

$V_{DSS}$	250V
$R_{DS(on)}$ (Max.)	140mΩ
$I_D$	22A
$P_D$	40W

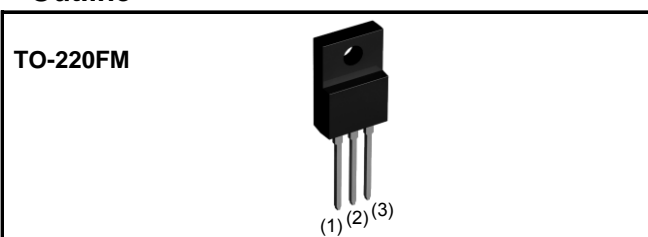
#### ●Features

- 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

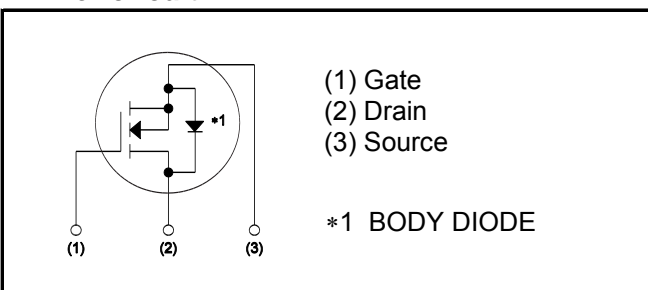
#### ●Application

Switching Power Supply  
 Automotive Motor Drive  
 Automotive Solenoid Drive

#### ●Outline



#### ●Inner circuit



#### ●Packaging specifications

Type	Packaging	Bulk
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	500
	Taping code	-
	Marking	RCX220N25

#### ●Absolute maximum ratings( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Value	Unit	
Drain - Source voltage	$V_{DSS}$	250	V	
Continuous drain current	$T_c = 25^\circ\text{C}$	$I_D^{*1}$	±22	A
	$T_c = 100^\circ\text{C}$	$I_D^{*1}$	±11.9	A
Pulsed drain current	$I_{D,pulse}^{*2}$	±88	A	
Gate - Source voltage	$V_{GSS}$	±30	V	
Avalanche energy, single pulse	$E_{AS}^{*3}$	36.8	mJ	
Avalanche current	$I_{AR}^{*3}$	11	A	
Power dissipation	$T_c = 25^\circ\text{C}$	$P_D$	40	W
	$T_a = 25^\circ\text{C}$	$P_D$	2.23	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	$R_{thJC}$	-	-	3.125	°C/W
Thermal resistance, junction - ambient	$R_{thJA}$	-	-	56	°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	$I_{DSS}$	$V_{DS} = 250V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	25	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	3.0	-	5.0	V
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = 10V, I_D = 11A$	-	105	140	$m\Omega$
		$V_{GS} = 10V, I_D = 11A$ $T_j = 125^\circ\text{C}$	-	230	320	
Forward transfer admittance	$g_{fs}$	$V_{DS} = 10V, I_D = 11A$	6	12	-	S

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$	-	3200	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 25\text{V}$	-	170	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	100	-	
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} \approx 125\text{V}, V_{GS} = 10\text{V}$	-	45	-	ns
Rise time	$t_r^{*4}$	$I_D = 11\text{A}$	-	100	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 11.4\Omega$	-	75	-	
Fall time	$t_f^{*4}$	$R_G = 10\Omega$	-	40	-	

**●Gate Charge characteristics**( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*4}$	$V_{DD} \approx 125\text{V}$	-	60	-	nC
Gate - Source charge	$Q_{gs}^{*4}$	$I_D = 22\text{A}$	-	15	-	
Gate - Drain charge	$Q_{gd}^{*4}$	$V_{GS} = 10\text{V}$	-	20	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \approx 125\text{V}, I_D = 22\text{A}$	-	7.4	-	V

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous source current	$I_S^{*1}$	$T_c = 25^\circ\text{C}$	-	-	22	A
Pulsed source current	$I_{SM}^{*2}$		-	-	88	A
Forward voltage	$V_{SD}^{*4}$	$V_{GS} = 0\text{V}, I_S = 22\text{A}$	-	-	1.5	V
Reverse recovery time	$t_{rr}^{*4}$	$I_S = 11\text{A}$	-	140	-	ns
Reverse recovery charge	$Q_{rr}^{*4}$	$di/dt = 100\text{A}/\mu\text{s}$	-	660	-	nC

\*1 Limited only by maximum temperature allowed.

