

V_{DSS}	200V
$R_{DS(on)}$ (Max.)	55mΩ
I_D	45A
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

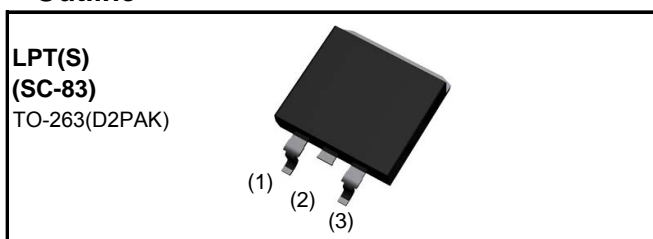
●Application

Switching Power Supply
 Automotive Motor Drive
 Automotive Solenoid Drive

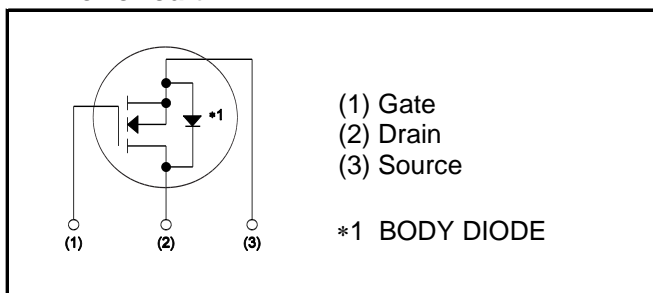
●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	200	V
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	±45 A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	±24.4 A
Pulsed drain current	$I_{D,pulse}^{*2}$	±180	A
Gate - Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse	E_{AS}^{*3}	160	mJ
Avalanche current	I_{AR}^{*3}	22.5	A
Power dissipation	$T_c = 25^\circ\text{C}$	P_D	40 W
	$T_a = 25^\circ\text{C}^{*4}$	P_D	1.56 W
Junction temperature	T_j	150	°C
Range of storage temperature	T_{stg}	-55 to +150	°C

●Outline



●Inner circuit



●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	330
	Tape width (mm)	24
	Basic ordering unit (pcs)	1,000
	Taping code	TL
	Marking	RCJ450N20

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	-	3.13	°C/W
Thermal resistance, junction - ambient ^{*4}	R_{thJA}	-	-	80	°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	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1.0mA$	200	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 200V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	-	1.0	μA
		$V_{DS} = 200V, V_{GS} = 0V$ $T_j = 125^\circ\text{C}$	-	-	100	
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	3.0	-	5.0	V
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 10V, I_D = 22.5A$	-	42	55	$m\Omega$
		$V_{GS} = 10V, I_D = 22.5A$ $T_j = 125^\circ\text{C}$	-	95	125	
Forward transfer admittance	g_{fs}	$V_{DS} = 10V, I_D = 22.5A$	10	20	-	S

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C _{iss}	V _{GS} = 0V	-	4200	-	pF
Output capacitance	C _{oss}	V _{DS} = 25V	-	270	-	
Reverse transfer capacitance	C _{rss}	f = 1MHz	-	160	-	
Turn - on delay time	t _{d(on)} ^{*5}	V _{DD} ≈ 100V, V _{GS} = 10V	-	52	-	ns
Rise time	t _r ^{*5}	I _D = 22.5A	-	210	-	
Turn - off delay time	t _{d(off)} ^{*5}	R _L = 4.4Ω	-	90	-	
Fall time	t _f ^{*5}	R _G = 10Ω	-	70	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q _g ^{*5}	V _{DD} ≈ 100V	-	80	-	nC
Gate - Source charge	Q _{gs} ^{*5}	I _D = 45A	-	28	-	
Gate - Drain charge	Q _{gd} ^{*5}	V _{GS} = 10V	-	28	-	
Gate plateau voltage	V _(plateau)	V _{DD} ≈ 100V, I _D = 45A	-	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	-	-	45	A
Pulsed source current	I _{SM} ^{*2}		-	-	104	A
Forward voltage	V _{SD} ^{*5}	V _{GS} = 0V, I _S = 26A	-	-	1.5	V
Reverse recovery time	t _{rr} ^{*5}	I _S = 22.5A	-	130	-	ns
Reverse recovery charge	Q _{rr} ^{*5}	di/dt = 100A/μs	-	600	-	nC

*1 Limited only by maximum temperature allowed.

