

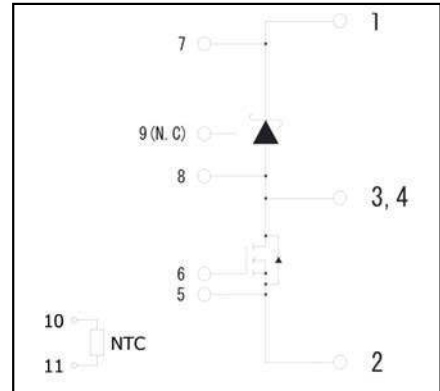
●Application

- Converter
- Photovoltaics, wind power generation.
- Induction heating equipment.

●Features

- 1) Low surge, low switching loss.
- 2) High-speed switching possible.
- 3) Reduced temperature dependence.

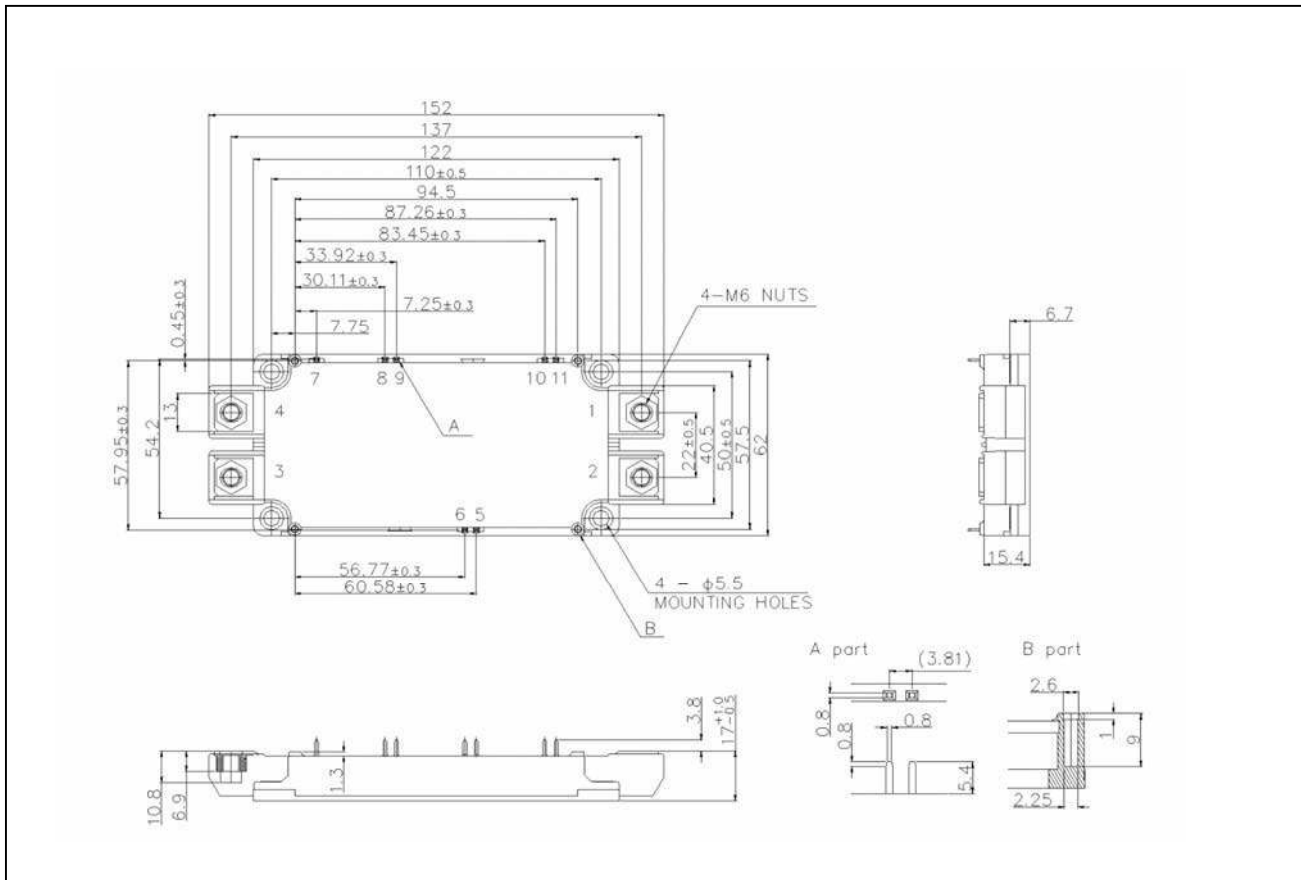
●Circuit diagram



●Construction

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

●Dimensions & Pin layout (Unit : mm)



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

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(-)			-6	
G - S Voltage ($t_{surge} < 300\text{nsec}$)	V_{GSS_surge}	D-S short	-10 to 26	
Drain current *1	I_D	DC ($T_c=60^\circ\text{C}$)	204	A
	I_{DRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms *2	360	
	I_{DRM}	Pulse ($T_c=60^\circ\text{C}$) 10us *2 *3	540	
Source current *1	I_S	DC ($T_c=60^\circ\text{C}$) $V_{GS}=18\text{V}$	204	
	I_{SRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms $V_{GS}=18\text{V}$ *2	360	
	I_{SRM}	Pulse ($T_c=60^\circ\text{C}$) 10us $V_{GS}=18\text{V}$ *2 *3	540	
Forward current (clamp diode) *1	I_F	DC ($T_c=60^\circ\text{C}$)	204	
	I_{FRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms *2	360	
	I_{FRM}	Pulse ($T_c=60^\circ\text{C}$) 10us *2 *3	540	
Total power dissipation *3	P_{tot}	$T_c=25^\circ\text{C}$	1360	W
Max Junction Temperature	T_{jmax}		175	$^\circ\text{C}$
Operating junction temperature	T_{jop}		-40 to 150	
Storage temperature	T_{stg}		-40 to 125	
Isolation voltage	Visol	Terminals to baseplate, $f=60\text{Hz}$ AC 1min.	2500	
Mounting torque	-	Main Terminals : M6 screw	4.5	N · m
		Mounting to heat sink : M5 screw	3.5	

