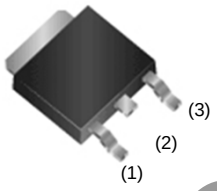
RND030N20

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>



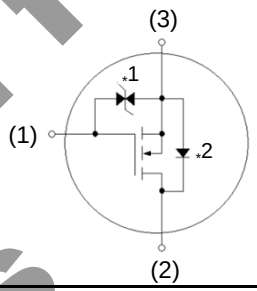
●Features

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

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●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

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●**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	$V_{DD} \simeq$ 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	$V_{DD} \simeq$ 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	$V_{(plateau)}$	$V_{DD} \simeq$ 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	-	55	-	ns
Reverse recovery charge	Q_{rr} *5	di/dt = 100A/μs	-	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

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Fig.1 Power Dissipation Derating Curve

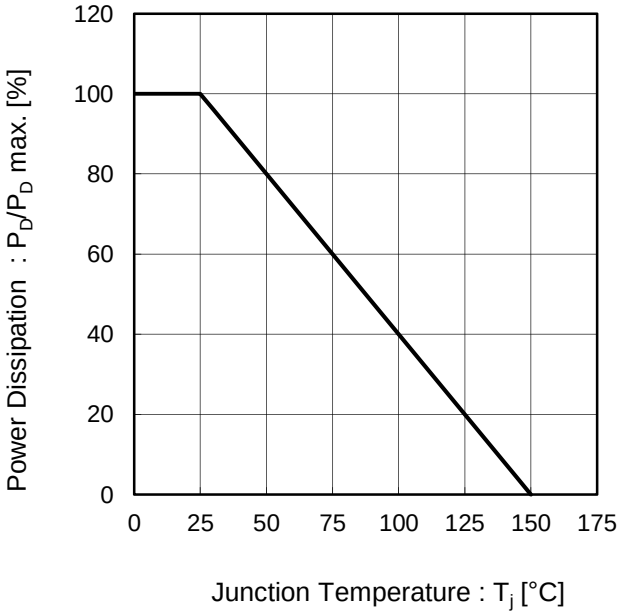


Fig.2 Maximum Safe Operating Area

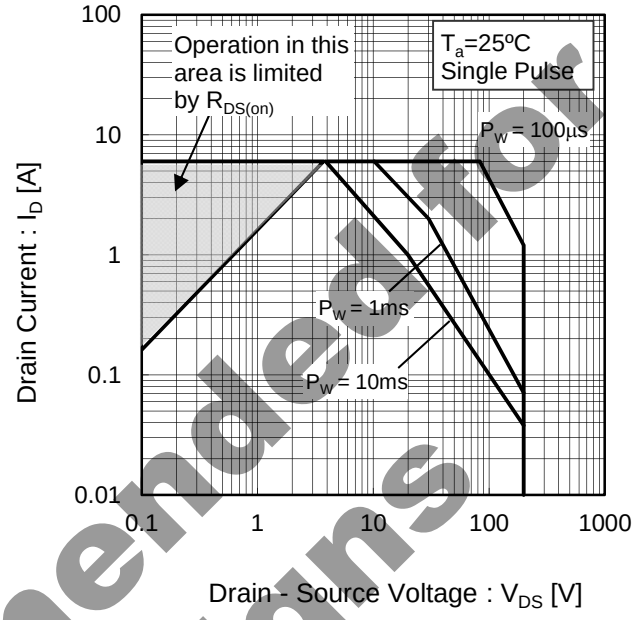
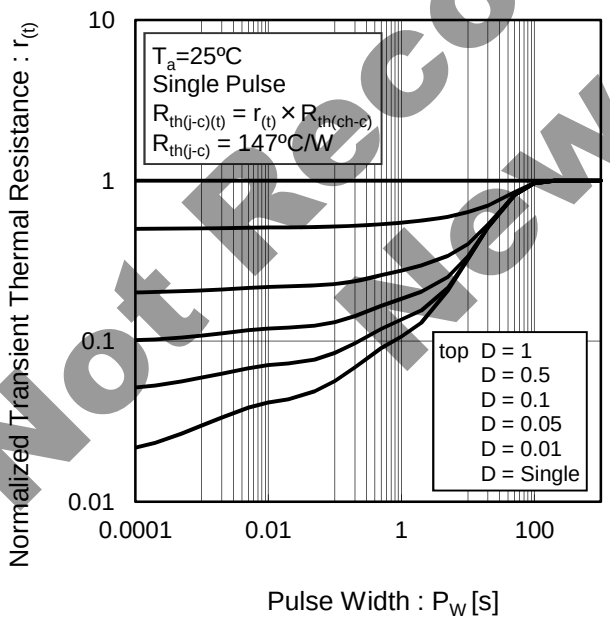


