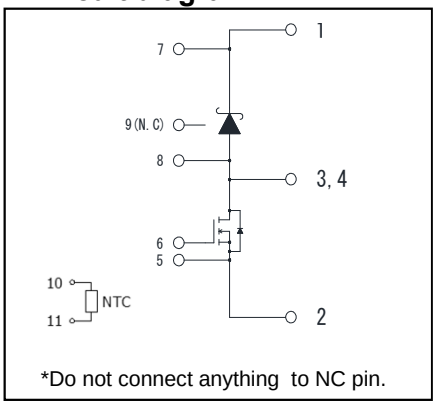
●Application

・Motor drive

・Converter

・Photovoltaics, wind power generation.

●Circuit diagram



*Do not connect anything to NC pin.

●Features

1) Low surge, low switching loss.

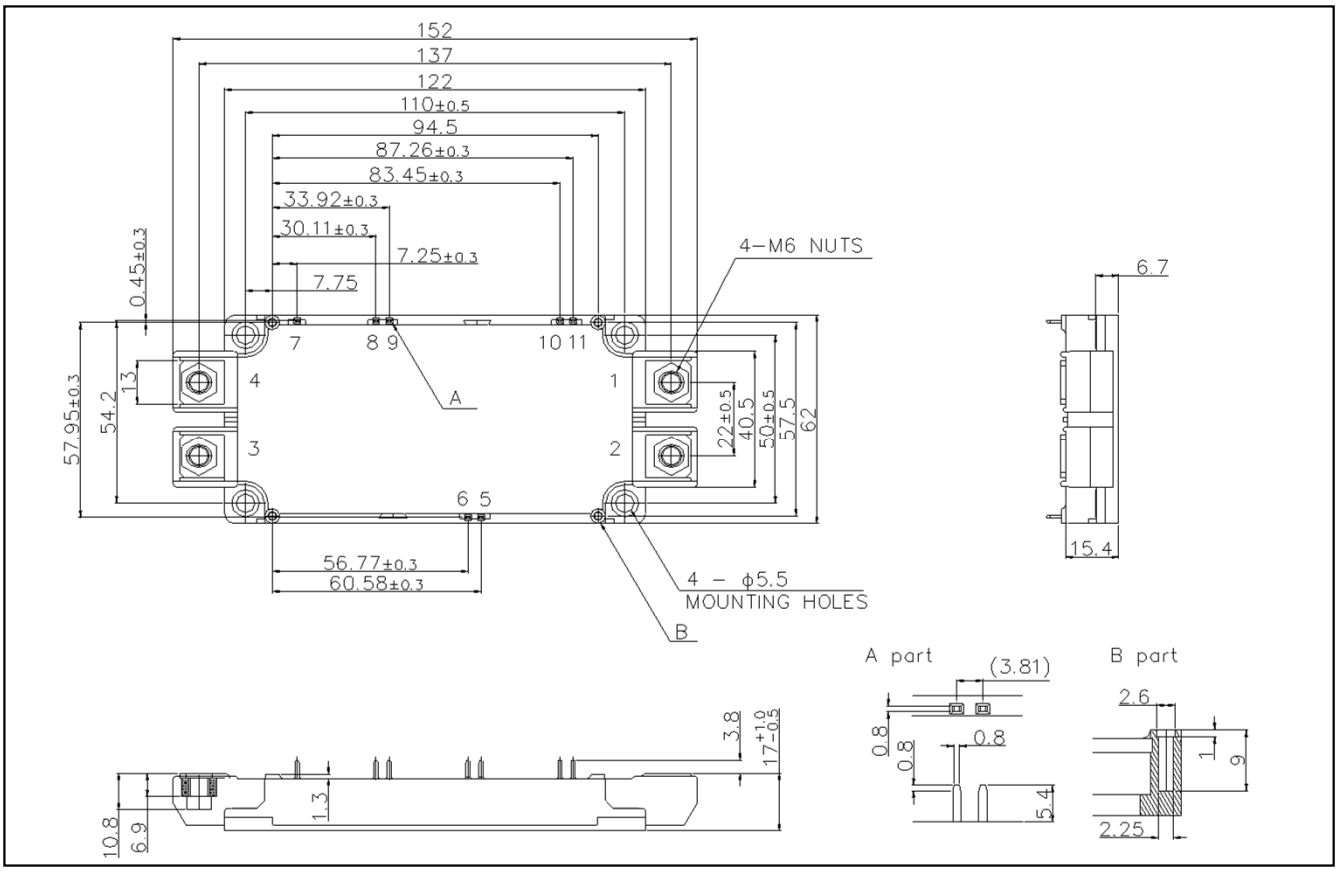
2) High-speed switching possible.

3) Reduced temperature dependence.

●Construction

This product is a chopper module consisting of SiC-UMOSFET and SiC-SBD from ROHM.

●Dimensions & Pin layout (Unit : mm)



●Absolute maximum ratings (T_j = 25°C)