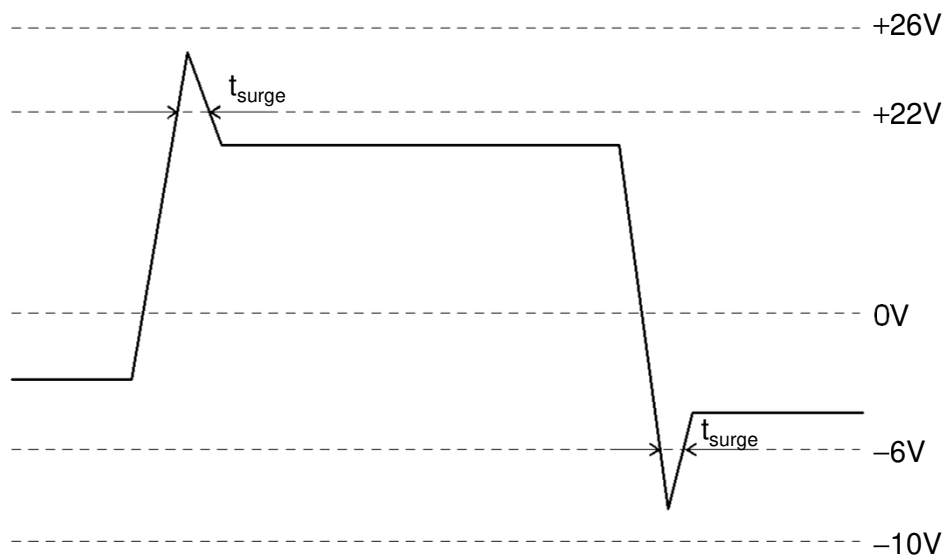
(*1) Case temperature (T_c) is defined on the surface of base plate just under the chips.

(*2) Repetition rate should be kept within the range where temperature rise if die should not exceed T_{jmax} .

(*3) Please use an appropriate external gate resistor not to exceed maximum ratings of Drain - Source Voltage.

(*4) T_j is less than 175°C

Example of acceptable V_{GS} waveform



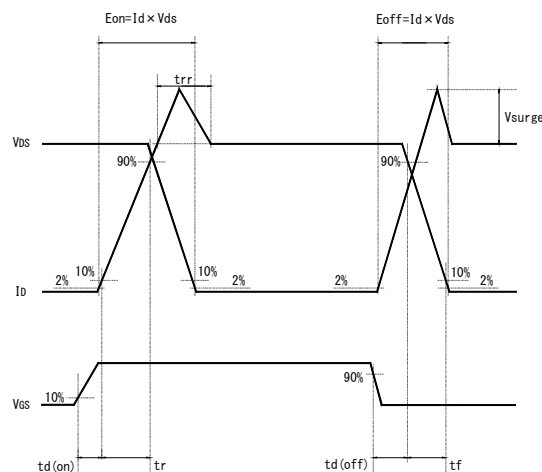
●Electrical characteristics (T_j=25°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
On-state static Drain-Source Voltage	V _{DS(on)}	I _D =180A, V _{GS} =18V	T _j =25°C	-	2.2	3.2	V
			T _j =125°C	-	3.1	-	
			T _j =150°C	-	3.5	5.0	
Drain cutoff current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V	-	-	10	μA	
Forward Voltage	V _F	I _F =180A	T _j =25°C	-	1.6	2.2	V
			T _j =125°C	-	2.0	-	
			T _j =150°C	-	2.2	3.3	
Reverse current	I _{RRM}	Clamp diode	-	-	3.2	mA	
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} =10V, I _D =35.2mA	1.6	-	4	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	-	49	-	ns	
	t _r	V _{DS} =600V	-	36	-		
	t _{rr}	I _D =180A	-	20	-		
	t _{d(off)}	R _{G(on)} =1.0Ω, R _{G(off)} =0.2Ω	-	139	-		
	t _f	inductive load	-	32	-		
Input Capacitance	C _{iss}	V _{DS} =10V, V _{GS} =0V, 200kHz	-	20	-	nF	
Gate Resistance	R _{Gint}	T _j =25°C	-	1.2	-	Ω	
NTC Rated Resistance	R ₂₅			5.0		kΩ	
NTC B Value	B50/25			3370		K	
Stray Inductance	L _s			13.0	-	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)}	DMOSFET (1/2 module) *5	-	-	0.11	K/W	
		SBD (1/2 module) *5	-	-	0.14		
Case-to-heat sink Thermal Resistance	R _{th(c-f)}	Case to heat sink, per 1 module, Thermal grease applied *6	-	0.035	-		

(*5) Measurement of T_c is to be done at the point just beneath the chip.

(*6) Typical value is measured by using thermally conductive grease of λ=0.9W/(m·K).

(*7) If the Product is used beyond absolute maximum ratings defined in the Specifications, as its internal structure may be damaged, please replace such Product with a new one.

