

### ●Application

- Motor drive
- Converter
- Photovoltaics, wind power generation.

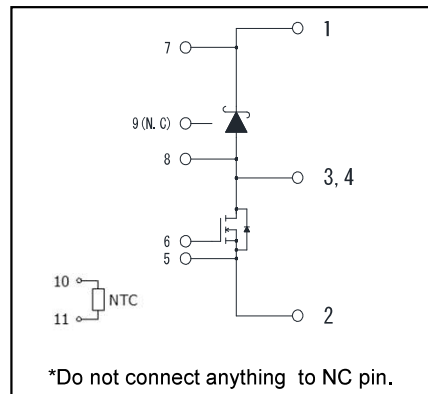
### ●Features

- 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.

### ●Circuit diagram



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

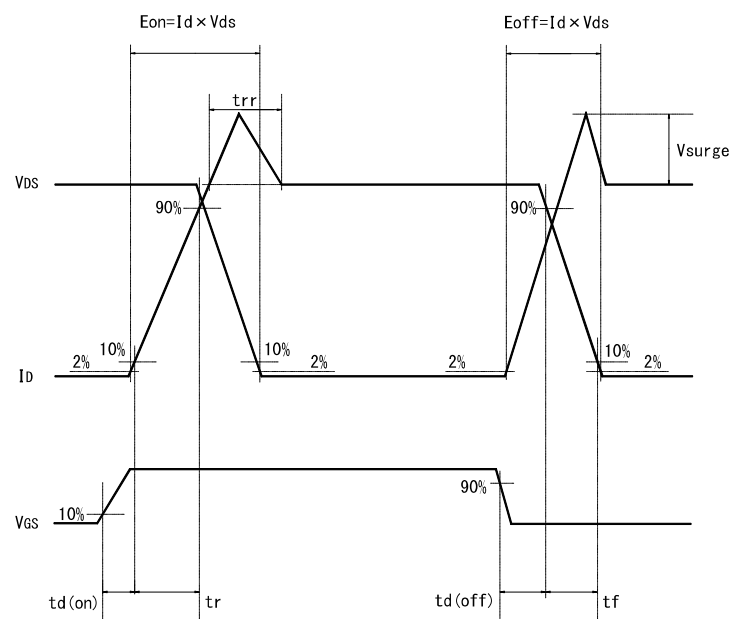
Parameter	Symbol	Conditions	Limit	Unit
Drain-source voltage	$V_{DSS}$	G-S short	1200	V
Repetitive reverse voltage	$V_{DSS}$	Clamp diode	1200	
Gate-source voltage(+)	$V_{GSS}$	D-S short	22	
Gate-source voltage(-)			-4	
Drain current * <sup>1</sup>	$I_D$	DC ( $T_c=60^\circ\text{C}$ )	300	A
	$I_{DRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 1ms * <sup>2</sup>	600	
Source current * <sup>1</sup>	$I_S$	DC ( $T_c=60^\circ\text{C}$ ) $V_{GS}=18\text{V}$	300	
	$I_{SRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 1ms $V_{GS}=18\text{V}$ * <sup>2</sup>	600	
	$I_{SRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 10 $\mu\text{s}$ $V_{GS}=0\text{V}$ * <sup>2</sup>	600	
Forward current (clamp diode) * <sup>1</sup>	$I_F$	DC ( $T_c=60^\circ\text{C}$ ) $V_{GS}=18\text{V}$	300	
	$I_{FRM}$	Pulse ( $T_c=60^\circ\text{C}$ ) 1ms $V_{GS}=18\text{V}$ * <sup>2</sup>	600	
Total power dissipation * <sup>3</sup>	$P_{tot}$	$T_c=25^\circ\text{C}$	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 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  $175^\circ\text{C}$

●Waveform for switching test



**●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>C</sub> =300A, V <sub>GS</sub> =18V	T <sub>j</sub> =25°C	-	1.9	3.0	V
			T <sub>j</sub> =125°C	-	2.7	-	
			T <sub>j</sub> =150°C	-	3	4.5	
Drain cutoff current	I <sub>DSS</sub>	V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V	-	-	10	μA	
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =300A	T <sub>j</sub> =25°C	-	1.6	2.1	V
			T <sub>j</sub> =125°C	-	2.2	-	
			T <sub>j</sub> =150°C	-	2.3	3.2	
Reverse current	I <sub>RRM</sub>	Clamp diode	-	-	3.2	mA	
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =80mA	2.7	-	5.6	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	-	40	-	ns	
	t <sub>r</sub>	V <sub>DS</sub> =600V	-	35	-		
	t <sub>rr</sub>	I <sub>D</sub> =300A	-	6	-		
	t <sub>d(off)</sub>	R <sub>G</sub> =1.8Ω	-	155	-		
	t <sub>f</sub>	inductive load	-	40	-		
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, 100kHz	-	15	-	nF	
Gate Resistance	R <sub>Gint</sub>	T <sub>j</sub> =25°C	-	0.9	-	Ω	
NTC Rated Resistance	R25			5.0		kΩ	
NTC B Value	B50/25			3370		K	
Stray Inductance	L <sub>s</sub>			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 <sub>th(j-c)</sub>	UMOS (1/2 module) *4	-	-	0.11	°C/W	
		SBD (1/2 module) *4	-	-	0.11		
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) In order to prevent self turn-on, it is recommended to apply negative gate bias.