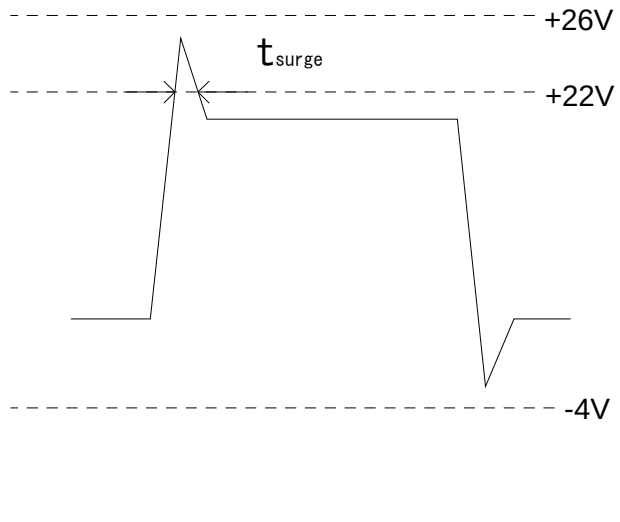
Parameter	Symbol	Conditions	Limit	Unit
Drain-source voltage	V_{DSS}	G-S short	1200	V
Repetitive reverse voltage	V_{DSS}	Clamp diode	1200	
Gate-source voltage(+)	V_{GSS}	D-S short	22	
Gate-source voltage(–)			–4	
G - S Voltage (t_{surge}<300nsec)	$V_{GSSurge}$		-4 to 26	
Drain current *1	I_D	DC (T_c=60°C)	300	A
	I_{DRM}	Pulse (T_c=60°C) 1ms *2	600	
Source current *1	I_S	DC (T_c=60°C) V_{GS}=18V	300	
	I_{SRM}	Pulse (Tc=60°C) 1ms V_{GS}=18V *2	600	
	I_{SRM}	Pulse (Tc=60°C) 10μs V_{GS}=0V *2	600	
Forward curent (clamp diode) *1	I_F	DC (T_c=60°C) V_{GS}=18V	300	
	I_{FRM}	Pulse (Tc=60°C) 1ms V_{GS}=18V *2	600	
Total power disspation *3	Ptot	T_c=25°C	1360	W
Max Junction Temperature	T_{jmax}		175	°C
Junction temperature	T_{jop}		–40 to 150	
Storage temperature	T_{stg}		–40 to 125	
Isolation voltage	Visol	Terminals to baseplate, f=60Hz AC 1min.	2500	Vrms
Mounting torque	–	Main Terminals : M6 screw	4.5	N · m
		Mounting to heat shink : M5 screw	3.5	

(*1) Case temperature (T_c) is defined on the surface of base plate just under the chips.

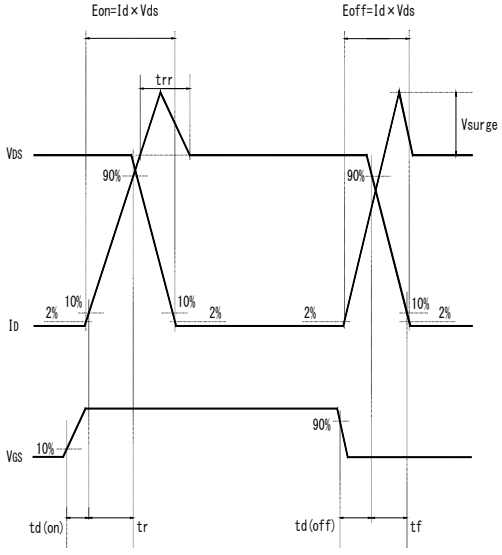
(*2) Repetition rate should be kept within the range where temperature rise if die should not exceed $T_{j\,max.}$

(*3) T_j is less than 175°C

●Example of acceptable VGS waveform



●Waveform for switching test



●Electrical characteristics (T_j=25°C)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Static drain-source on-state voltage	$V_{DS(on)}$	I_D=300A, V_{GS}=18V	T_j=25°C	-	1.9	3.0	V
			T_j=125°C	-	2.7	-	
			T_j=150°C	-	3	4.5	
Drain cutoff current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V		-	-	10	μA
Forwad Voltag	V_F	I_F=300A	T_j=25°C	-	1.6	2.1	V
			T_j=125°C		2.2	-	
			T_j=150°C	-	2.3	3.2	
Reverse curent	I_{RRM}	Clamp diode		-	-	3.2	mA
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS}=10V, I_D=80mA		2.7	-	5.6	V
Gate-source leakage current	I_{GSS}	V_{GS}=22V, V_{DS}=0V		-	-	0.5	μA
		V_{GS}= −6V, V_{DS}=0V		−0.5	-	-	
Switching characteristics	$t_{d(on)}$	$V_{GS(on)}$=18V, $V_{GS(off)}$=0V V_{DS}=600V I_D=300A R_G=1.8Ω inductive load		-	40	-	ns
	t_r			-	35	-	
	t_{rr}			-	6	-	
	$t_{d(off)}$			-	155	-	
	t_f			-	40	-	
Input capacitance	Ciss	V_{DS}=10V, V_{GS}=0V,100kHz		-	15	-	nF
Gate Registance	R_{Gint}	T_j=25°C		-	0.9	-	Ω
NTC Rated Resistance	R25				5.0		kΩ
NTC B Value	B50/25				3370		K
Stray Inductance	Ls				13	-	nH
Creepage Distance	-	Terminal to heat sink			14.5	-	mm
		Terminal to terminal			15.0	-	mm
Clearance Distance	-	Terminal to heat sink			12.0	-	mm
		Terminal to terminal			9.0	-	mm
Junction-to-case thermal resistance	R_{th}(j-c)	UMOS (1/2 module) *4		-	-	0.11	°C/W
		SBD (1/2 module) *4		-	-	0.11	
Case-to-heat sink Thermal resistance	R_{th}(c-f)	Case to heat sink, per 1 module, Thermal grease applied *5		-	0.035	-	

(*4) Measurement of Tc is to be done at the point just under the chip.
(*5) Typical value is measured by using thermally conductive grease of λ=0.9W/(m･K).
(*6) SiC devices have lower short cuicuit withstand capability due to high current density.
Please be advised to pay careful attention to short cuicuit accident and try to adjust protection time to shutdown them as short as possible.
(*7) If the Product is used beyond absolute maximum ratings defined in the Specifications, as its internal structure may be dameged, please replace such Product with a new one.

