



**THE DATASHEET OF
BSM180D12P3C007**



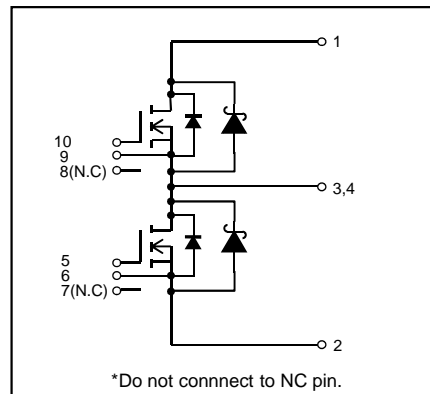
●Application

- 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.

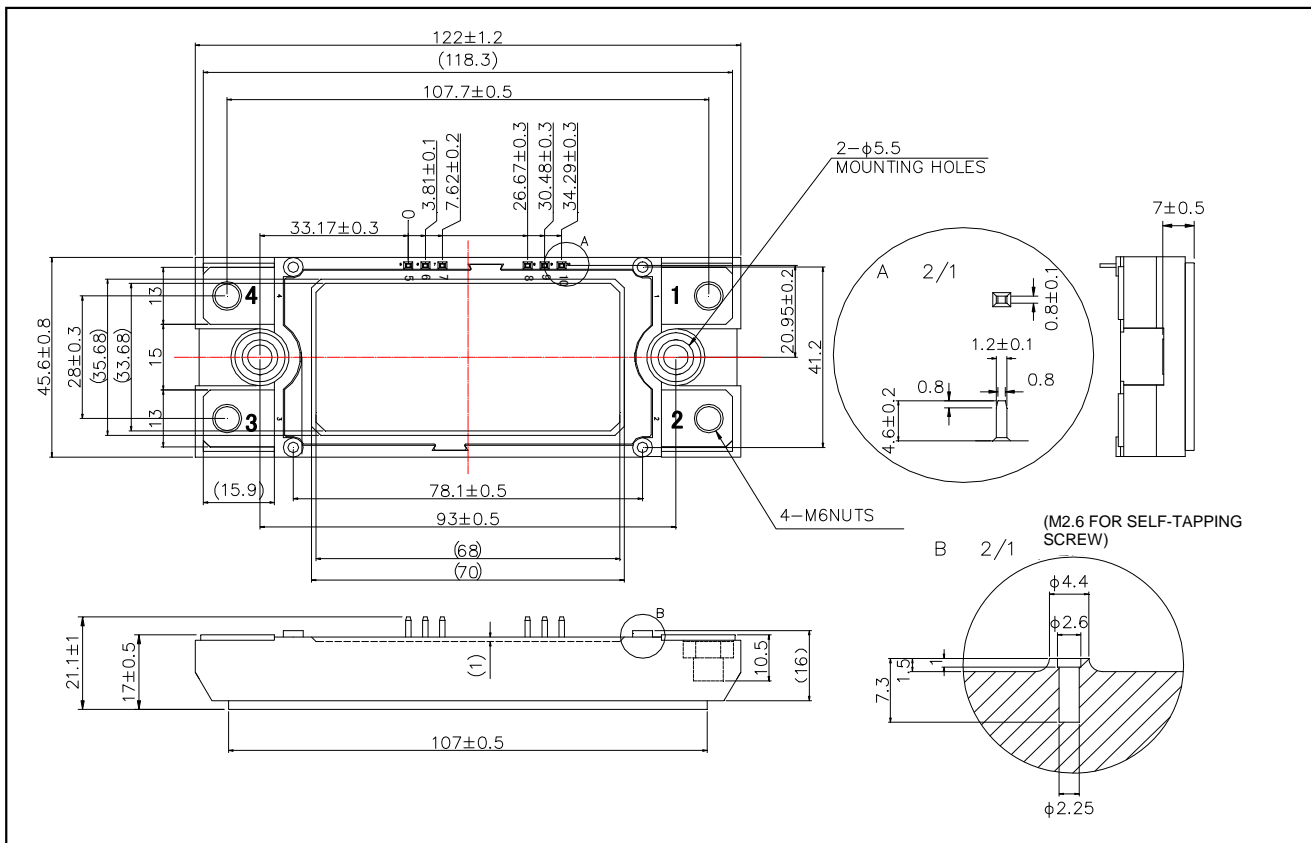
●Circuit diagram



●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 ($T_j = 25^\circ\text{C}$)

