

### ●Application

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

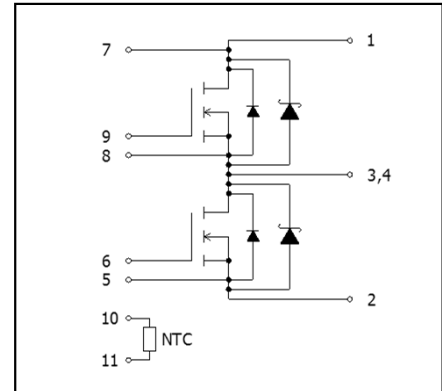
### ●Features

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

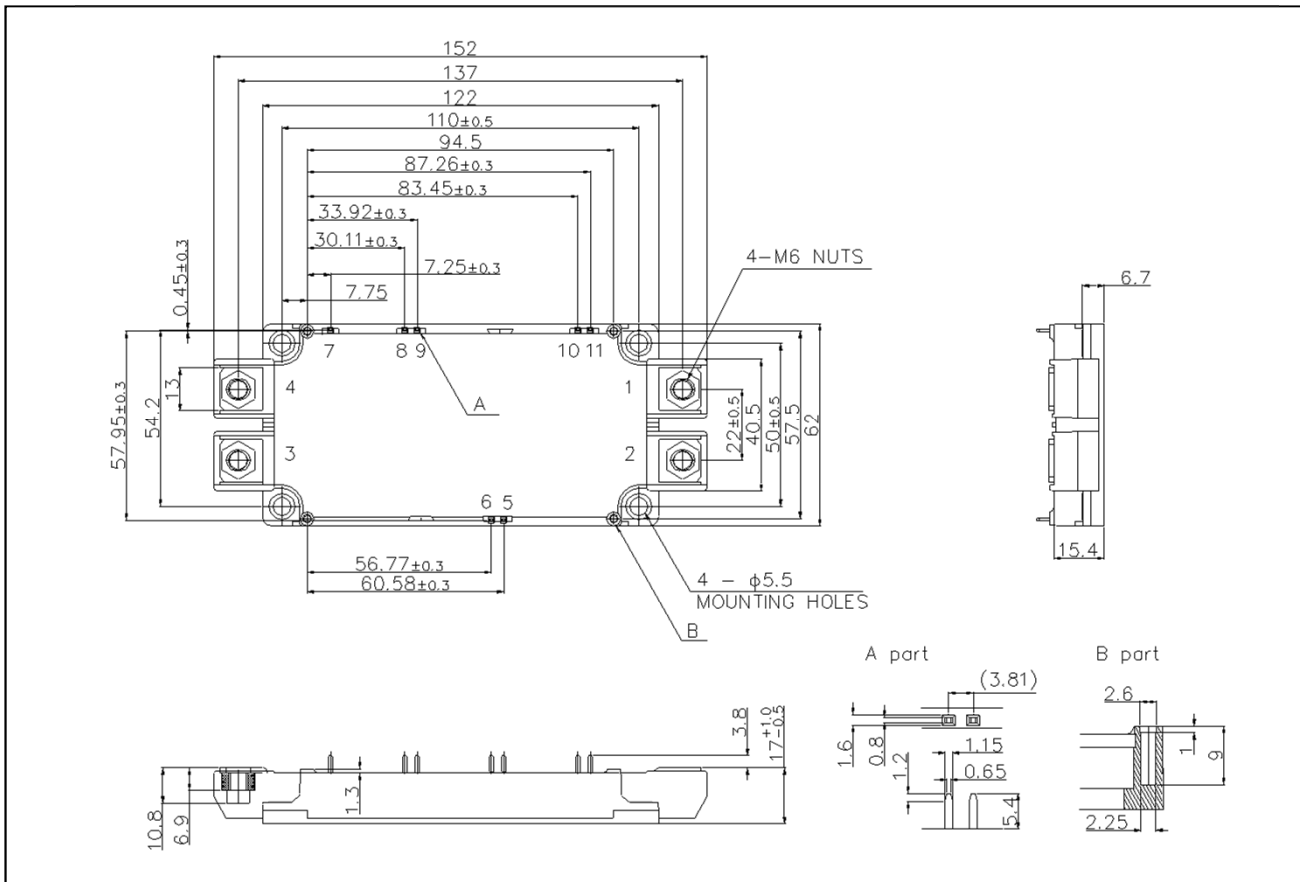
### ●Construction

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

### ●Circuit diagram



### ●Dimensions & Pin layout (Unit : mm)



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

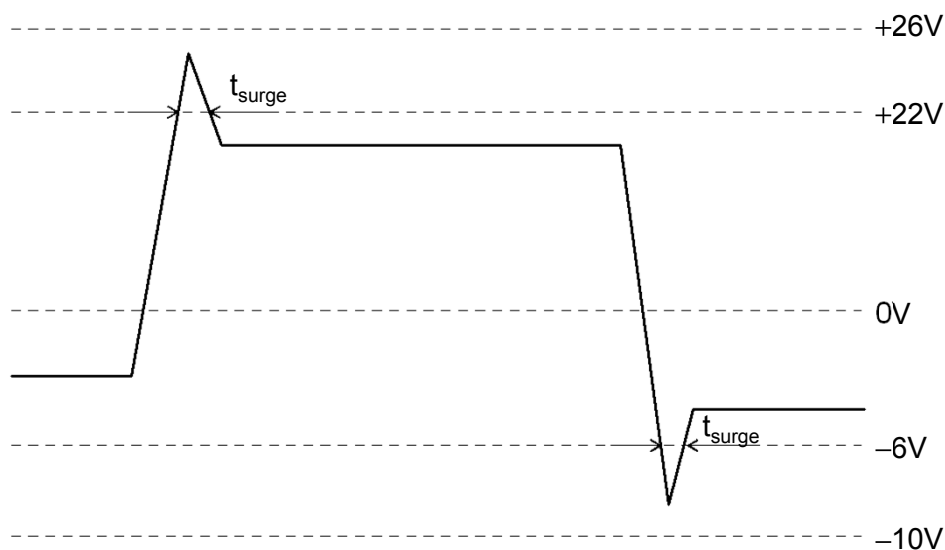
Parameter	Symbol	Conditions	Limit	Unit
Drain-source voltage	$V_{DSS}$	G-S short	1200	V
Gate-source voltage(+)	$V_{GSS}$	D-S short	22	
Gate-source voltage(-)			-6	
G - S Voltage ( $t_{surge} < 300\text{nsec}$ )	$V_{GSS\_surge}$	D-S short	-10 to 26	
Drain current * <sup>1</sup>	$I_D$	DC ( $T_c=60^\circ\text{C}$ )	204	A
	$I_{DRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 1ms * <sup>2</sup>	360	
	$I_{DRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 10us * <sup>2</sup>	540	
Source current * <sup>1</sup>	$I_S$	DC ( $T_c=60^\circ\text{C}$ ) $V_{GS}=18\text{V}$	204	
	$I_{SRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 1ms $V_{GS}=18\text{V}$ * <sup>2</sup>	360	
	$I_{SRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 10us $V_{GS}=18\text{V}$ * <sup>2</sup>	540	
Total power dissipation * <sup>3</sup>	$P_{tot}$	$T_c=25^\circ\text{C}$	1360	W
Max Junction Temperature	$T_{jmax}$		175	°C
Operating junction temperature	$T_{jop}$		-40 to 150	
Storage temperature	$T_{stg}$		-40 to 125	
Isolation voltage	$V_{isol}$	Terminals to baseplate, f=60Hz AC 1min.	2500	Vrms
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)  $T_j$  is less than  $175^\circ\text{C}$

Example of acceptable  $V_{GS}$  waveform



### ●Electrical characteristics (T<sub>j</sub>=25°C)

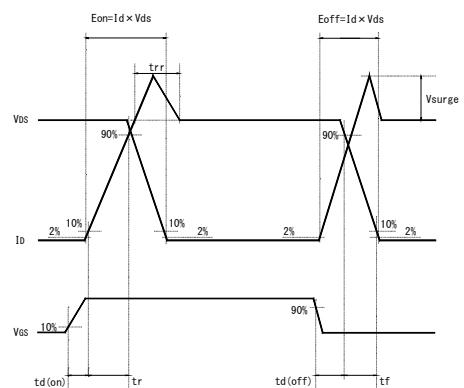