*2 P_w ≤ 10μs, Duty cycle ≤ 1%

*3 L ≈ 500μH, V_{DD} = 50V, R_G = 25Ω, starting T_j = 25°C

*4 Mounted on a epoxy PCB FR4 (25mm × 27mm × 0.8mm)

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

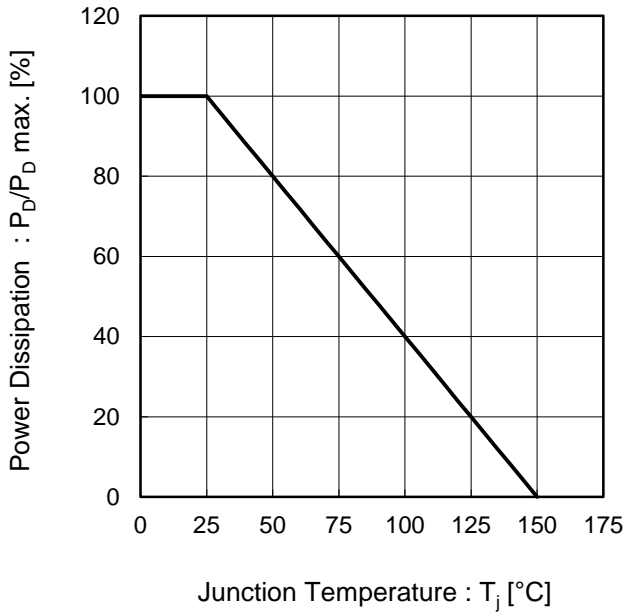


Fig.2 Maximum Safe Operating Area

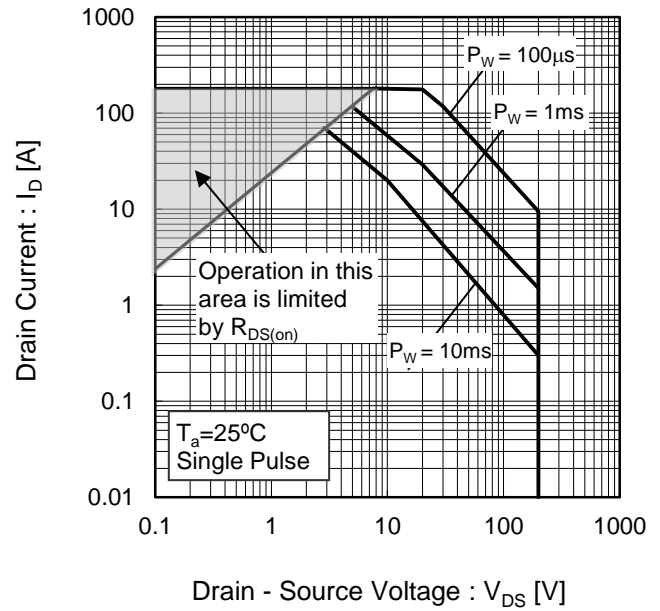
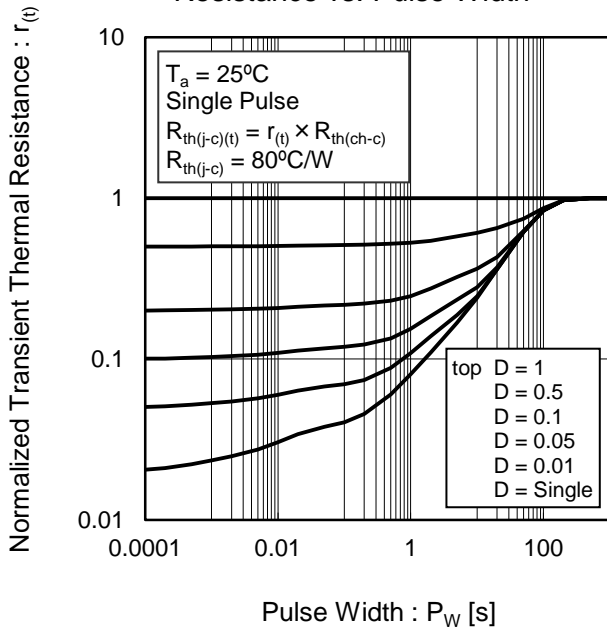


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Avalanche Current vs Inductive Load