(\*5) Measurement of T<sub>c</sub> 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.

●Electrical characteristic curves (Typical)

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

Fig.2 Drain-Source Voltage vs. Drain Current

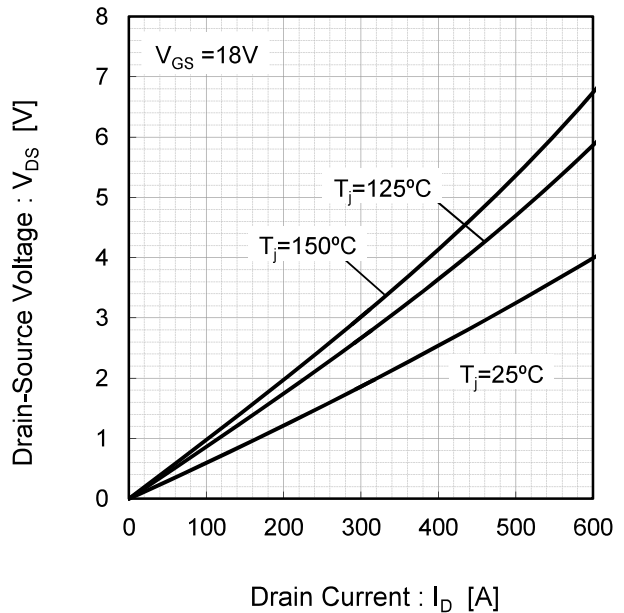
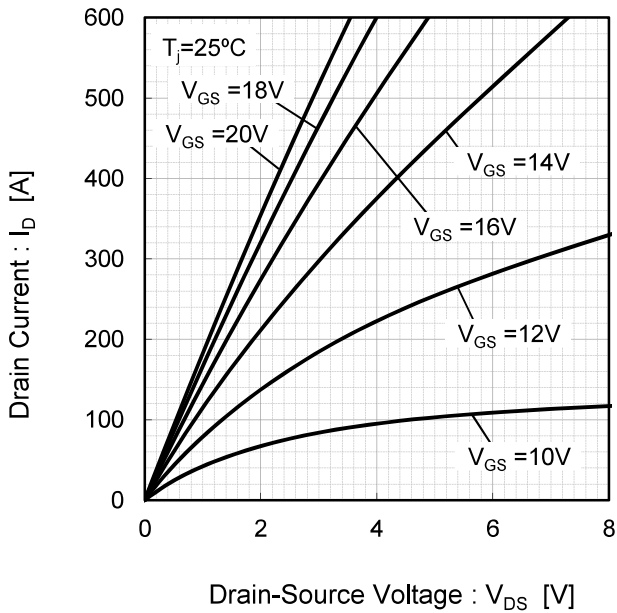
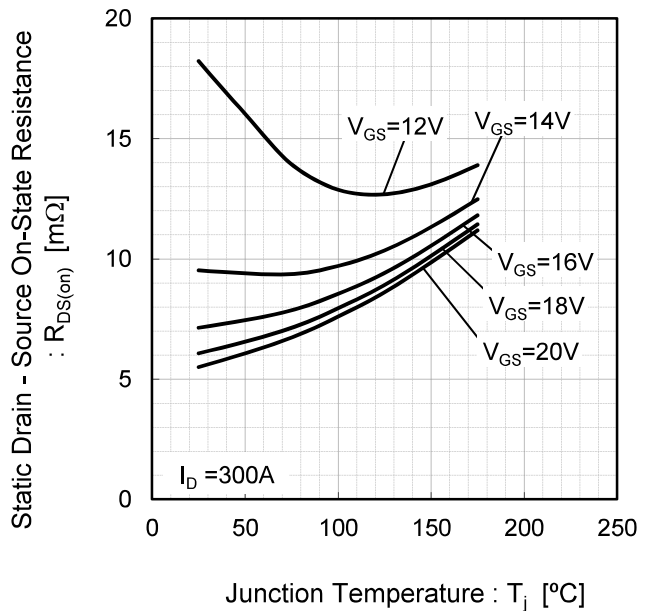
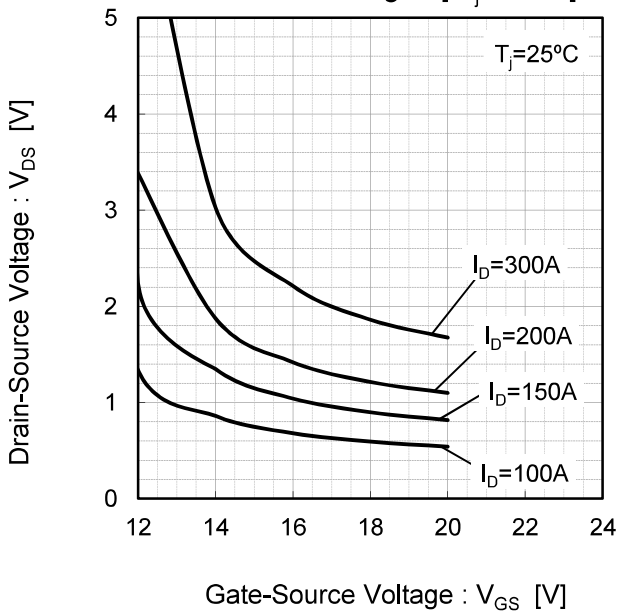


