R6035ENZ1

Nch 600V 35A Power MOSFET

Data Sheet

V_{DSS}	600V
$R_{DS(on)}$ (Max.)	0.102Ω
I_D	35A
P_D	120W

●Outline

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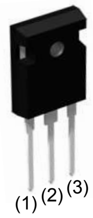


●Features

1) Low on-resistance.

2) Fast switching speed.

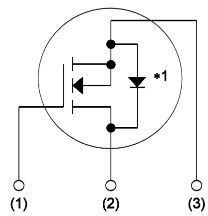
3) Gate-source voltage (V_{GSS}) guaranteed to be ±20V.

4) Drive circuits can be simple.

5) Parallel use is easy.

6) Pb-free lead plating ; RoHS compliant

●Inner circuit



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

*1 BODY DIODE

●Packaging specifications

Type	Packaging	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	450
	Taping code	C9
	Marking	R6035ENZ1

●Application

Switching Power Supply

●Absolute maximum ratings (T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	600	V
Continuous drain current	T_c = 25°C	I_D *1	±35	A
	T_c = 100°C	I_D *1	±19	A
Pulsed drain current		$I_{D,pulse}$ *2	±105	A
Gate - Source voltage		V_{GSS}	±20	V
Avalanche energy, single pulse		E_{AS} *3	796	mJ
Avalanche energy, repetitive		E_{AR} *3	1.2	mJ
Avalanche current, repetitive		I_{AR}	6.6	A
Power dissipation (T_c = 25°C)		P_D	120	W
Junction temperature		T_j	150	°C
Range of storage temperature		T_{stg}	–55 to +150	°C
Reverse diode dv/dt		dv/dt *4	15	V/ns

●Absolute maximum ratings

Parameter	Symbol	Conditions	Values	Unit
Drain - Source voltage slope	dv/dt	V_{DS} = 480V T_j = 125°C	50	V/ns

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	-	1.04	°C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	30	°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	600	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 600V, V_{GS} = 0V T_j = 25°C T_j = 125°C	- -	0.1 -	100 1000	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS (th)}$	V_{DS} = 10V, I_D = 1mA	2	-	4	V
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = 10V, I_D = 18.1A T_j = 25°C T_j = 125°C	- -	0.092 0.200	0.102 -	Ω
Gate input resistance	R_G	f = 1MHz, open drain	-	1.5	-	Ω

●**Electrical characteristics** (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *5	V_{DS} = 10V, I_D = 17.5A	11	22	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	2720	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	2000	-	pF
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	240	-	pF
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 480V	-	100	-	pF
Effective output capacitance, time related	$C_{o(tr)}$		-	500	-	pF
Turn - on delay time	$t_{d(on)}$ *5	$V_{DD} \simeq$ 300V, V_{GS} = 10V	-	40	-	ns
Rise time	t_r *5	I_D = 17.5A	-	80	-	ns
Turn - off delay time	$t_{d(off)}$ *5	R_L = 17.4Ω	-	210	-	ns
Fall time	t_f *5	R_G = 10Ω	-	80	-	ns

●**Gate Charge characteristics** (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	$V_{DD} \simeq$ 300V	-	110	-	nC
Gate - Source charge	Q_{gs} *5	I_D = 35A	-	15	-	nC
Gate - Drain charge	Q_{gd} *5	V_{GS} = 10V	-	60	-	nC
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \simeq$ 300V, I_D = 35A	-	6.0	-	V

*1 Limited only by maximum temperature allowed.

*2 $P_W \leq 10\mu s$, Duty cycle ≤ 1%

*3 I_D = 6.6A, V_{DD} = 50V

*4 Reference measurement circuits Fig.5-1.

*5 Pulsed

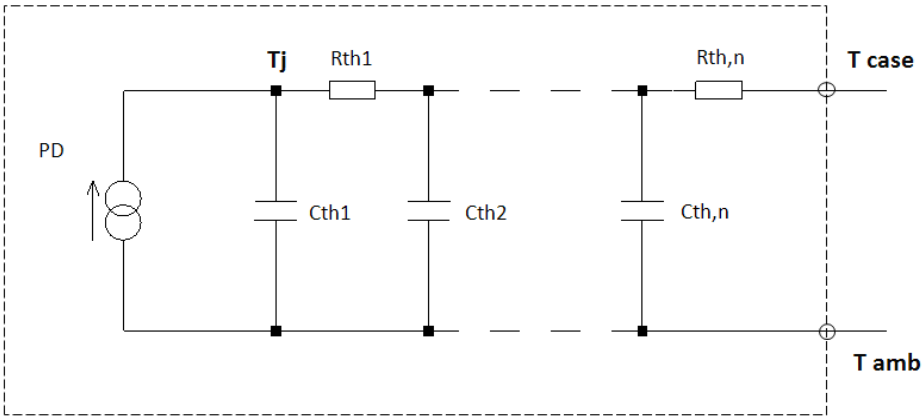
●**Body diode electrical characteristics** (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_c = 25°C	-	-	35	A
Inverse diode direct current, pulsed	I_{SM} *2		-	-	105	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = 35A	-	-	1.5	V
Reverse recovery time	t_{rr} *5	I_S = 35A di/dt = 100A/μs	-	780	-	ns
Reverse recovery charge	Q_{rr} *5		-	16.5	-	μC
Peak reverse recovery current	I_{rrm} *5		-	45	-	A

