

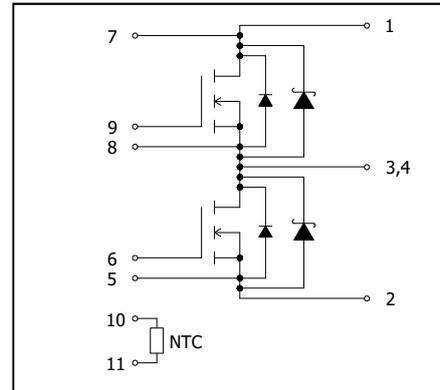
●Application

- Motor drive
- Inverter, Converter
- Photovoltaics, wind power generation.
- Induction heating equipment.

●Features

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

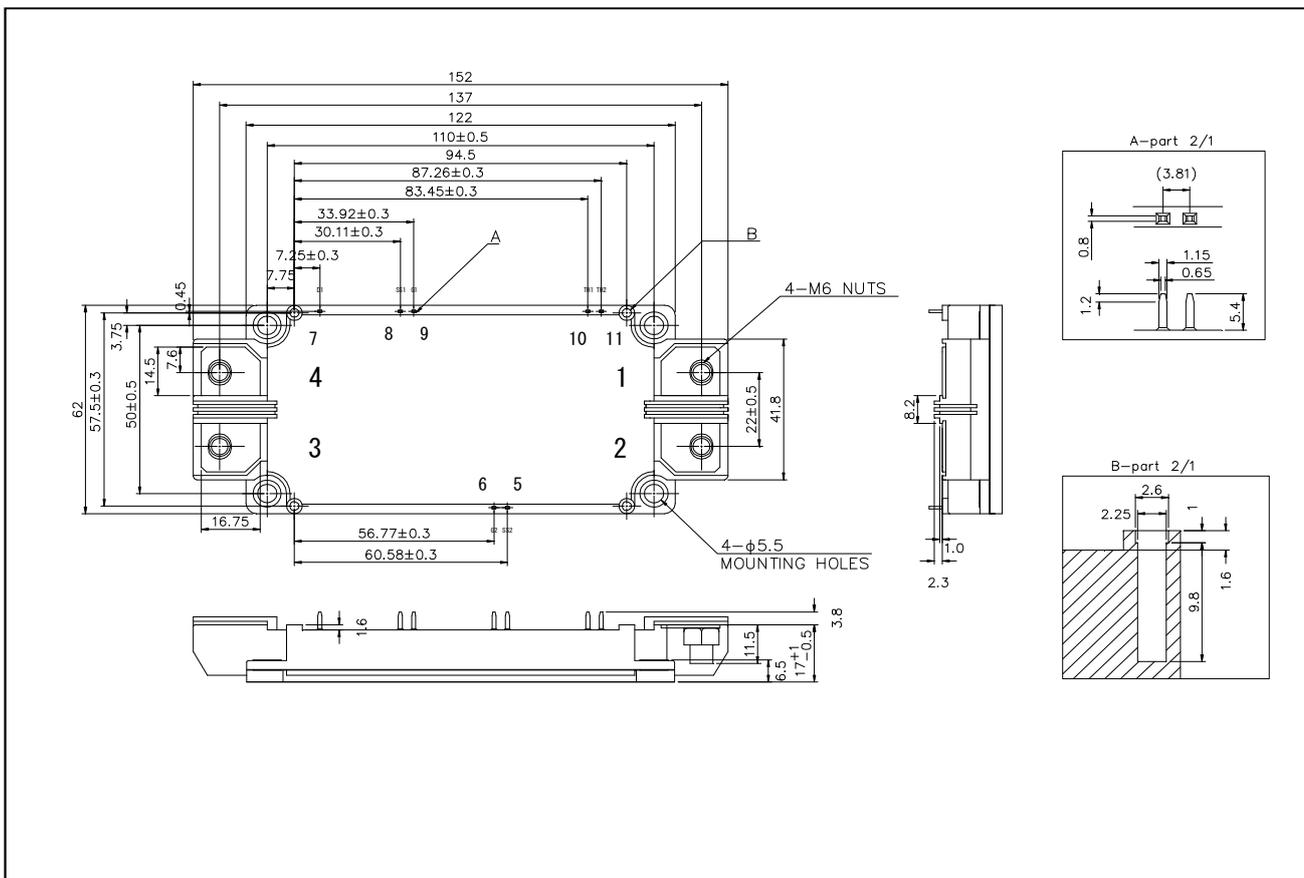
●Circuit diagram



●Construction

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

●Dimensions & Pin layout (Unit : mm)