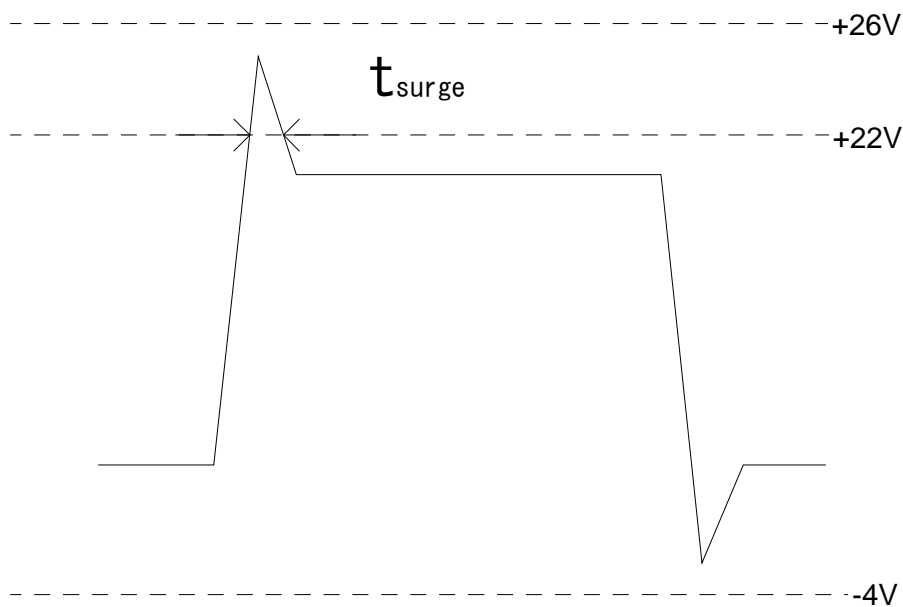
Parameter	Symbol	Conditions	Limit	Unit
Drain-source voltage	V_{DSS}	G-S short	1200	V
Gate-source voltage(+)	V_{GSS}	D-S short	22	
Gate-source voltage(-)			-4	
G - S Voltage ($t_{surge} < 300\text{ns}$)	$V_{GSSsurge}$		-4 to 26	
Drain current *1	I_D	DC ($T_c=60^\circ\text{C}$)	180	A
	I_{DRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms *2	360	
Source current *1	I_S	DC ($T_c=60^\circ\text{C}$) $V_{GS}=18\text{V}$	180	
	I_{SRM}	Pulse ($T_c=60^\circ\text{C}$) 1ms $V_{GS}=18\text{V}$ *2	360	
		Pulse ($T_c=60^\circ\text{C}$) 10 μs $V_{GS}=0\text{V}$ *2	360	
Total power dissipation *3	P_{tot}	$T_c=25^\circ\text{C}$	880	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 *4	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 _C =180A, V _{GS} =18V	T _j =25°C	-	1.8	2.6	V
			T _j =125°C	-	2.7	-	
			T _j =150°C	-	3.1	4	
Drain cutoff current	I _{DSS}	V _{DS} =1200V, V _{GS} =0V	-	-	2	mA	
Source-drain voltage	V _{SD}	V _{GS} =0V, I _S =180A	T _j =25°C	-	2.1	2.6	V
			T _j =125°C	-	2.6	-	
			T _j =150°C	-	2.8	4.3	
		V _{GS} =18V, I _S =180A	T _j =25°C	-	1.4	-	
			T _j =125°C	-	1.9	-	
			T _j =150°C	-	2	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} =10V, I _D =50mA	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)} =-2V *4 V _{DS} =600V I _D =180A R _{G(on)} =8.2Ω, R _{G(off)} =4.7Ω inductive load	-	50	-	ns	
	t _r		-	70	-		
	t _{rr}		-	35	-		
	t _{d(off)}		-	165	-		
	t _f		-	50	-		
Input capacitance	C _{iss}	V _{DS} =10V, V _{GS} =0V, 200kHz	-	9	-	nF	
Gate Registance	R _{Gint}	T _j =25°C	-	1.4	-	Ω	
Stray Inductance	L _s			25.0	-	nH	
Creepage Distance	-	Terminal to heat sink		11.5	-	mm	
		Terminal to terminal		19.0	-	mm	
Clearance Distance	-	Terminal to heat sink		9.5	-	mm	
		Terminal to terminal		13.0	-	mm	
Junction-to-case thermal resistance	R _{th(j-c)}	UMOSFET (1/2 module) *5	-	-	0.17	°C/W	
		SBD (1/2 module) *5	-	-	0.21		
Case-to-heat sink Thermal resistance	R _{th(c-f)}	Case to heat sink, per 1 module, Thermal grease applied *6	-	0.035	-	°C/W	

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

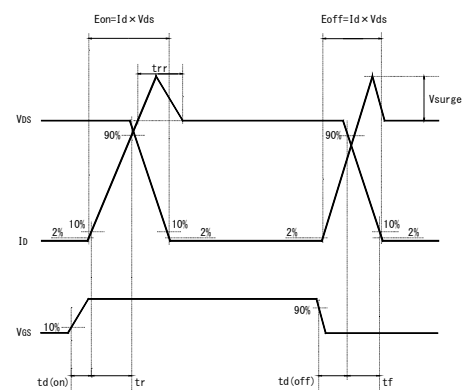
(*5) Measurement of T_c is to be done at the point just under the chip.

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

(*7) SiC devices have lower short circuit withstand capability due to high current density. Please be advised to pay careful attention to short circuit 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.

<Wavelength for Switching Test>



●Electrical characteristic curves (Typical)

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

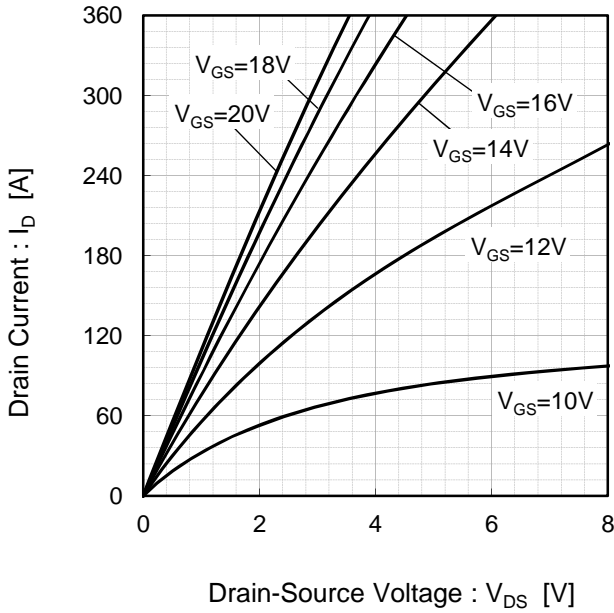


Fig.2 Drain-Source Voltage vs. Drain Current [$T_j=25^\circ\text{C}$]