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



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Fig.4 Avalanche Current vs Inductive Load

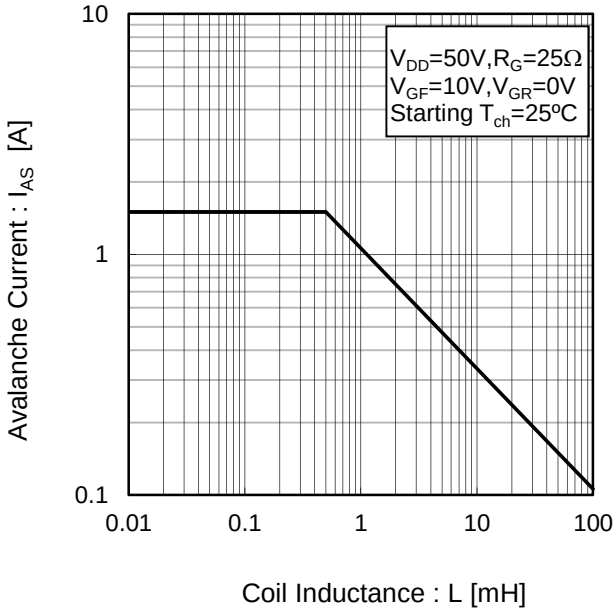


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

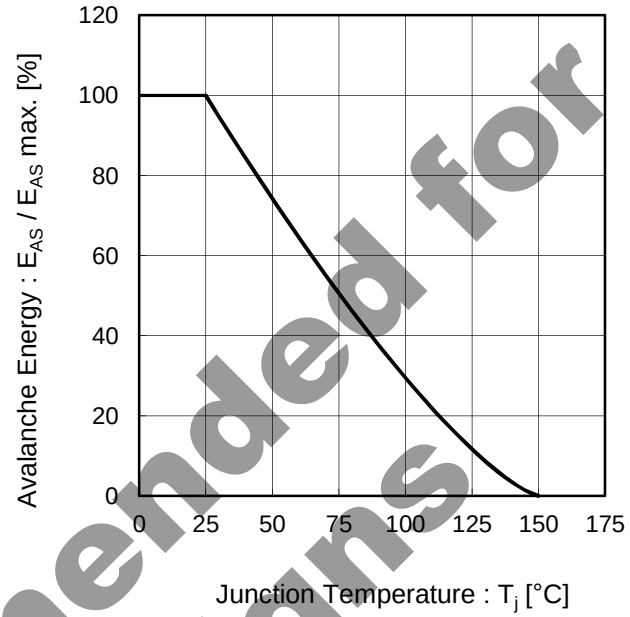


Fig.6 Typical Output Characteristics(I)

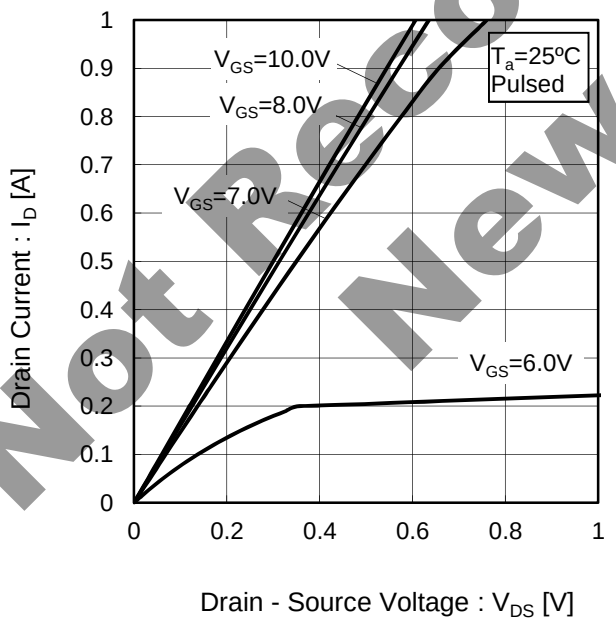
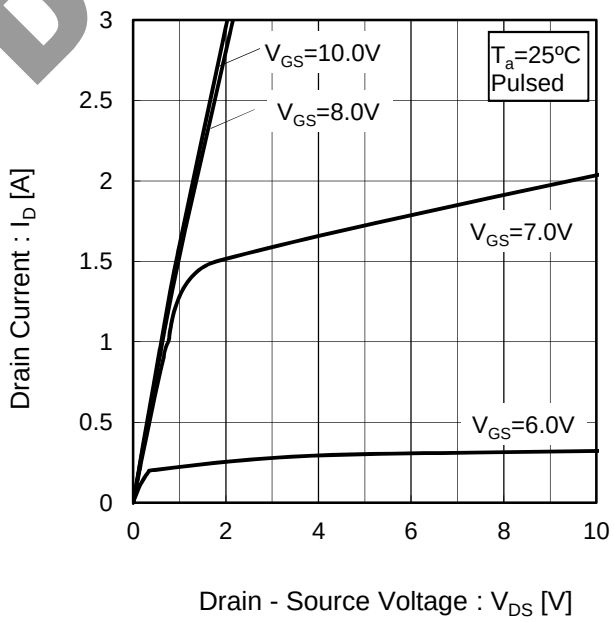