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

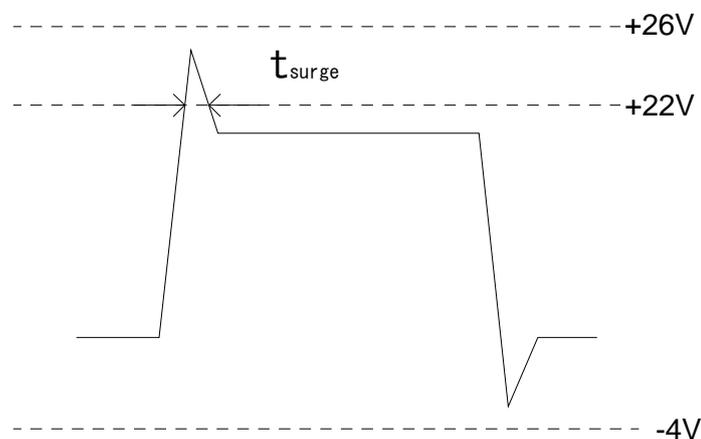
Parameter	Symbol	Conditions	Limit	Unit	
Drain-source voltage	V_{DSS}	G-S short	1200	V	
Gate-source voltage(+)	V_{GSS}	D-S short	22		
Gate-source voltage(-)			-4		
G - S Voltage ($t_{\text{surge}} < 300\text{nsec}$)			V_{GSSsurge}		-4 to 26
Drain current *1	I_{D}	DC ($T_c=60^\circ\text{C}$) $V_{\text{GS}}=18\text{V}$	358	A	
	I_{D}	DC ($T_c=32^\circ\text{C}$) $V_{\text{GS}}=18\text{V}$	400		
	I_{DRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms $V_{\text{GS}}=18\text{V}$ *2	800		
Source current *1	I_{S}	DC ($T_c=60^\circ\text{C}$) $V_{\text{GS}}=18\text{V}$	358		
	I_{S}	DC ($T_c=32^\circ\text{C}$) $V_{\text{GS}}=18\text{V}$	400		
	I_{S}	DC ($T_c=60^\circ\text{C}$) $V_{\text{GS}}=0\text{V}$	260		
	I_{SRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms $V_{\text{GS}}=18\text{V}$ *2	800		
	I_{SRM}	Pulse ($T_c=60^\circ\text{C}$) 10 μs $V_{\text{GS}}=0\text{V}$ *2	800		
Total power dissipation *3	P_{tot}	$T_c=25^\circ\text{C}$	1570		W
Max Junction Temperature	T_{jmax}		175		$^\circ\text{C}$
Junction temperature	T_{jop}		-40 to 150		
Storage temperature	T_{stg}		-40 to 125		
Isolation voltage	V_{isol}	Terminals to baseplate, $f=60\text{Hz}$ 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_{jmax} .

(*3) 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	
Static drain-source on-state voltage	V _{DS(on)}	I _D =400A, V _{GS} =18V	T _j =25°C	-	1.8	2.5	V
			T _j =125°C	-	2.6	-	
			T _j =150°C	-	3.0	4.5	
Drain cutoff current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V	-	-	2.4	mA	
Souce-Drain Voltage	V _{SD}	V _{GS} =0V, I _S =400A	T _j =25°C	-	2.1	2.6	V
			T _j =125°C	-	2.7	-	
			T _j =150°C	-	2.8	4.8	
		V _{GS} =18V, I _S =400A	T _j =25°C	-	1.3	-	V
			T _j =125°C	-	1.8	-	
			T _j =150°C	-	1.9	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} =10V, I _D =109.2mA	2.7	-	5.6	V	
Gate-source leakage current	I _{GSS}	V _{GS} =22V, V _{DS} =0V	-	-	0.5	μA	
		V _{GS} =-4V, V _{DS} =0V	-0.5	-	-		
Switching characteristics	t _{d(on)}	V _{GS(on)} =18V, V _{GS(off)} =-2V *4 V _{DS} =600V I _D =400A R _{G(on)} =2.2Ω, R _{G(off)} =2.2Ω inductive load	-	45	-	ns	
	t _r		-	55	-		
	t _{rr}		-	45	-		
	t _{d(off)}		-	240	-		
	t _f		-	55	-		
Input capacitance	C _{iss}	V _{DS} =10V, V _{GS} =0V, 200kHz	-	17	-	nF	
Gate Registance	R _{Gint}	T _j =25°C	-	2.4	-	Ω	
NTC Rated Resistance	R25		-	5.0	-	kΩ	
NTC B Value	B _{50/25}		-	3370	-	K	
Stray Inductance	Ls		-	10.5	-	nH	
Creepage Distance	-	Terminal to heat sink	-	16.7	-	mm	
		Terminal to terminal	-	16.7	-	mm	
Clearance Distance	-	Terminal to heat sink	-	12.0	-	mm	
		Terminal to terminal	-	11.0	-	mm	
Junction-to-case thermal resistance	R _{th(j-c)}	UMOS (1/2 module) *5	-	-	96	°C/kW	
		SBD (1/2 module) *5	-	-	127		
Case-to-heat sink Thermal resistance	R _{th(c-f)}	Case to heat sink, per 1 module, Thermal grease applied *6	-	15	-		

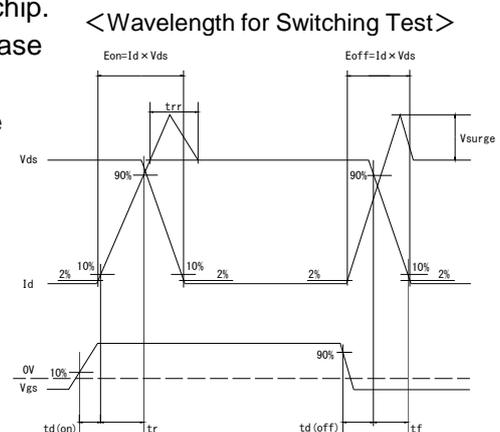
(*4) In order to prevent self turn-on, it is recommended to apply negative gate bias.

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

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

(*7) 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.

(*8) 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.