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

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

\*4 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

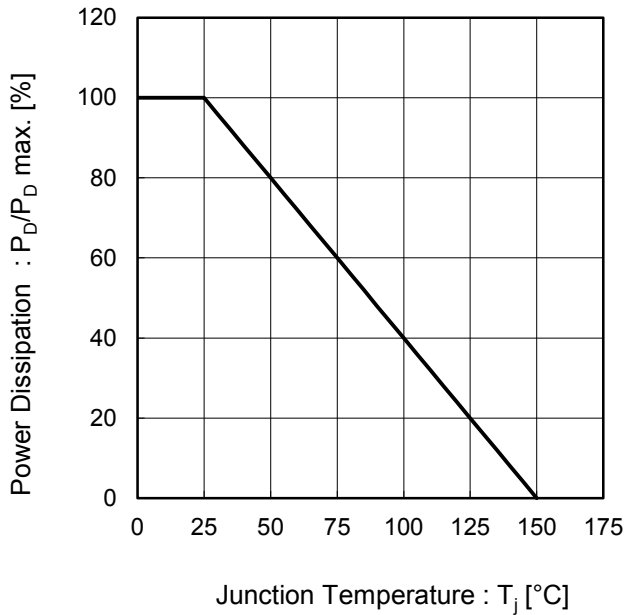


Fig.2 Maximum Safe Operating Area

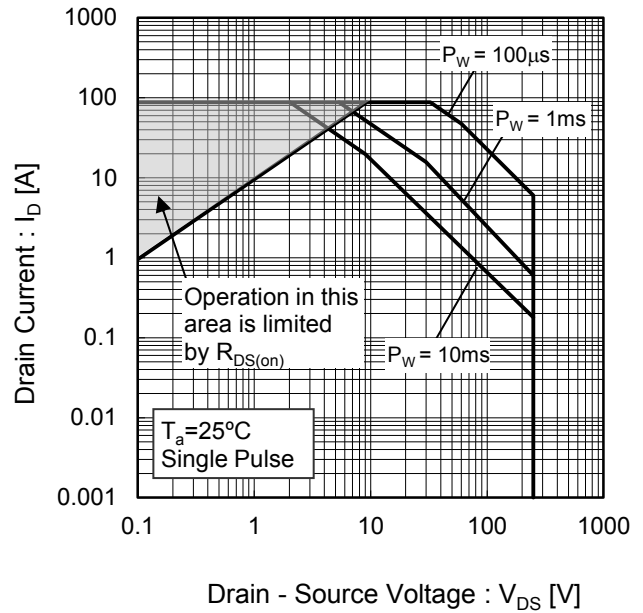
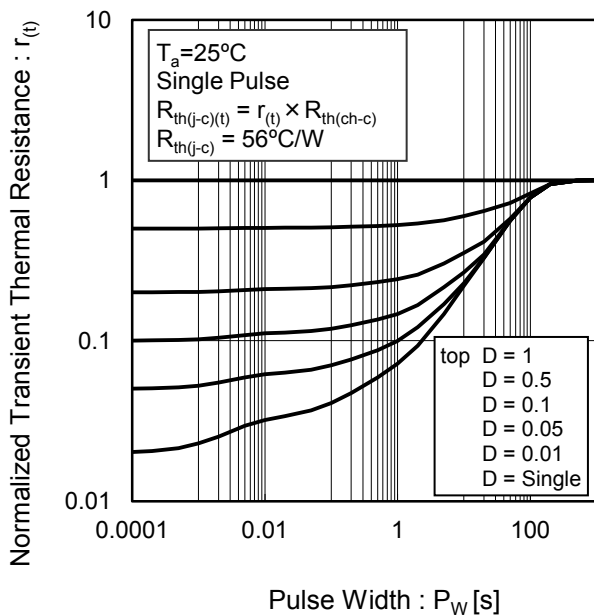