Fig.3 Drain-Source Voltage vs. Gate-Source Voltage [  $T_j=25^\circ\text{C}$  ]

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



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode

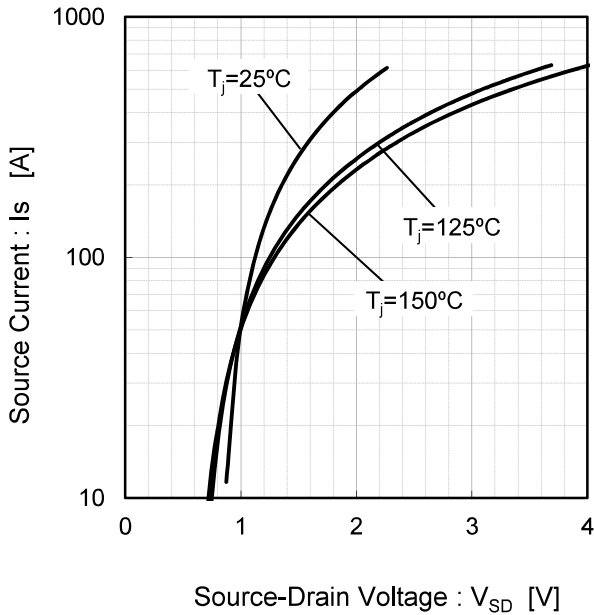


Fig.6 Forward characteristic of Diode

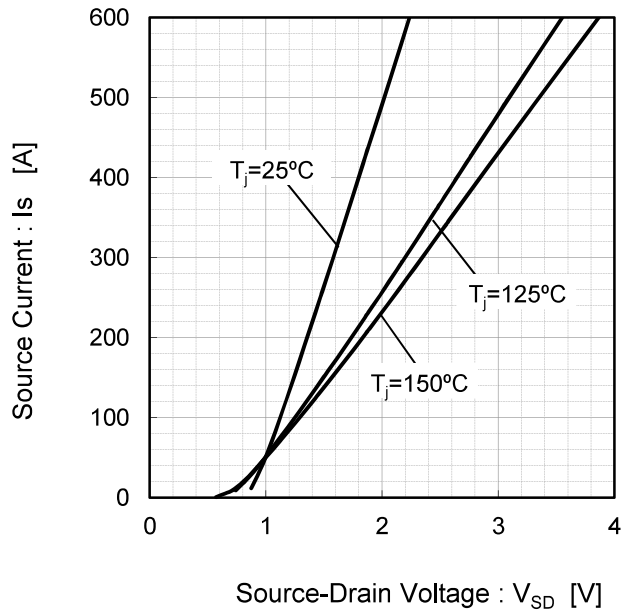


Fig.7 Drain Current vs. Gate-Source Voltage

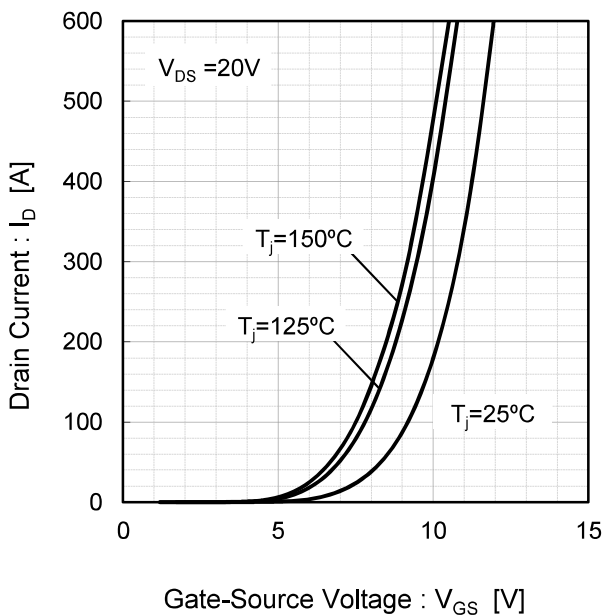