●**Typical Transient Thermal Characteristics**

Symbol	Value	Unit
R_{th1}	0.151	K/W
R_{th2}	0.428	
R_{th3}	0.250	

Symbol	Value	Unit
C_{th1}	0.018	Ws/K
C_{th2}	0.400	
C_{th3}	15.4	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

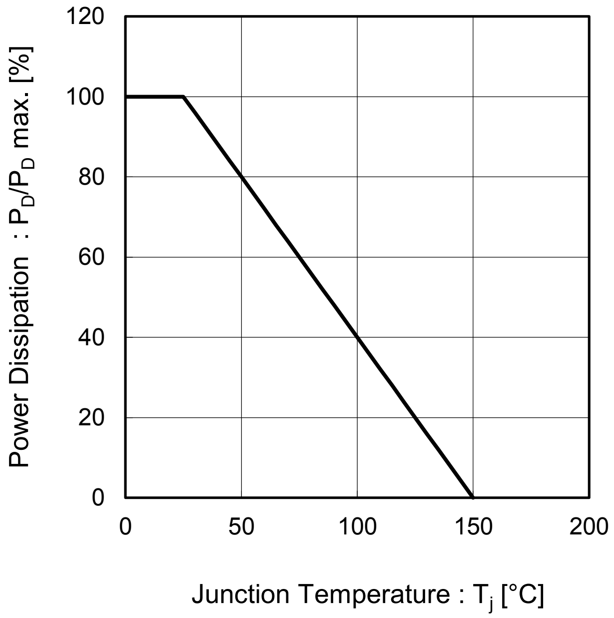


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width

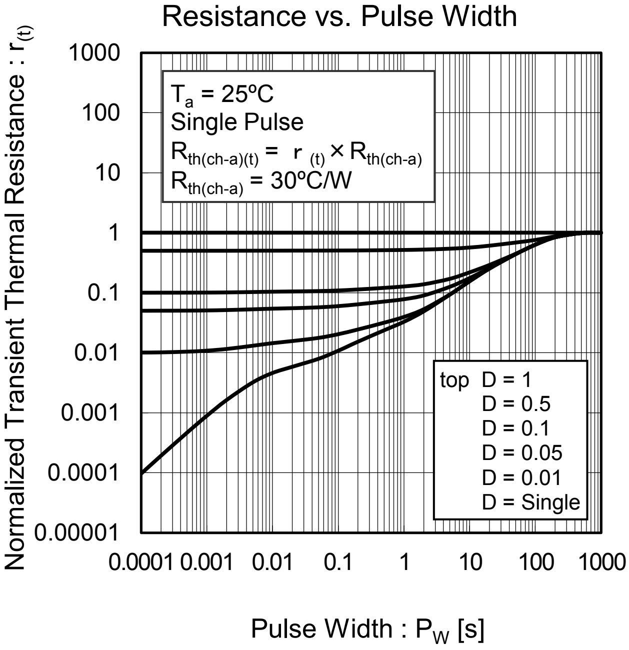
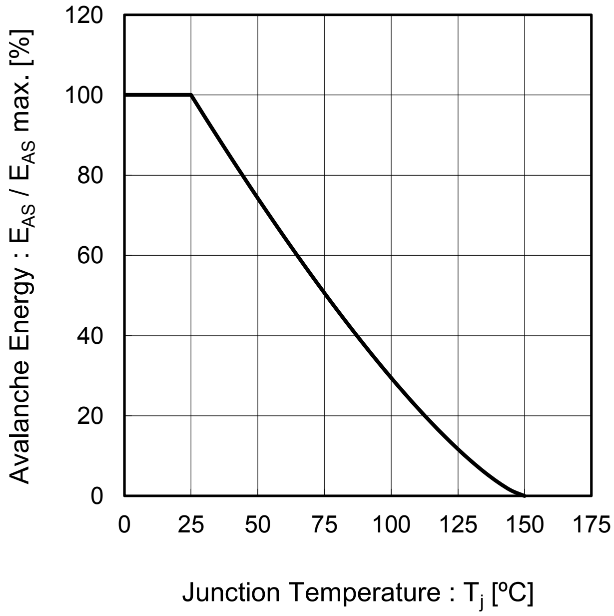


Fig.3 Avalanche Energy Derating Curve vs Junction Temperature



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

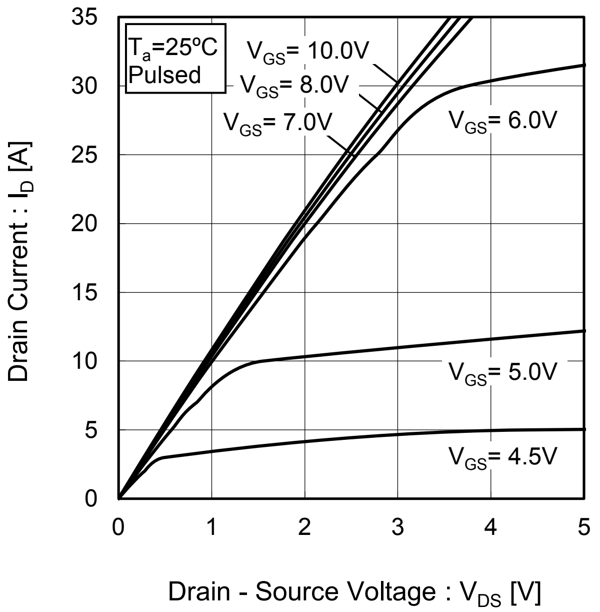


Fig.5 Typical Output Characteristics(II)