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

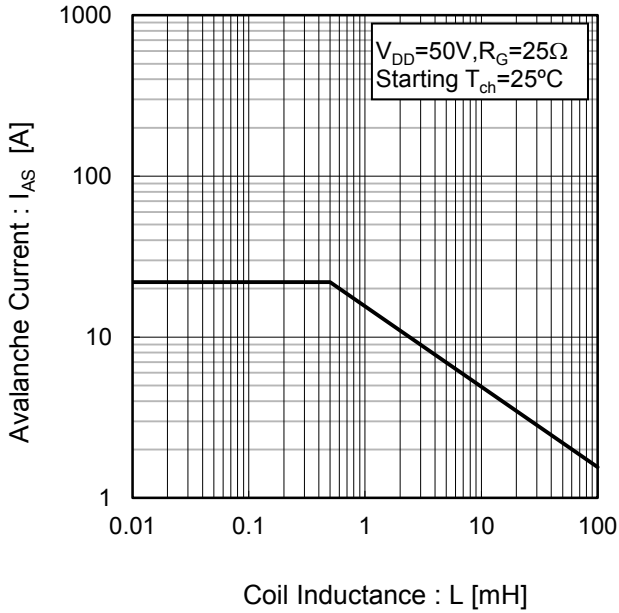


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

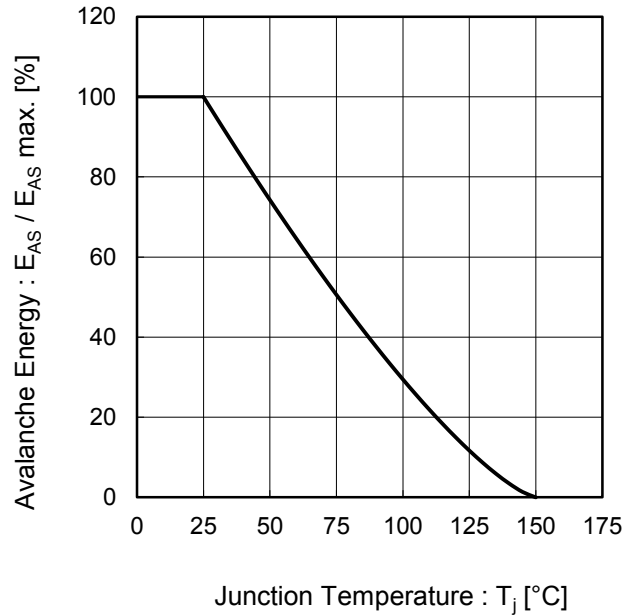


Fig.6 Typical Output Characteristics(I)

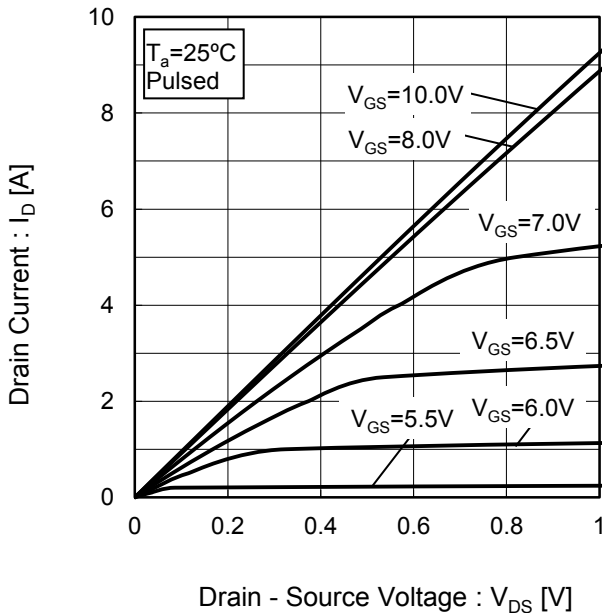
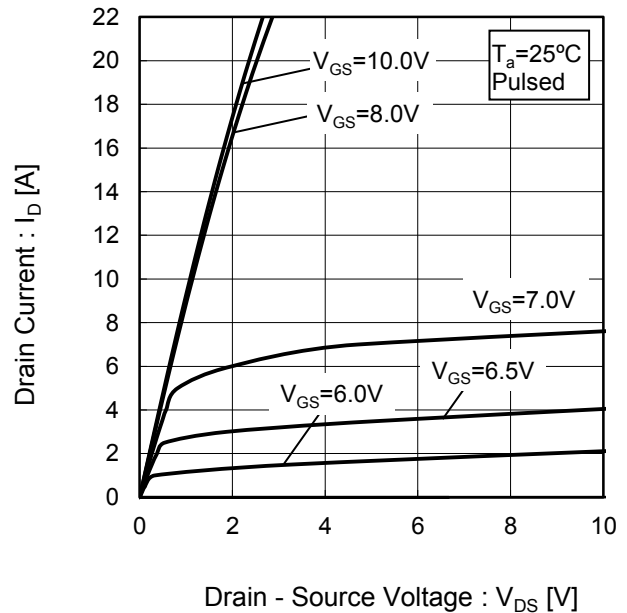


