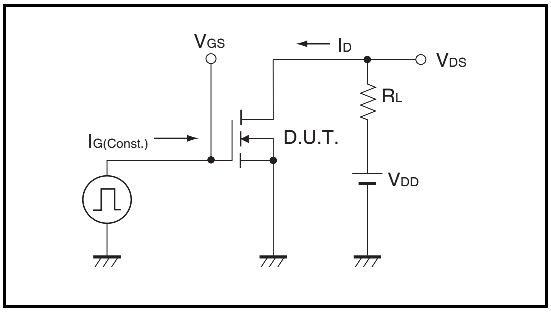


Fig.2-2 Gate Charge Waveform

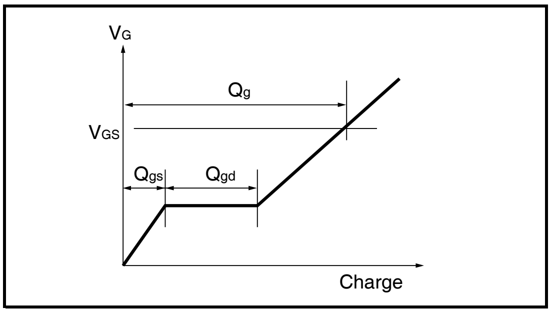


Fig.3-1 Avalanche Measurement Circuit

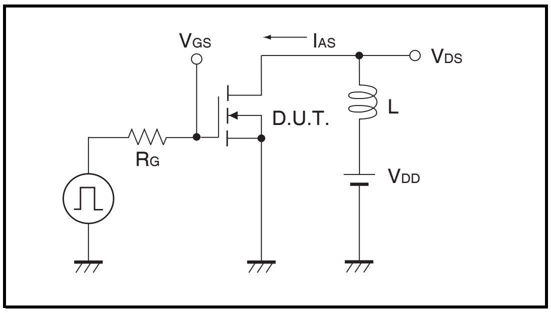
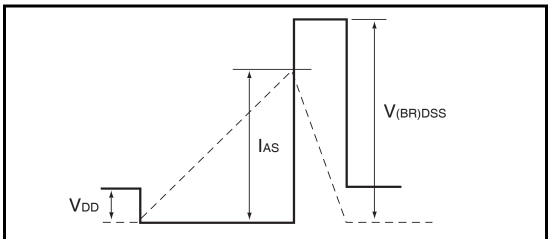


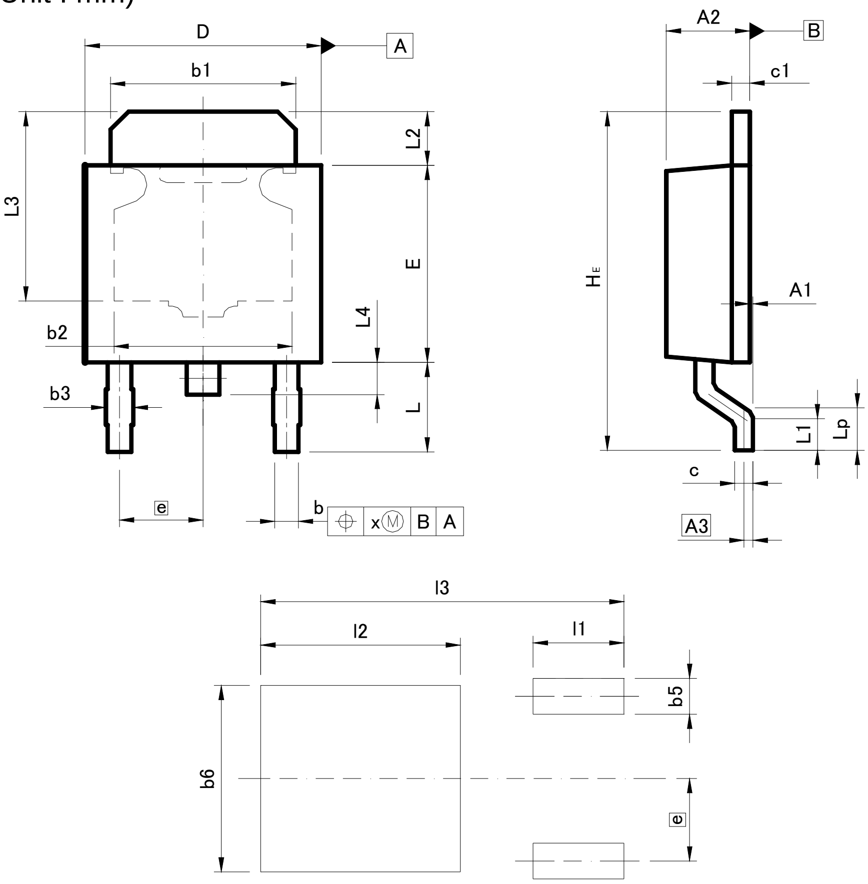
Fig.3-2 Avalanche Waveform



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

●Dimensions (Unit : mm)

CPT3



DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A1	0.00	0.15	0	0.006
A2	2.20	2.50	0.087	0.098
A3	0.25		0.01	
b	0.55	0.75	0.022	0.03
b1	5.00	5.30	0.197	0.209
b2	5.00		0.20	
b3	0.75		0.03	
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		0.09	
H_E	9.00	10.00	0.354	0.394
L	2.20	2.80	0.087	0.11
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	–	0.01

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

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