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Static drain-source on-state voltage	V <sub>DS(on)</sub>	I <sub>D</sub> 180A, V <sub>GS</sub> =18V	T <sub>j</sub> =25°C	-	2.2	3.2	V
			T <sub>j</sub> =125°C	-	3.1	-	
			T <sub>j</sub> =150°C	-	3.5	5.0	
Drain cutoff current	I <sub>DSS</sub>	V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V	-	-	3.2	mA	
Source-drain voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =180A	T <sub>j</sub> =25°C	-	1.6	2.2	V
			T <sub>j</sub> =125°C	-	2	-	
			T <sub>j</sub> =150°C	-	2.2	3.3	
		V <sub>GS</sub> =18V, I <sub>S</sub> =180A	T <sub>j</sub> =25°C	-	1.3	-	
			T <sub>j</sub> =125°C	-	1.5	-	
			T <sub>j</sub> =150°C	-	1.6	-	
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =35.2mA	1.6	-	4	V	
Gate-source leakage current	I <sub>GSS</sub>	V <sub>GS</sub> =22V, V <sub>DS</sub> =0V	-	-	0.5	μA	
		V <sub>GS</sub> =-6V, V <sub>DS</sub> =0V	-0.5	-	-		
Switching characteristics	t <sub>d(on)</sub>	V <sub>GS(on)</sub> =18V, V <sub>GS(off)</sub> =0V	-	45	-	ns	
	t <sub>r</sub>	V <sub>DS</sub> =600V	-	45	-		
	t <sub>rr</sub>	I <sub>D</sub> =180A	-	45	-		
	t <sub>d(off)</sub>	R <sub>G(on)</sub> =1.0Ω, R <sub>G</sub> =0.2Ω	-	125	-		
	t <sub>f</sub>	inductive load	-	45	-		
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, 200kHz	-	18	-	nF	
Gate Resistance	R <sub>Gint</sub>	T <sub>j</sub> =25°C	-	1.2	-	Ω	
NTC Rated Resistance	R25			5.0		kΩ	
NTC B Value	B50/25			3370		K	
Stray Inductance	L <sub>s</sub>			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 <sub>th(j-c)</sub>	DMOS (1/2 module) *4	-	-	0.11	°C/W	
		SBD (1/2 module) *4	-	-	0.14		
Case-to-heat sink Thermal resistance	R <sub>th(c-f)</sub>	Case to heat sink, per 1 module, Thermal grease applied *5	-	0.035	-		

(\*4) Measurement of T<sub>c</sub> 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) 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