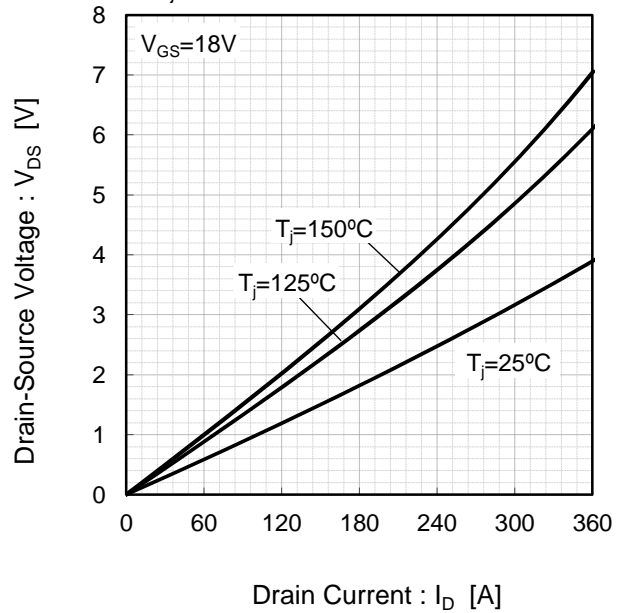


Fig.3 Drain-Source Voltage vs. Gate-Source Voltage [$T_j=25^\circ\text{C}$]

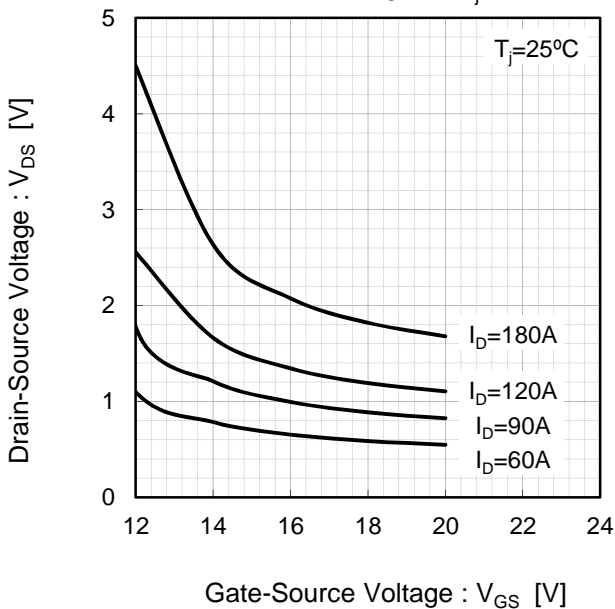
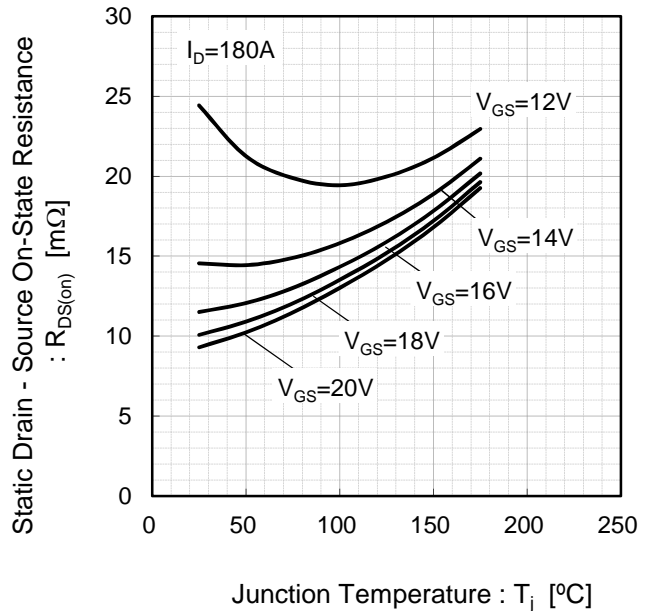