●Electrical characteristic curves (Typical)

Fig.1 Typical Output Characteristics [T_j=25ºC]

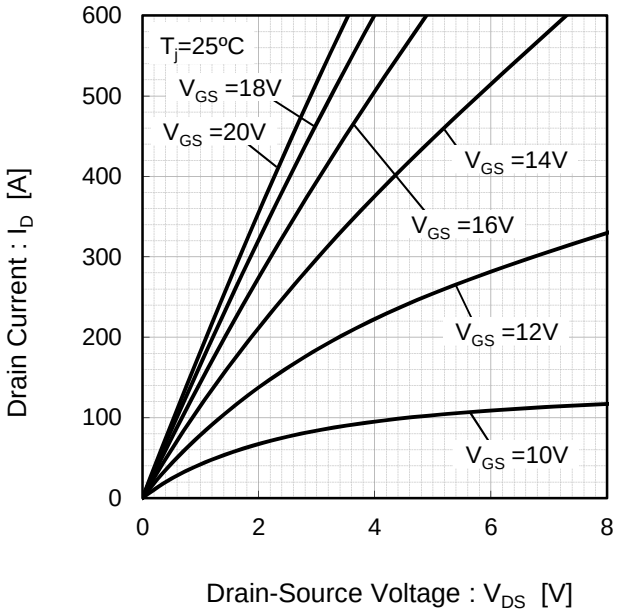


Fig.2 Drain-Source Voltage vs. Drain Current

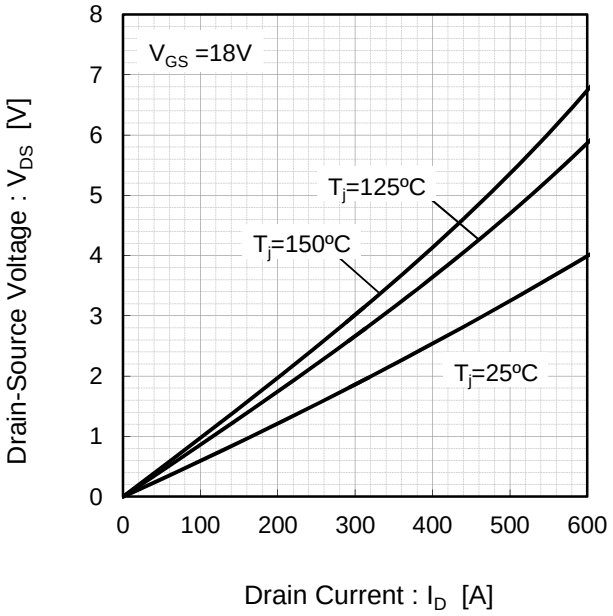


Fig.3 Drain-Source Voltage vs. Gate-Source Voltage [T_j=25ºC]

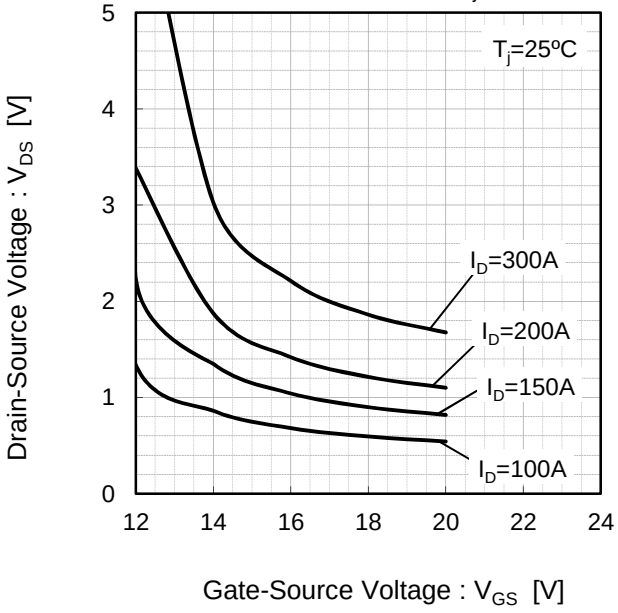
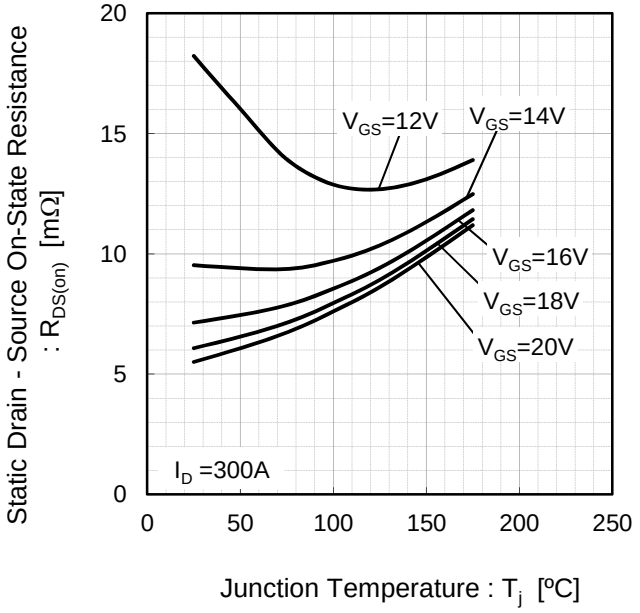