Fig.7 Typical Output Characteristics(II)



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Fig.8 Breakdown Voltage vs. Junction Temperature

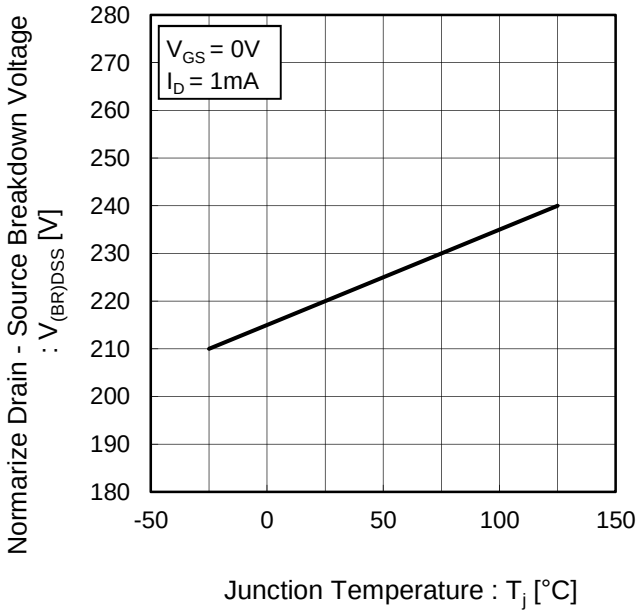


Fig.9 Typical Transfer Characteristics

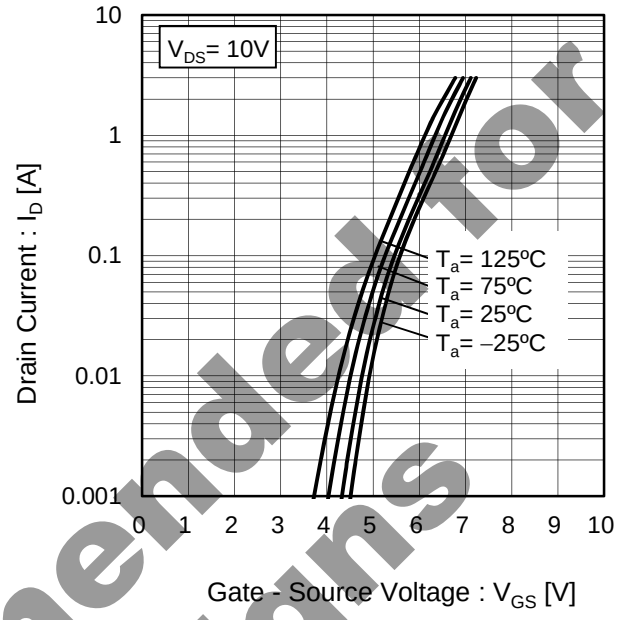


Fig.10 Gate Threshold Voltage vs. Junction Temperature

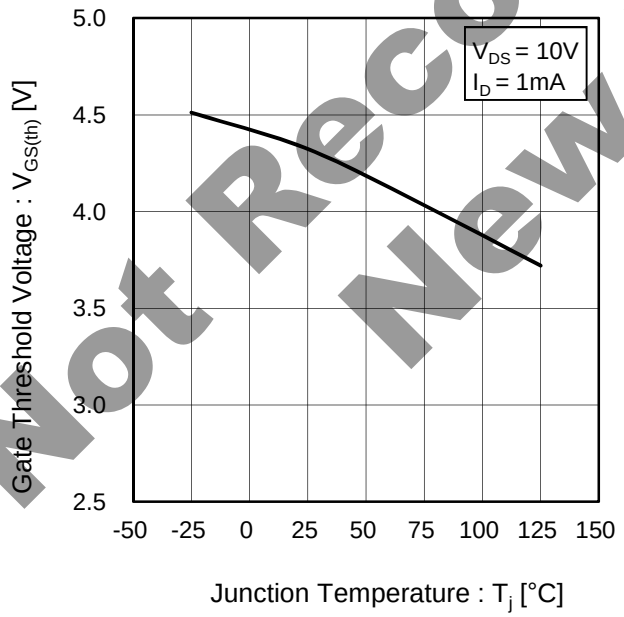
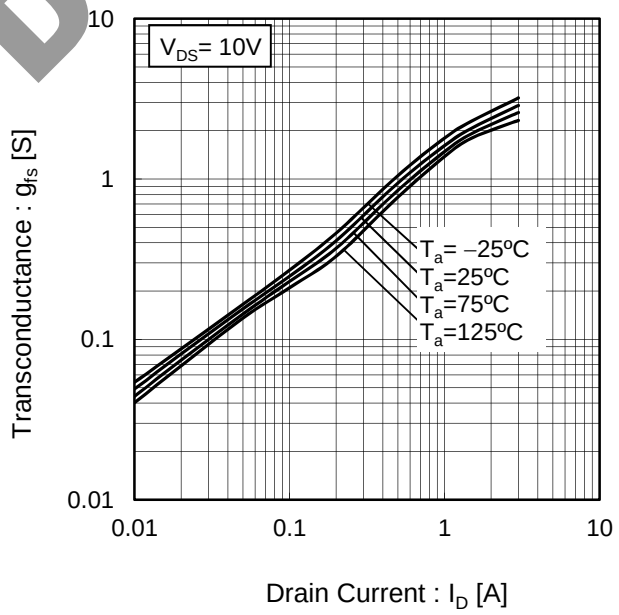


