

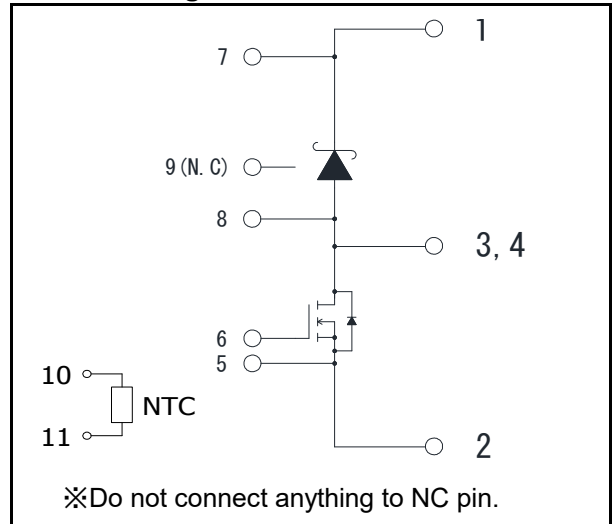
●Application

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

●Features

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

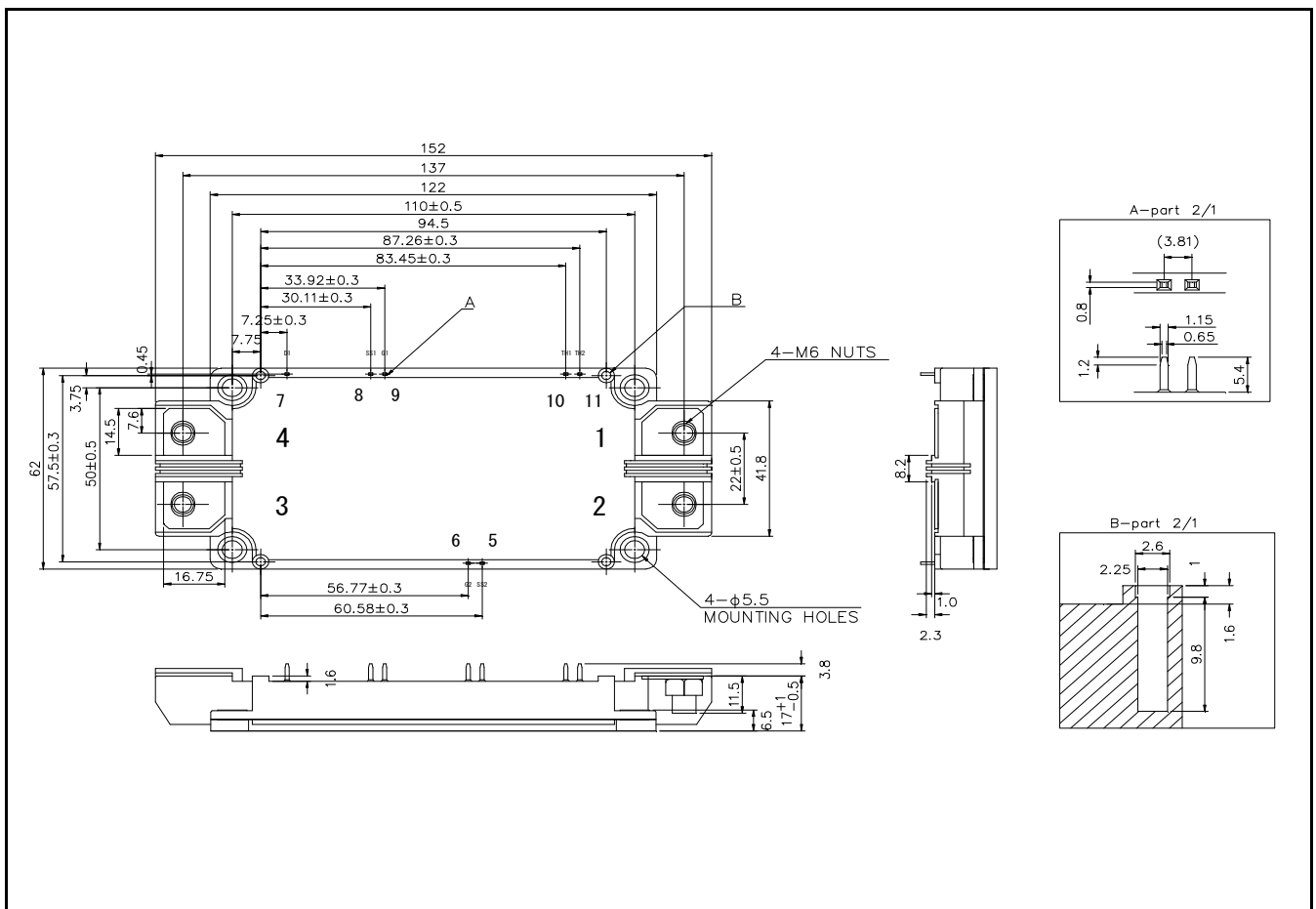
●Circuit diagram



●Construction

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

●Dimensions & Pin layout (Unit : mm)



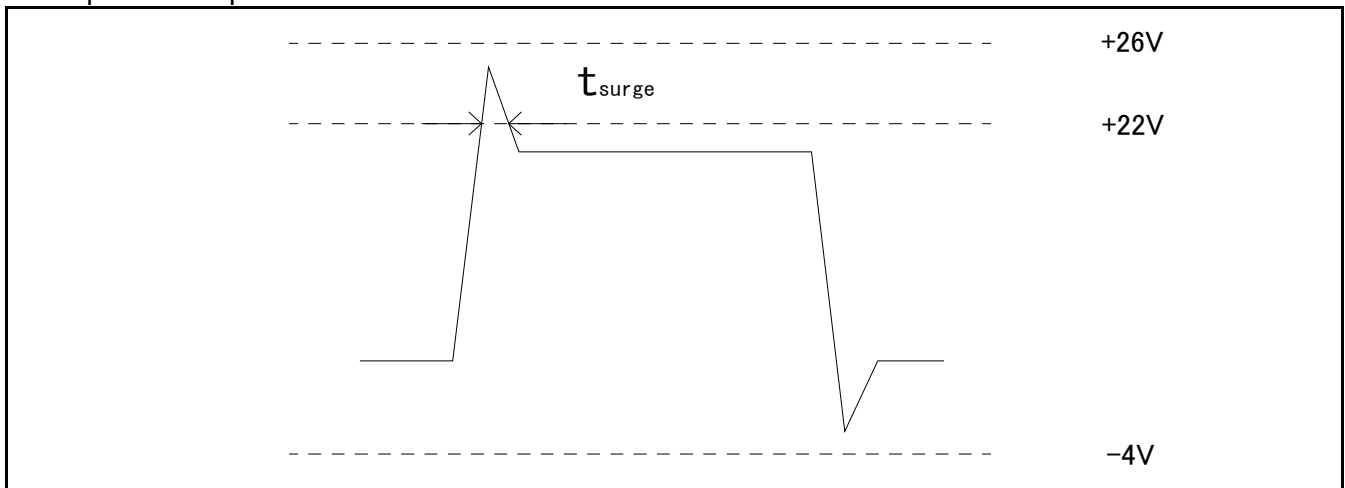
●Absolute maximum ratings ($T_j = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Ratings	Unit
Drain - Source Voltage	V_{DSS}	G-S short	1200	V
Repetitive Reverse Voltage	V_{RRM}	Clamp diode	1200	
Gate - Source Voltage (+)	V_{GSS}	D-S short	22	
Gate - Source Voltage (-)	V_{GSS}	D-S short	-4	
G - S Voltage ($t_{surge} < 300\text{nsec}$)	$V_{GSSsurge}$	D-S short	-4 to 26	
Drain Current <small>Note 1)</small>	I_D	DC($T_c=60^\circ\text{C}$) $V_{GS}=18\text{V}$	358	A
	I_D	DC($T_c=32^\circ\text{C}$) $V_{GS}=18\text{V}$	400	