Fig.4 Static Drain - Source On-State Resistance vs. Junction Temperature



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode

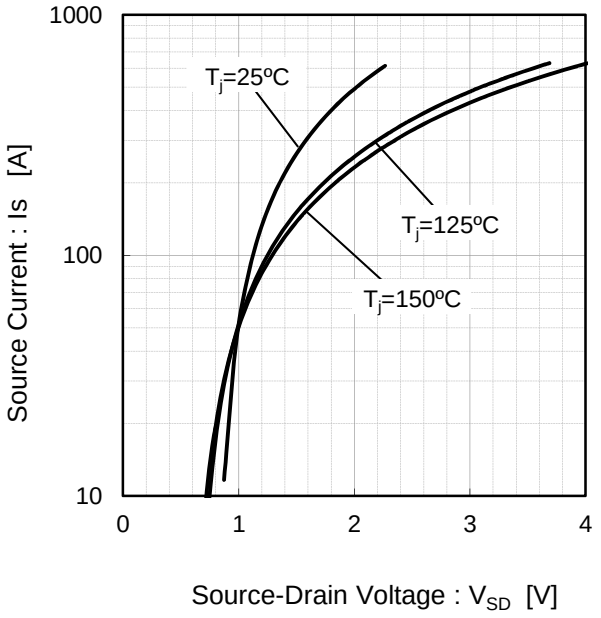


Fig.6 Forward characteristic of Diode

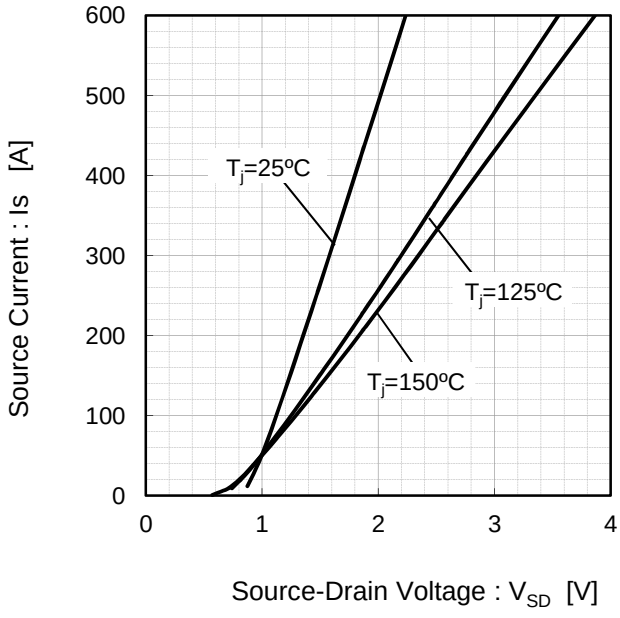


Fig.7 Drain Current vs. Gate-Source Voltage

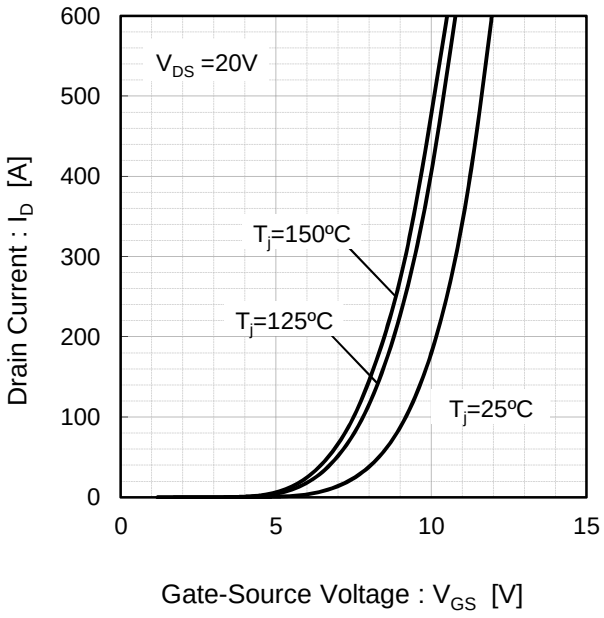
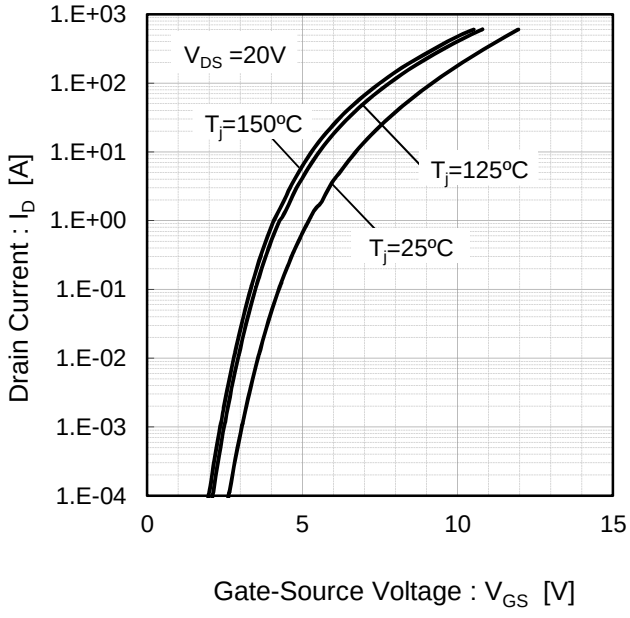


Fig.8 Drain Current vs. Gate-Source Voltage



●**Electrical characteristic curves** (Typical)

Fig.9 Switching Characteristics [T_j=25ºC]

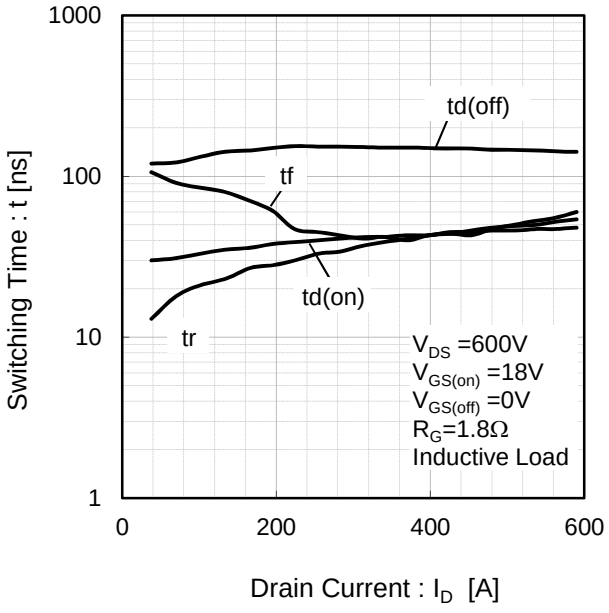


Fig.10 Switching Characteristics [T_j=125ºC]