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

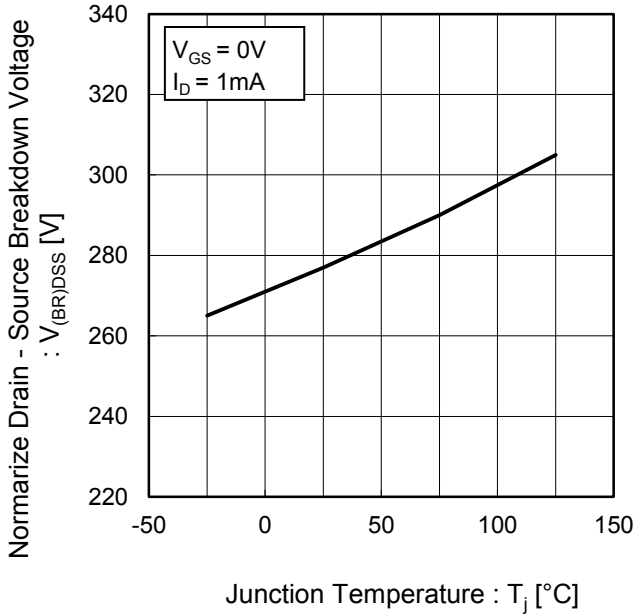


Fig.9 Typical Transfer Characteristics

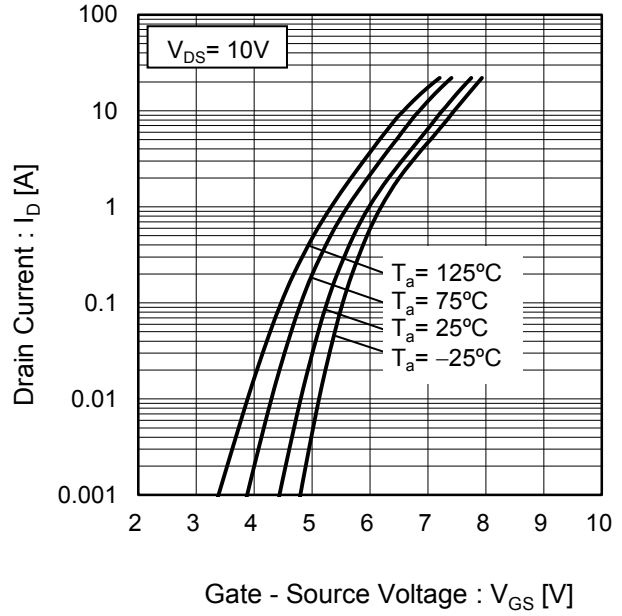


Fig.10 Gate Threshold Voltage vs. Junction Temperature

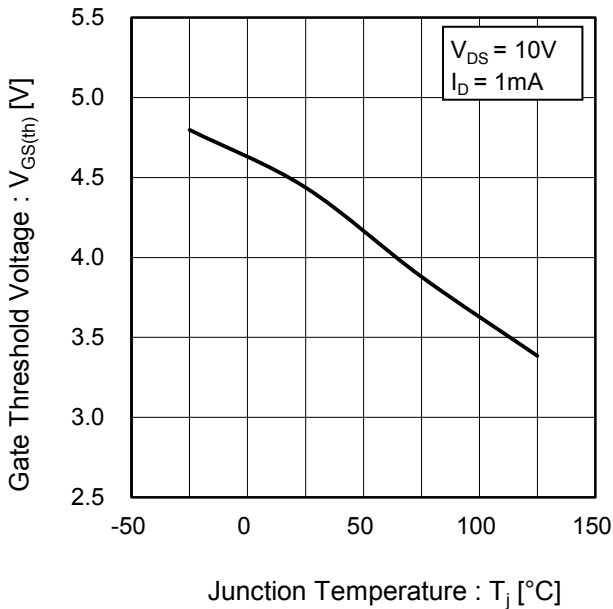
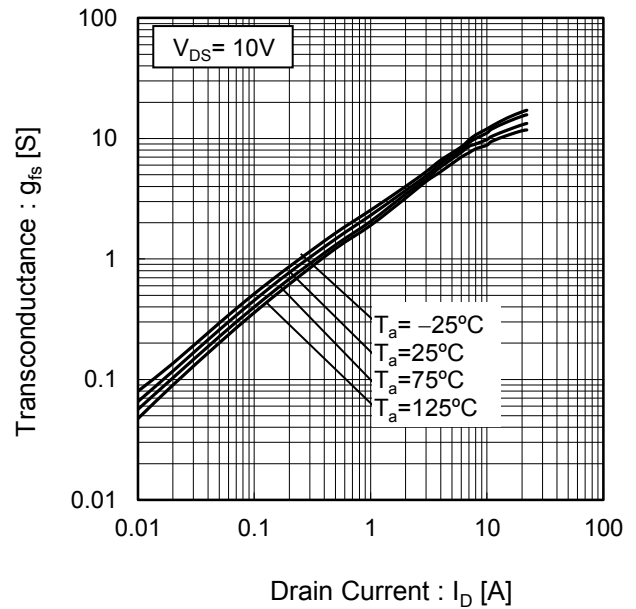