Fig.4 Static Drain - Source On-State Resistance vs. Junction Temperature



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode

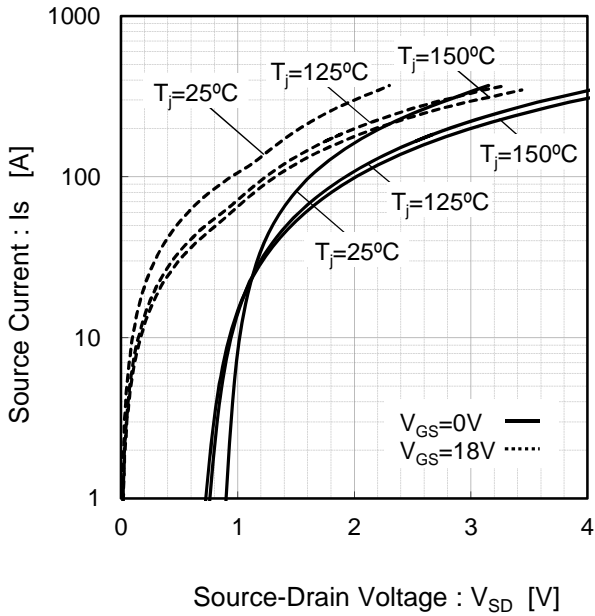


Fig.6 Forward characteristic of Diode

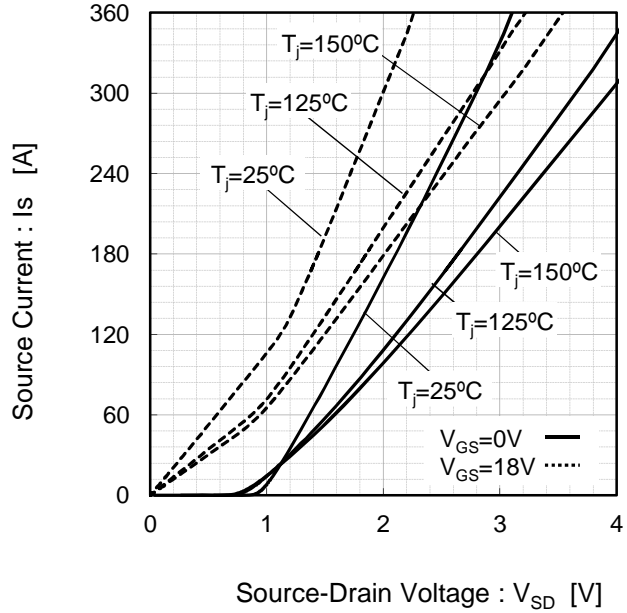


Fig.7 Drain Current vs. Gate-Source Voltage

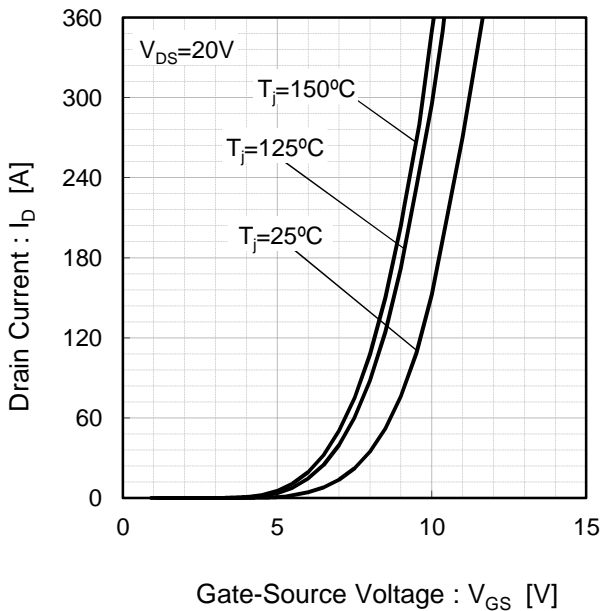
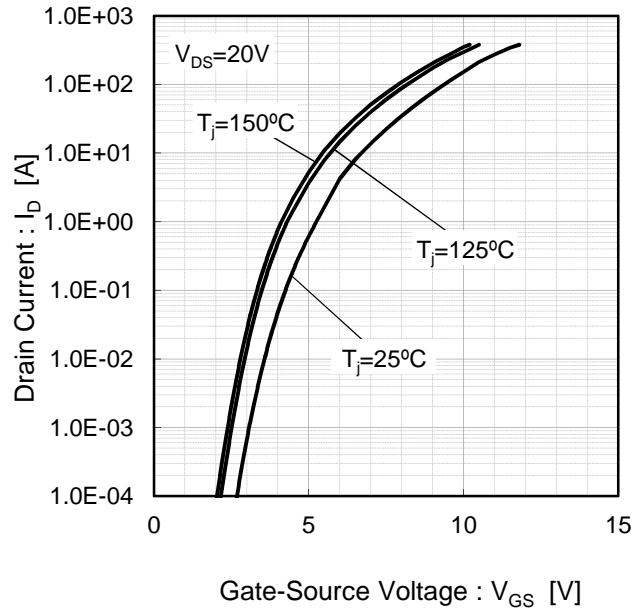


Fig.8 Drain Current vs. Gate-Source Voltage



●Electrical characteristic curves (Typical)

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

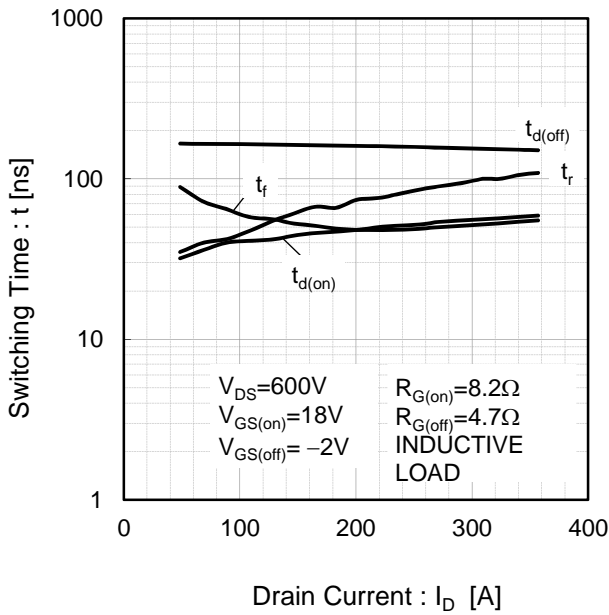


Fig.10 Switching Characteristics [$T_j=125^{\circ}\text{C}$]