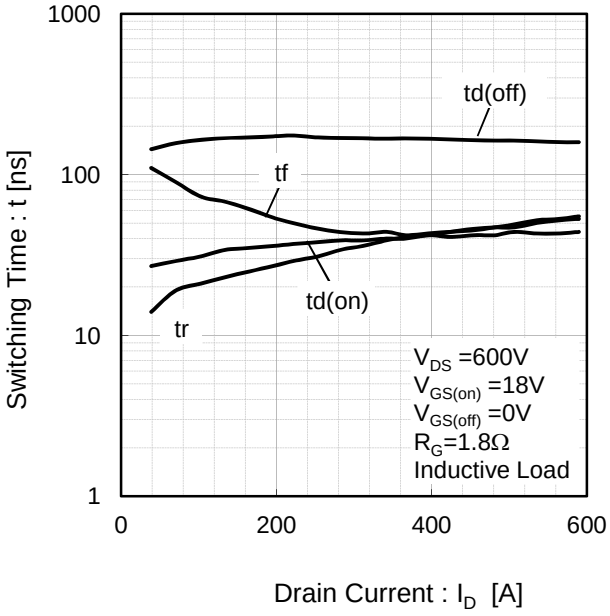


Fig.11 Switching Characteristics [T_j=150ºC]

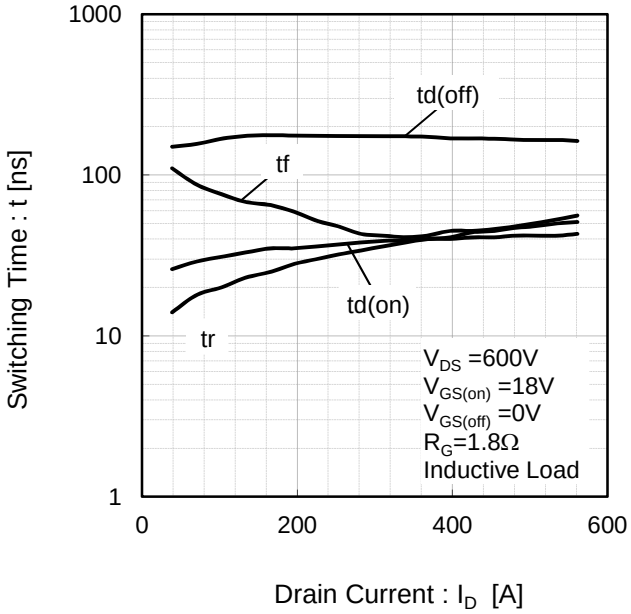
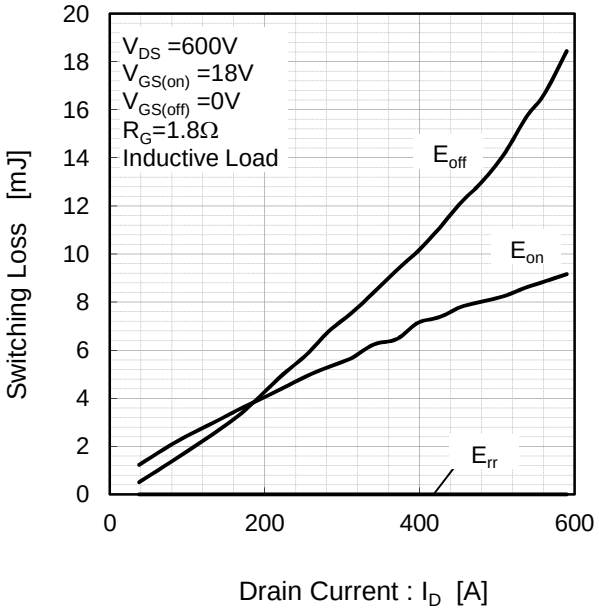


Fig.12 Switching Loss vs. Drain Current [T_j=25ºC]



●**Electrical characteristic curves** (Typical)

Fig.13 Switching Loss vs. Drain Current [T_j=125ºC]

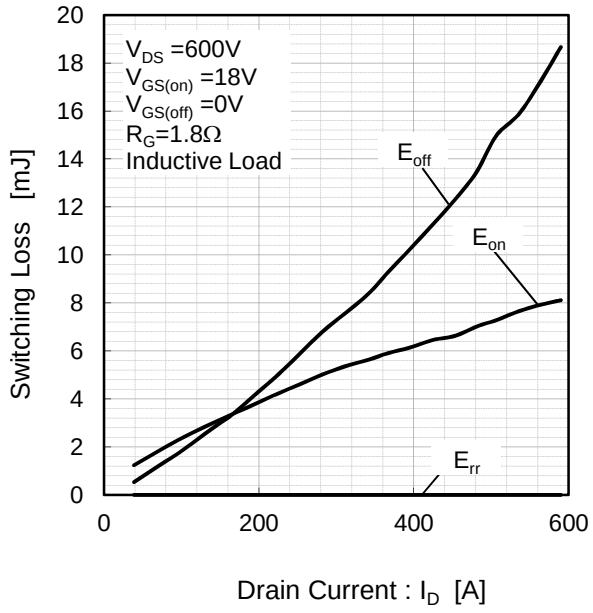


Fig.14 Switching Loss vs. Drain Current [T_j=150ºC]