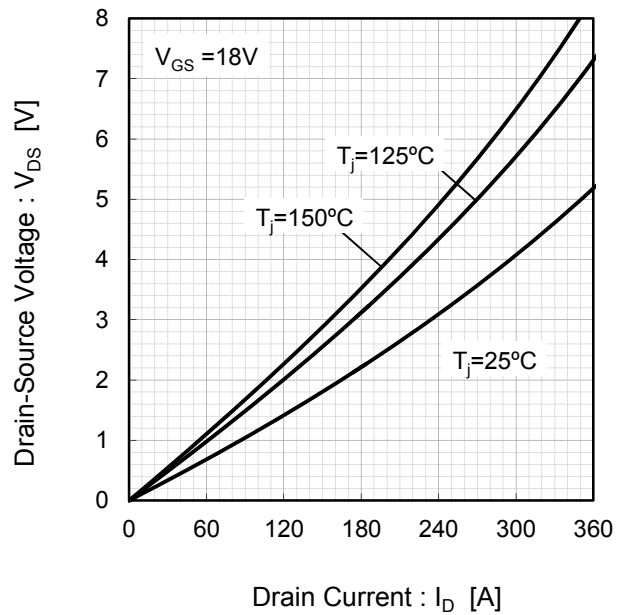
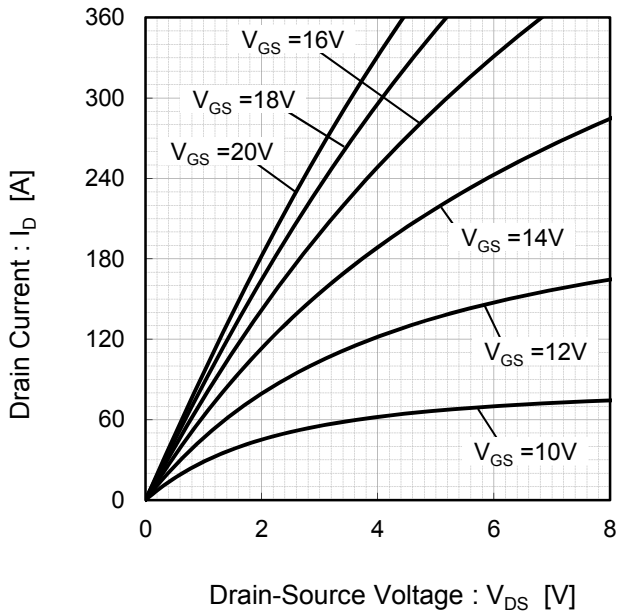
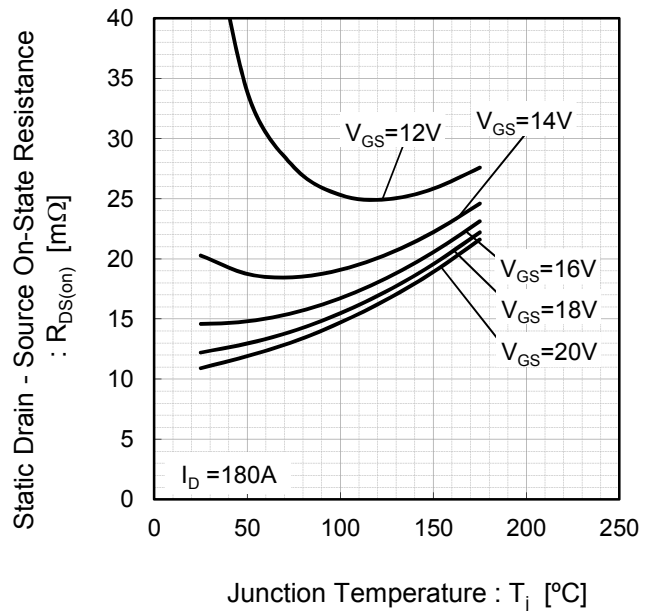
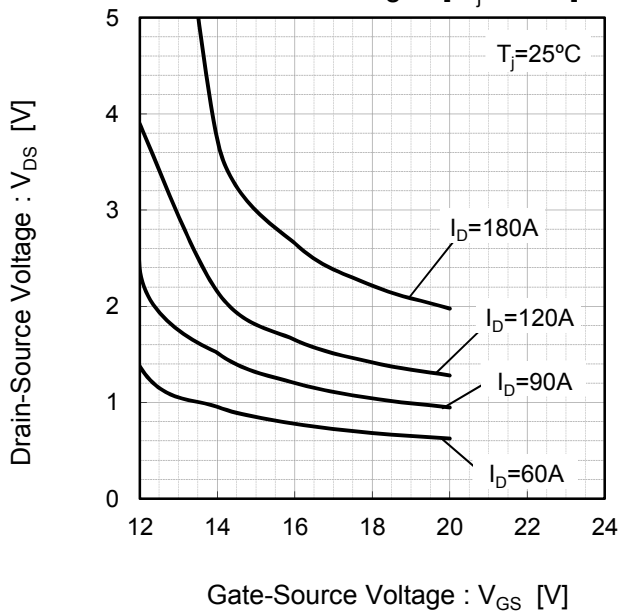


Fig.3 Drain-Source Voltage vs. Gate-Source Voltage [  $T_j=25^\circ\text{C}$  ]