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

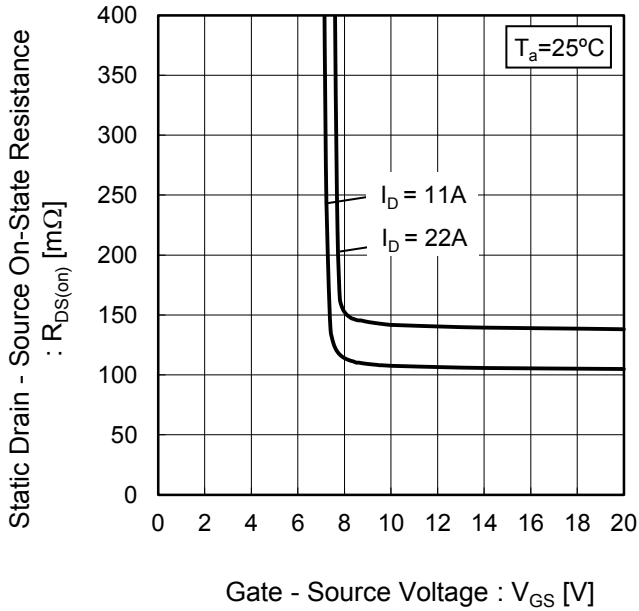


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

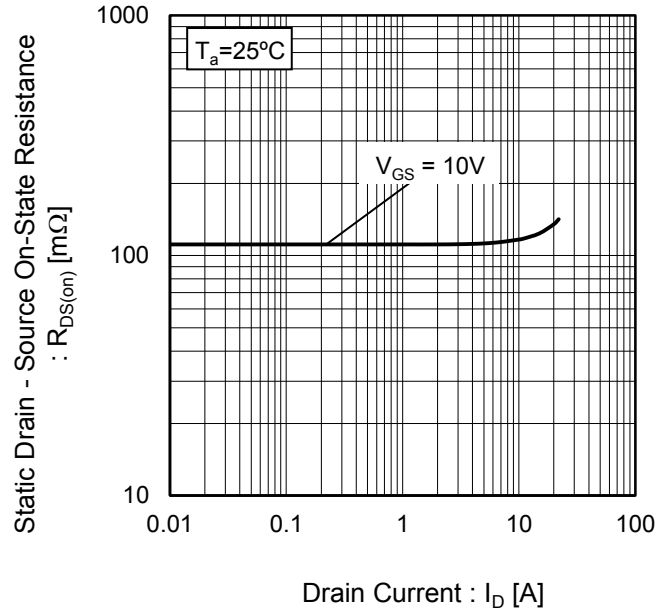
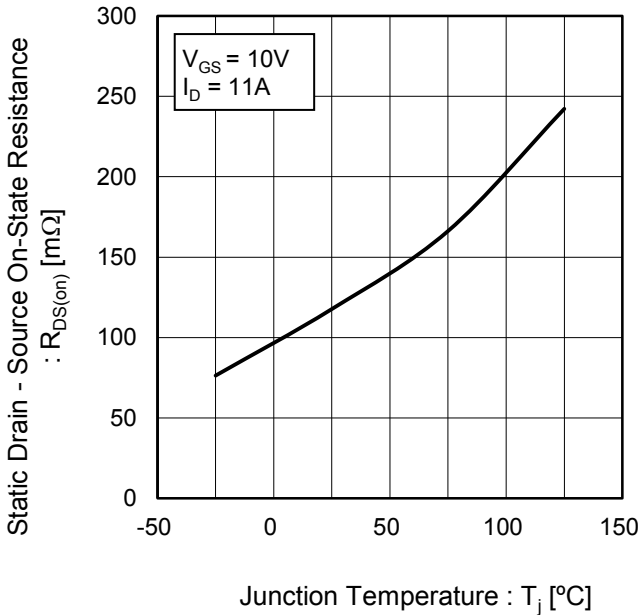


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

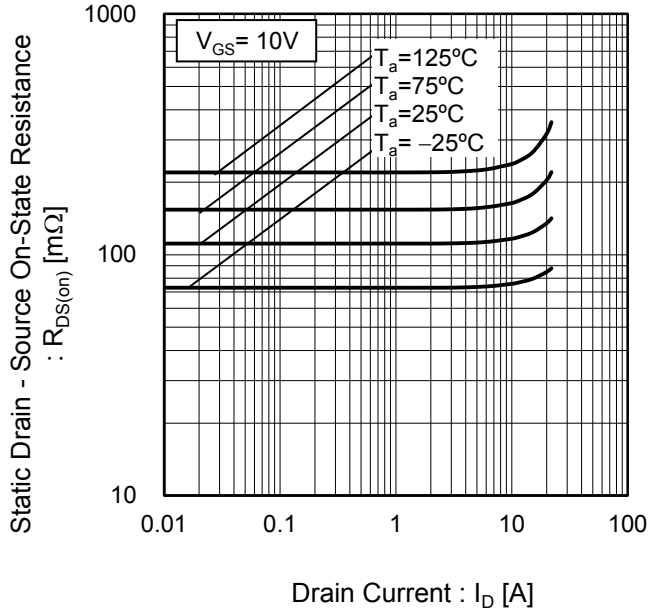
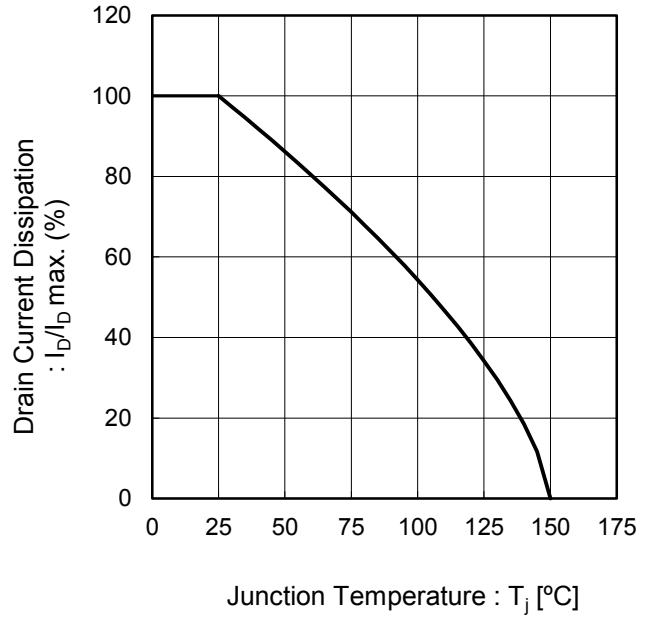