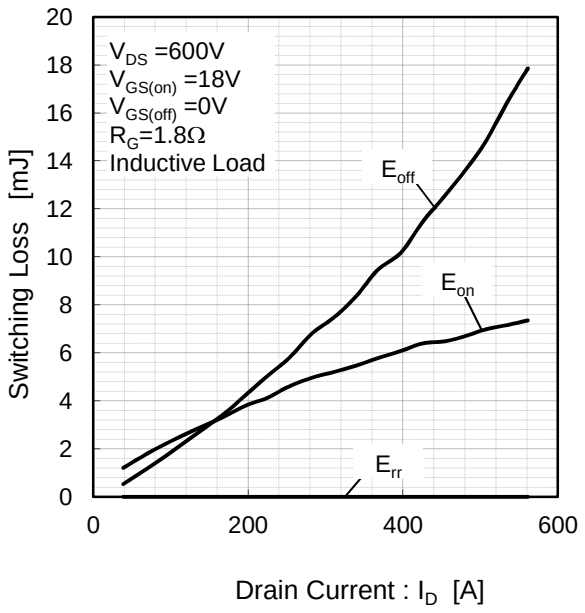


Fig.15 Recovery Characteristics vs. Drain Current [T_j=25ºC]

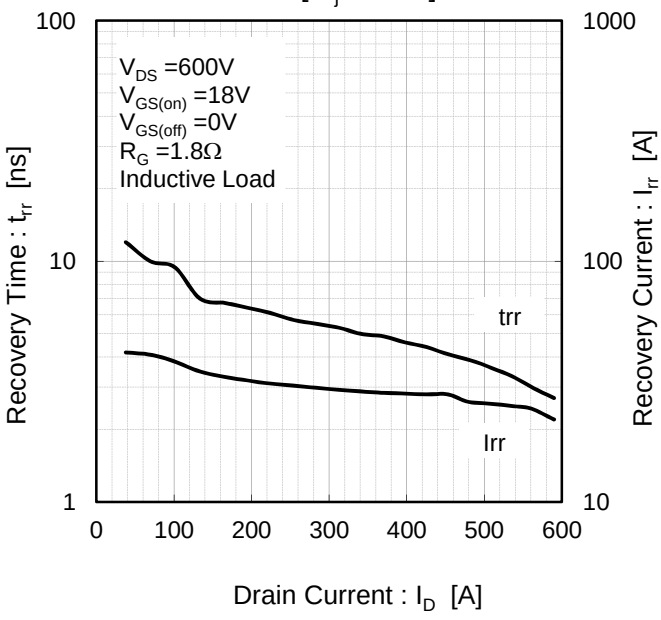
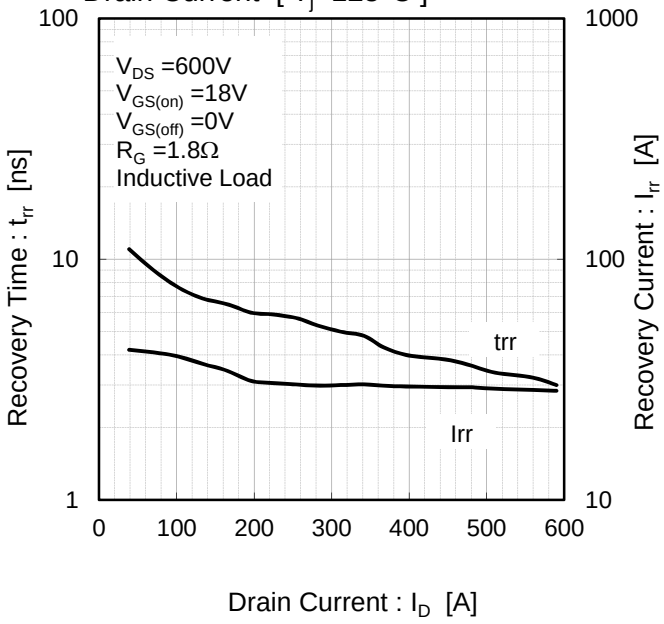


Fig.16 Recovery Characteristics vs. Drain Current [T_j=125ºC]



●**Electrical characteristic curves** (Typical)

Fig.17 Recovery Characteristics vs. Drain Current [T_j=150ºC]

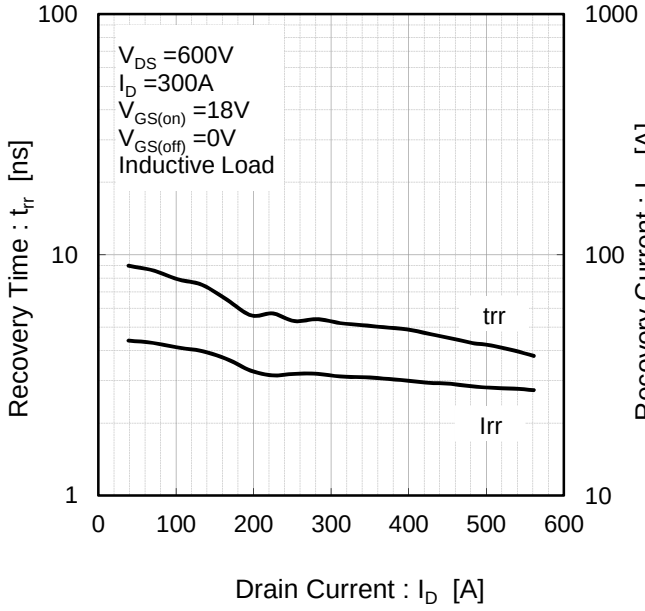


Fig.18 Switching Characteristics vs. Gate Resistance [T_j=25ºC]