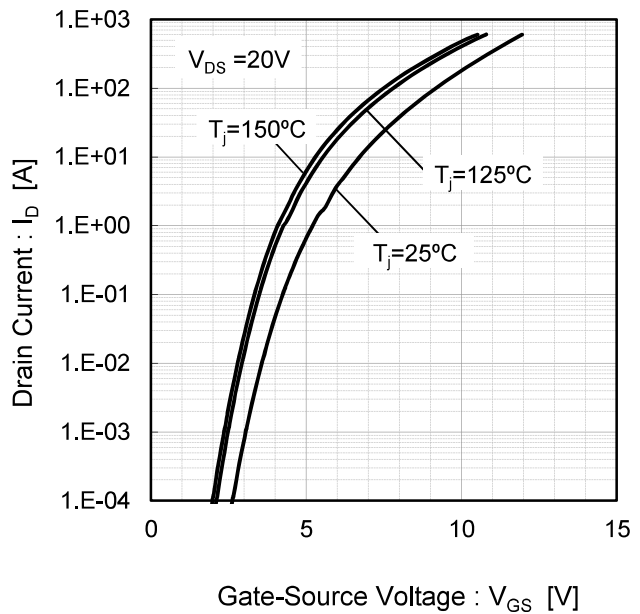


Fig.8 Drain Current vs. Gate-Source Voltage



●Electrical characteristic curves (Typical)

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

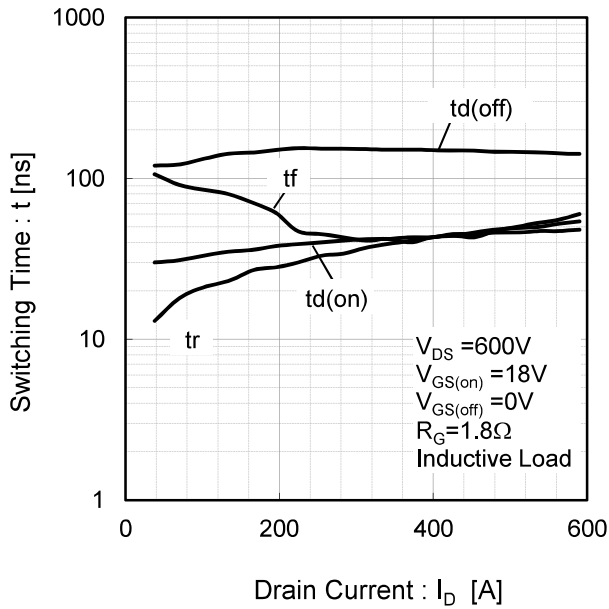


Fig.10 Switching Characteristics [  $T_j=125^\circ\text{C}$  ]

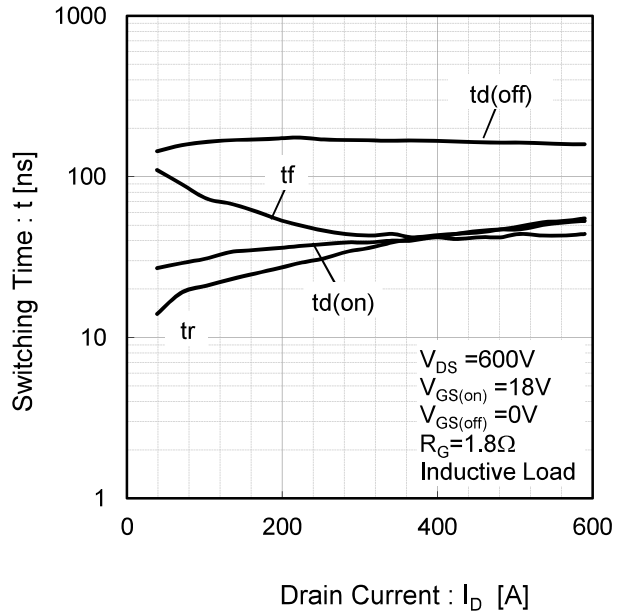


Fig.11 Switching Characteristics [  $T_j=150^\circ\text{C}$  ]