	I_{DRM}	Pulse ($T_c = 60^\circ\text{C}$) 1ms $V_{GS}=18\text{V}$ <small>Note 2)</small>	800	
Source Current <small>Note 1)</small>	I_S	DC($T_c=60^\circ\text{C}$) $V_{GS}=18\text{V}$	358	
	I_S	DC($T_c=32^\circ\text{C}$) $V_{GS}=18\text{V}$	400	
	I_{SRM}	Pulse ($T_c = 60^\circ\text{C}$) 1ms $V_{GS}=18\text{V}$ <small>Note 2)</small>	800	
	I_{SRM}	Pulse ($T_c = 60^\circ\text{C}$) 10us $V_{GS}=0\text{V}$ <small>Note 2)</small>	800	
Forward Current (clamp diode) <small>Note 1)</small>	I_F	DC($T_c = 60^\circ\text{C}$)	400	
	I_{FRM}	Pulse ($T_c = 60^\circ\text{C}$) 1ms <small>Note 2)</small>	800	
Total Power Dissipation <small>Note 3)</small>	P_{tot}	$T_c = 25^\circ\text{C}$	1570	
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	Visol	Terminals to baseplate $f = 60\text{Hz AC}$ 1 min.	2500	Vrms
Mounting Torque	-	Main Terminals : M6 screw	4.5	N · m
		Mounting to heat sink M5 screw	3.5	