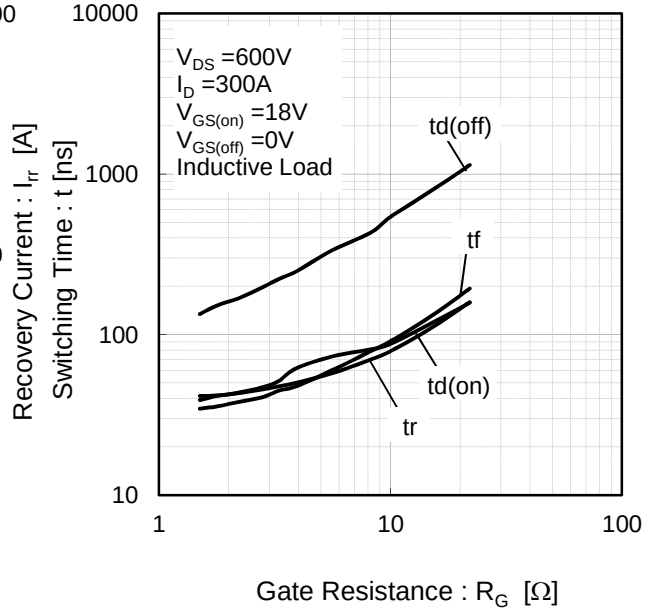


Fig.19 Switching Characteristics vs. Gate Resistance [T_j=125ºC]

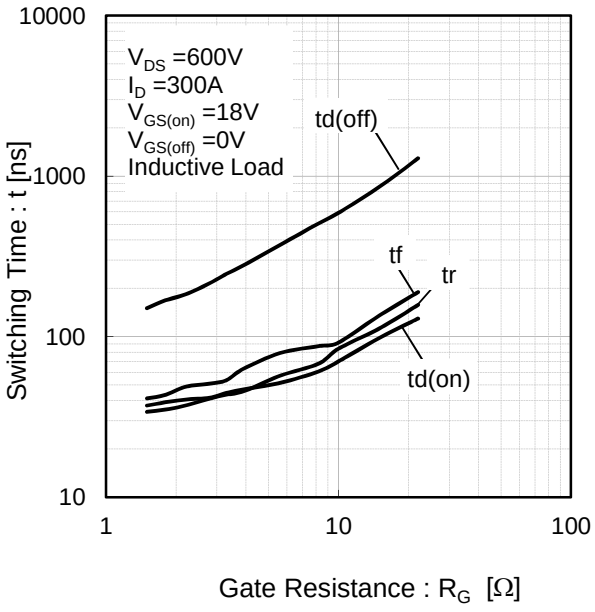
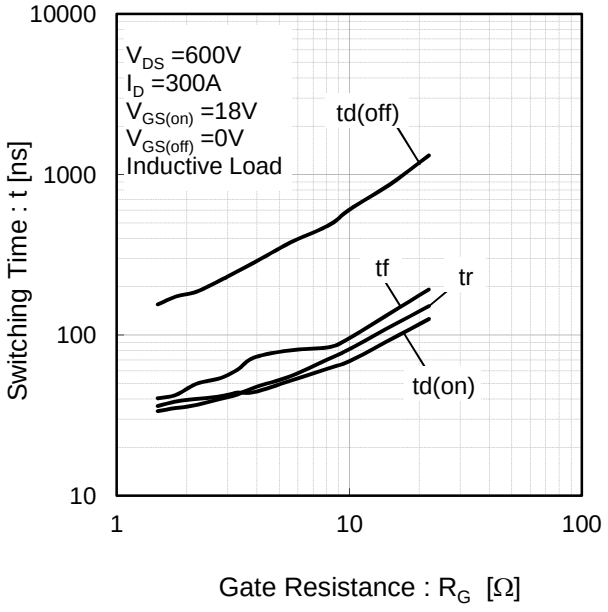


Fig.20 Switching Characteristics vs. Gate Resistance [T_j=150ºC]



●Electrical characteristic curves (Typical)

Fig.21 Switching Loss vs. Gate Resistance [T_j=25ºC]

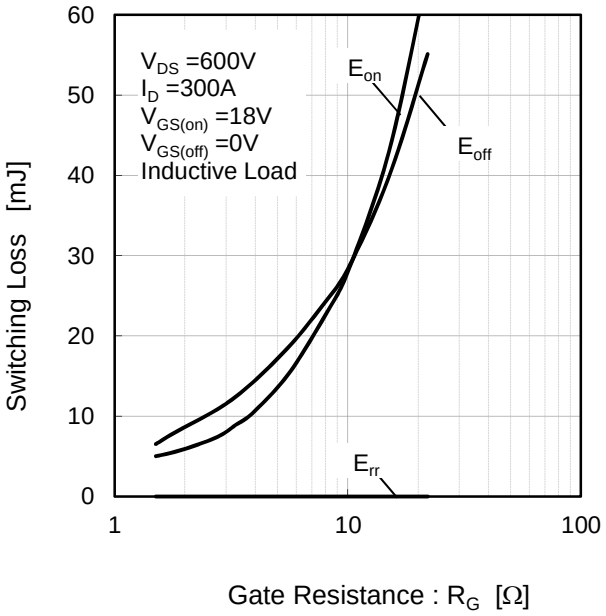


Fig.22 Switching Loss vs. Gate Resistance [T_j=125ºC]

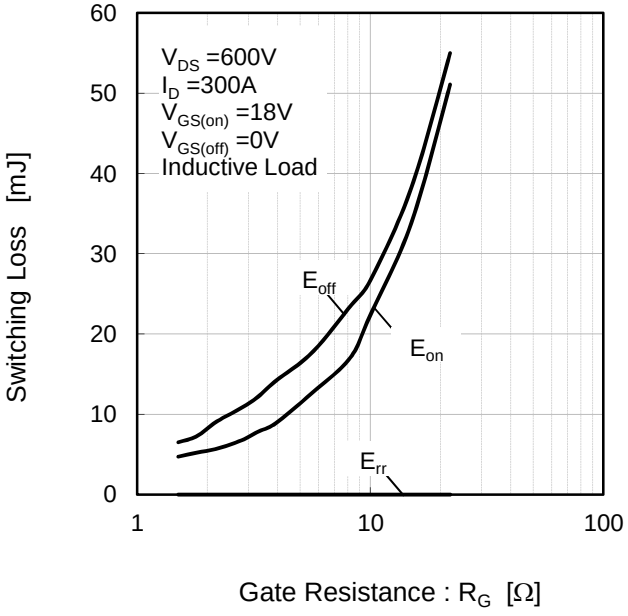


Fig.23 Switching Loss vs. Gate Resistance [T_j=150ºC]