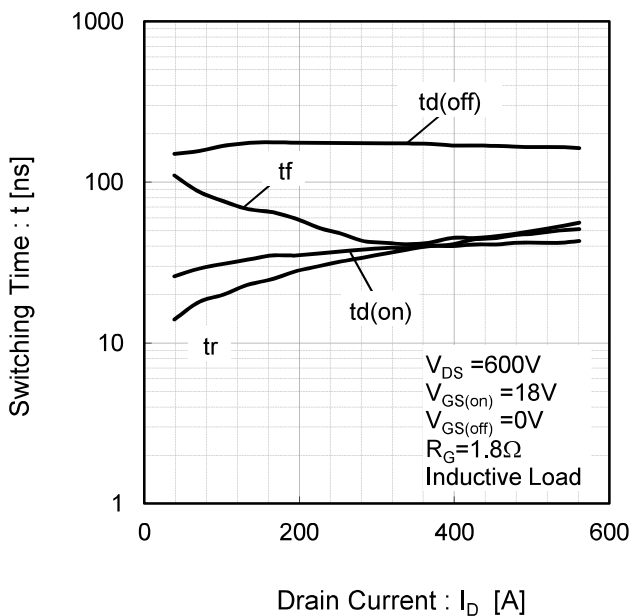
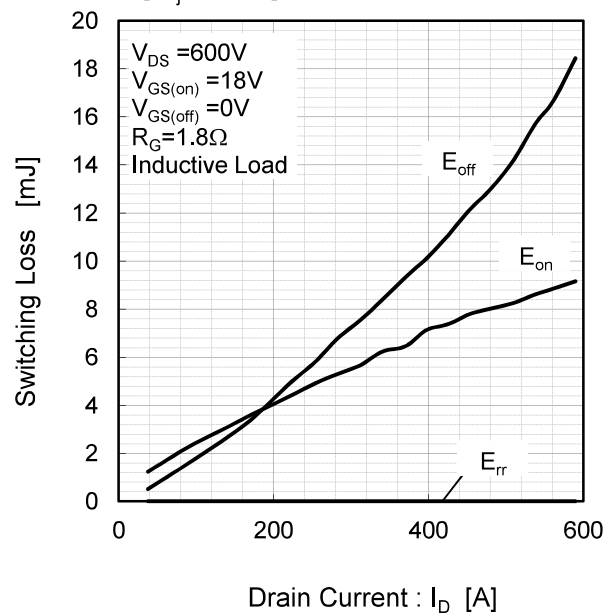


Fig.12 Switching Loss vs. Drain Current [  $T_j=25^\circ\text{C}$  ]



●Electrical characteristic curves (Typical)

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

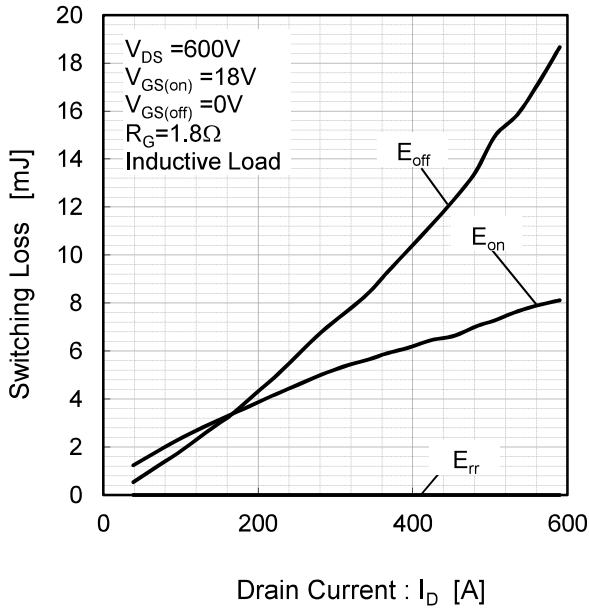


Fig.14 Switching Loss vs. Drain Current [  $T_j=150^\circ\text{C}$  ]

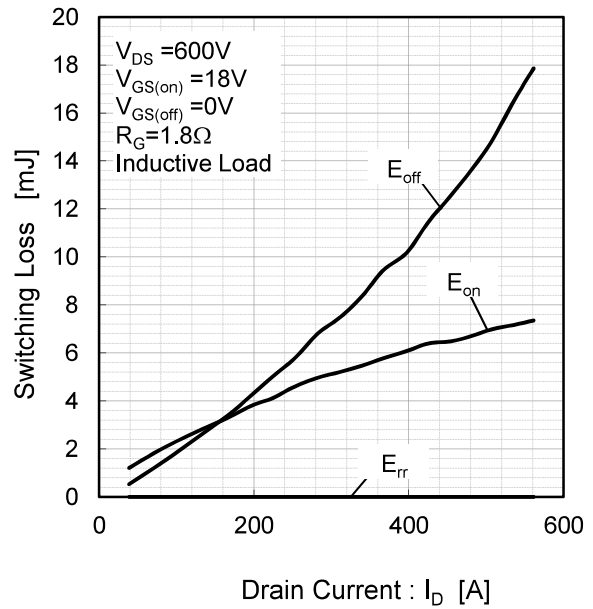


Fig.15 Recovery Characteristics vs. Drain Current [  $T_j=25^\circ\text{C}$  ]