Fig.16 Drain Current Derating Curve





●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

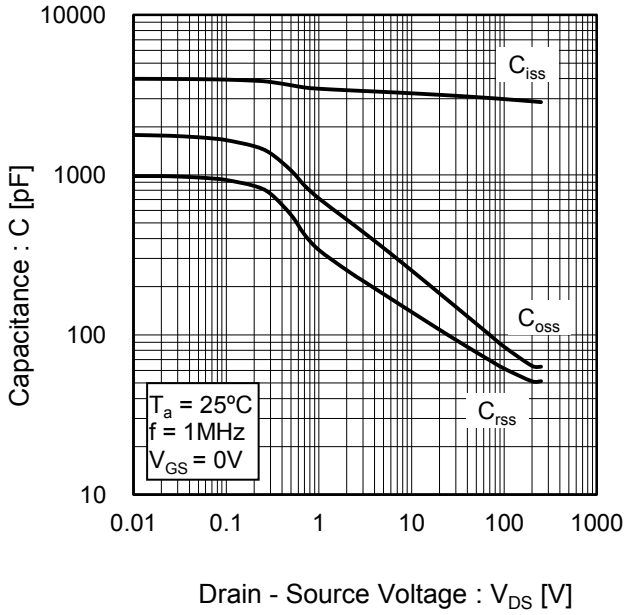


Fig.18 Switching Characteristics

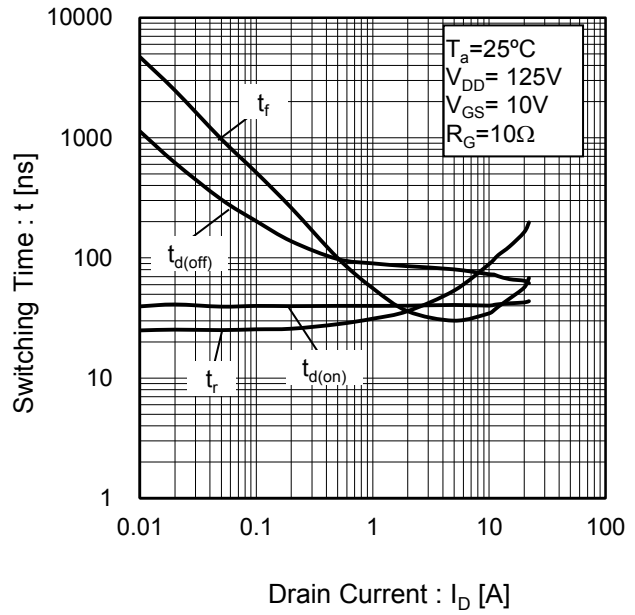
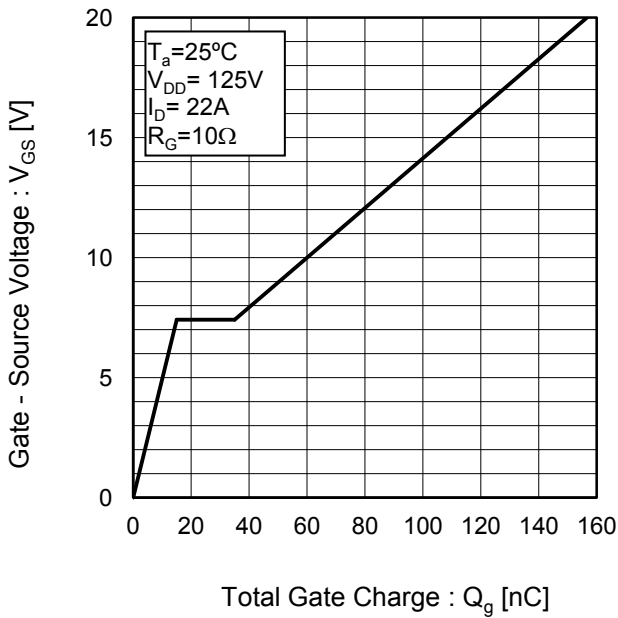


Fig.19 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.20 Source Current vs. Source - Drain Voltage