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

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

Note 3) T_j is less than 175°C .

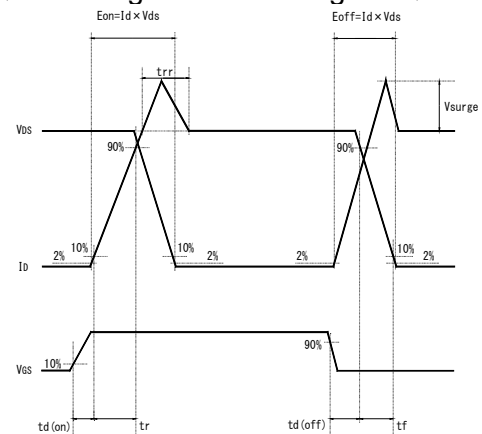
Example of acceptable VGS waveform


●Electrical characteristics (T_j=25°C)

Parameter	Symbol	Conditions	Ratings			Unit	
			Min.	Typ.	Max.		
On-state static Drain-Source 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	—	—	10	μA	
Forward Voltage	V _F	I _F =400A	T _j =25°C	—	1.7	2.1	V
			T _j =125°C	—	2.0	—	
			T _j =150°C	—	2.1	3.4	
Reverse current	I _{RRM}	Clamp diode	—	—	4	mA	
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} =10V, I _D =106.8mA	2.7	—	5.6	V	
Gate-Source Leak Current	I _{GSS}	V _{GS} =22V, V _{DS} =0V	—	—	0.5	μA	
		V _{GS} =-4V, V _{DS} =0V	-0.5	—	—		
Switching Characteristics	td(on)	V _{GS(on)} =18V, V _{GS(off)} =0V V _{DS} =600V I _D =400A R _{G(on)} =1.0 ohm, R _{G(off)} =0.2 ohm Inductive load	—	55	—	ns	
	tr		—	40	—		
	trr		—	25	—		
	td(off)		—	180	—		
	tf		—	45	—		
Input Capacitance	C _{iss}	V _{DS} =10V, V _{GS} =0V, 200kHz	—	17	—	nF	
Gate Resistance	R _{Gint}	T _j =25°C	—	2.4	—	Ω	
NTC Rated Resistance	R ₂₅		—	5.0	—	kΩ	
NTC B Value	B _{50/25}		—	3370	—	K	
Stray Inductance	L _s		—	10.0	—	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)}	UMOSFET (1/2 module) <small>Note 4)</small>	—	—	96	°C/kW	
		SBD (1/2 module) <small>Note 4)</small>	—	—	80		
Case-to -heat sink Thermal Resistance	R _{th(c-f)}	Case to heat sink, per 1 module. Thermal grease applied. <small>Note 5)</small>	—	15	—		

- Note 4) Measurement of T_c is to be done at the point just under the chip.
- Note 5) Typical value is measured by using thermally conductive grease of λ=0.9W/(m·K).
- Note 6) 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.
- Note 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.