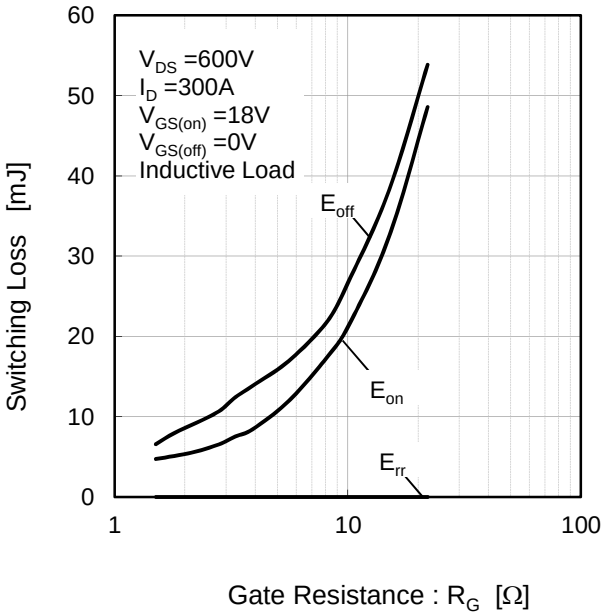
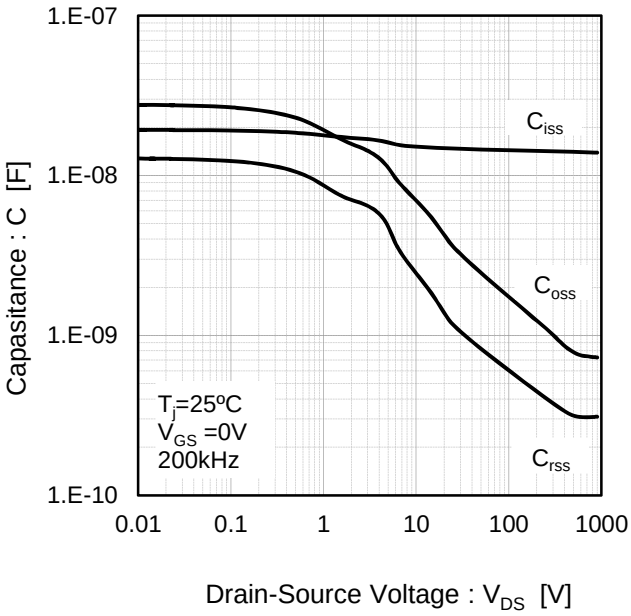


Fig.24 Typical Capacitance vs. Drain-Source Voltage



●Electrical characteristic curves (Typical)

Fig.25 Gate Charge Characteristics

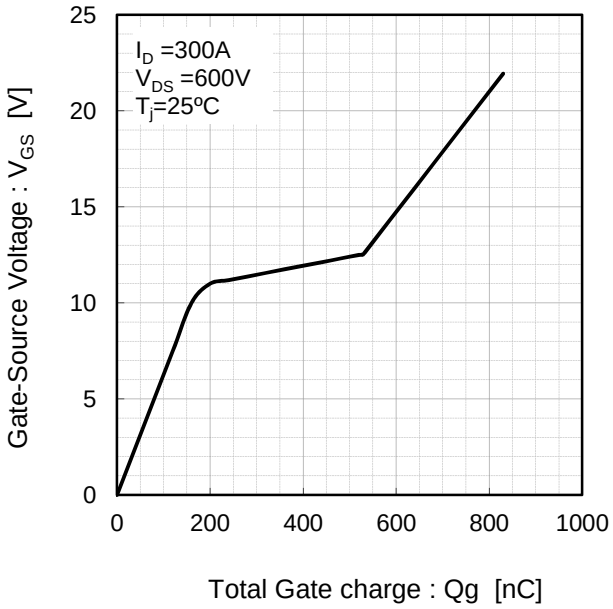
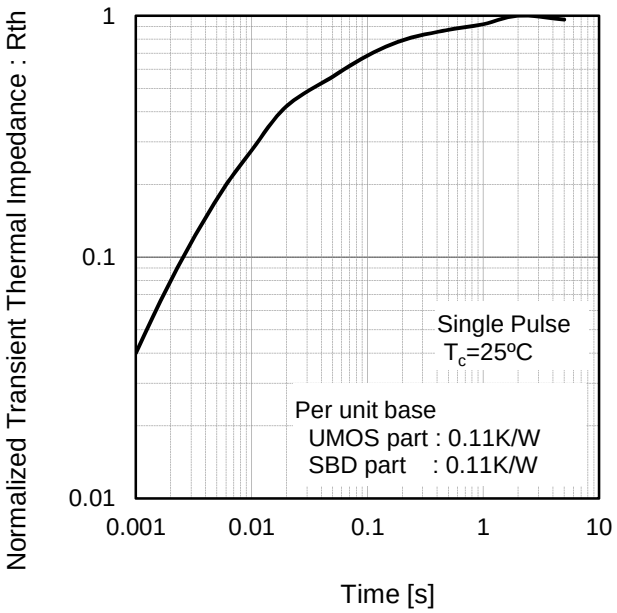


Fig.26 Normalized Transient Thermal Impedance



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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.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

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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7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

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