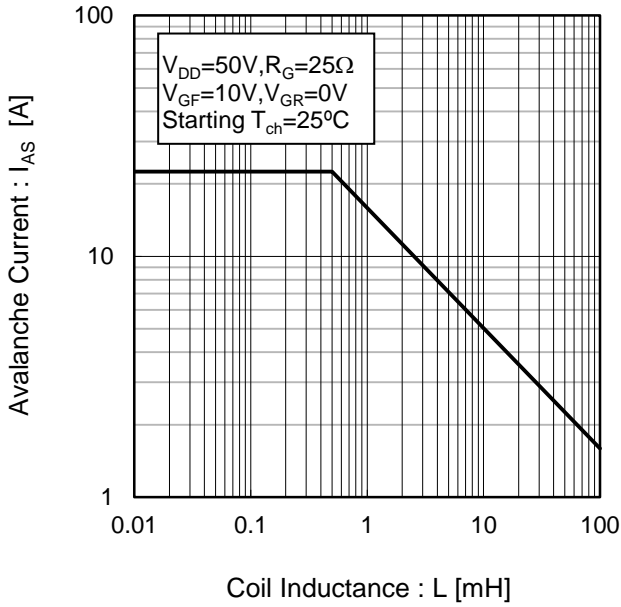


Fig.5 Avalanche Energy Derating Curve vs Junction Temperature

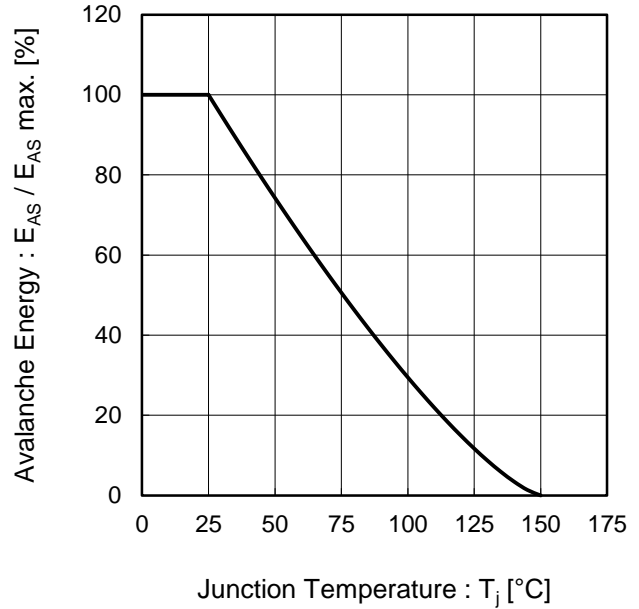


Fig.6 Typical Output Characteristics(I)

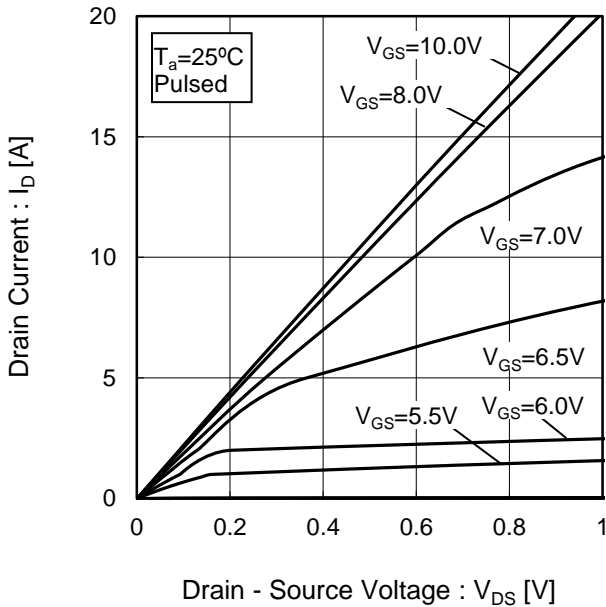
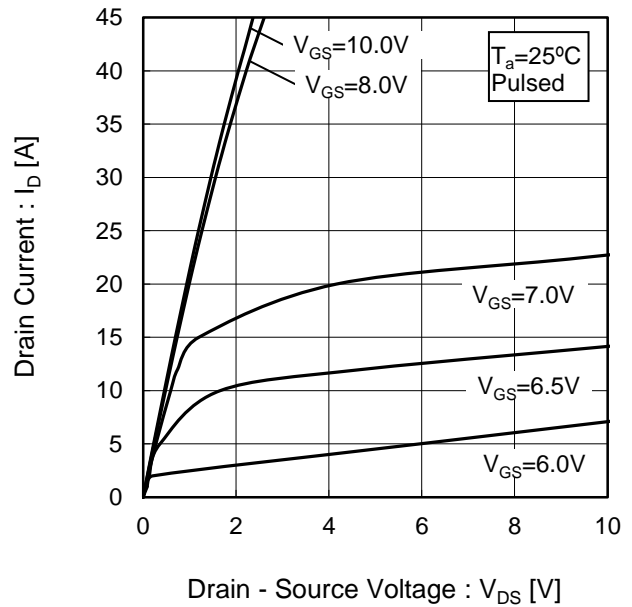