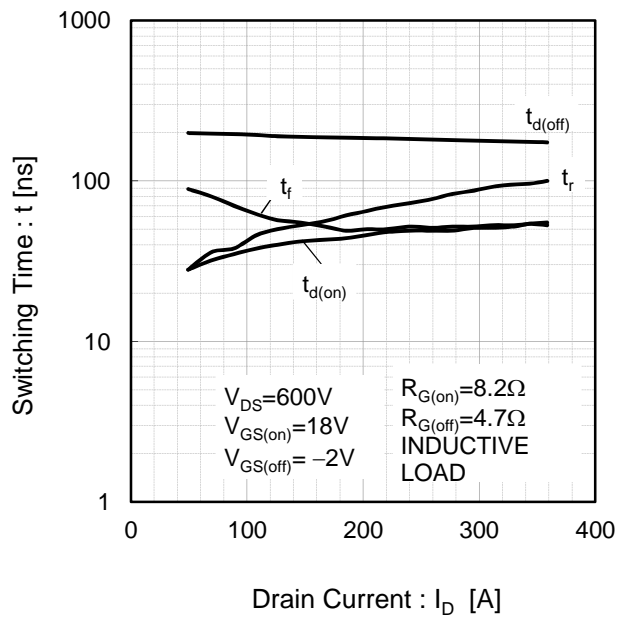


Fig.11 Switching Characteristics [$T_j=150^{\circ}\text{C}$]

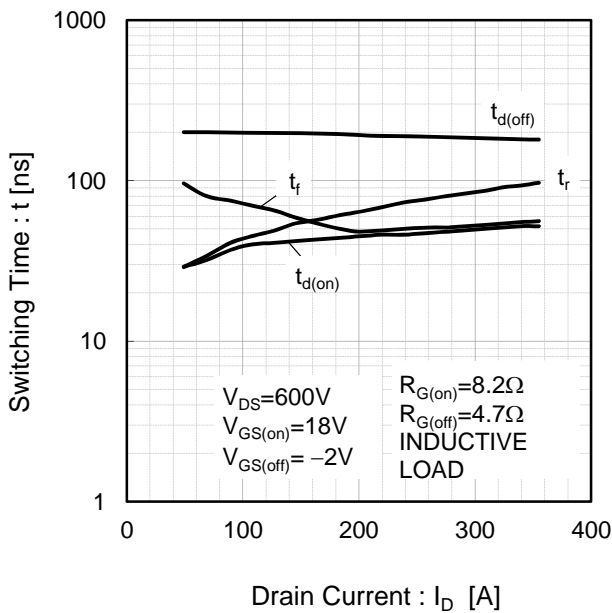
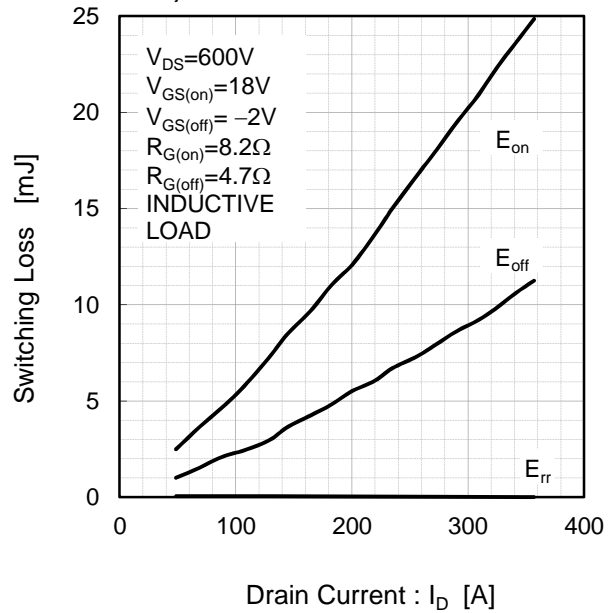


Fig.12 Switching Loss vs. Drain Current [$T_j=25^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

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

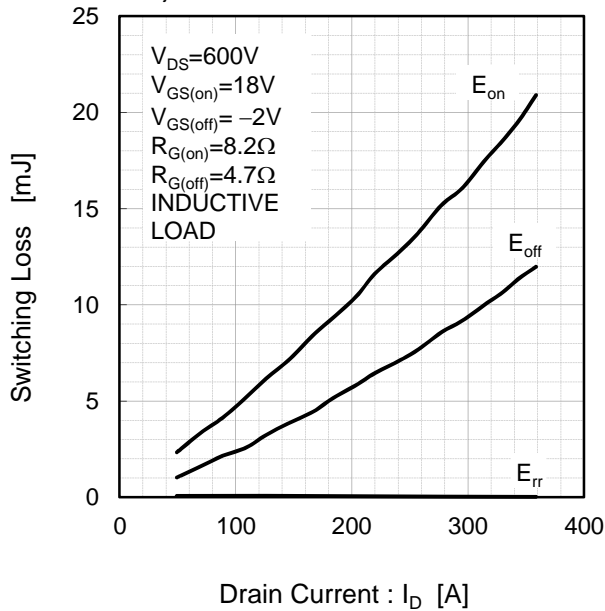


Fig.14 Switching Loss vs. Drain Current [$T_j=150^{\circ}\text{C}$]

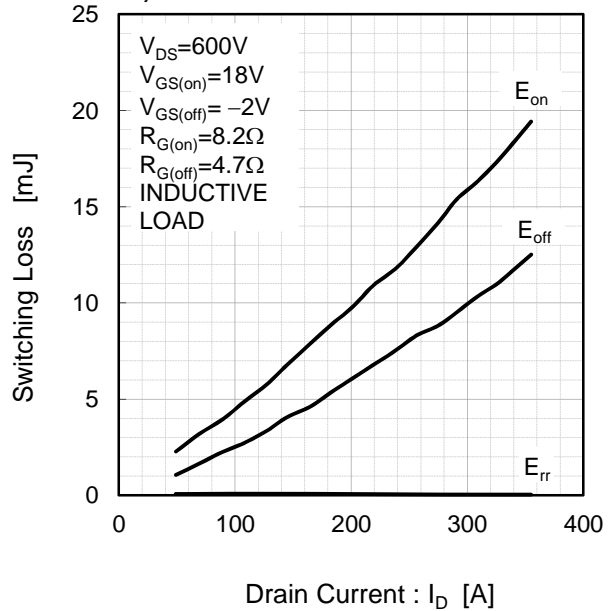


Fig.15 Recovery Characteristics vs. Drain Current [$T_j=25^{\circ}\text{C}$]