Fig.11 Transconductance vs. Drain Current



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

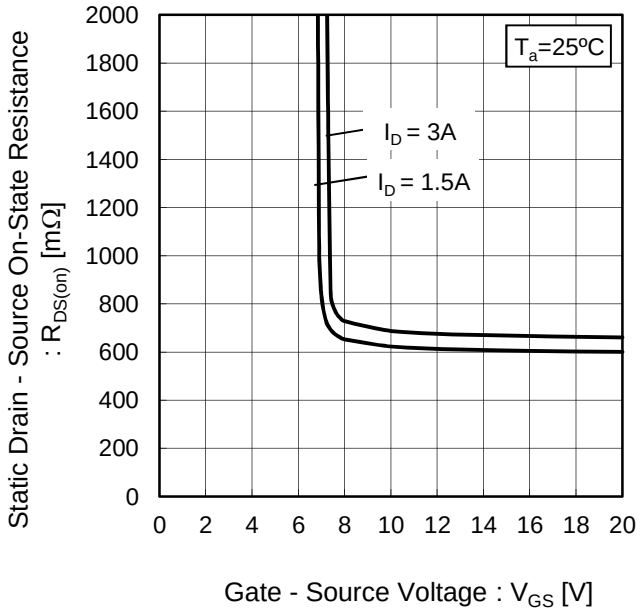


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

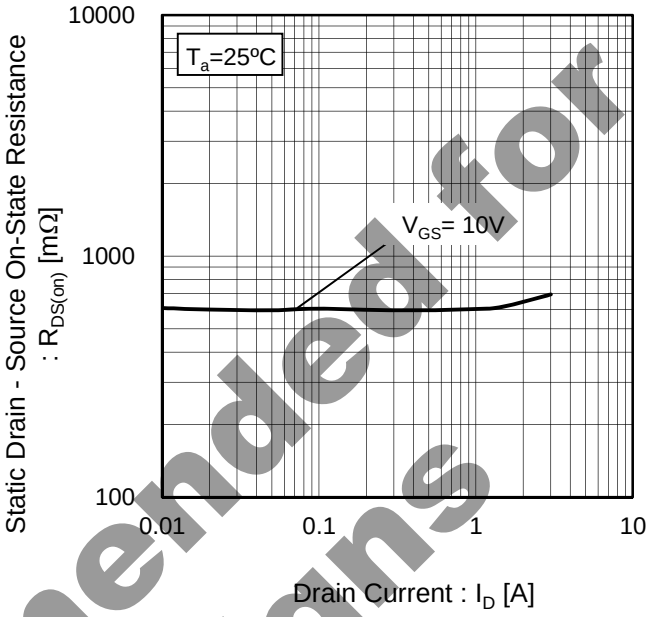