●Electrical characteristic curves (Typical)

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

Fig.2 Drain-Source Voltage vs. Drain Current

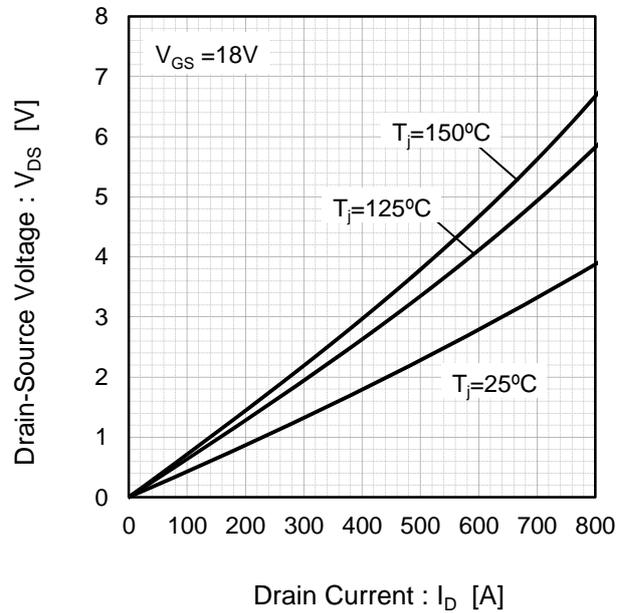
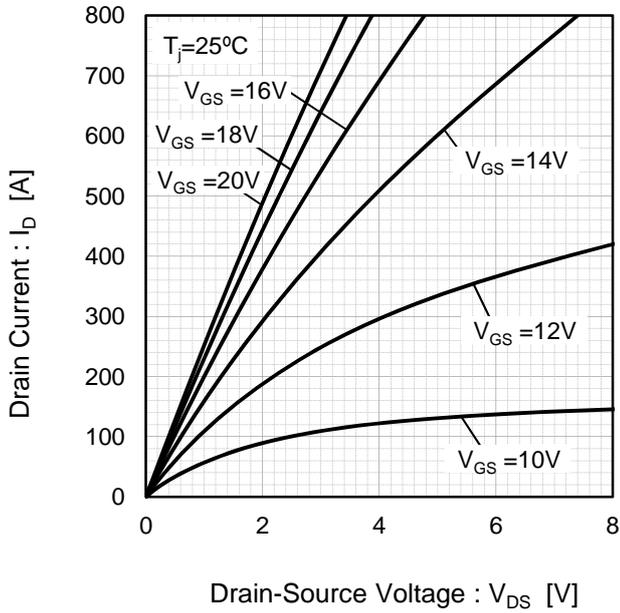
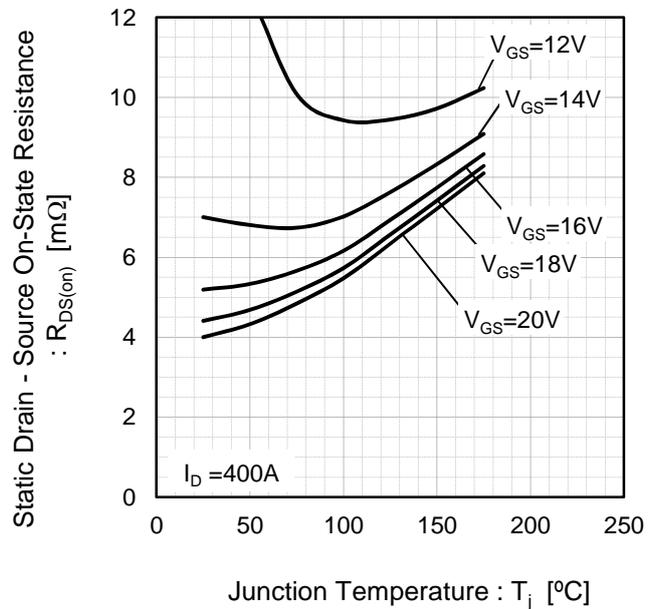
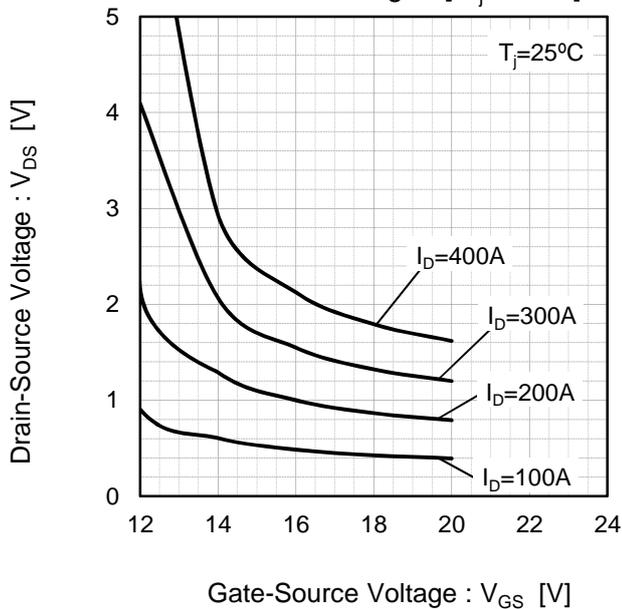


Fig.3 Drain-Source Voltage vs. Gate-Source Voltage [$T_j=25^\circ\text{C}$]