<Wavelength for Switching Test>



●Electrical characteristic curves (Typical)

Fig.1 Output characteristic 25°C (TYP)

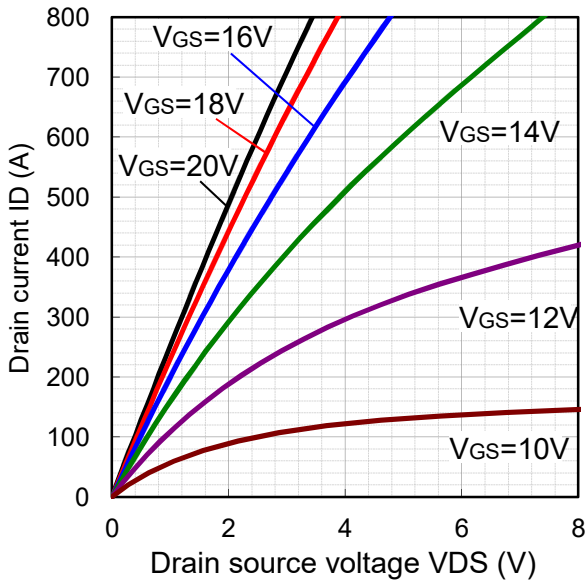


Fig.2 Drain source voltage characteristic (TYP)

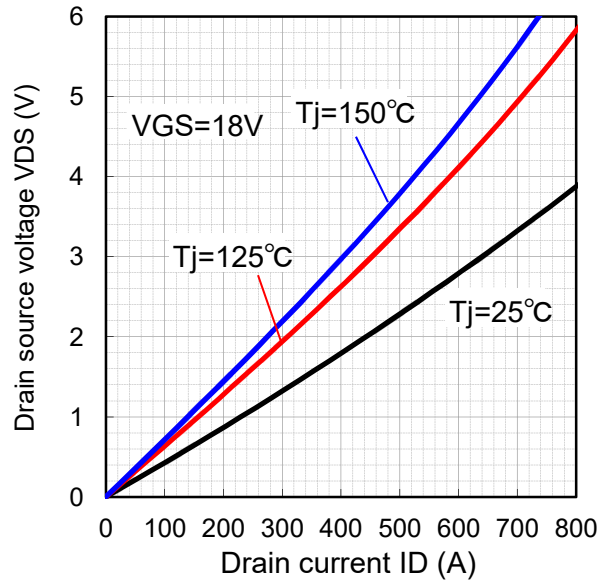


Fig.3 Drain source voltage characteristic 25°C (TYP)

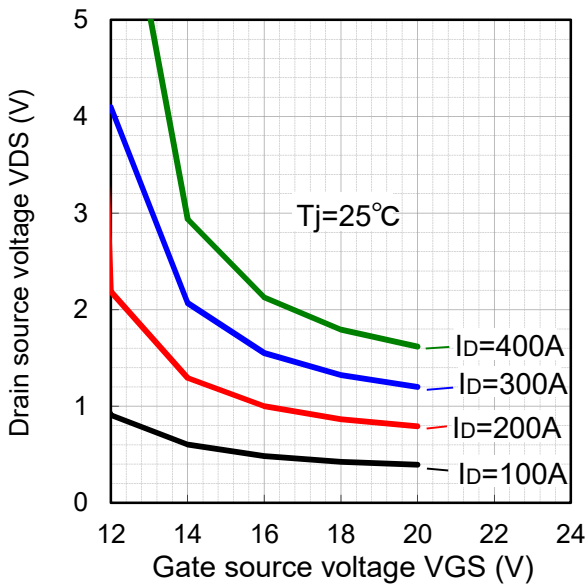
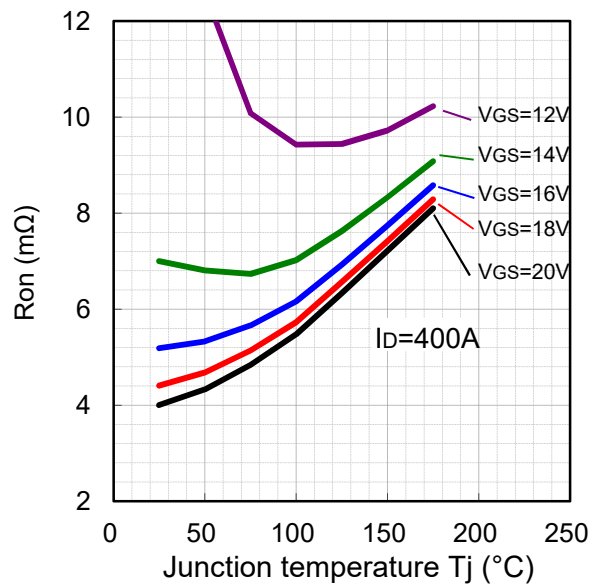