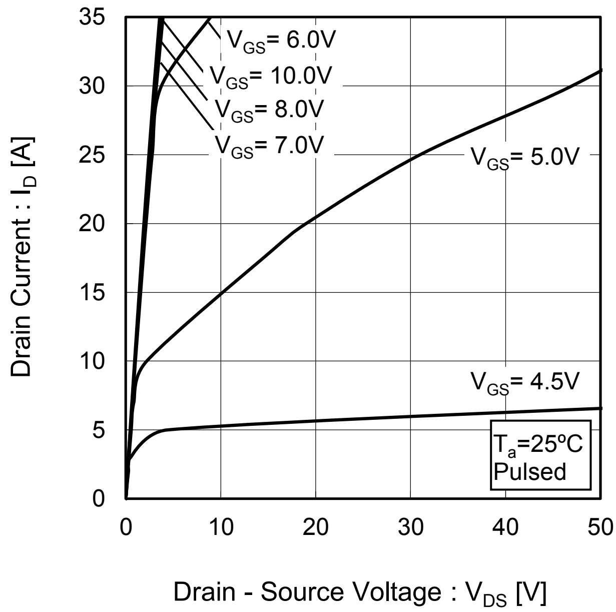


Fig.6 T_j = 150°C Typical Output Characteristics(I)

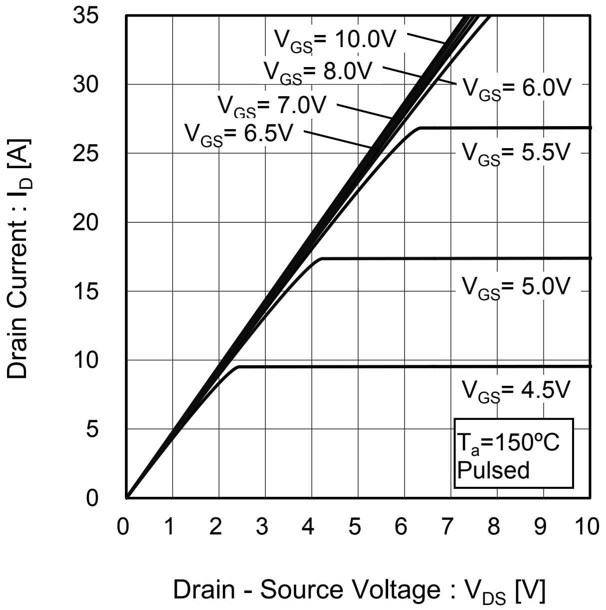
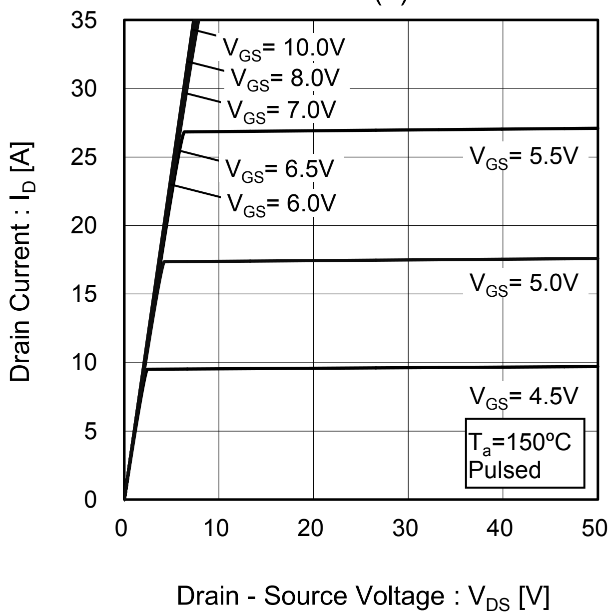


Fig.7 T_j = 150°C Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Breakdown Voltage vs. Junction Temperature