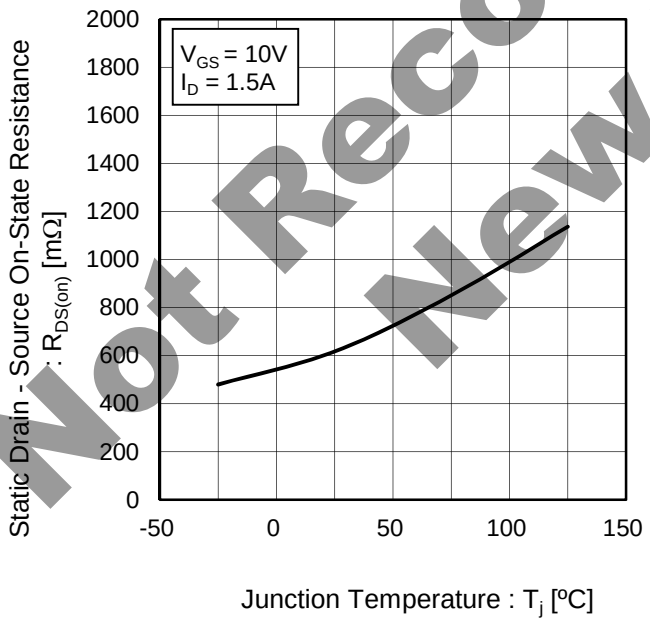


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



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

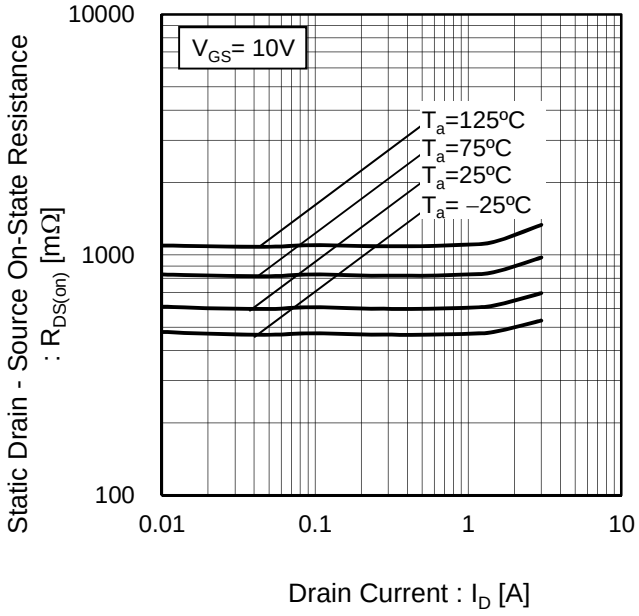
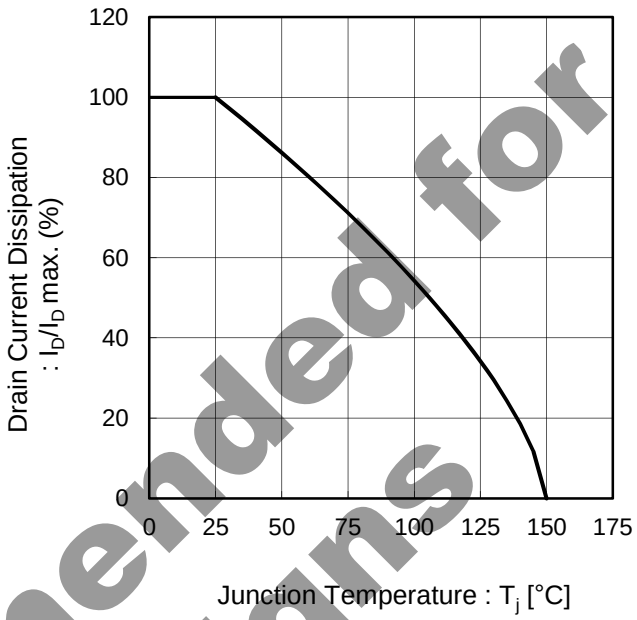