●Waveform for switching test


●Electrical characteristic curves (Typical)

Fig.1 Typical Output Characteristics [$T_j=25^\circ\text{C}$]

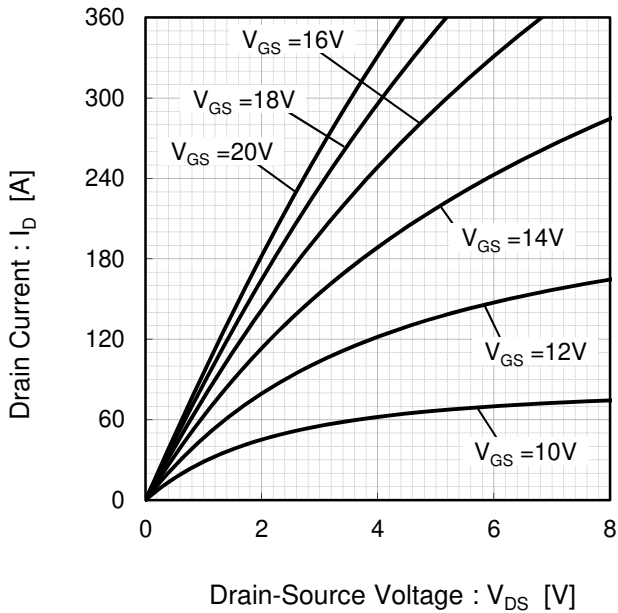


Fig.2 Drain-Source Voltage vs. Drain Current

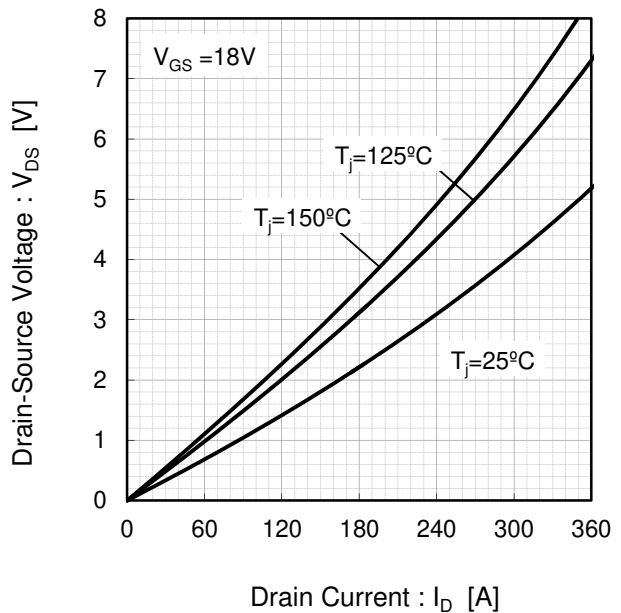


Fig.3 Drain-Source Voltage vs. Gate-Source Voltage [$T_j=25^\circ\text{C}$]

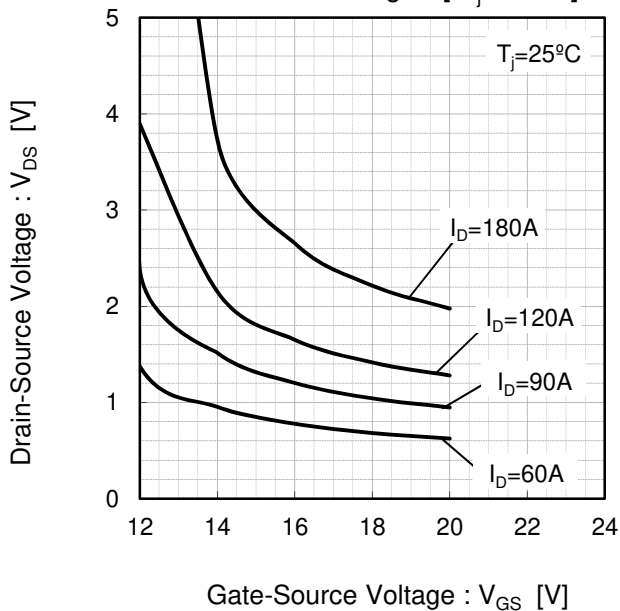
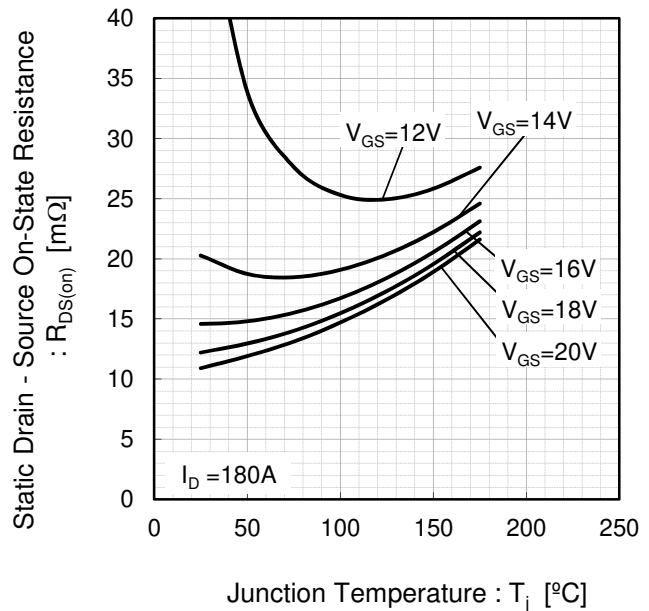