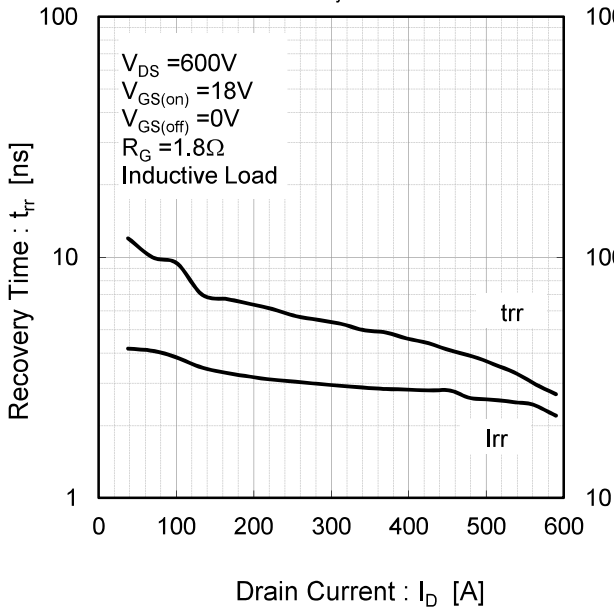
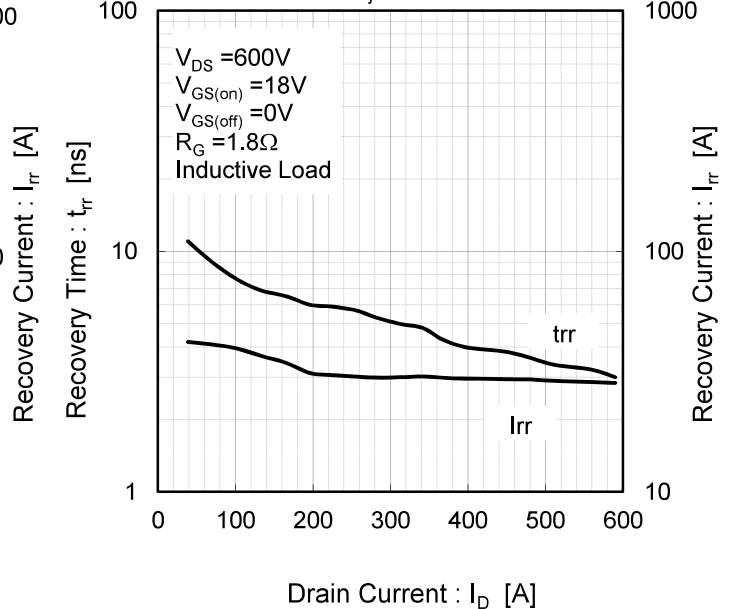


Fig.16 Recovery Characteristics vs. Drain Current [  $T_j=125^\circ\text{C}$  ]



●Electrical characteristic curves (Typical)

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

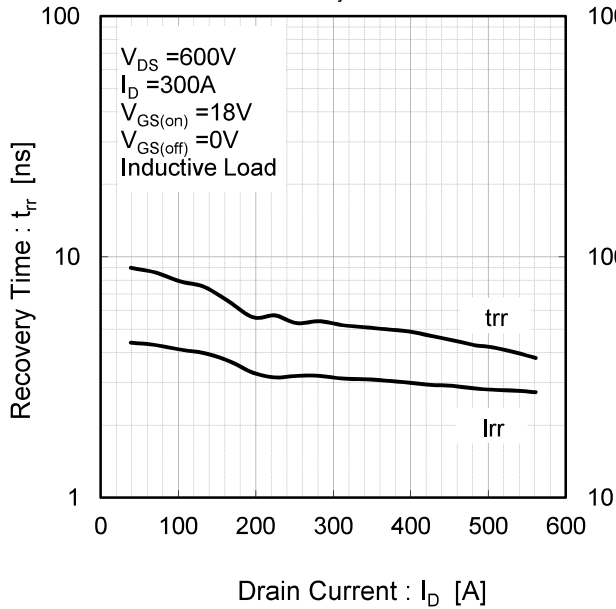


Fig.18 Switching Characteristics vs. Gate Resistance [  $T_j=25^{\circ}\text{C}$  ]

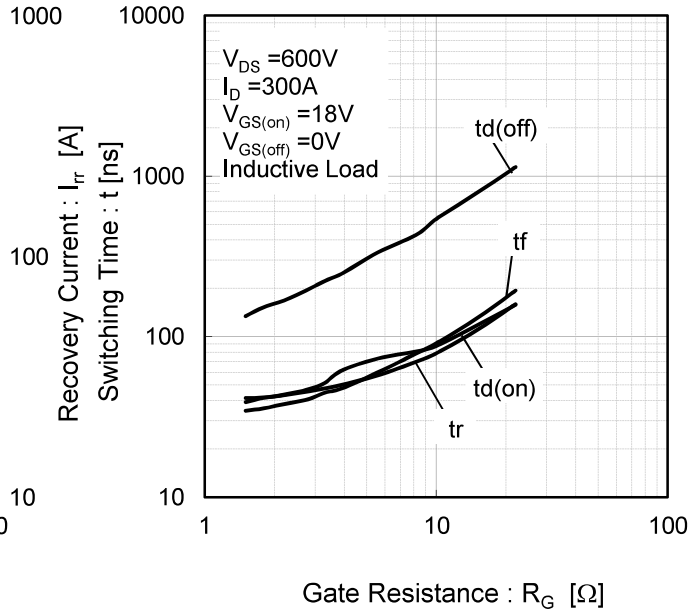


Fig.19 Switching Characteristics vs. Gate Resistance [  $T_j=125^{\circ}\text{C}$  ]