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



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode

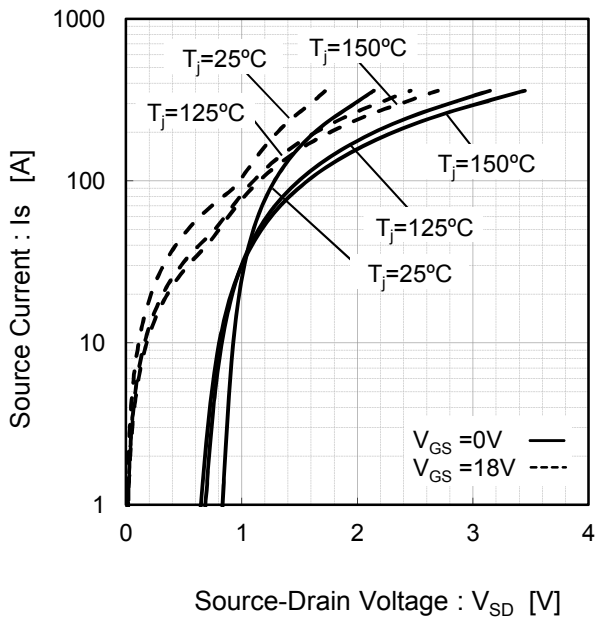


Fig.6 Forward characteristic of Diode

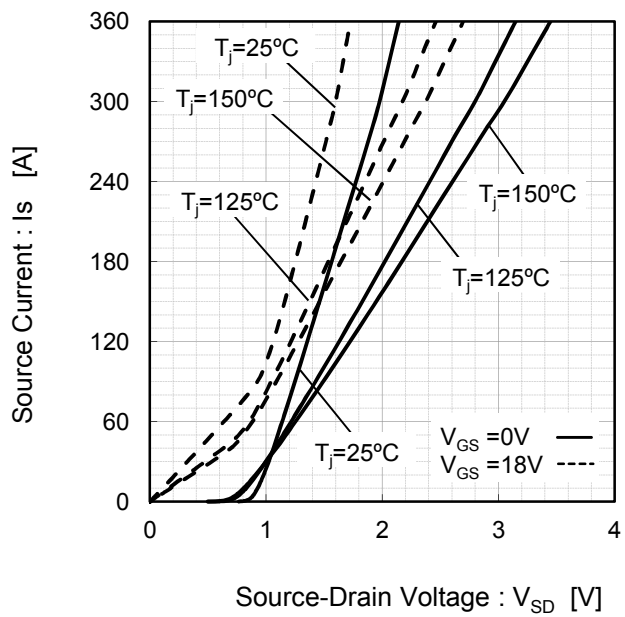


Fig.7 Drain Current vs. Gate-Source Voltage

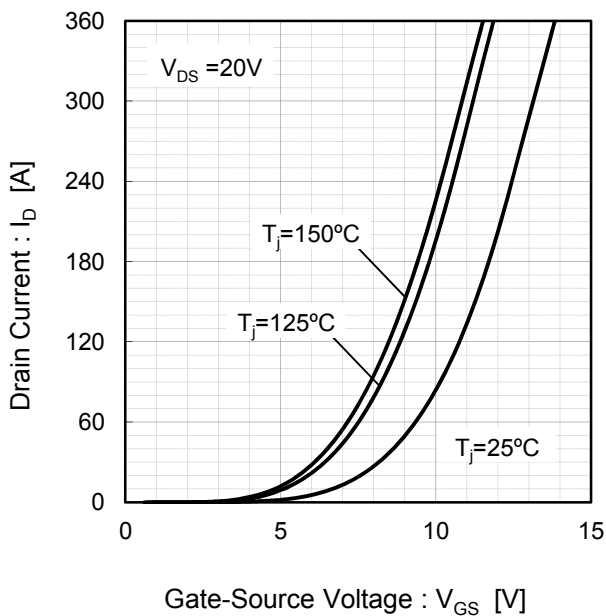
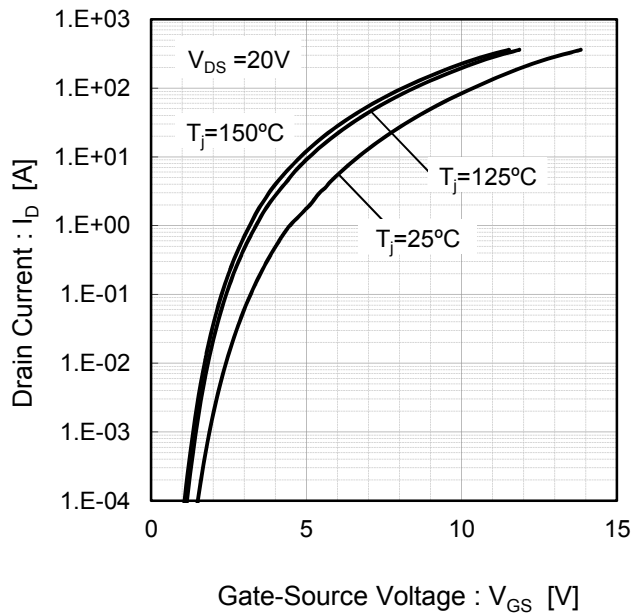


Fig.8 Drain Current vs. Gate-Source Voltage



●Electrical characteristic curves (Typical)

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

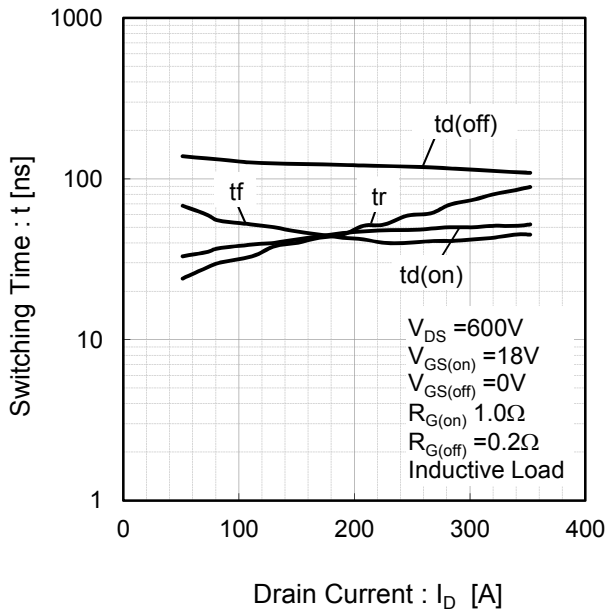


Fig.10 Switching Characteristics [  $T_j=125^\circ\text{C}$  ]