Fig.4 Static Drain - Source On-State Resistance vs. Junction Temperature



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode

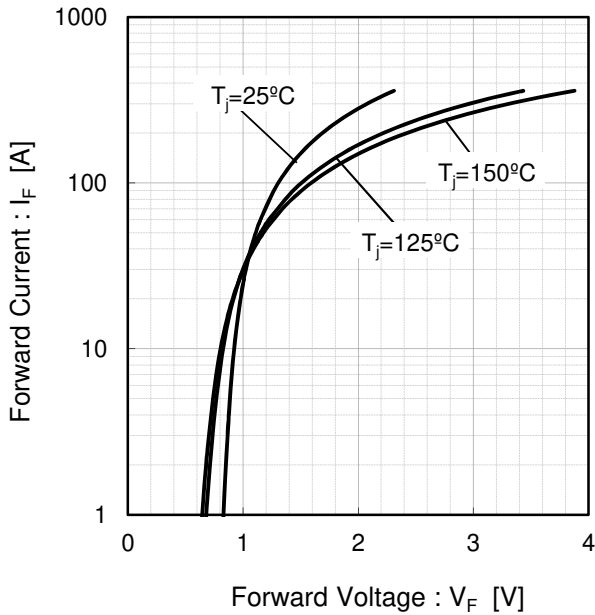


Fig.6 Forward characteristic of Diode

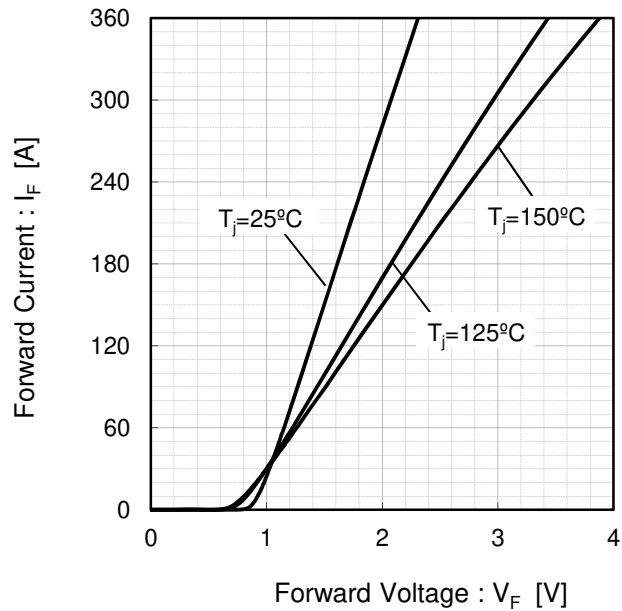


Fig.7 Drain Current vs. Gate-Source Voltage

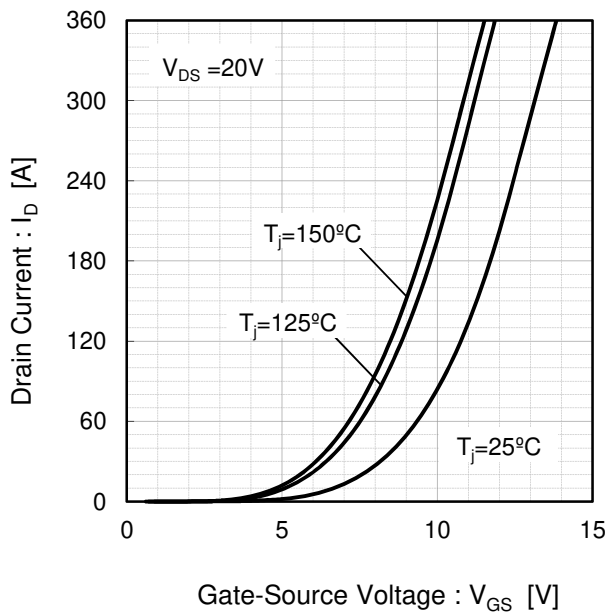
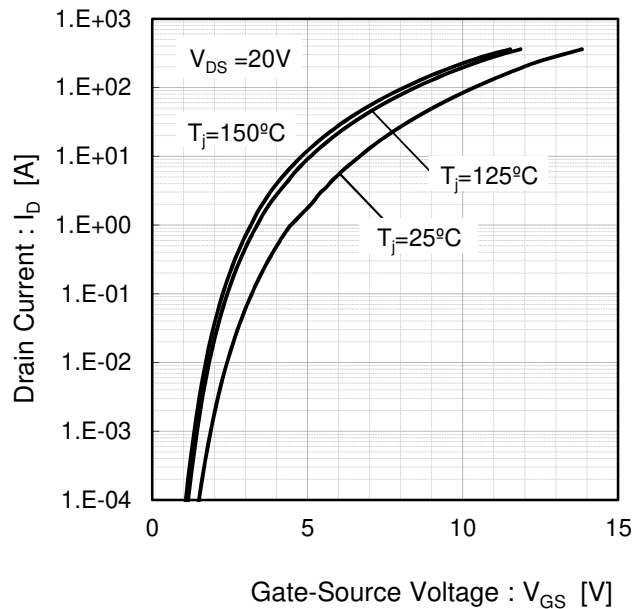


Fig.8 Drain Current vs. Gate-Source Voltage



●Electrical characteristic curves (Typical)

Fig.9 Switching Characteristics [$T_j=25^{\circ}\text{C}$]

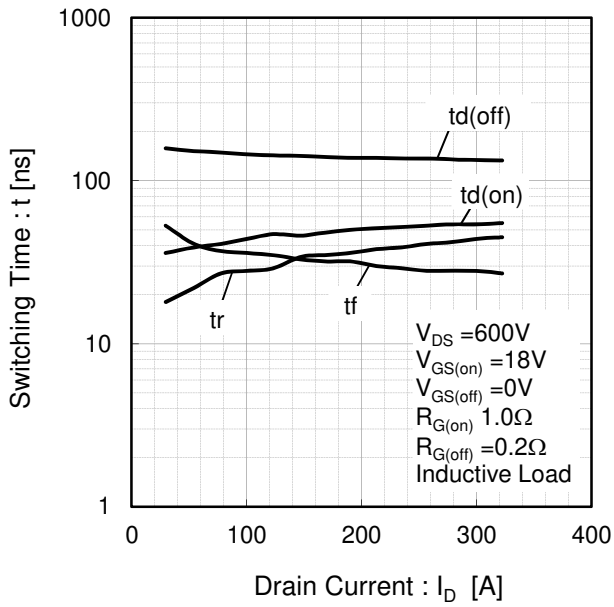


Fig.10 Switching Characteristics [$T_j=125^{\circ}\text{C}$]