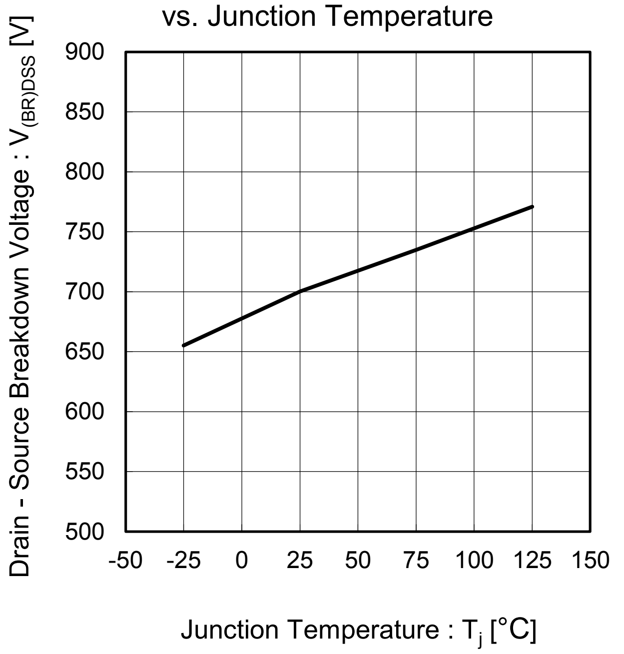


Fig.9 Typical Transfer Characteristics

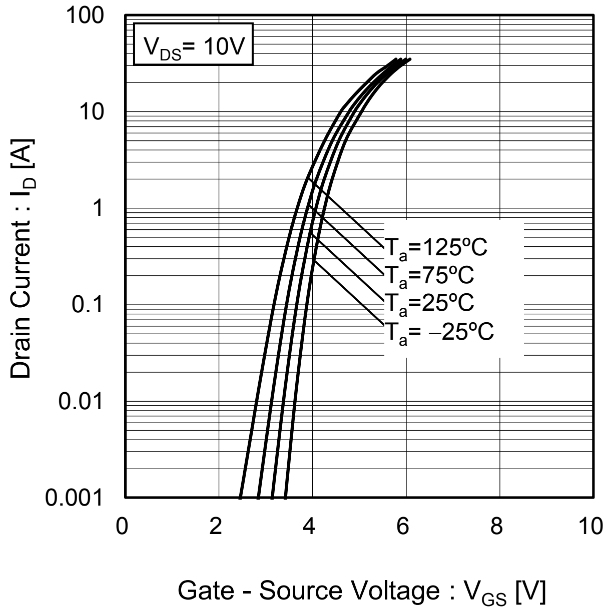


Fig.10 Gate Threshold Voltage vs. Junction Temperature

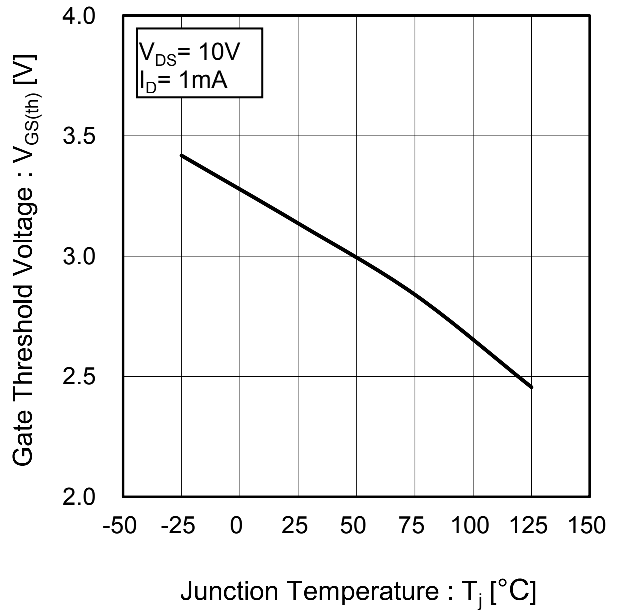
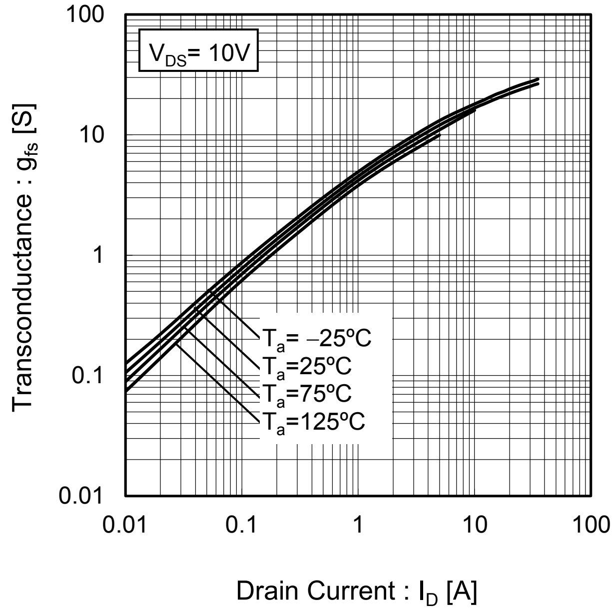