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



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode

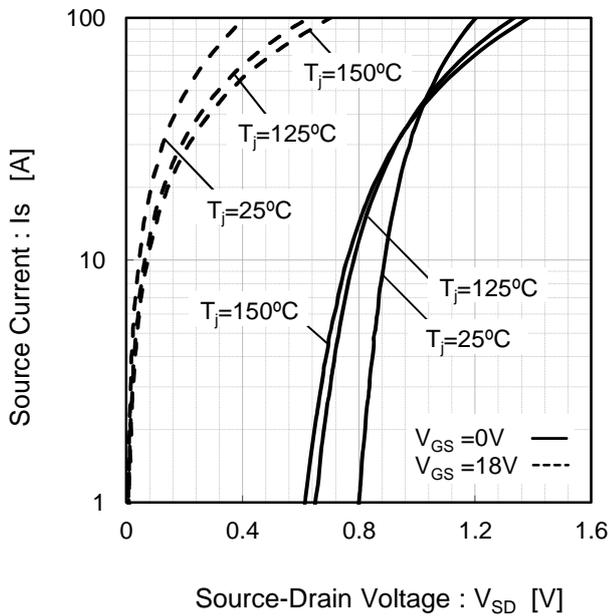


Fig.6 Forward characteristic of Diode

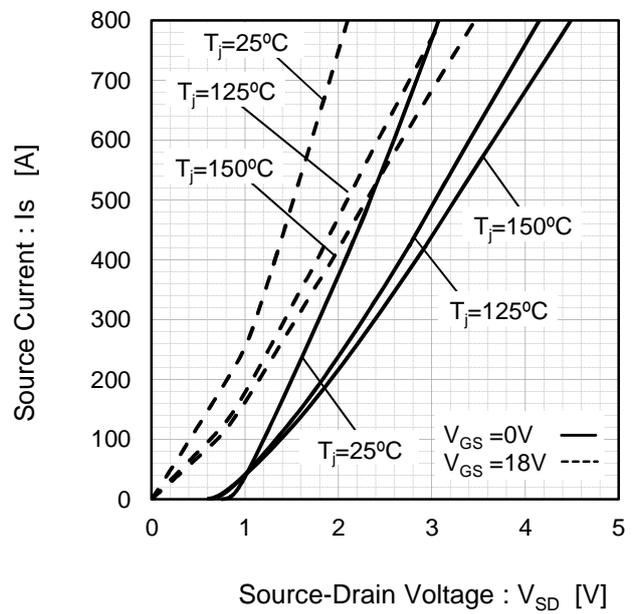


Fig.7 Drain Current vs. Gate-Source Voltage

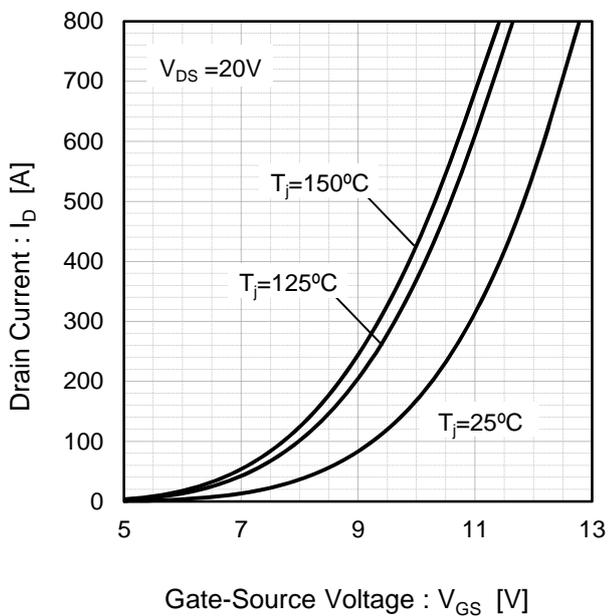
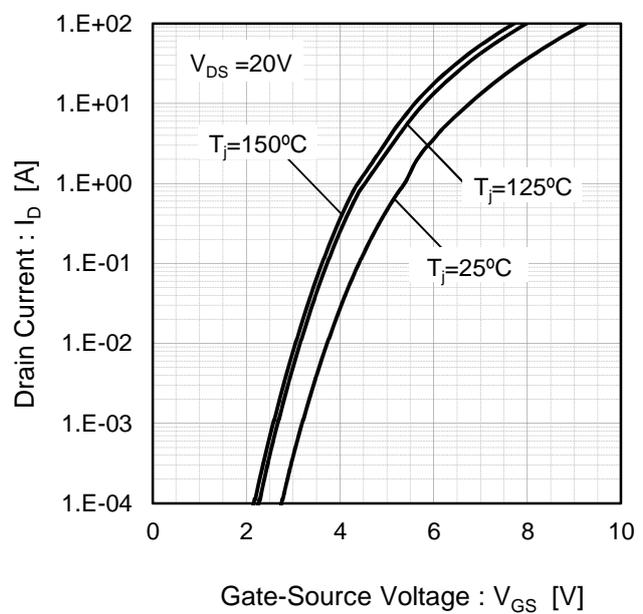


Fig.8 Drain Current vs. Gate-Source Voltage



●Electrical characteristic curves (Typical)

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

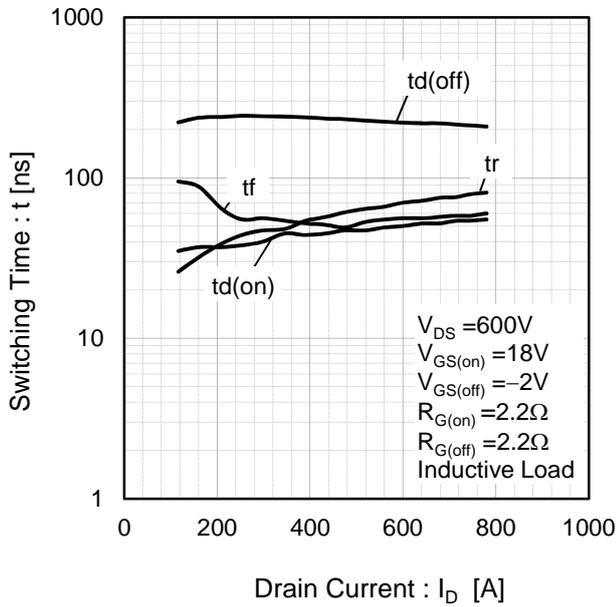


Fig.10 Switching Characteristics [$T_j=125^{\circ}\text{C}$]