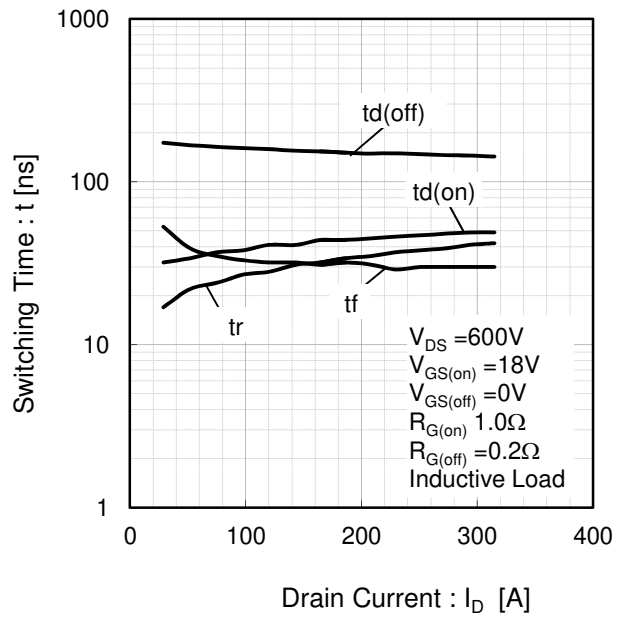


Fig.11 Switching Characteristics [$T_j=150^{\circ}\text{C}$]

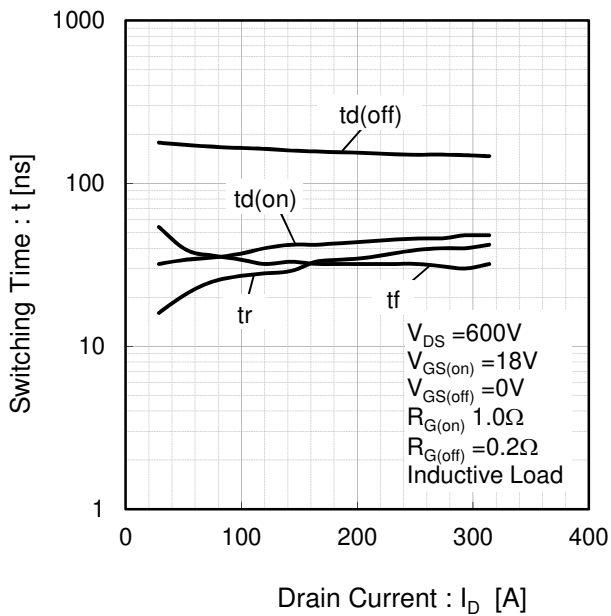
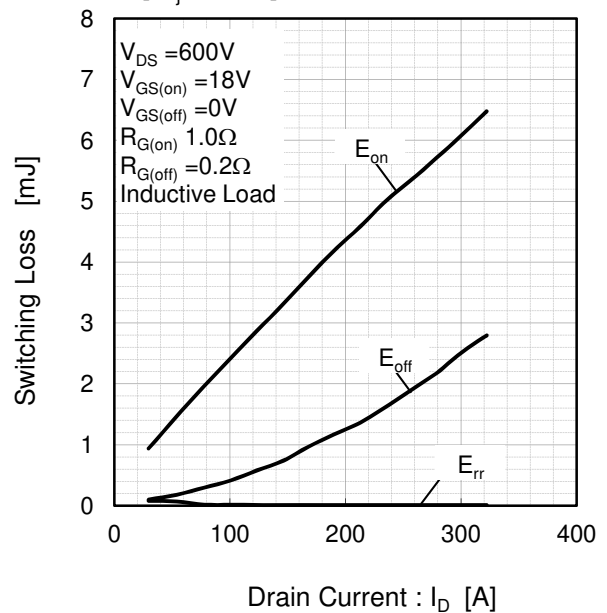


Fig.12 Switching Loss vs. Drain Current [$T_j=25^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

Fig.13 Switching Loss vs. Drain Current [$T_j=125^{\circ}\text{C}$]

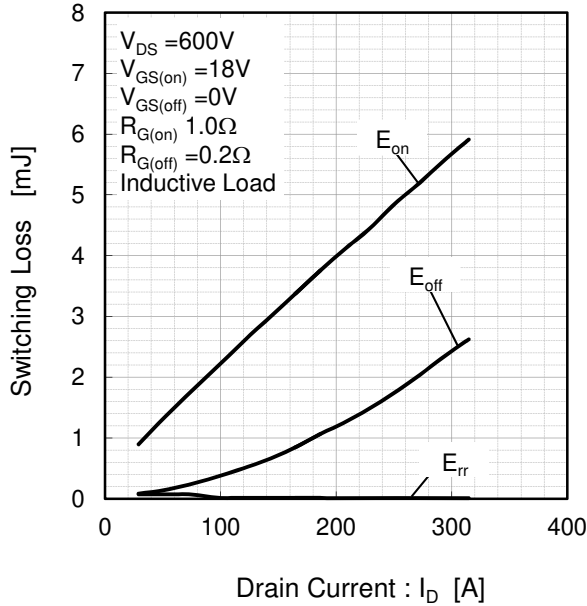


Fig.14 Switching Loss vs. Drain Current [$T_j=150^{\circ}\text{C}$]