Fig.4 Ron vs Tj characteristic (TYP)



●Electrical characteristic curves (Typical)

Fig.5 Forward characteristic of Diode (TYP)

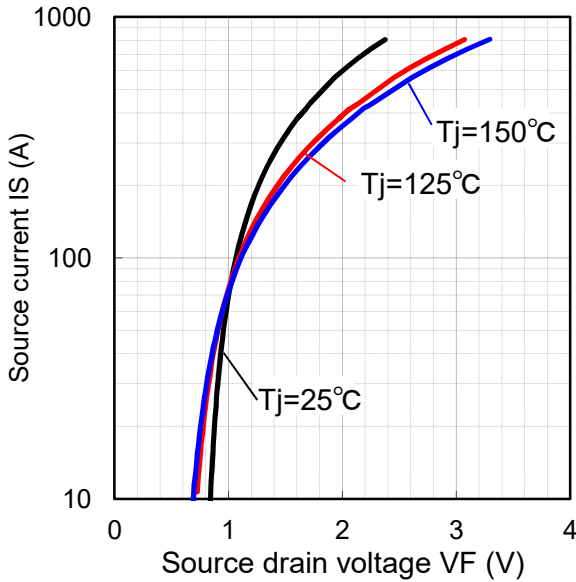


Fig.6 Forward characteristic of Diode (TYP)

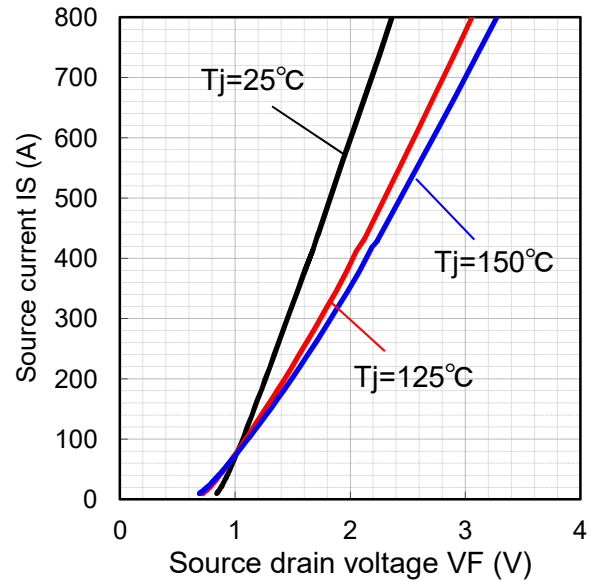


Fig.7 Drain Current vs Gate Voltage (TYP)

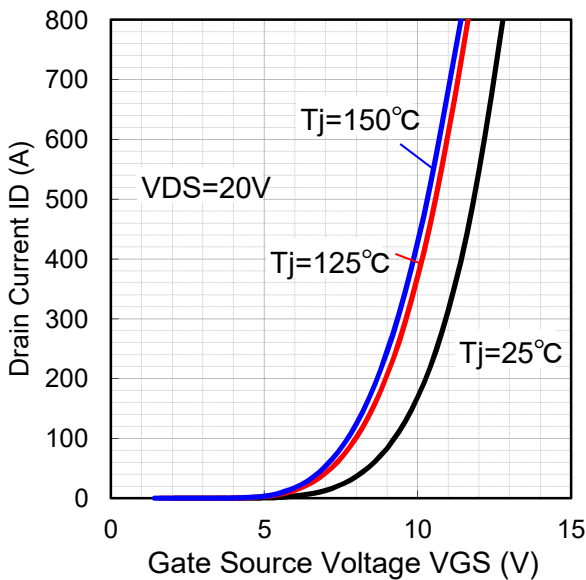
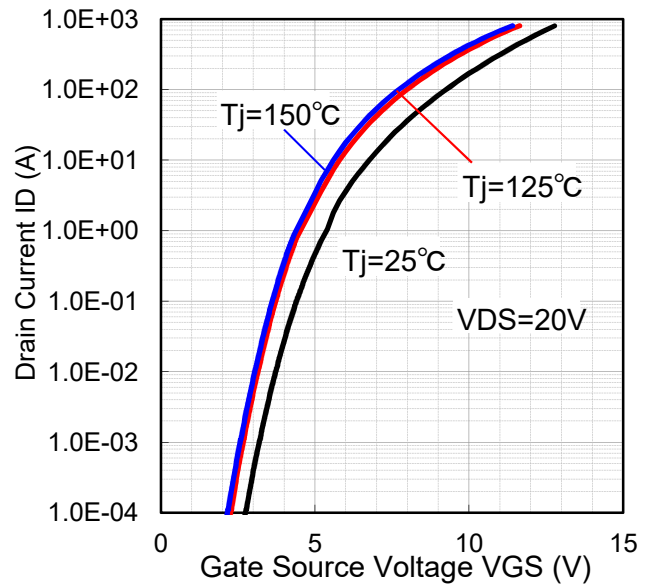