Fig.16 Drain Current Derating Curve



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Fig.17 Typical Capacitance vs. Drain - Source Voltage

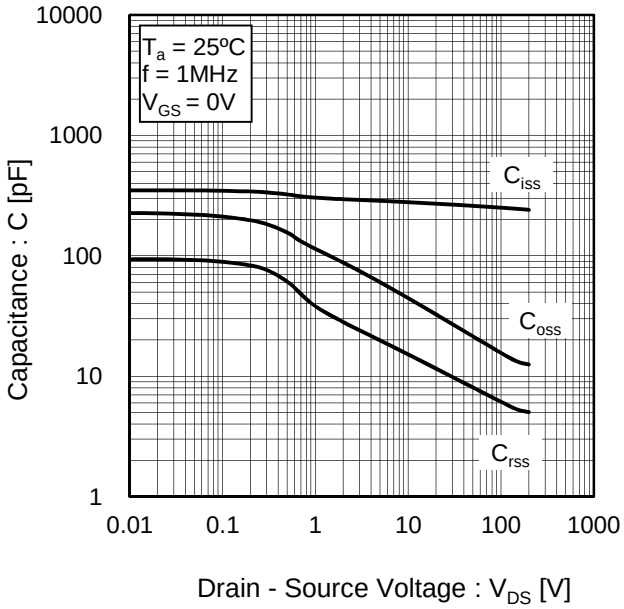


Fig.18 Switching Characteristics

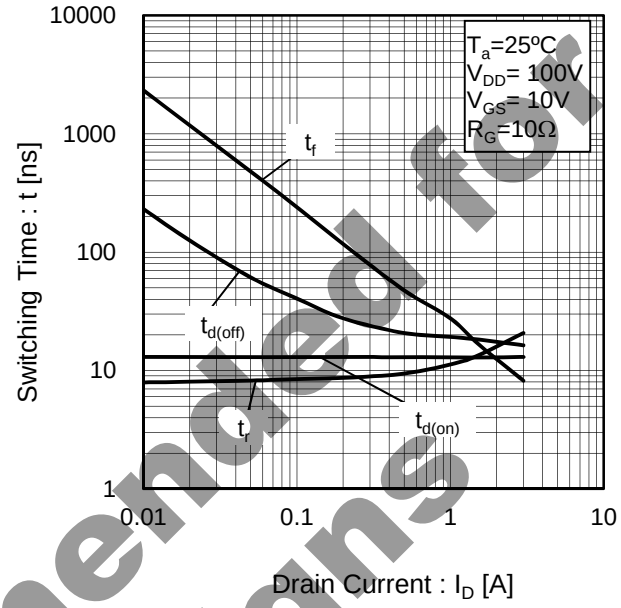
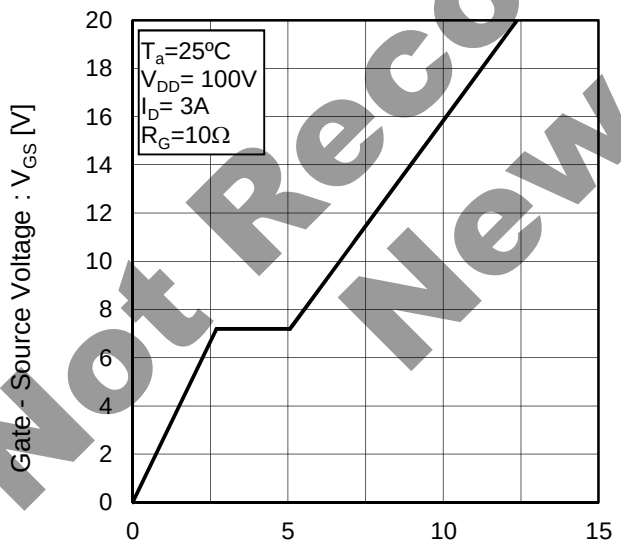


Fig.19 Dynamic Input Characteristics



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Fig.20 Source Current vs. Source - Drain Voltage