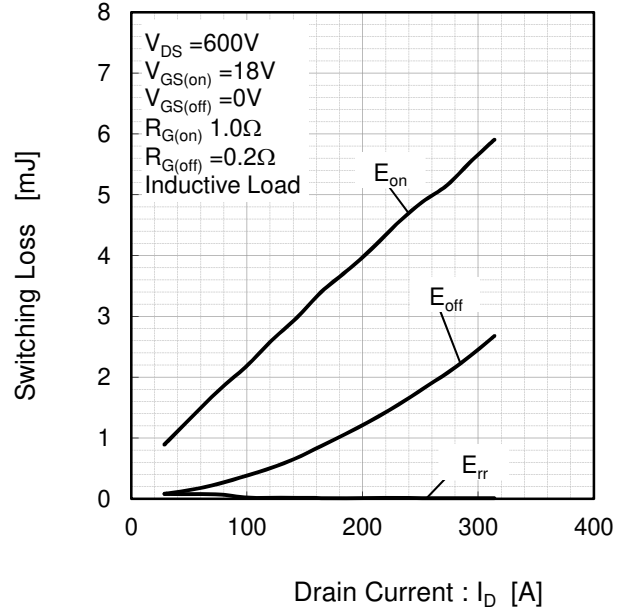


Fig.15 Recovery Characteristics vs. Drain Current [$T_j=25^{\circ}\text{C}$]

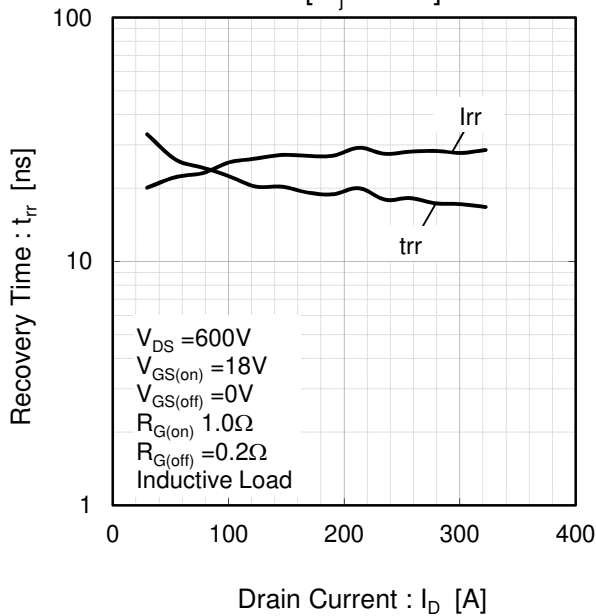
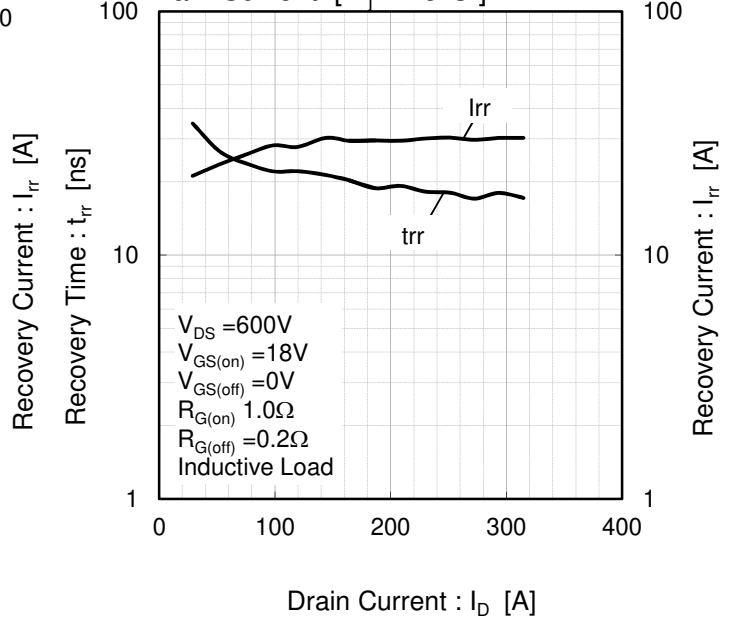


Fig.16 Recovery Characteristics vs. Drain Current [$T_j=125^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

Fig.17 Recovery Characteristics vs. Drain Current [$T_j=150^{\circ}\text{C}$]

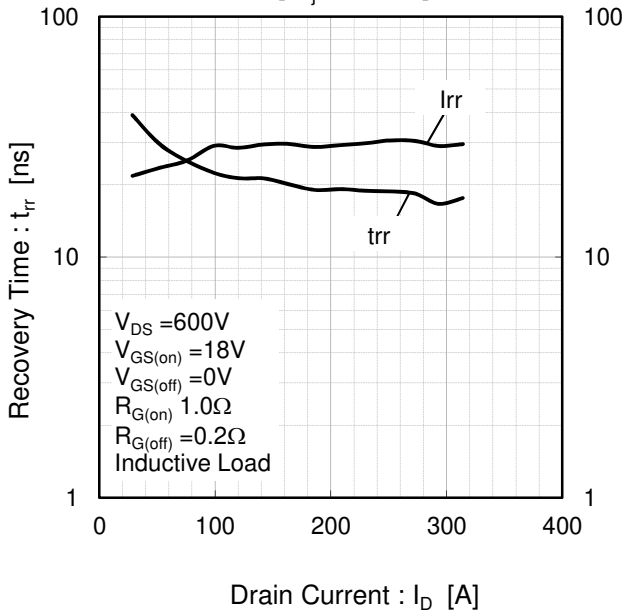


Fig.18 Switching Characteristics vs. Gate Resistance [$T_j=25^{\circ}\text{C}$]