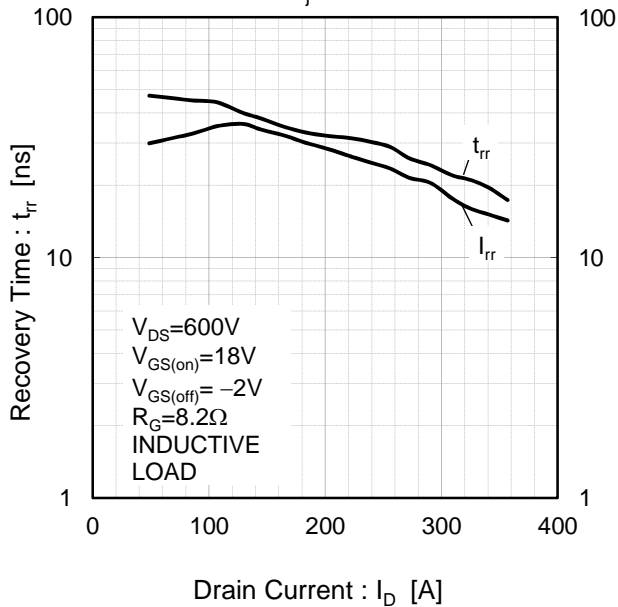
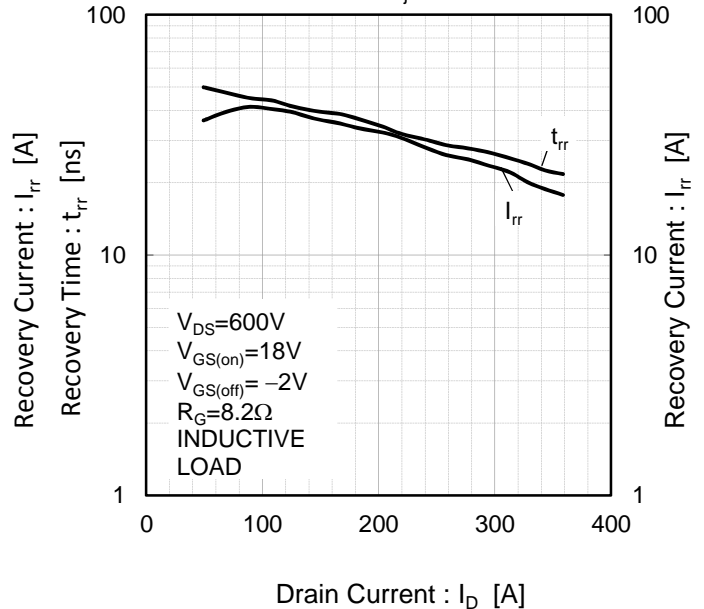


Fig.16 Recovery Characteristics vs. Drain Current [$T_j=125^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

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

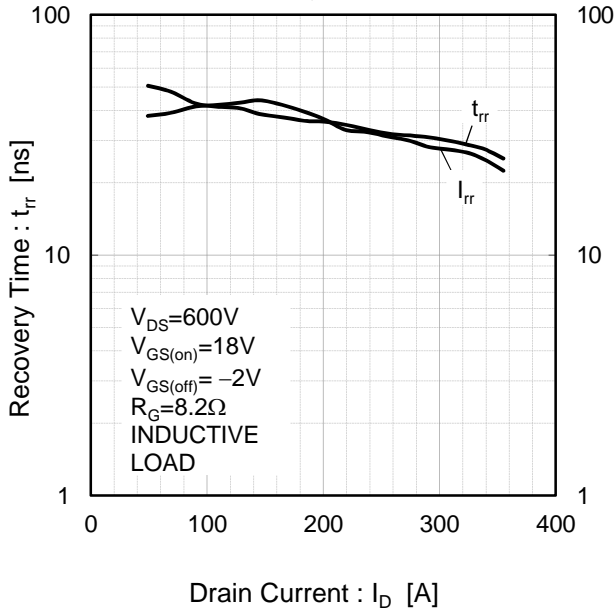


Fig.18 Switching Characteristics vs. Gate Resistance [$T_j=25^{\circ}\text{C}$]

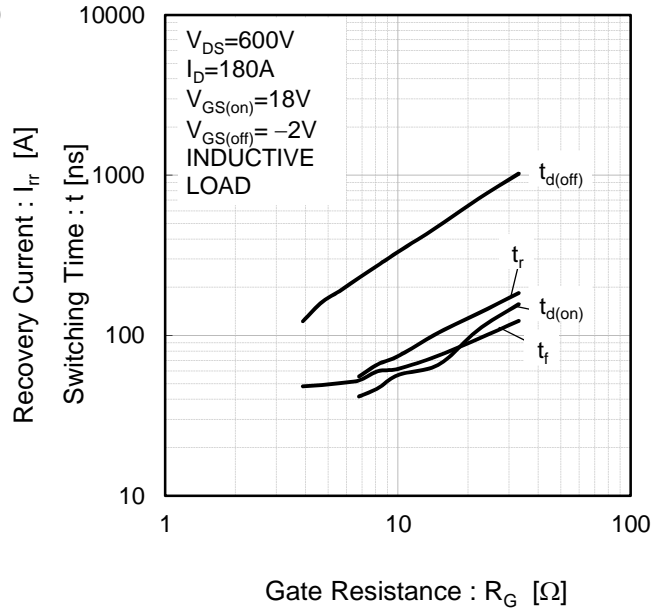


Fig.19 Switching Characteristics vs. Gate Resistance [$T_j=125^{\circ}\text{C}$]