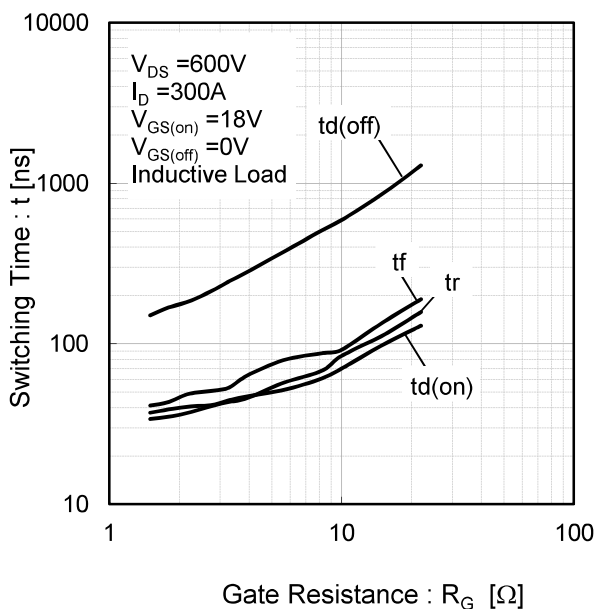
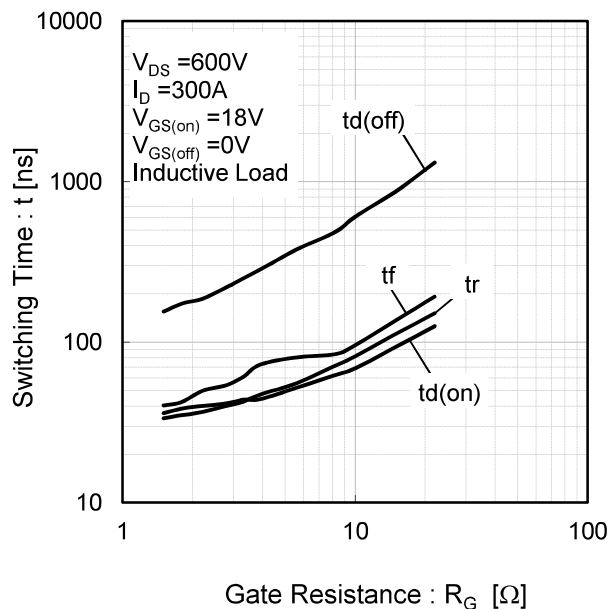


Fig.20 Switching Characteristics vs. Gate Resistance [  $T_j=150^{\circ}\text{C}$  ]





●Electrical characteristic curves (Typical)

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

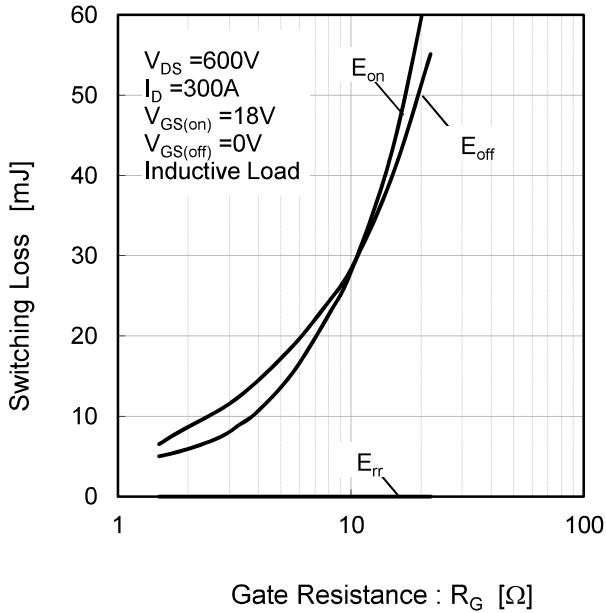


Fig.22 Switching Loss vs. Gate Resistance [  $T_j=125^\circ\text{C}$  ]