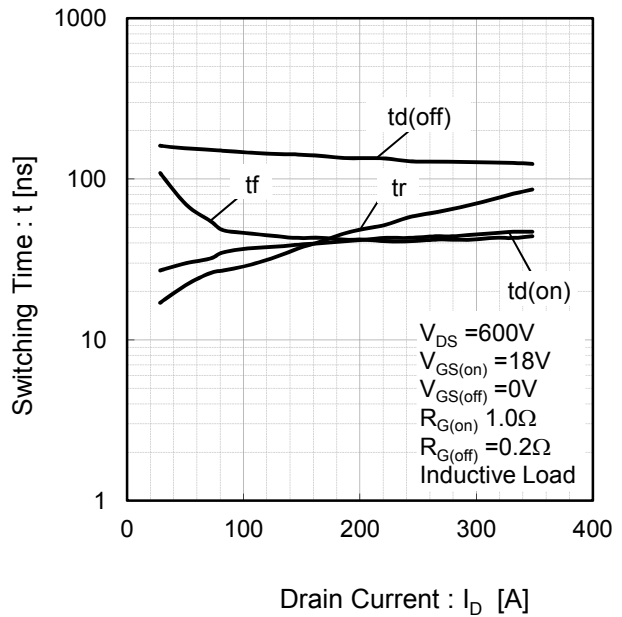


Fig.11 Switching Characteristics [  $T_j=150^\circ\text{C}$  ]

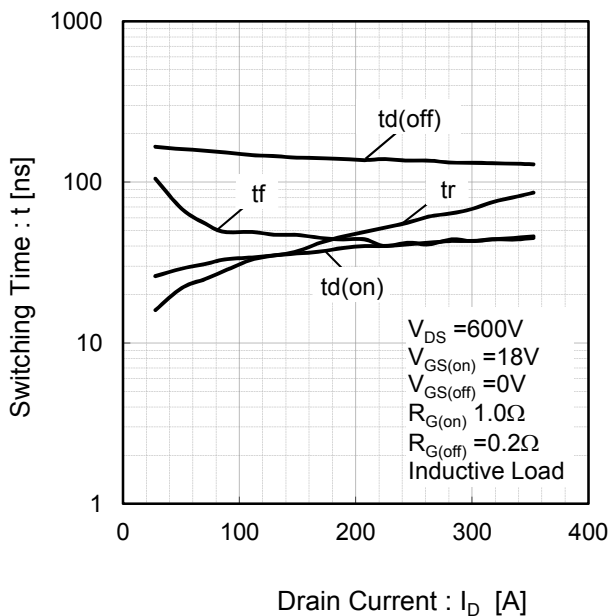
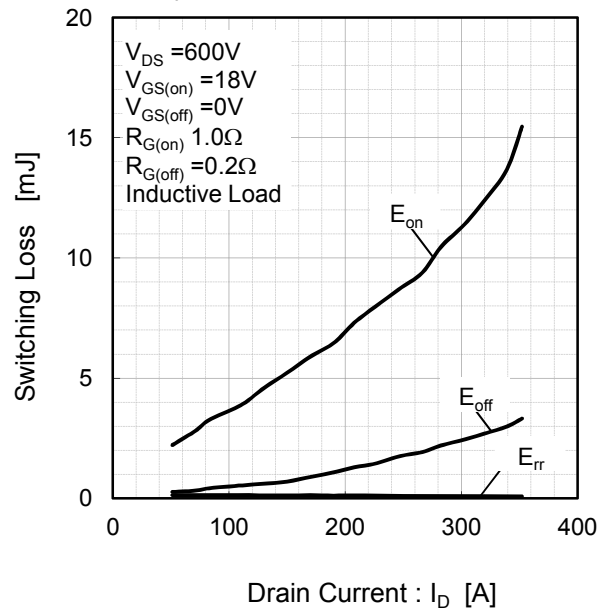


Fig.12 Switching Loss vs. Drain Current [  $T_j=25^\circ\text{C}$  ]



●Electrical characteristic curves (Typical)

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

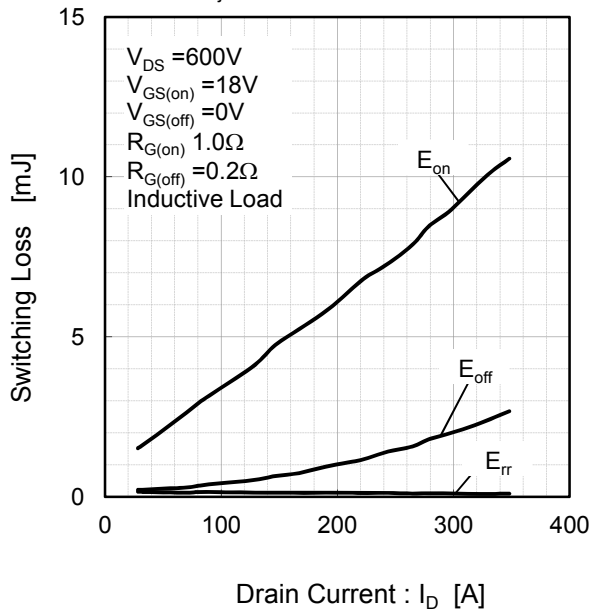


Fig.14 Switching Loss vs. Drain Current [  $T_j=150^{\circ}\text{C}$  ]

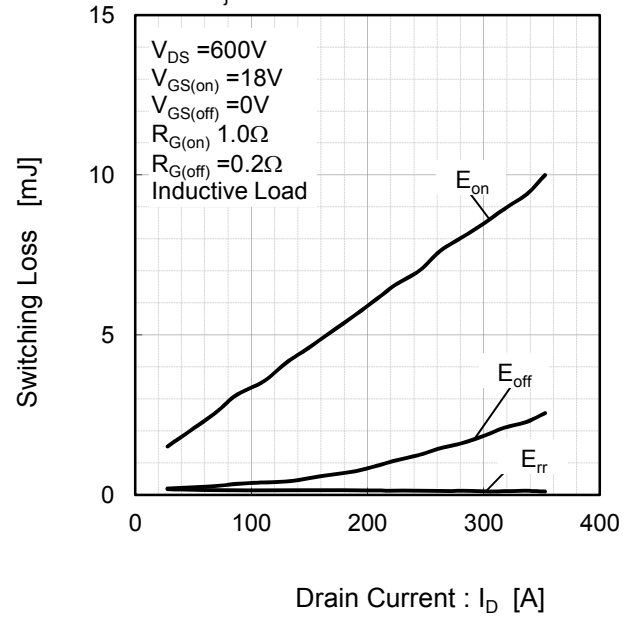


Fig.15 Recovery Characteristics vs. Drain Current [  $T_j=25^{\circ}\text{C}$  ]