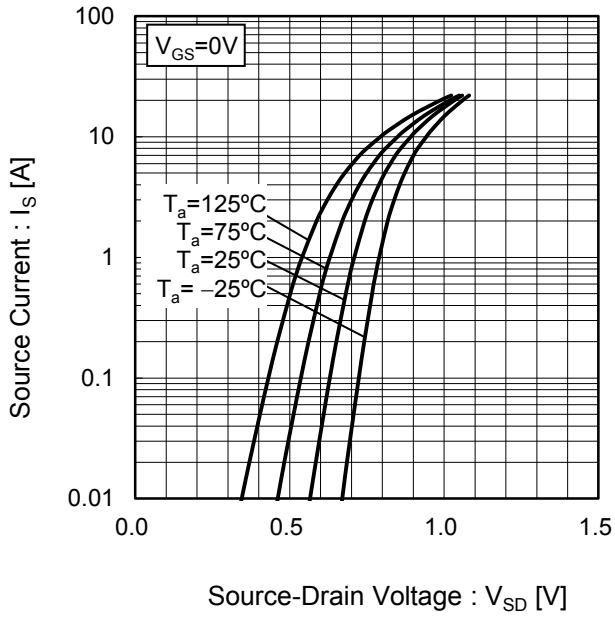
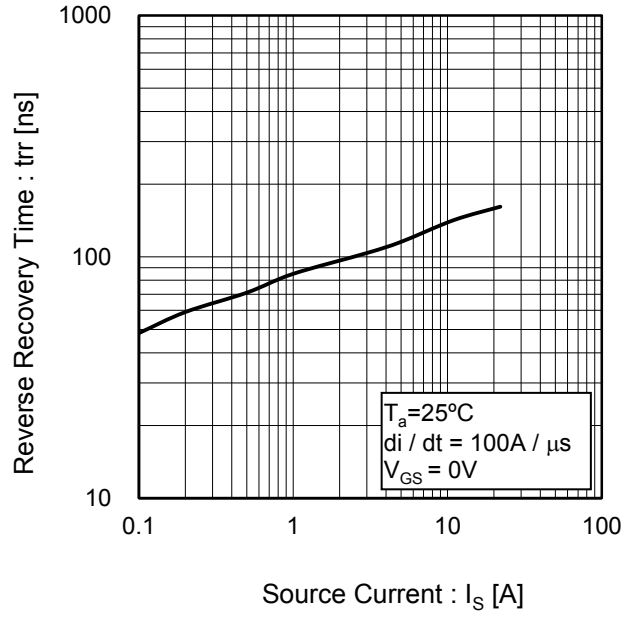


Fig.21 Reverse Recovery Time vs. Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