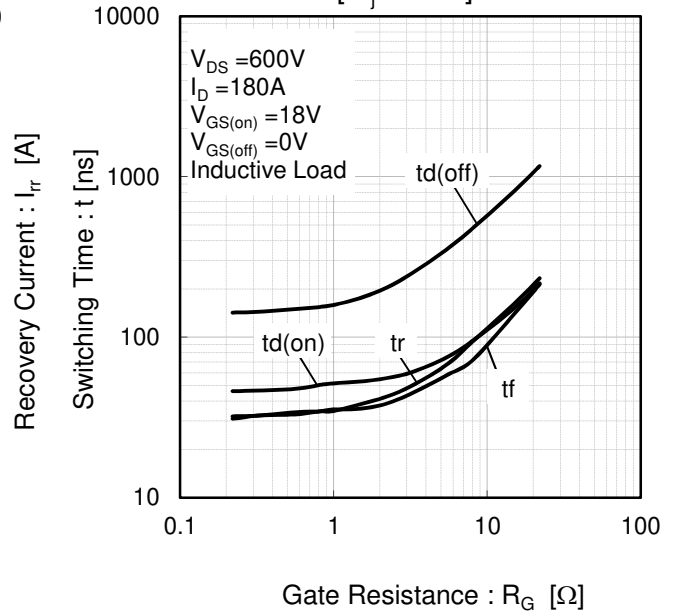


Fig.19 Switching Characteristics vs. Gate Resistance [$T_j=125^{\circ}\text{C}$]

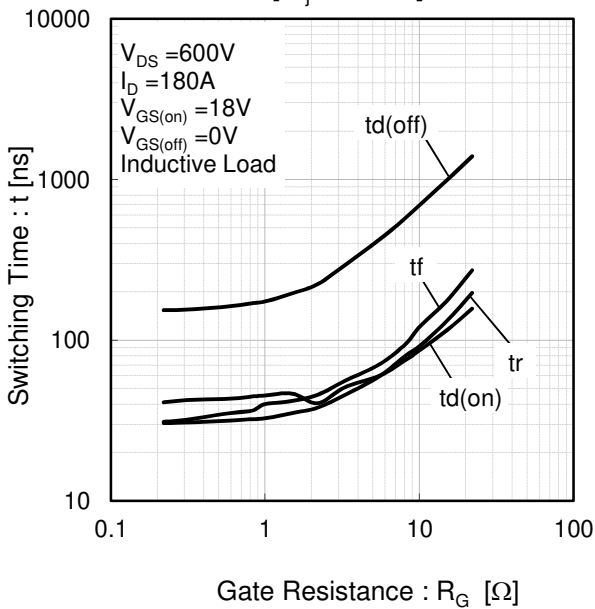
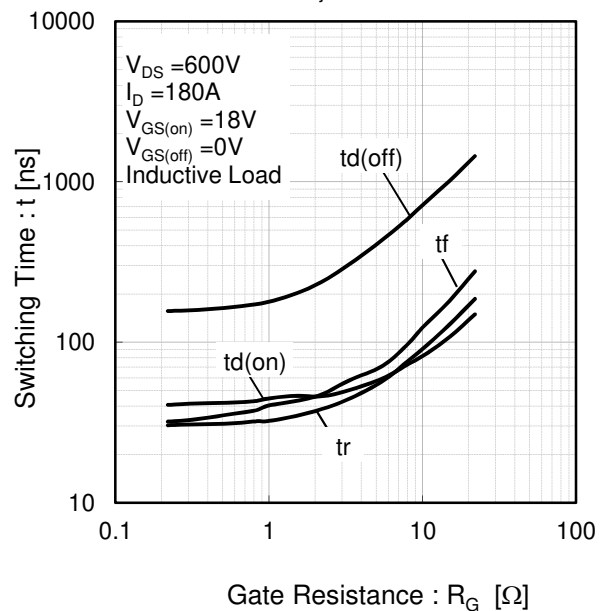


Fig.20 Switching Characteristics vs. Gate Resistance [$T_j=150^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

Fig.21 Switching Loss vs. Gate Resistance [$T_j=25^{\circ}\text{C}$]

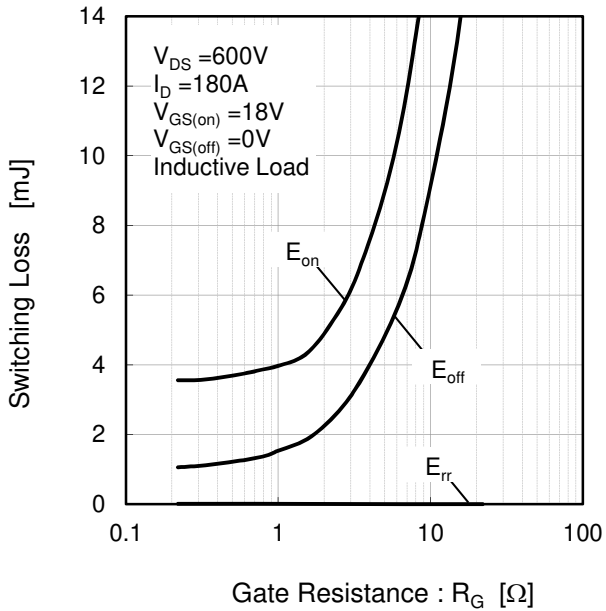


Fig.22 Switching Loss vs. Gate Resistance [$T_j=125^{\circ}\text{C}$]

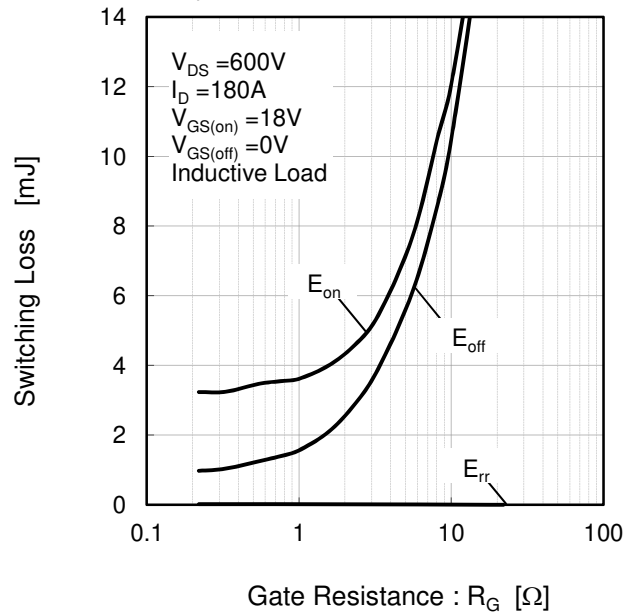


Fig.23 Switching Loss vs. Gate Resistance [$T_j=150^{\circ}\text{C}$]