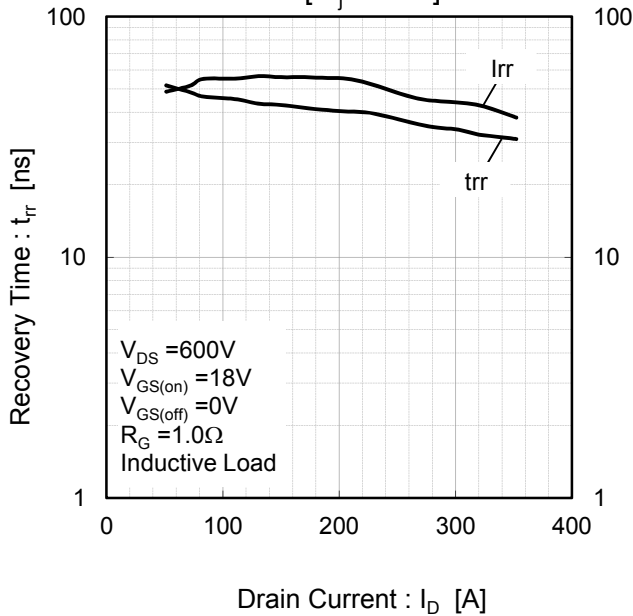
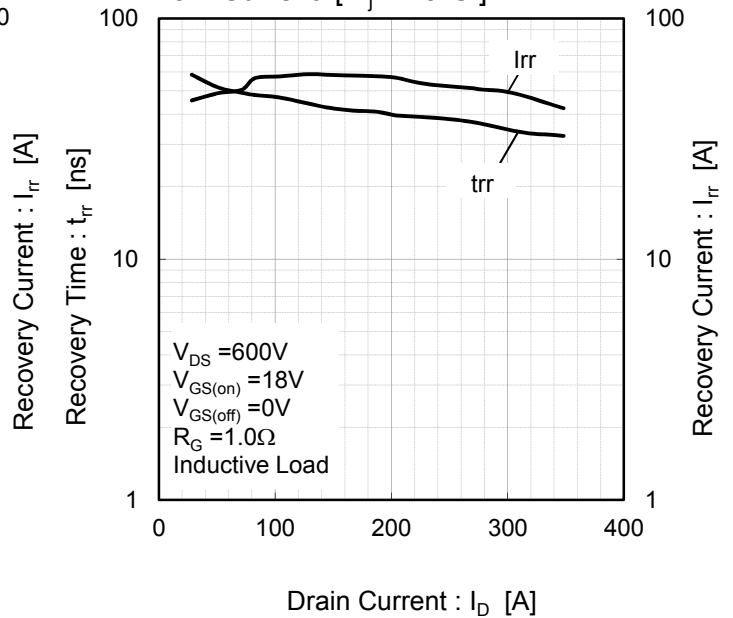


Fig.16 Recovery Characteristics vs. Drain Current [  $T_j=125^{\circ}\text{C}$  ]



●Electrical characteristic curves (Typical)

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

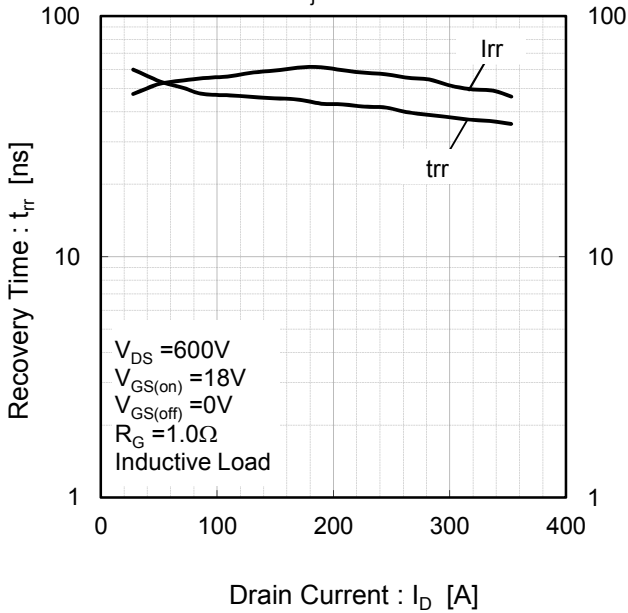


Fig.18 Switching Characteristics vs. Gate Resistance [  $T_j=25^{\circ}\text{C}$  ]