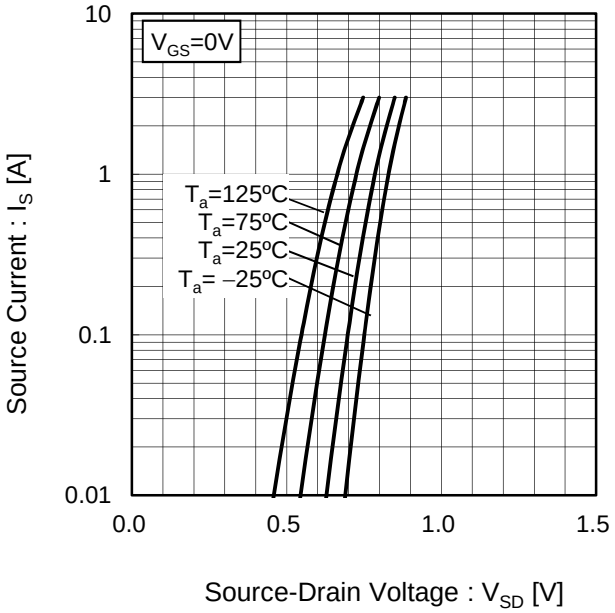
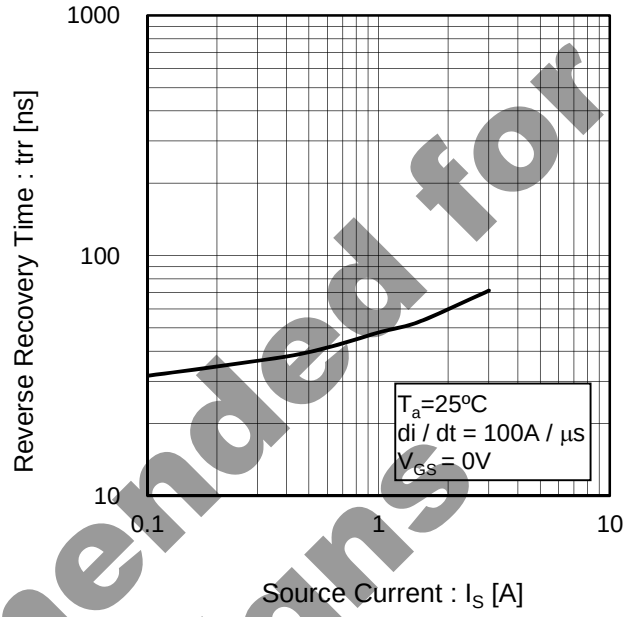


Fig21 Reverse Recovery Time vs.Source Current



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●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