Fig.8 Drain Current vs Gate Voltage (TYP)



●Electrical characteristic curves (Typical)

Fig.9 Switching time vs drain current at 25°C (TYP)

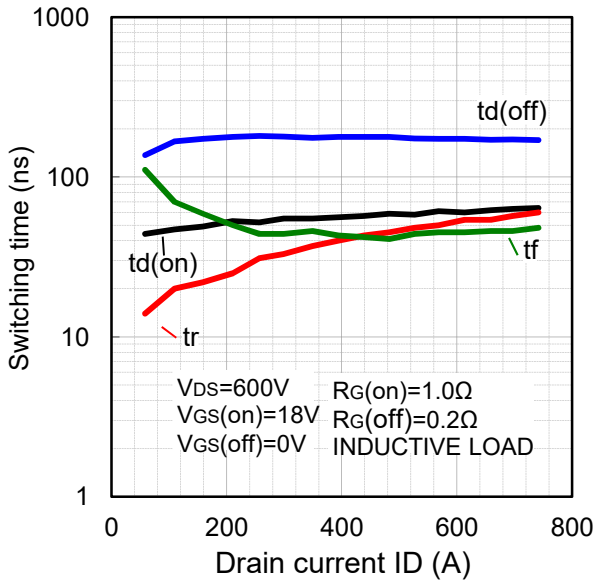


Fig.10 Switching time vs drain current at 125°C (TYP)

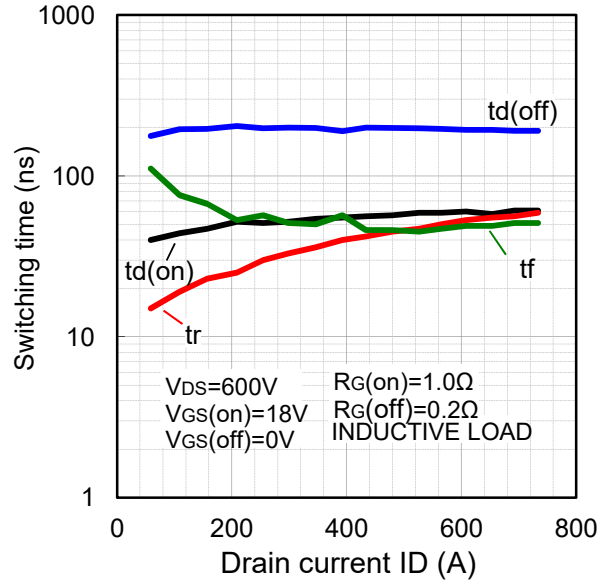


Fig.11 Switching time vs drain current at 150°C (TYP)