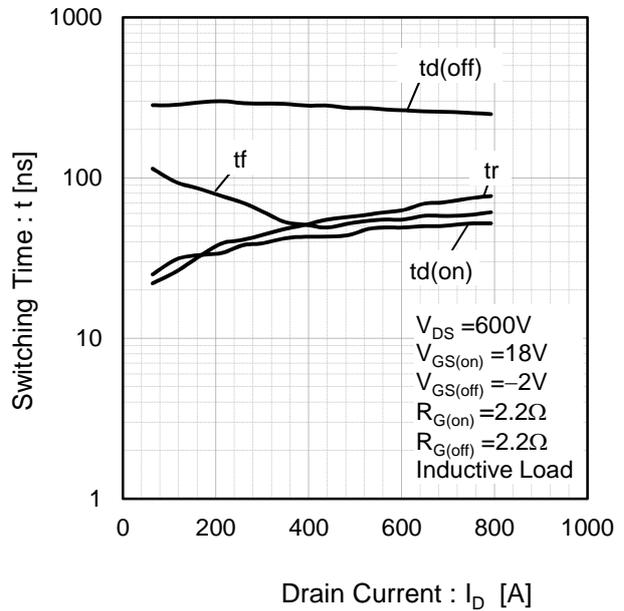


Fig.11 Switching Characteristics [$T_j=150^{\circ}\text{C}$]

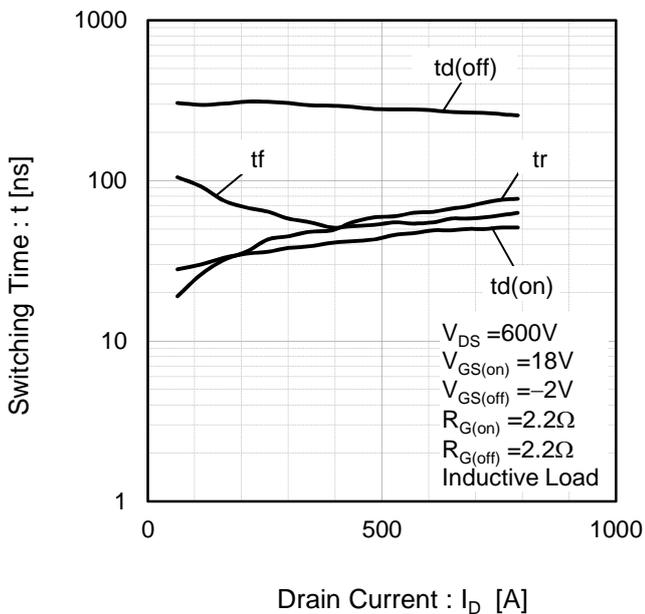
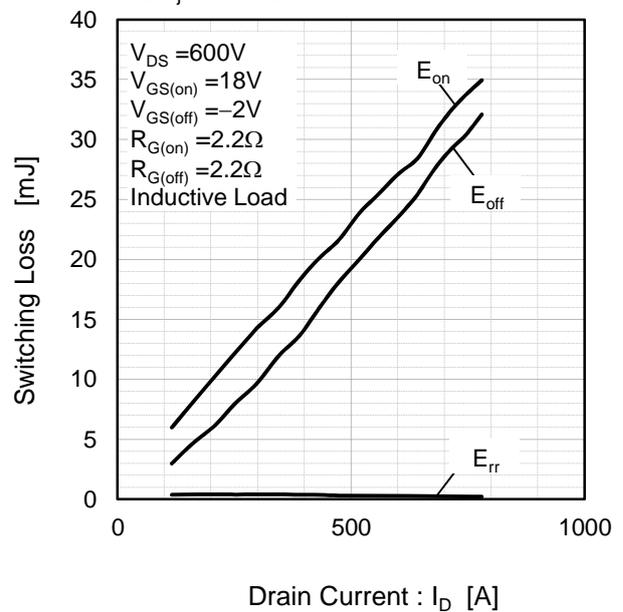


Fig.12 Switching Loss vs. Drain Current [$T_j=25^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

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

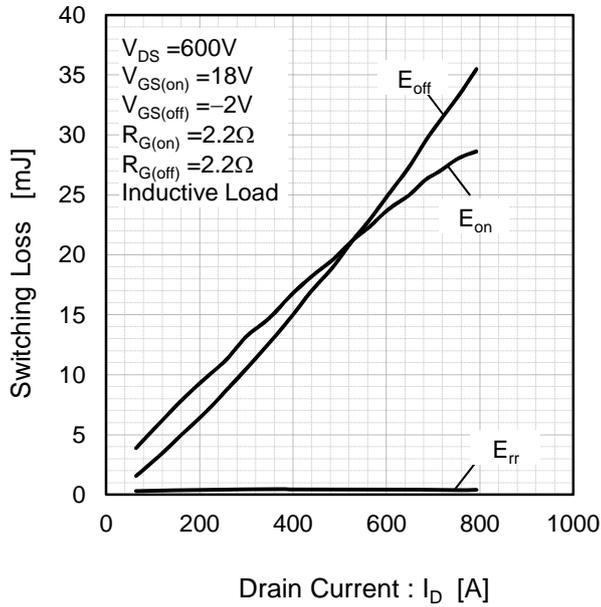


Fig.14 Switching Loss vs. Drain Current [$T_j=150^{\circ}\text{C}$]