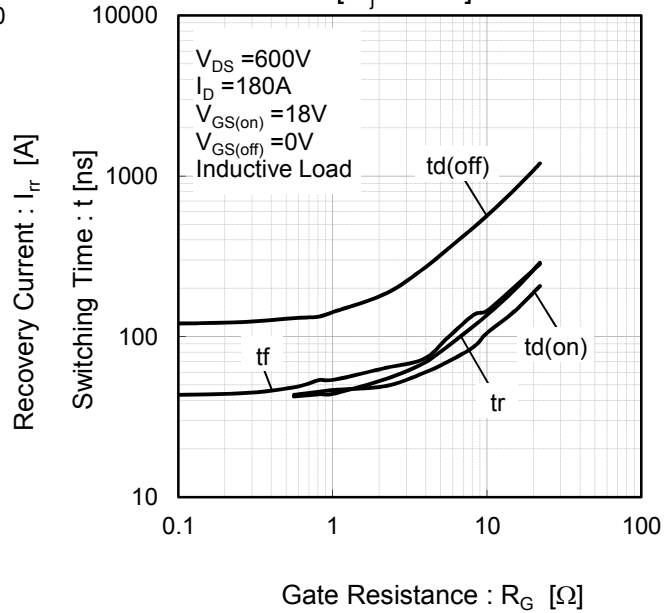


Fig.19 Switching Characteristics vs. Gate Resistance [  $T_j=125^{\circ}\text{C}$  ]

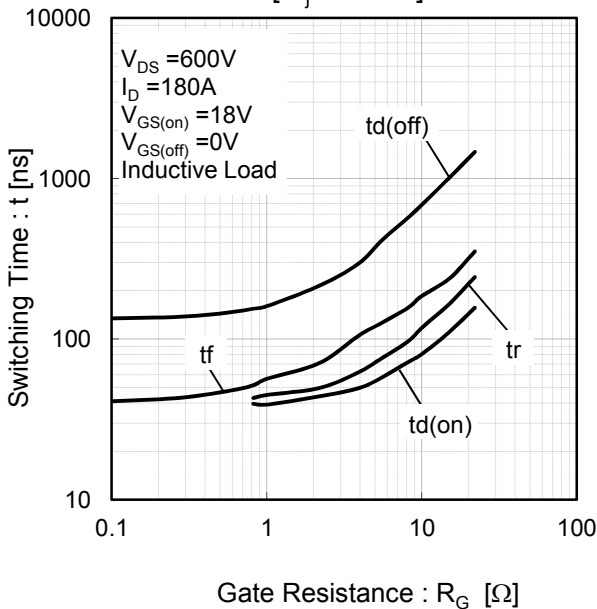
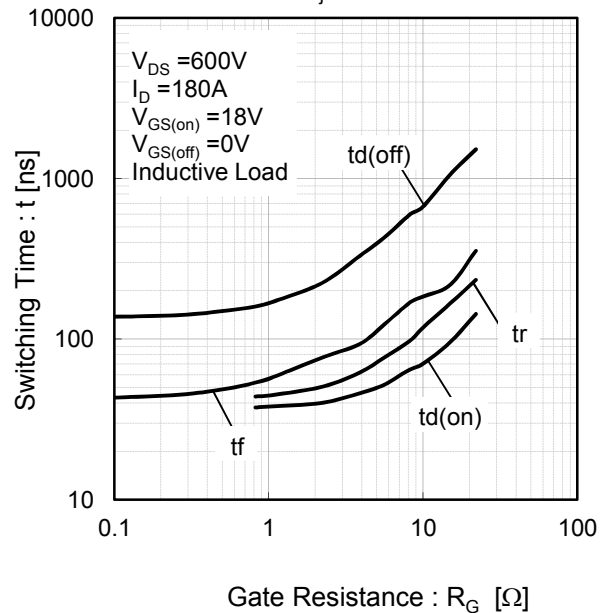


Fig.20 Switching Characteristics vs. Gate Resistance [  $T_j=150^{\circ}\text{C}$  ]





●Electrical characteristic curves (Typical)

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

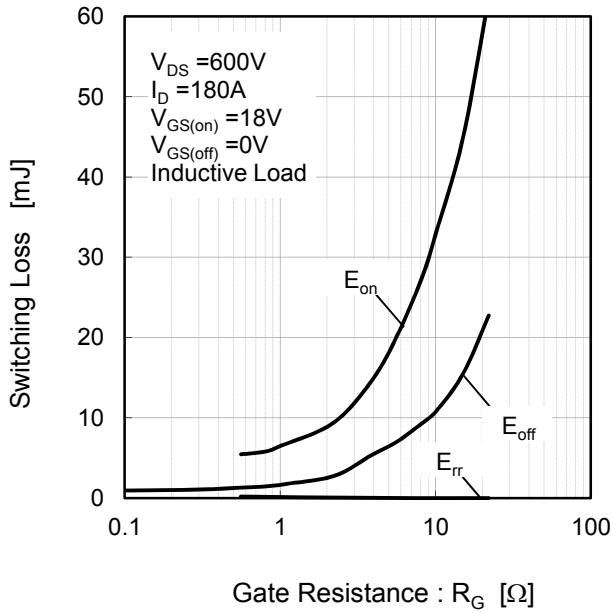


Fig.22 Switching Loss vs. Gate Resistance [  $T_j=125^\circ\text{C}$  ]

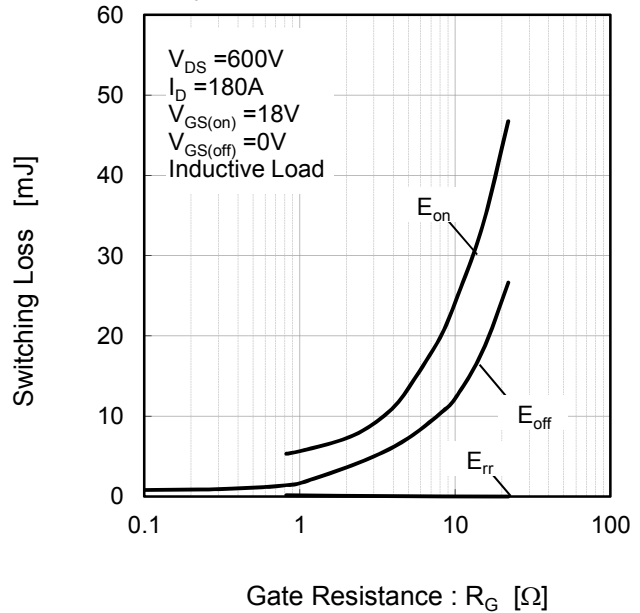


Fig.23 Switching Loss vs. Gate Resistance [  $T_j=150^\circ\text{C}$  ]