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

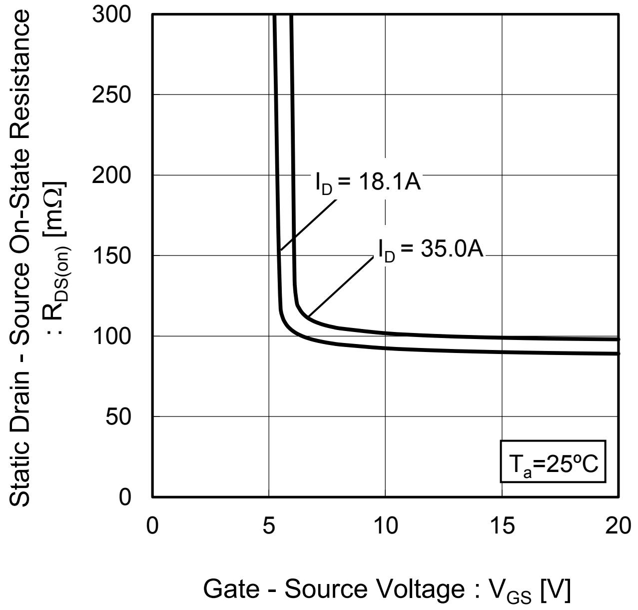


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

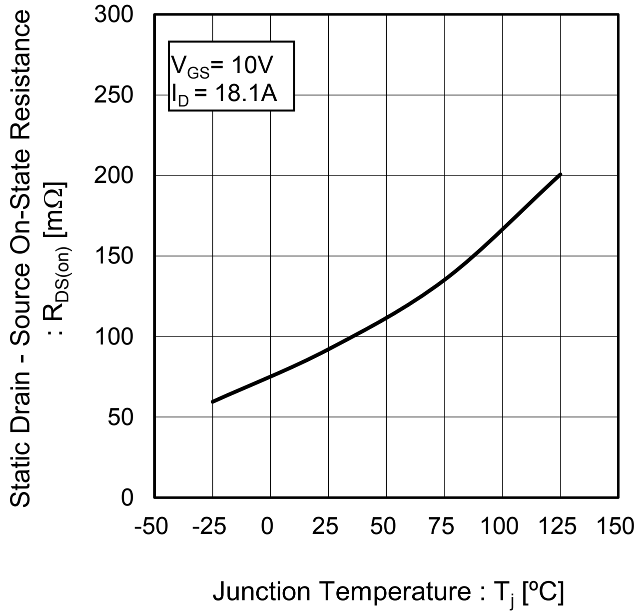


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current

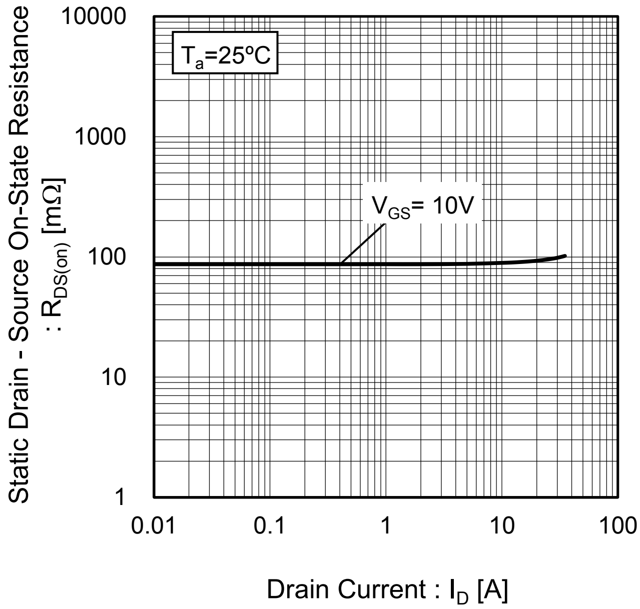
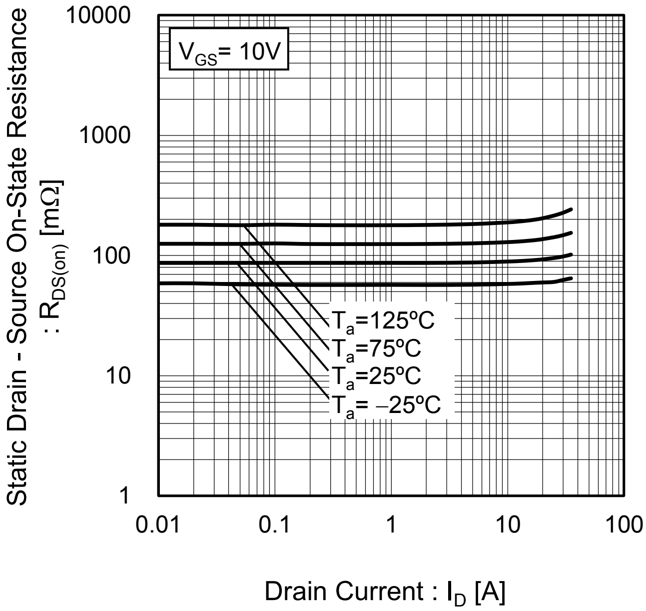


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.16 Typical Capacitance vs. Drain - Source Voltage