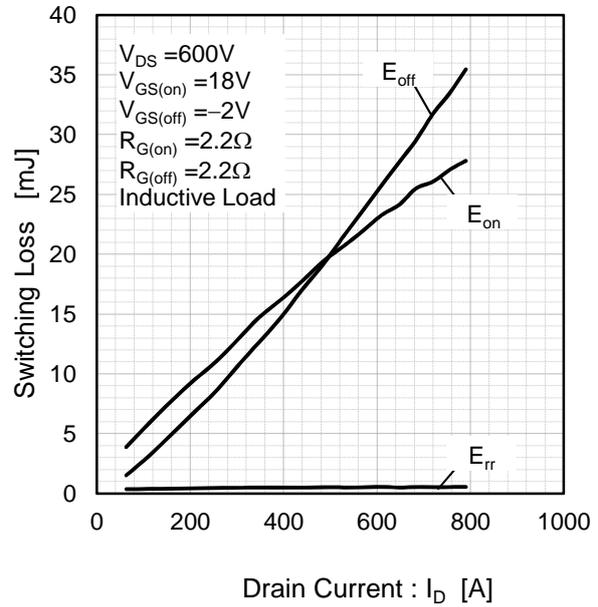


Fig.15 Recovery Characteristics vs. Drain Current [$T_j=25^{\circ}\text{C}$]

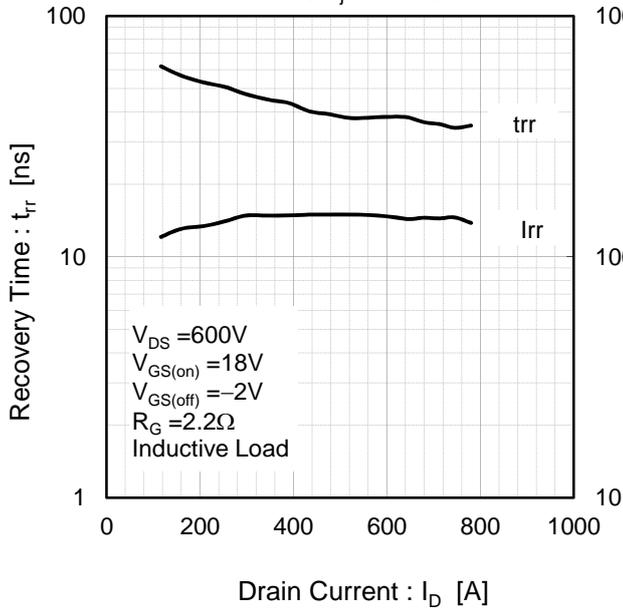
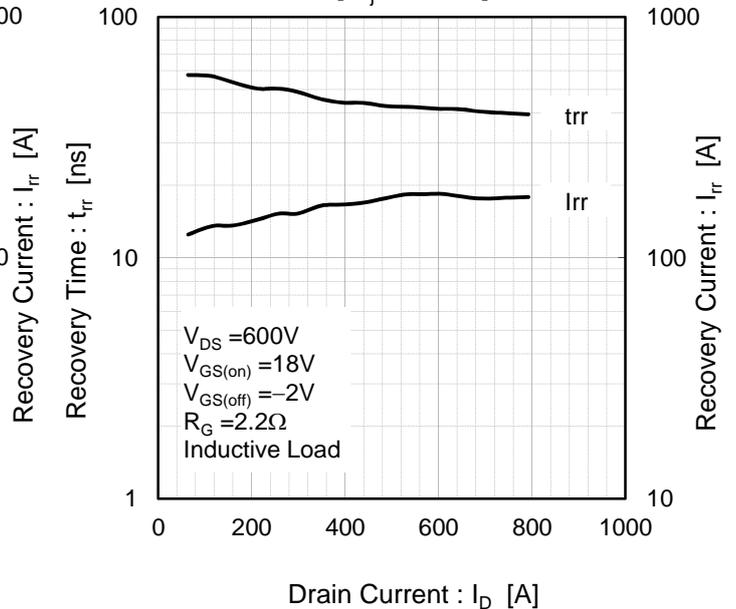


Fig.16 Recovery Characteristics vs. Drain Current [$T_j=125^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

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

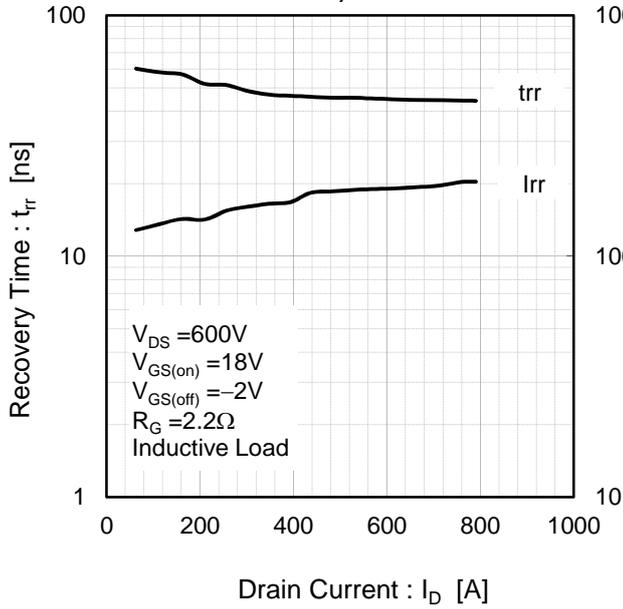


Fig.18 Switching Characteristics vs. Gate Resistance [$T_j=25^{\circ}\text{C}$]