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

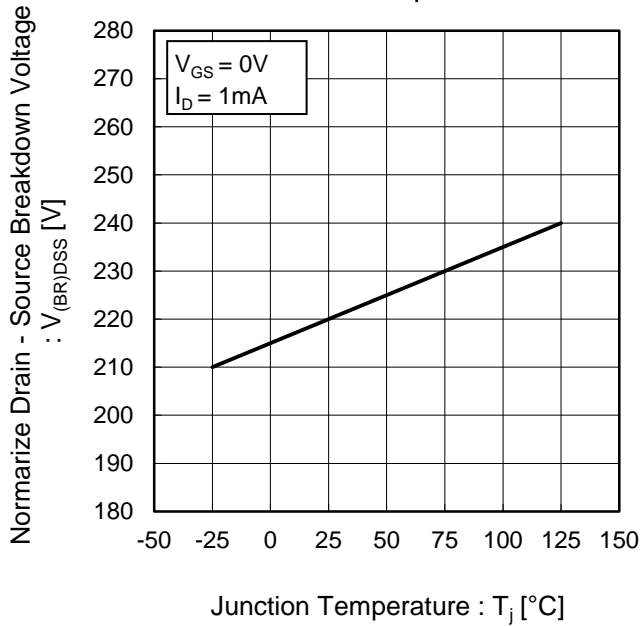


Fig.9 Typical Transfer Characteristics

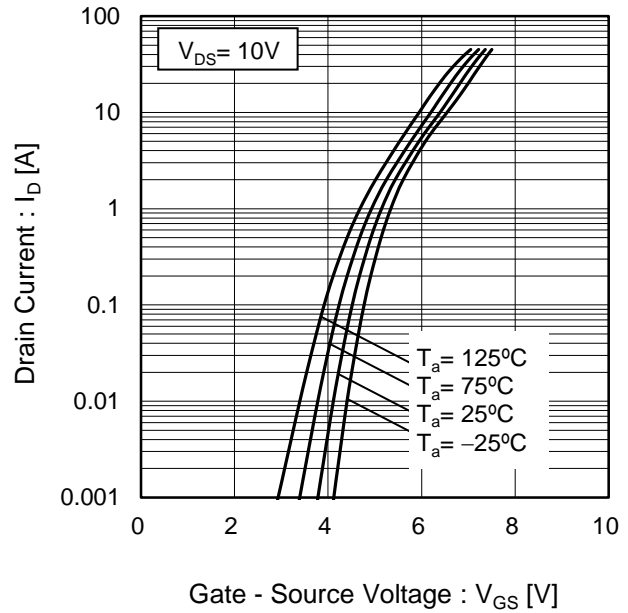


Fig.10 Gate Threshold Voltage vs. Junction Temperature

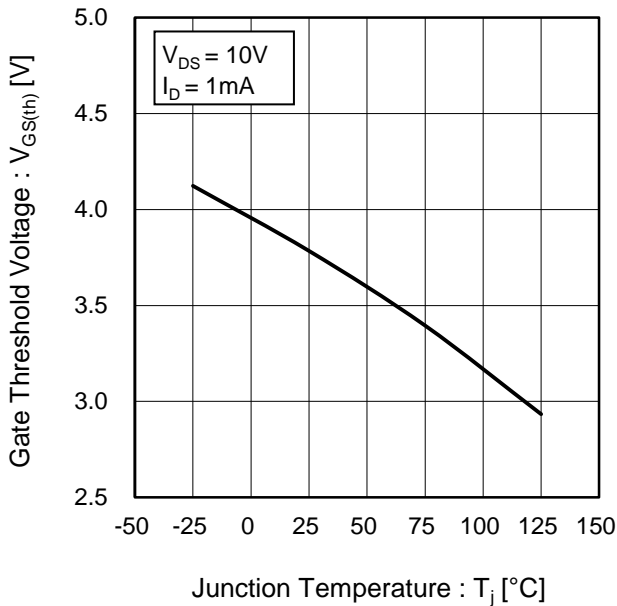
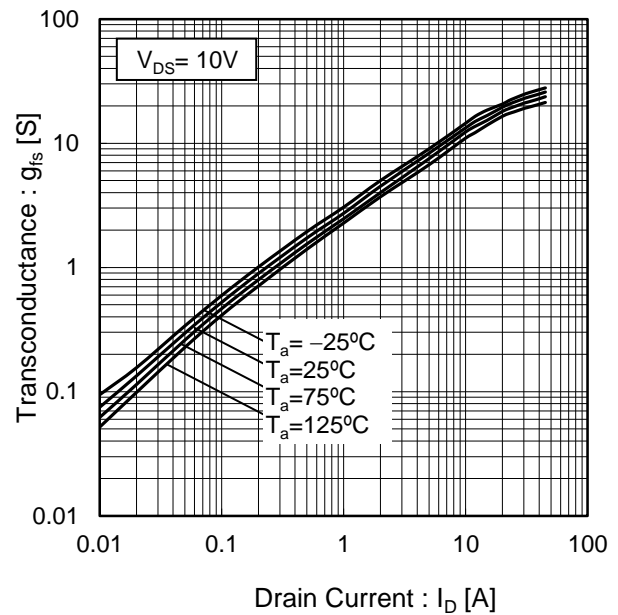