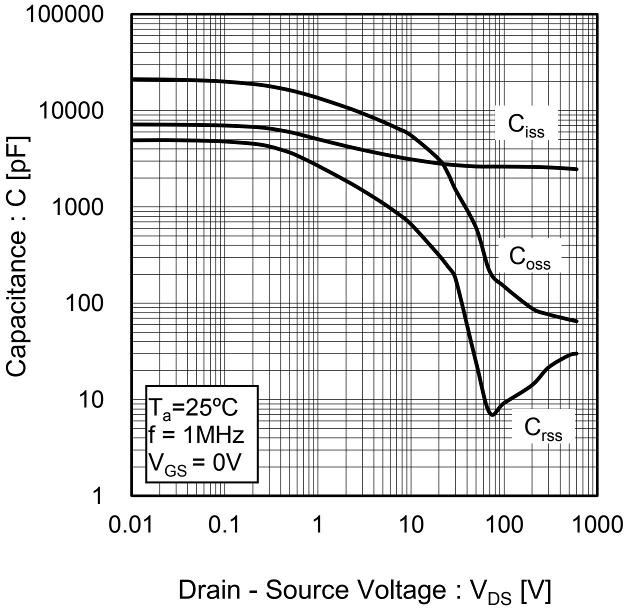


Fig.17 Coss Stored Energy

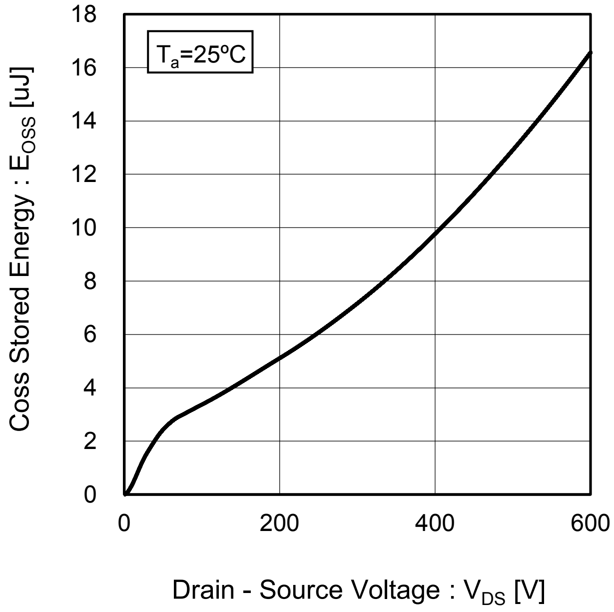


Fig.18 Switching Characteristics

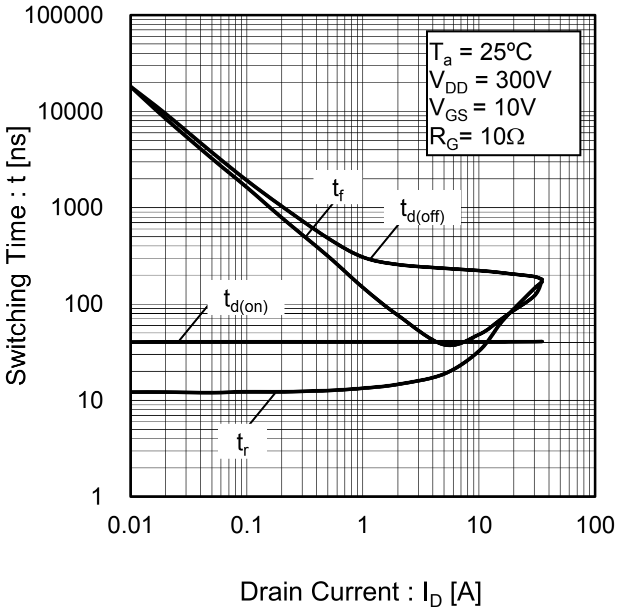
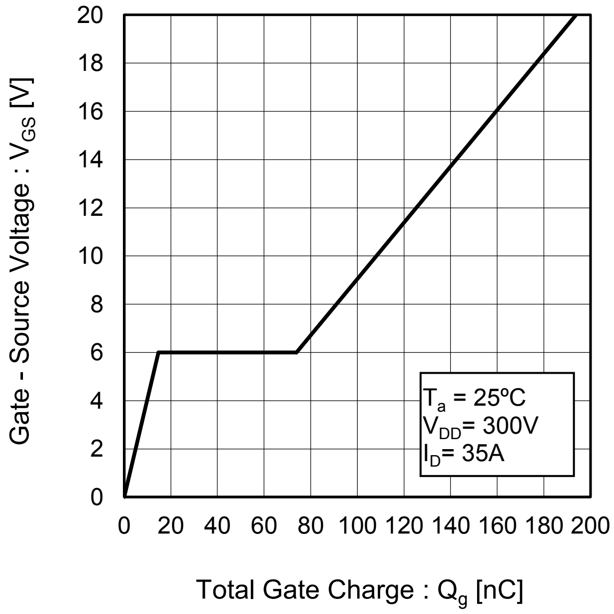
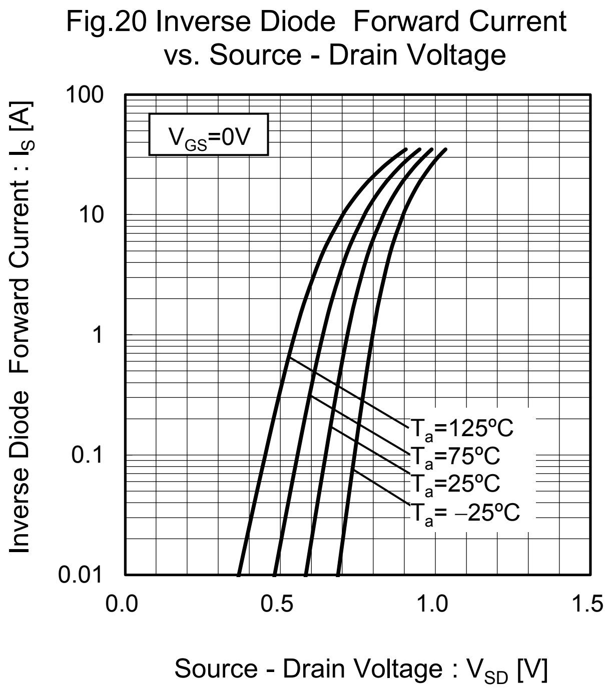
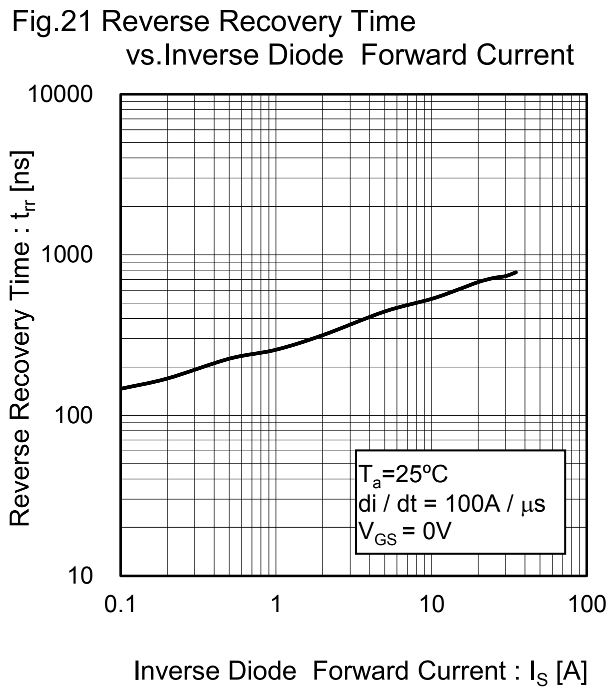