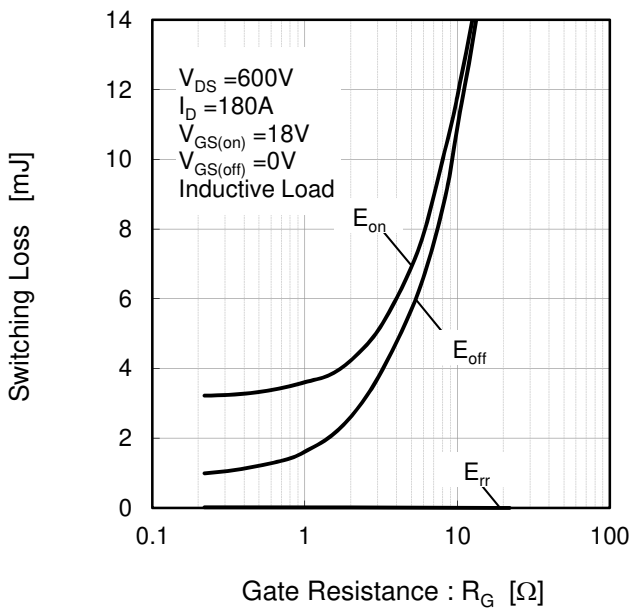
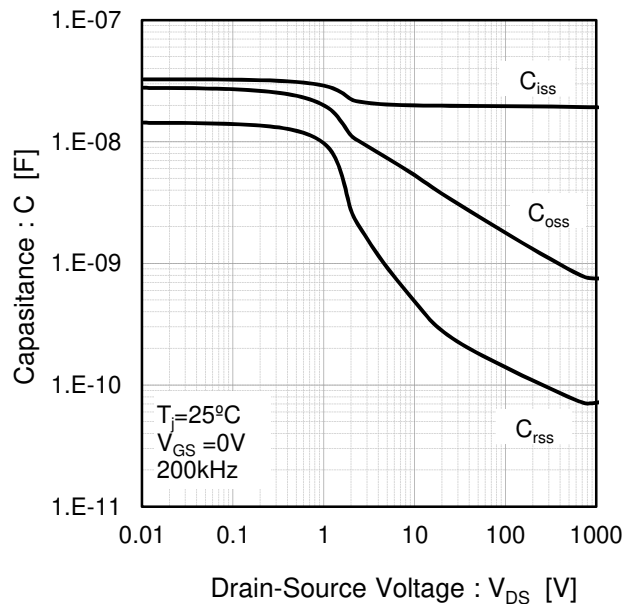


Fig.24 Typical Capacitance vs. Drain-Source Voltage



●Electrical characteristic curves (Typical)

Fig.25 Gate Charge Characteristics
[$T_j=25^\circ\text{C}$]

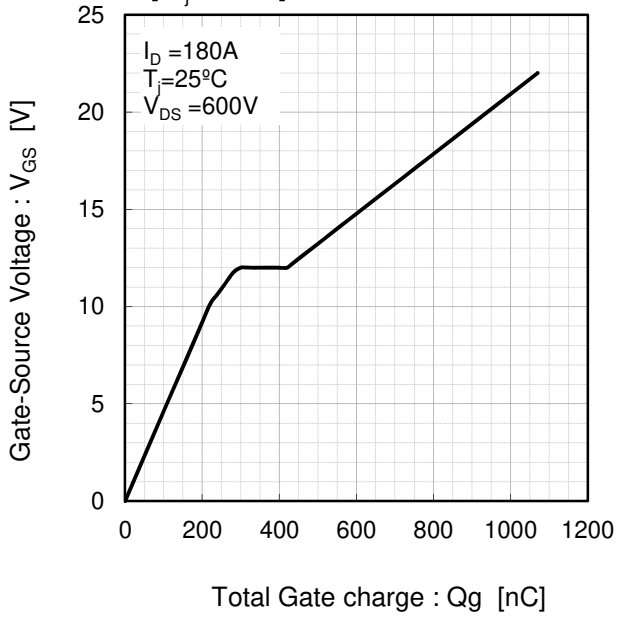
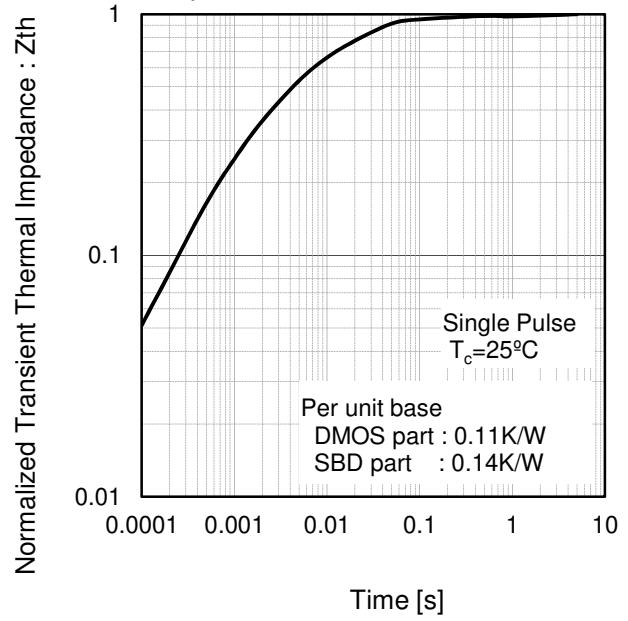


Fig.26 Normalized Transient Thermal Impedance



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