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

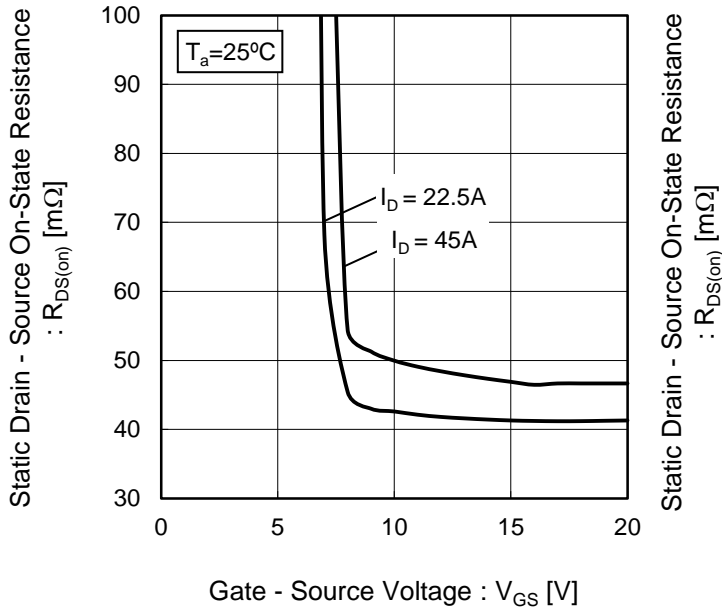


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

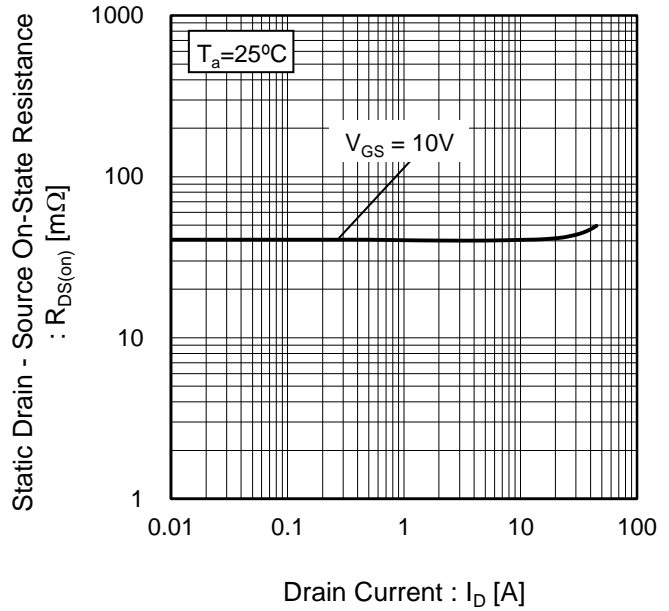
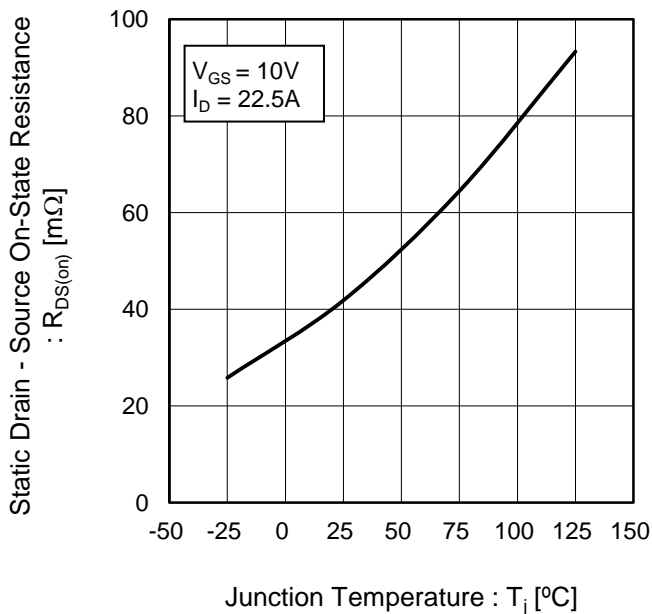