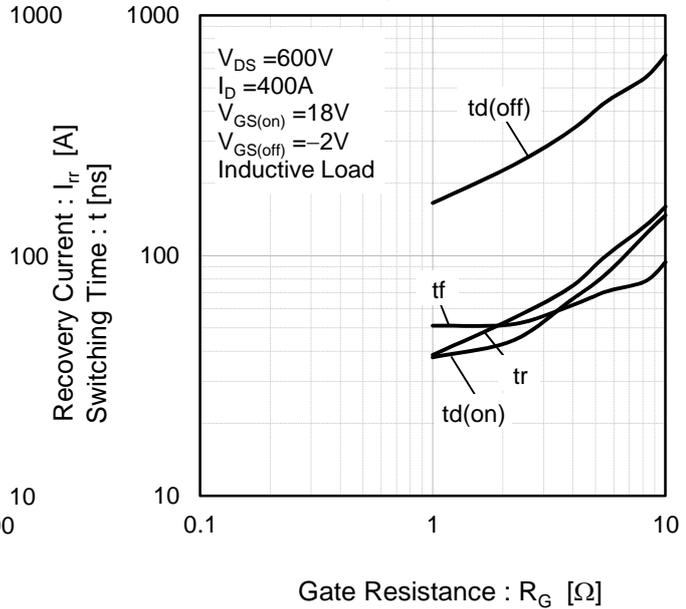


Fig.19 Switching Characteristics vs. Gate Resistance [$T_j=125^{\circ}\text{C}$]

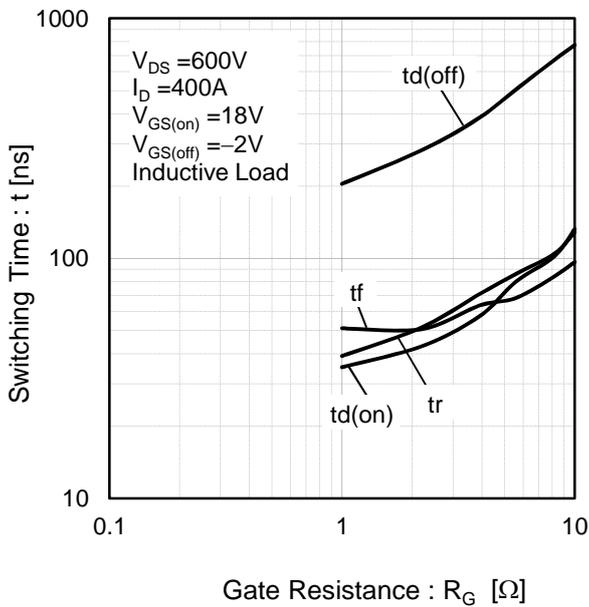
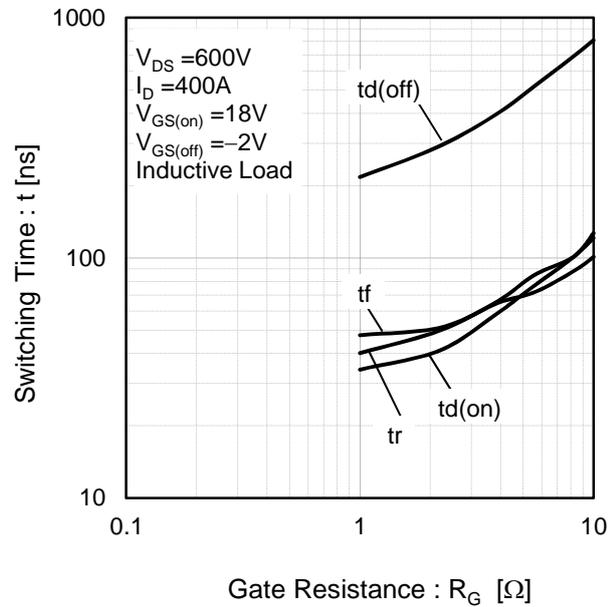


Fig.20 Switching Characteristics vs. Gate Resistance [$T_j=150^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

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

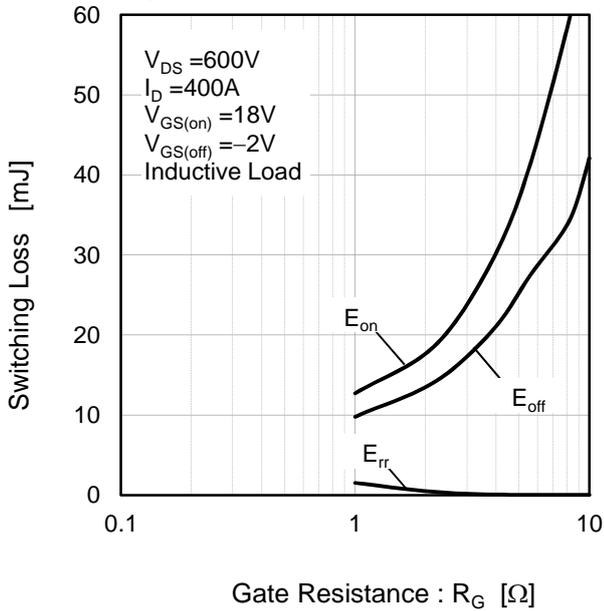


Fig.22 Switching Loss vs. Gate Resistance [$T_j=125^\circ\text{C}$]

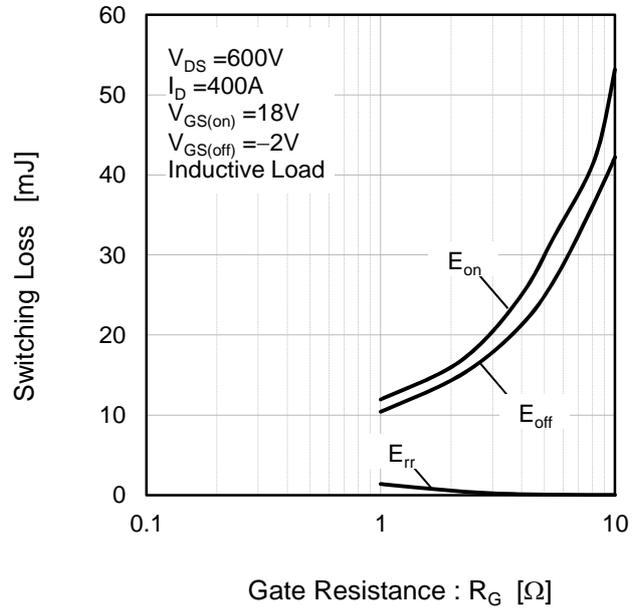


Fig.23 Switching Loss vs. Gate Resistance [$T_j=150^\circ\text{C}$]