Fig.19 Dynamic Input Characteristics



●Electrical characteristic curves





●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

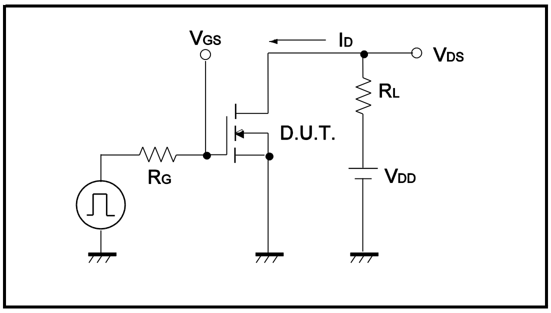


Fig.1-2 Switching Waveforms

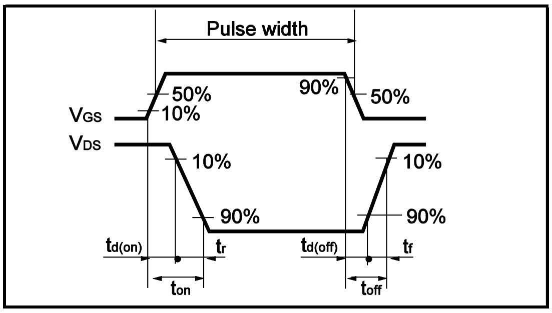


Fig.2-1 Gate Charge Measurement Circuit

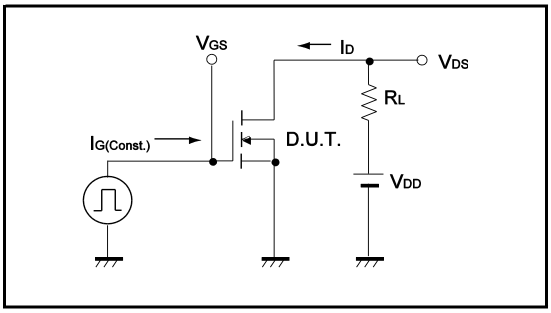


Fig.2-2 Gate Charge Waveform

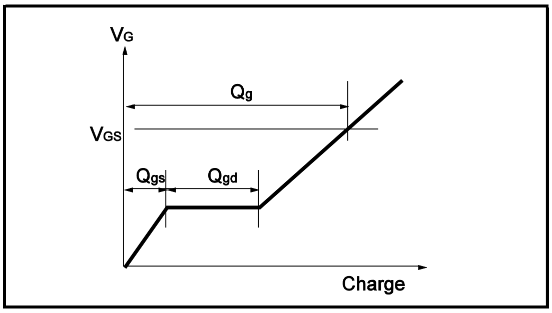


Fig.3-1 Avalanche Measurement Circuit

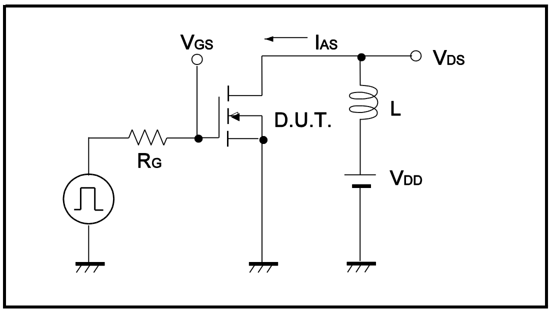


Fig.3-2 Avalanche Waveform

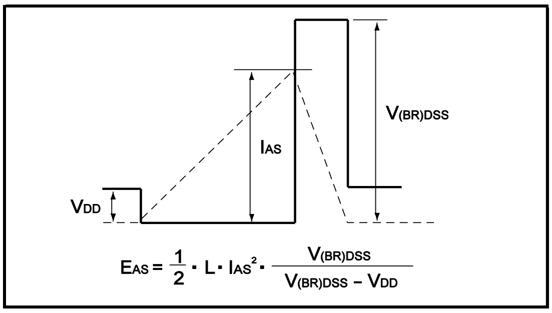


Fig.4-1 dv/dt Measurement Circuit

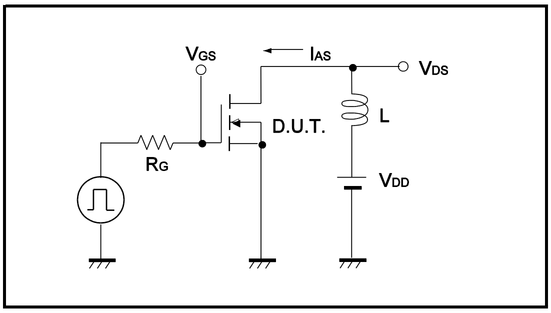


Fig.4-2 dv/dt Waveform

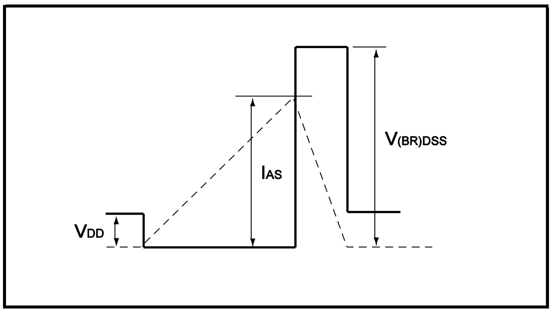


Fig.5-1 di/dt Measurement Circuit