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

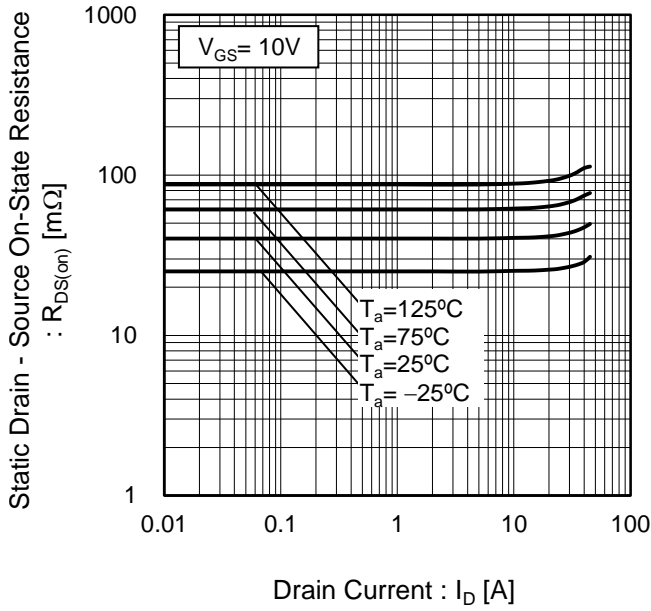
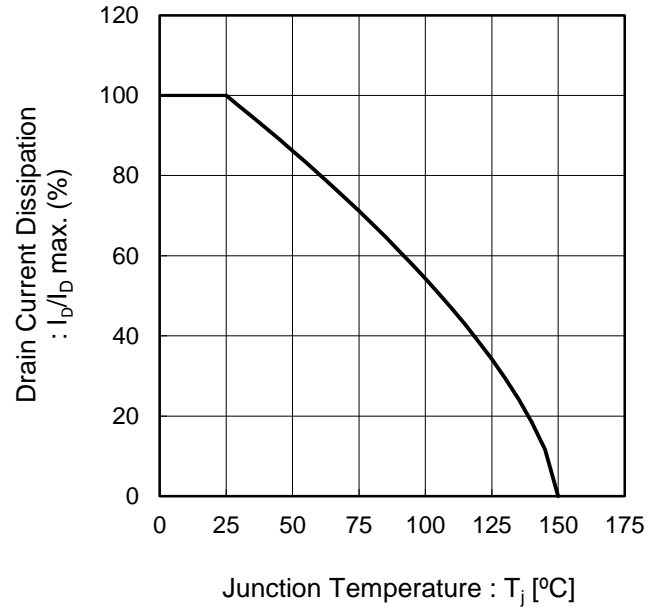


Fig.16 Drain Current Derating Curve



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

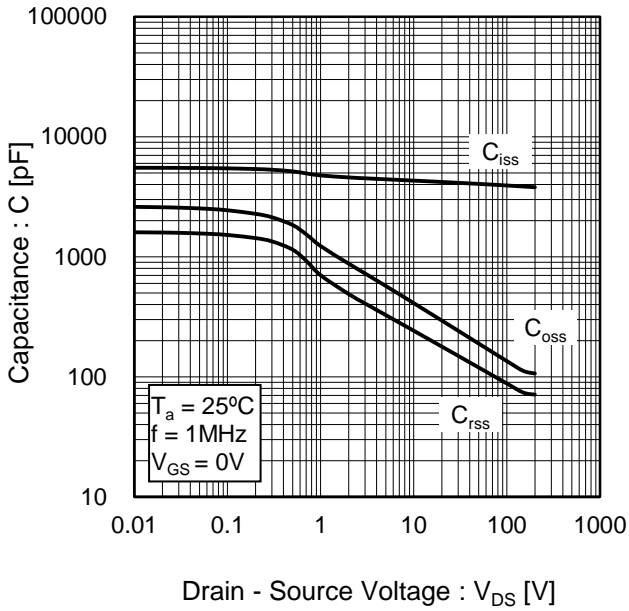


Fig.18 Switching Characteristics

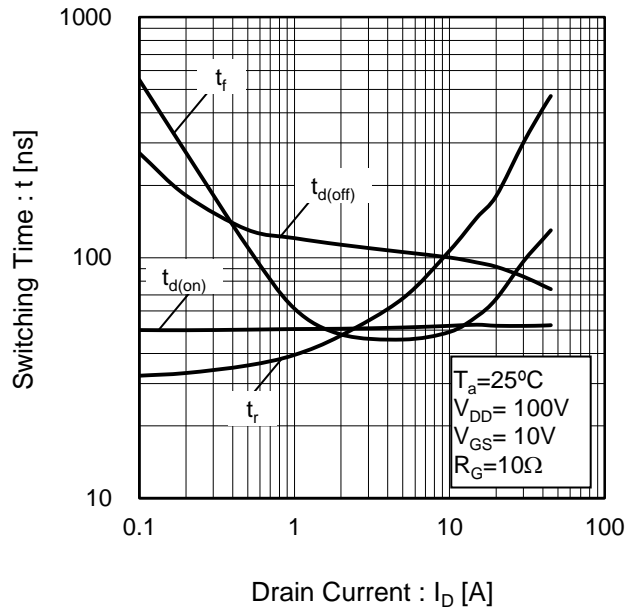
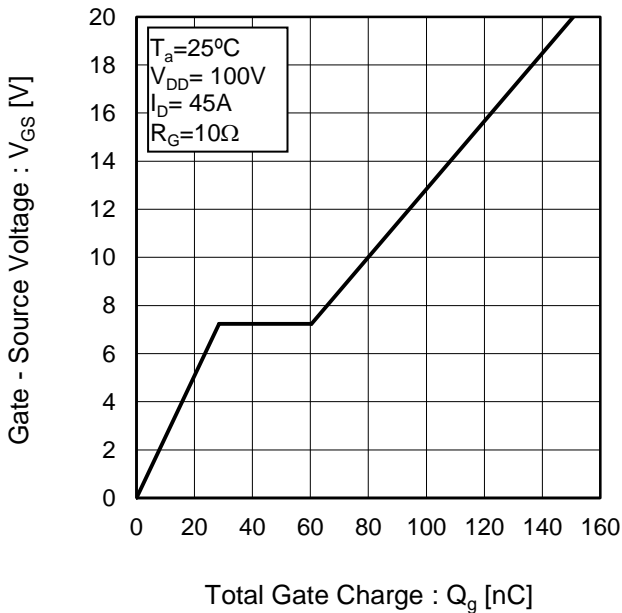