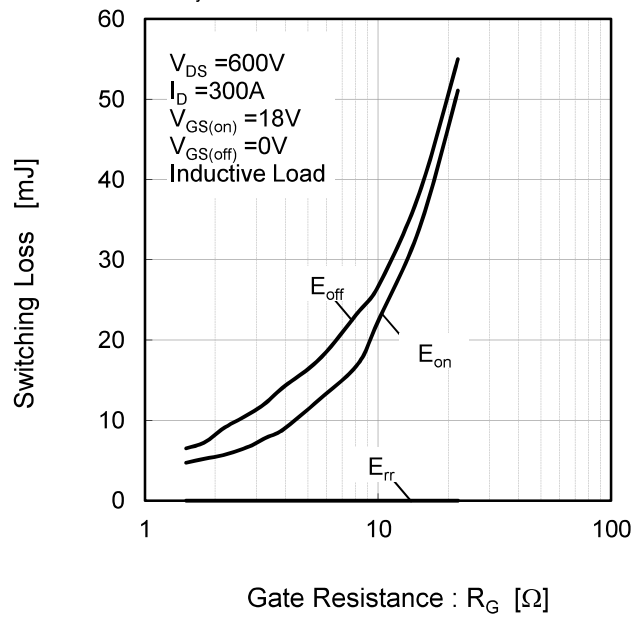


Fig.23 Switching Loss vs. Gate Resistance [  $T_j=150^\circ\text{C}$  ]

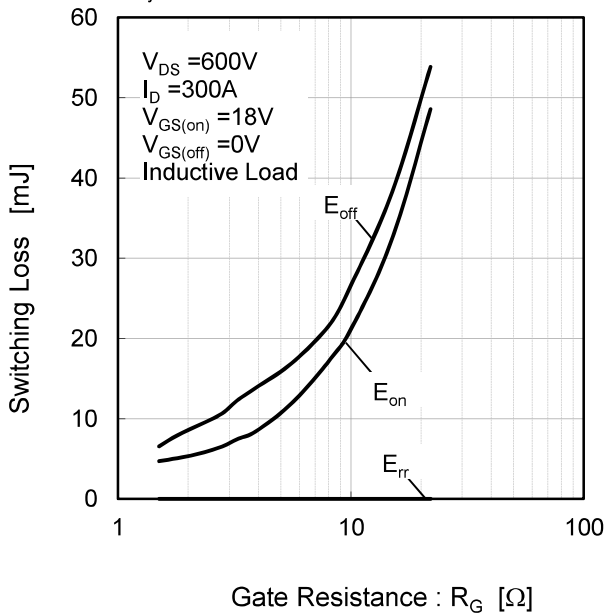
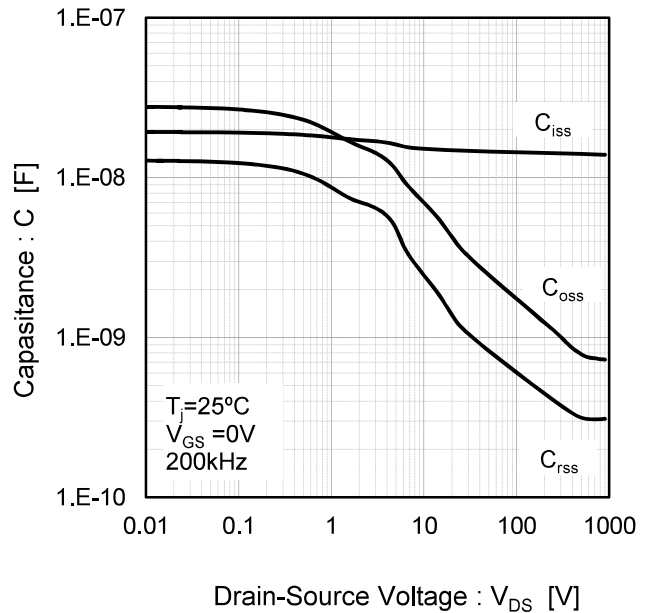


Fig.24 Typical Capacitance vs. Drain-Source Voltage



●Electrical characteristic curves (Typical)

Fig.25 Gate Charge Characteristics

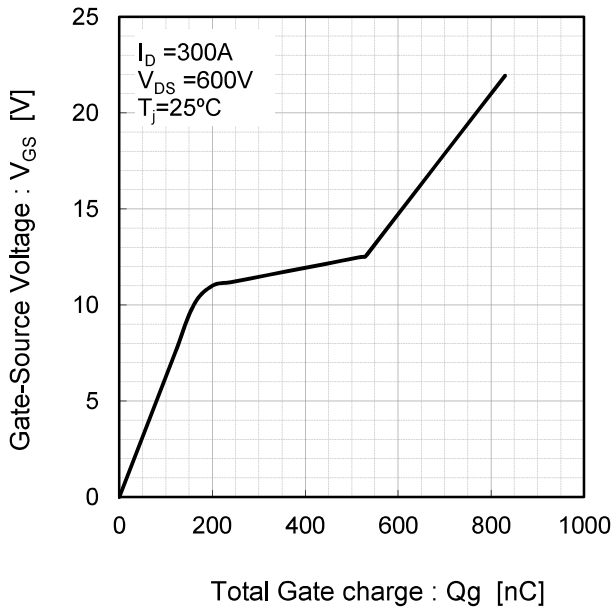


Fig.26 Normalized Transient Thermal Impedance