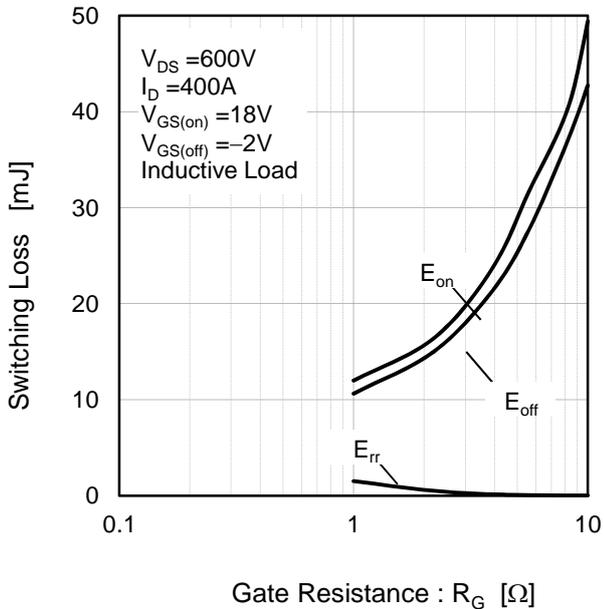
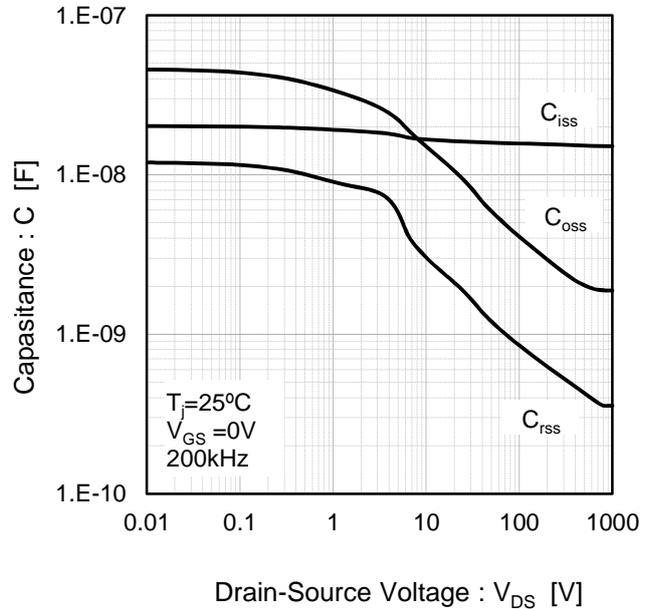


Fig.24 Typical Capacitance vs. Drain-Source Voltage



●Electrical characteristic curves (Typical)

Fig.25 Gate Charge Characteristics

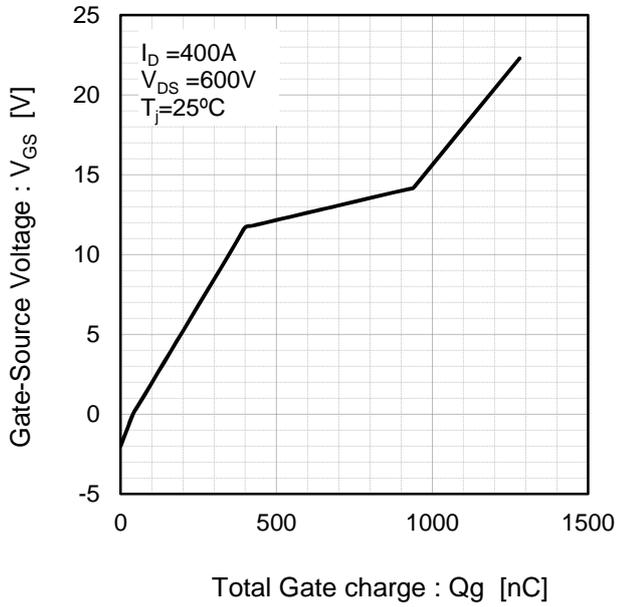
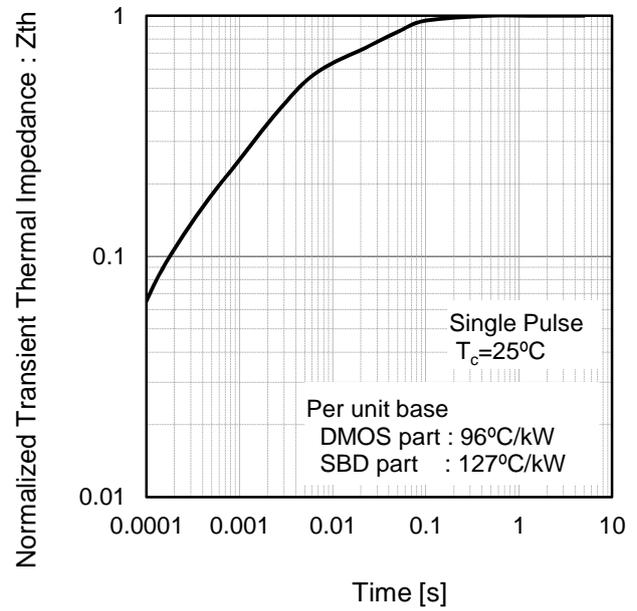


Fig.26 Normalized Transient Thermal Impedance



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