Fig.19 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.20 Source Current vs. Source - Drain Voltage

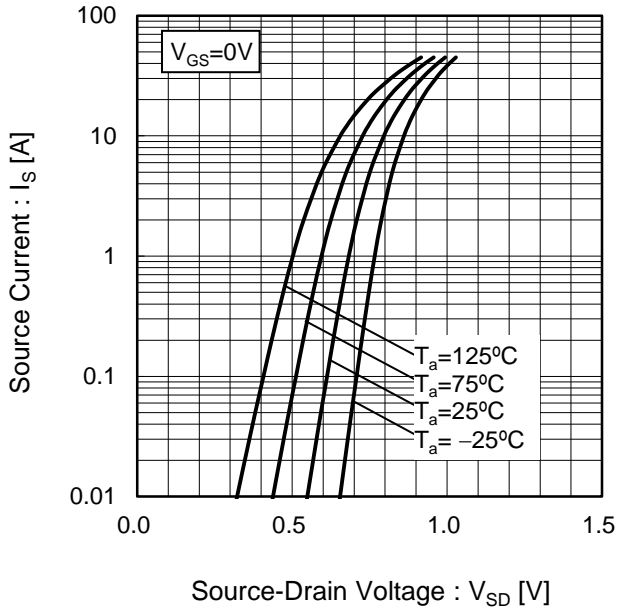
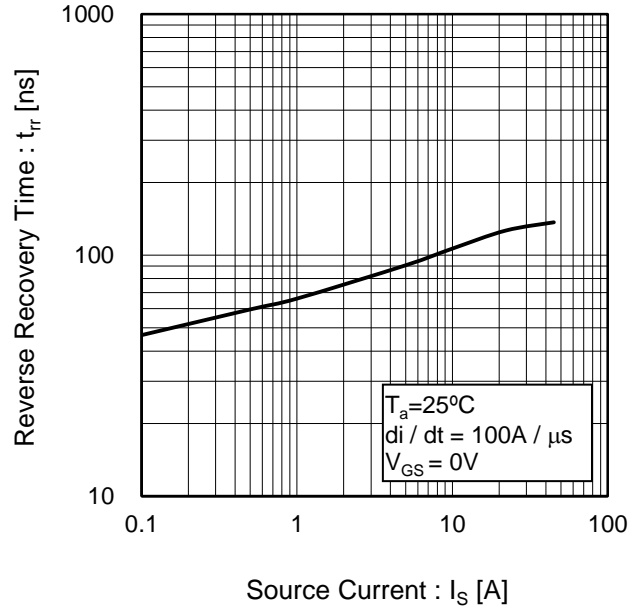


Fig.21 Reverse Recovery Time vs. Source Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