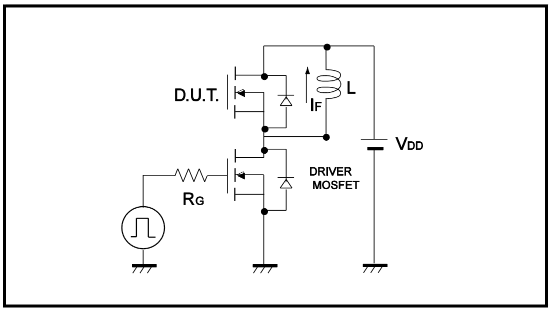
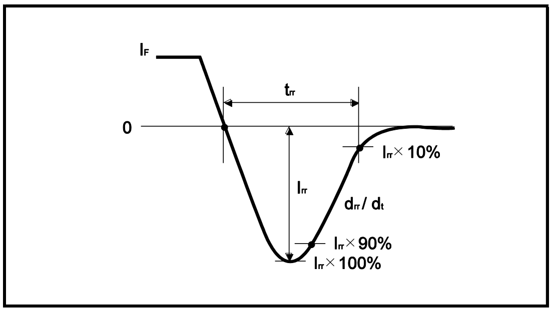


Fig.5-2 di/dt Waveform



●Dimensions (Unit : mm)

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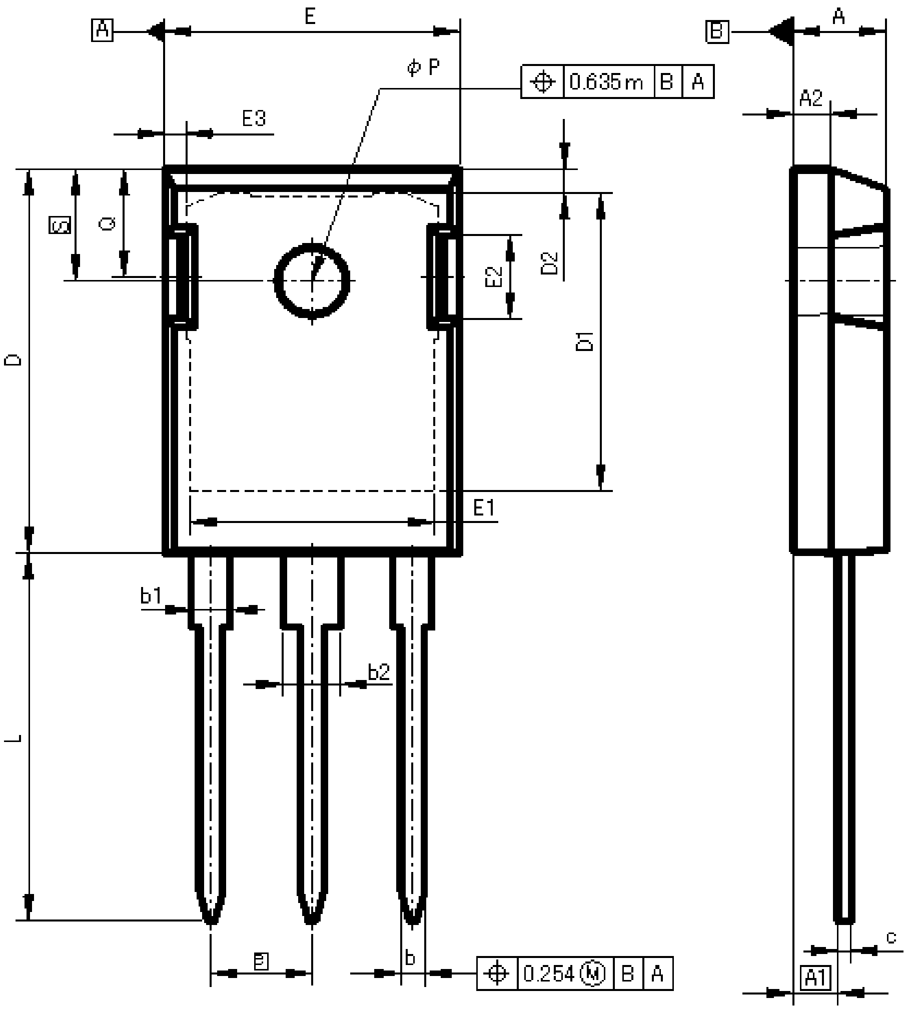

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b1	1.91	2.20	0.075	0.087
b2	2.92	3.20	0.115	0.126
c	0.61	0.80	0.024	0.031
D	20.80	21.34	0.819	0.840
D1	17.43	17.83	0.686	0.702
E	15.75	16.13	0.620	0.635
e	5.45		0.215	
N	3.00		3.000	
L	19.81	20.57	0.780	0.810
L1	3.81	4.32	0.150	0.170
Φ P	3.55	3.65	0.140	0.144
Q	5.59	6.20	0.220	0.244
S	6.15		0.240	

Dimension in mm / inches

Notes

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3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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