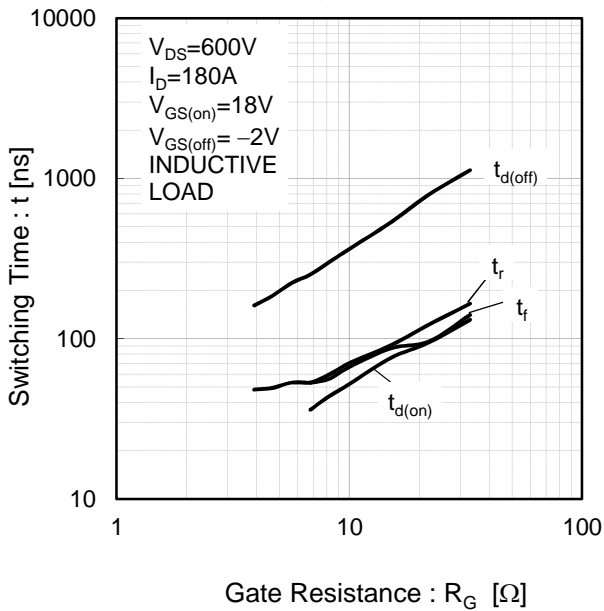
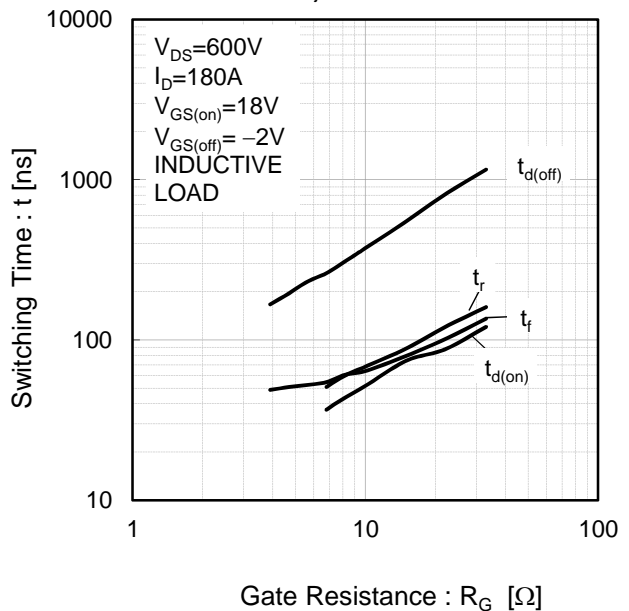


Fig.20 Switching Characteristics vs. Gate Resistance [$T_j=150^{\circ}\text{C}$]



●Electrical characteristic curves (Typical)

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

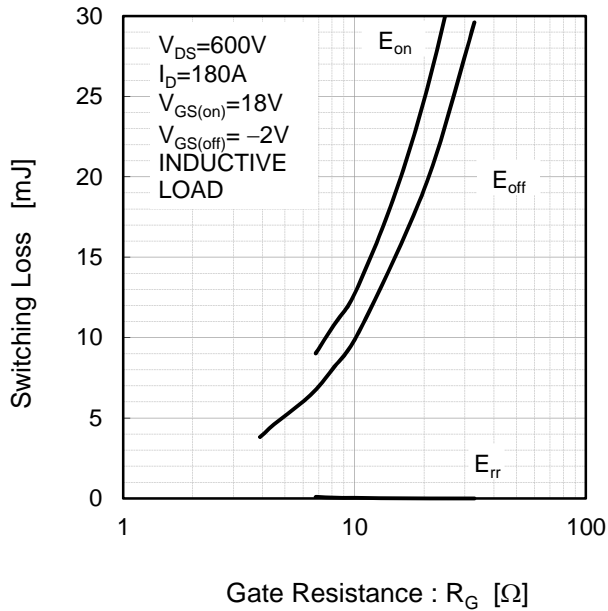


Fig.22 Switching Loss vs. Gate Resistance [$T_j=125^{\circ}\text{C}$]

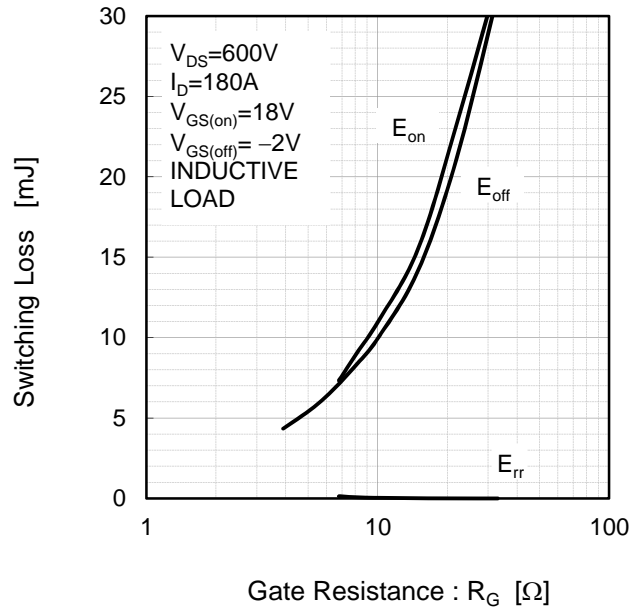


Fig.23 Switching Loss vs. Gate Resistance [$T_j=150^{\circ}\text{C}$]