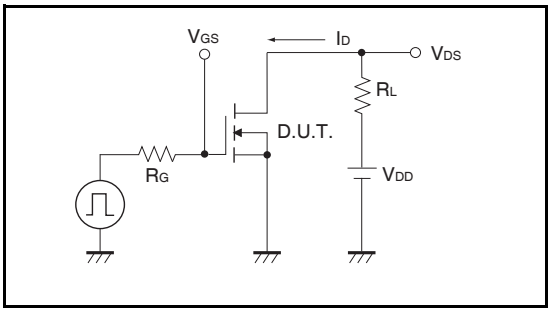


Fig.1-2 Switching Waveforms

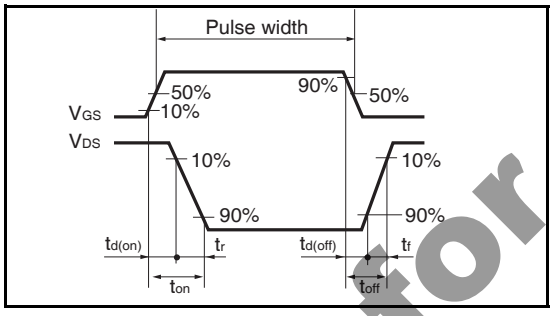


Fig.2-1 Gate Charge Measurement Circuit

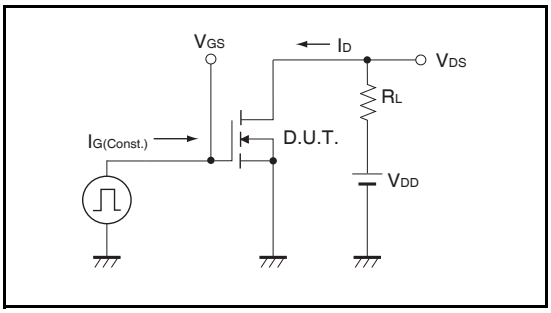


Fig.2-2 Gate Charge Waveform

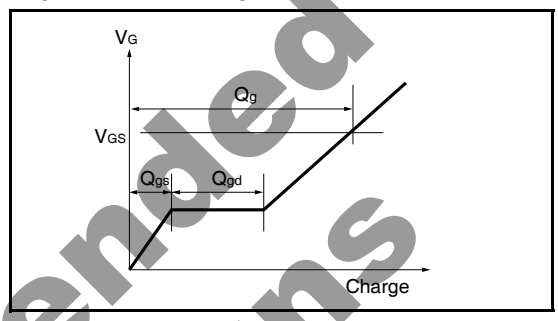


Fig.3-1 Avalanche Measurement Circuit

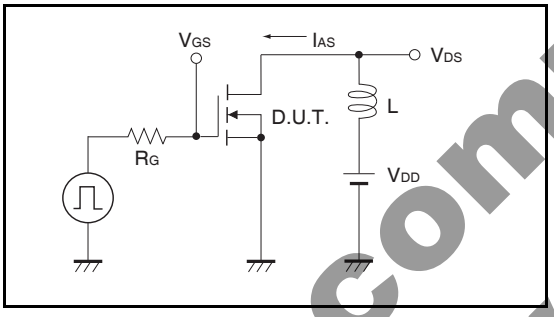
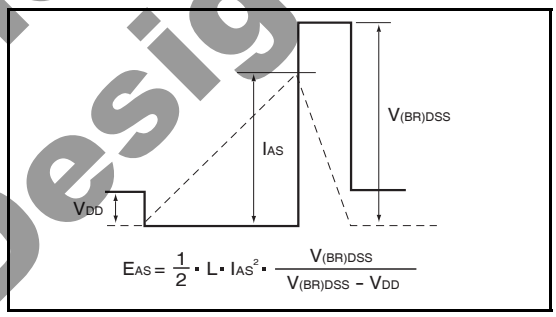


Fig.3-2 Avalanche Waveform



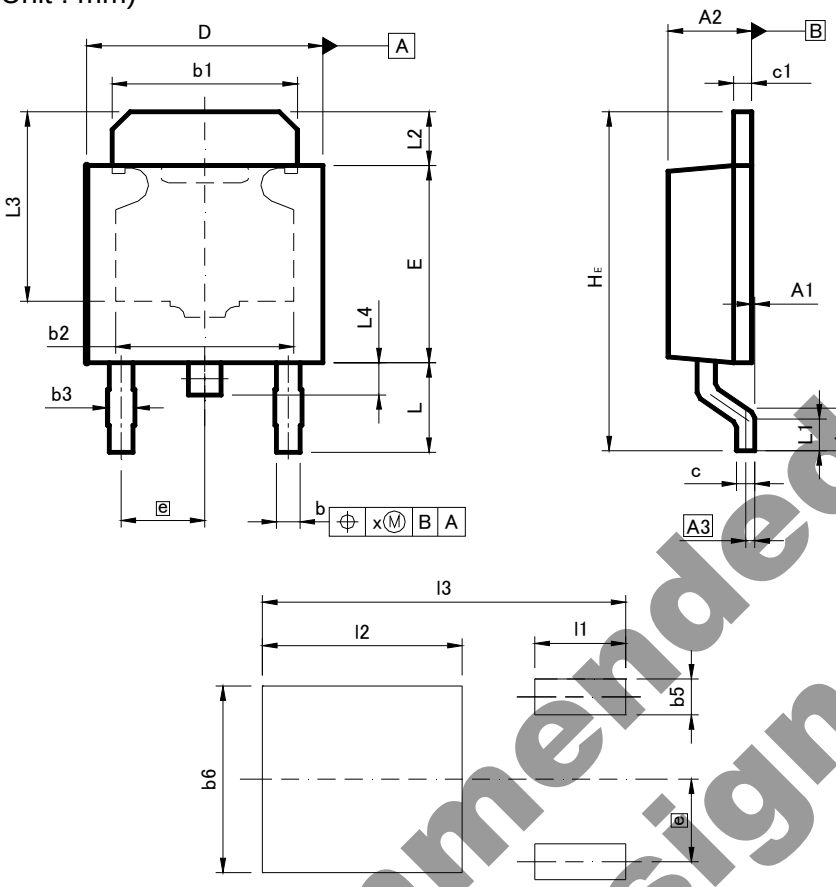
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●**Dimensions** (Unit : mm)

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	
HE	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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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.

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