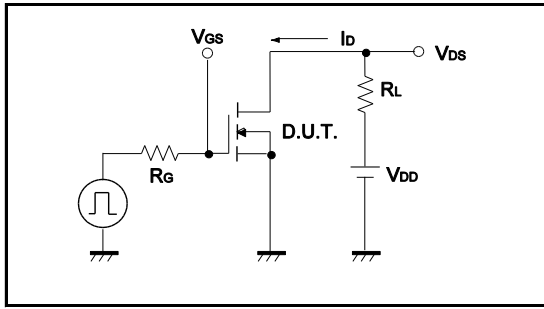


Fig.1-2 Switching Waveforms

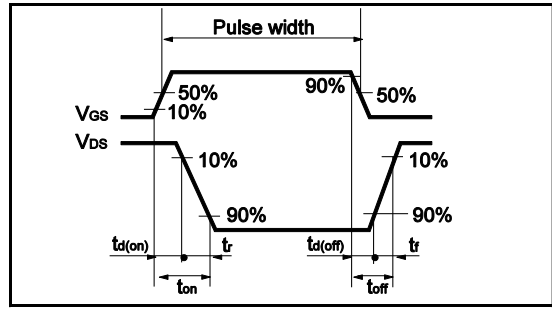


Fig.2-1 Gate Charge Measurement Circuit

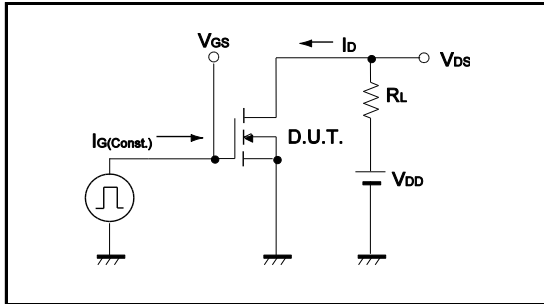


Fig.2-2 Gate Charge Waveform

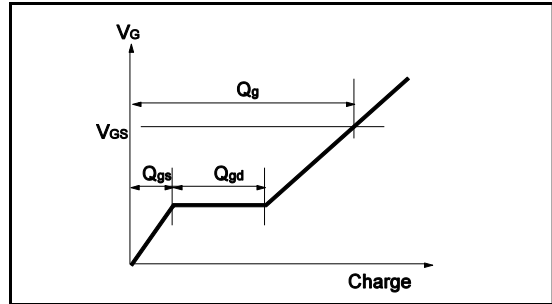


Fig.3-1 Avalanche Measurement Circuit

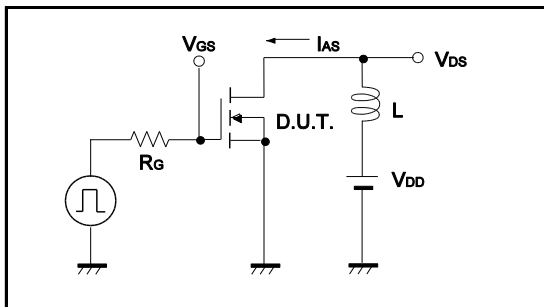
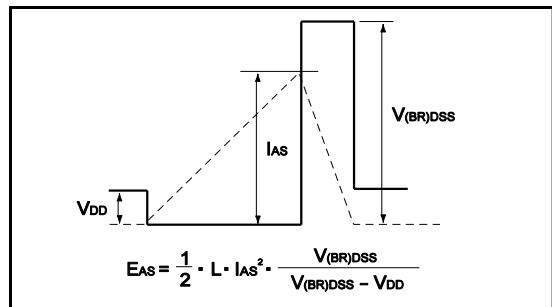
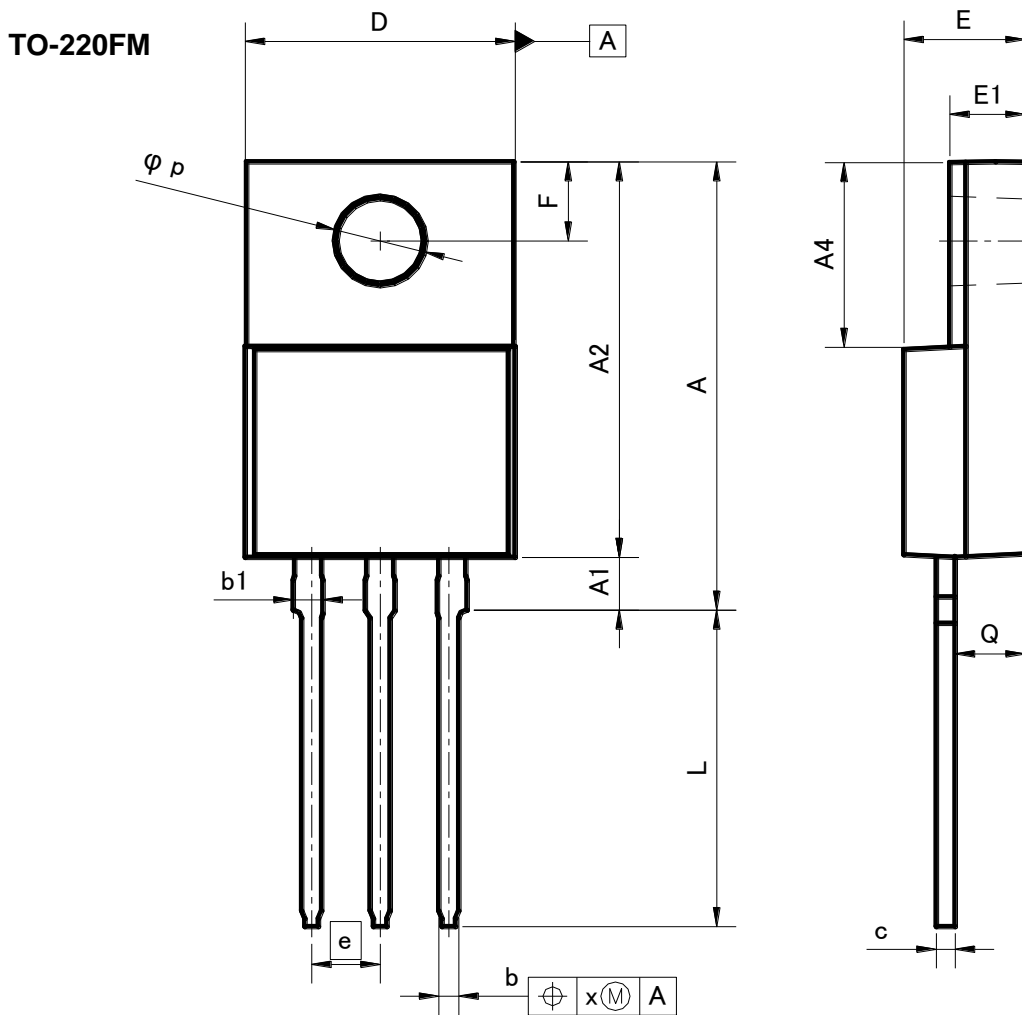


Fig.3-2 Avalanche Waveform



●Dimensions (Unit : mm)



DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	16.60	17.60	0.654	0.693
A1	1.80	2.20	0.071	0.087
A2	14.80	15.40	0.583	0.606
A4	6.80	7.20	0.268	0.283
b	0.70	0.85	0.028	0.033
b1	1.10	1.50	0.043	0.059
c	0.70	0.85	0.028	0.033
D	9.90	10.30	0.390	0.406
E	4.40	4.80	0.173	0.189
e	2.54		0.100	
E1	2.70	3.00	0.106	0.118
F	2.80	3.20	0.110	0.126
L	11.50	12.50	0.453	0.492
p	3.00	3.40	0.118	0.134
Q	2.10	3.10	0.083	0.122
x	-	0.38	-	0.015

Dimension in mm / inches

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