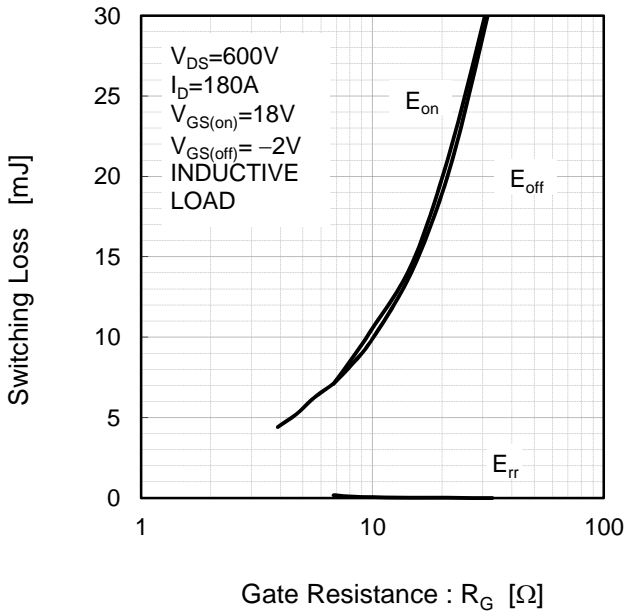
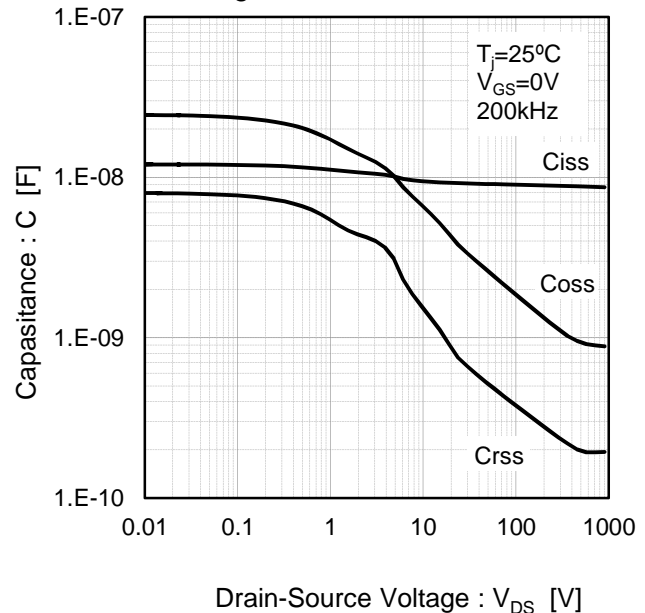


Fig.24 Typical Capacitance vs. Drain-Source Voltage



●Electrical characteristic curves (Typical)

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

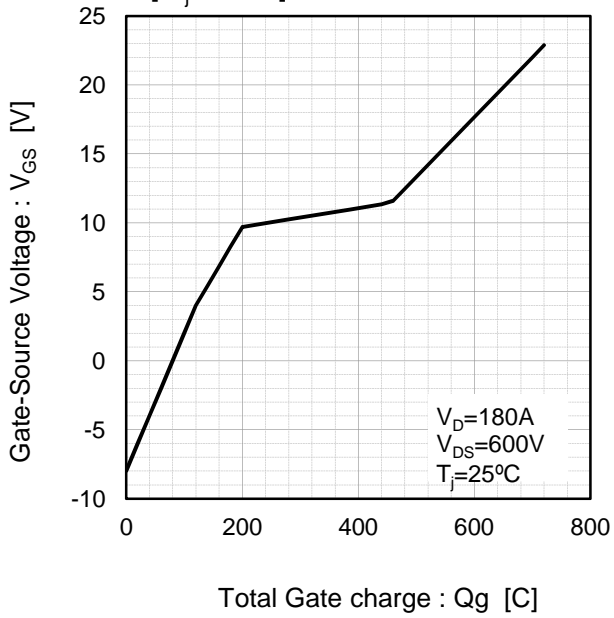
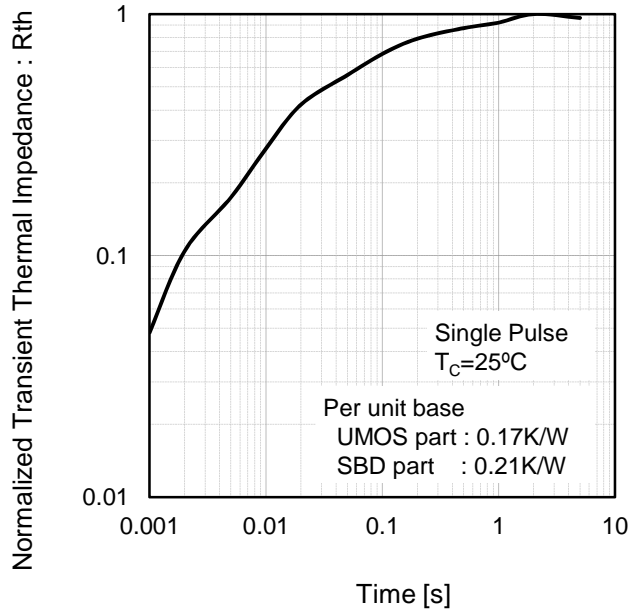


Fig.26 Normalized Transient Thermal Impedance



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