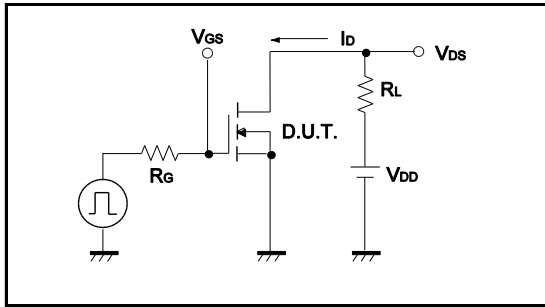


Fig.1-2 Switching Waveforms

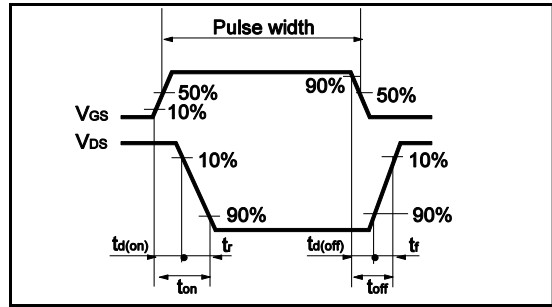


Fig.2-1 Gate Charge Measurement Circuit

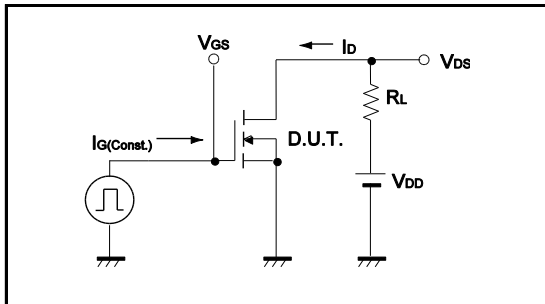


Fig.2-2 Gate Charge Waveform

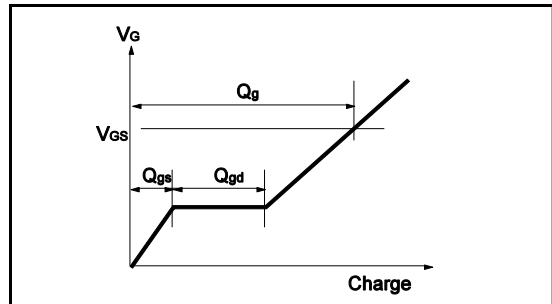


Fig.3-1 Avalanche Measurement Circuit

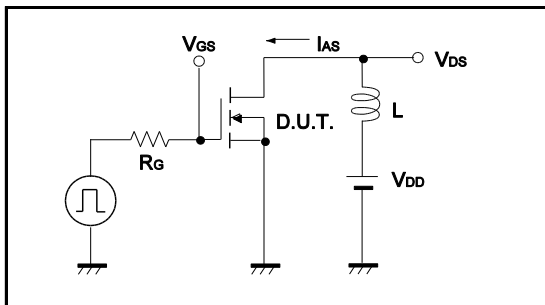
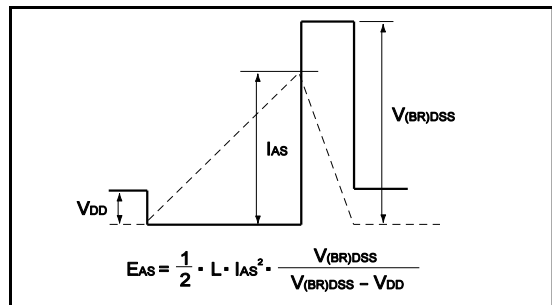
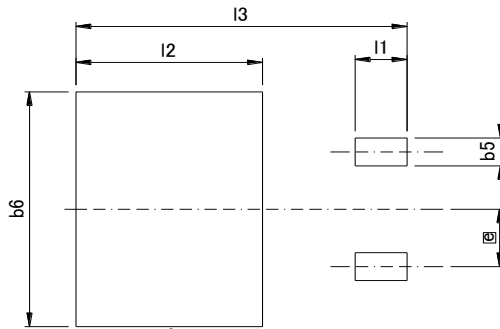
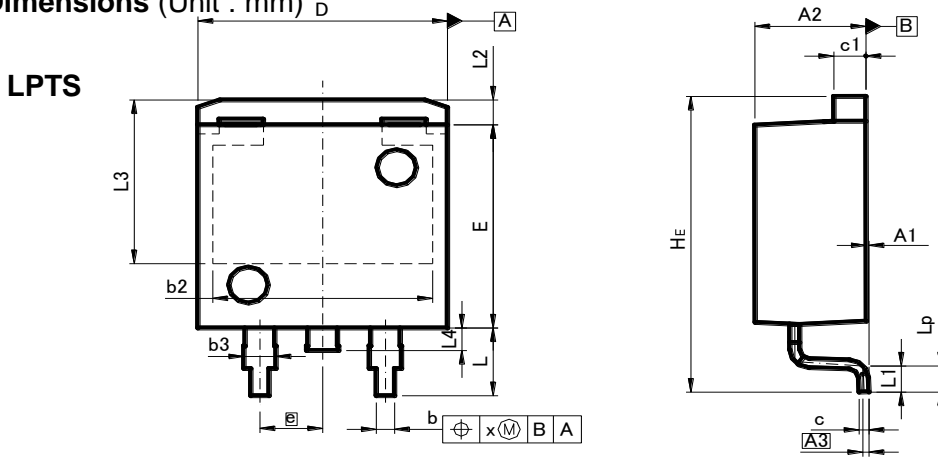


Fig.3-2 Avalanche Waveform



●Dimensions (Unit : mm) D



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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A1	0.00	0.30	0.000	0.012
A2	4.30	4.70	0.169	0.185
A3		0.25		0.010
b	0.68	0.98	0.027	0.039
b2		8.90		0.350
b3	1.14	1.44	0.045	0.057
c	0.30	0.60	0.012	0.024
c1	1.10	1.50	0.043	0.059
D	9.80	10.40	0.386	0.409
E	8.80	9.20	0.346	0.362
e		2.54		0.100
HE	12.80	13.40	0.504	0.528
L	2.70	3.30	0.106	0.130
L1	0.90	1.50	0.035	0.059
L2		1.10		0.043
L3		7.25		0.285
L4		1.00		0.039
Lp	0.90	1.50	0.035	0.059
x	-	0.25	-	0.010

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b5	-	1.23	-	0.049
b6	-	10.40	-	0.409
I1	-	2.10	-	0.083
I2	-	7.55	-	0.297
I3	-	13.40	-	0.528

Dimension in mm / inches

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