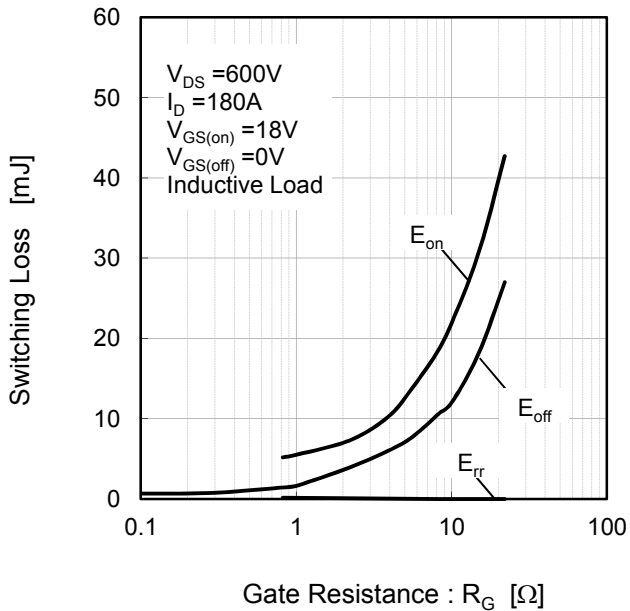
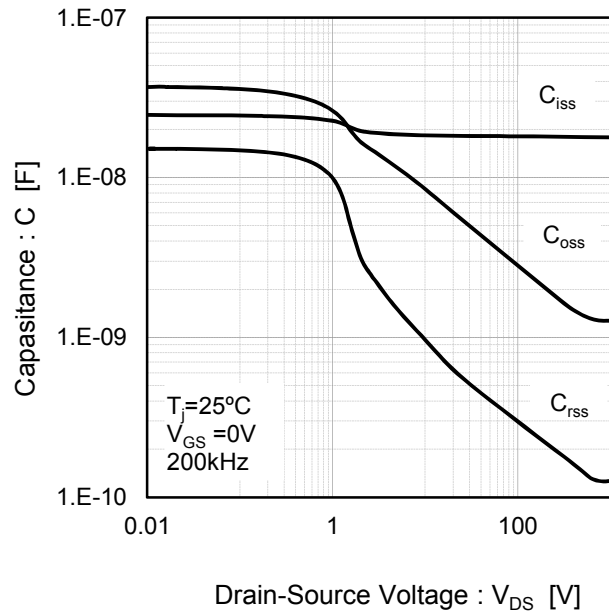


Fig.24 Typical Capacitance vs. Drain-Source Voltage



●Electrical characteristic curves (Typical)

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

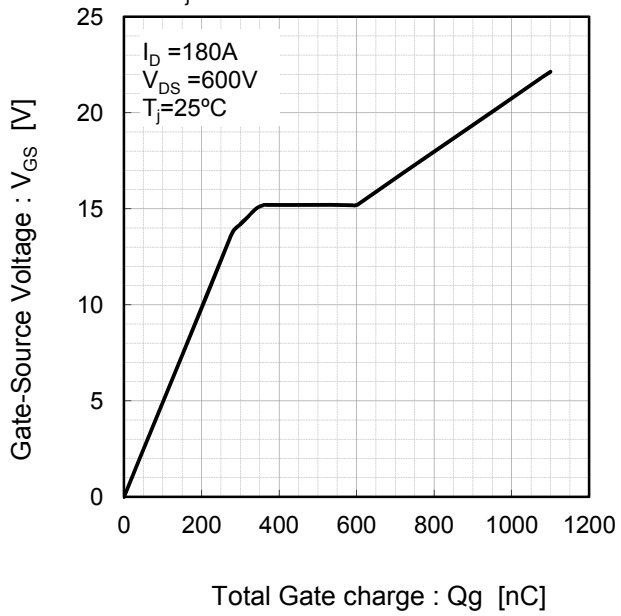
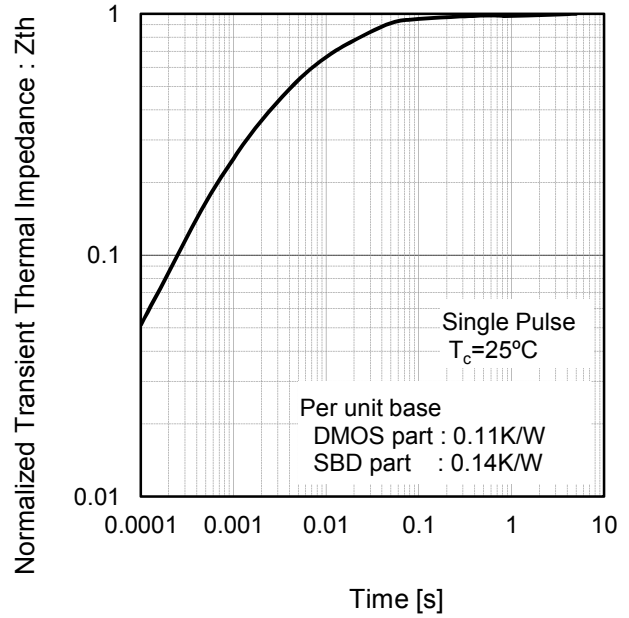


Fig.26 Normalized Transient Thermal Impedance



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BSM180D12P2E002 - Web Page

Part Number	BSM180D12P2E002
Package	E
Unit Quantity	4
Minimum Package Quantity	4
Packing Type	Corrugated Cardboard
Constitution Materials List	inquiry
RoHS	Yes