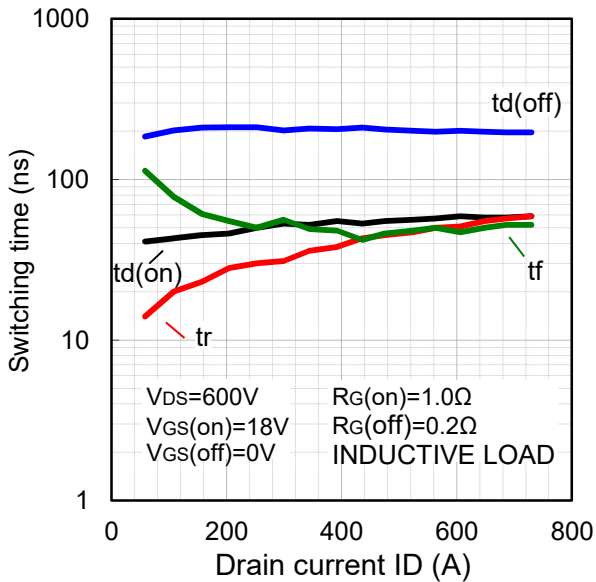
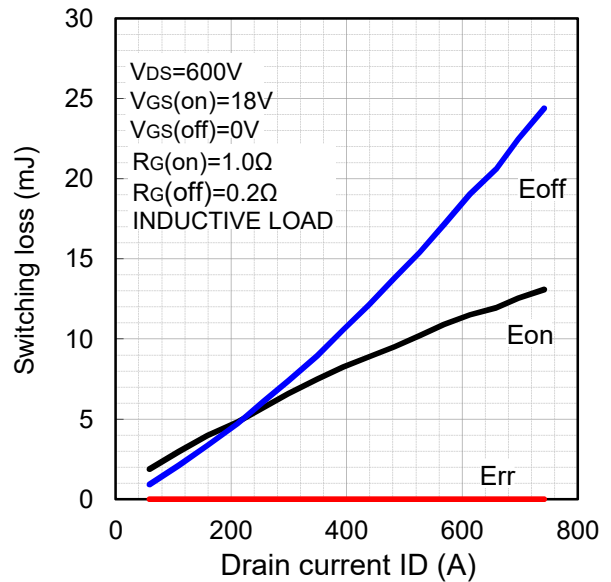


Fig.12 Switching loss vs drain current at 25°C (TYP)



●Electrical characteristic curves (Typical)

Fig.13 Switching loss vs drain current at 125°C (TYP)

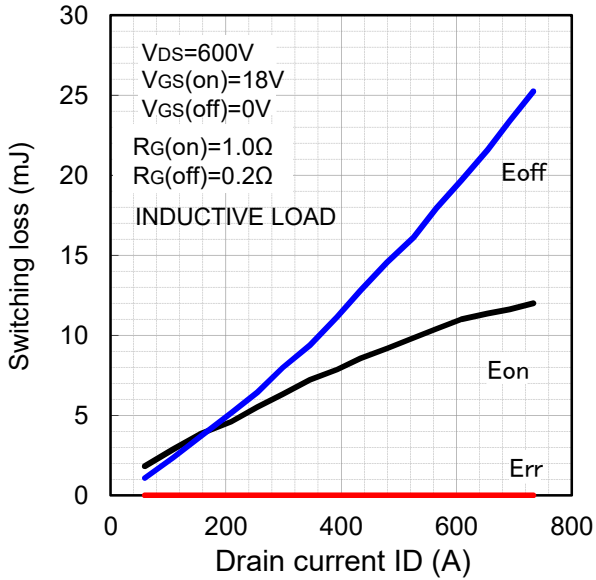


Fig.14 Switching loss vs drain current at 150°C (TYP)

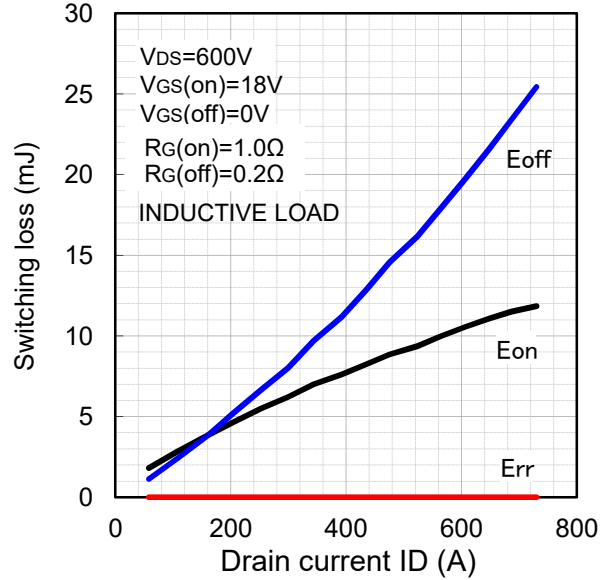


Fig.15 Recovery characteristic vs drain current at 25°C (TYP)

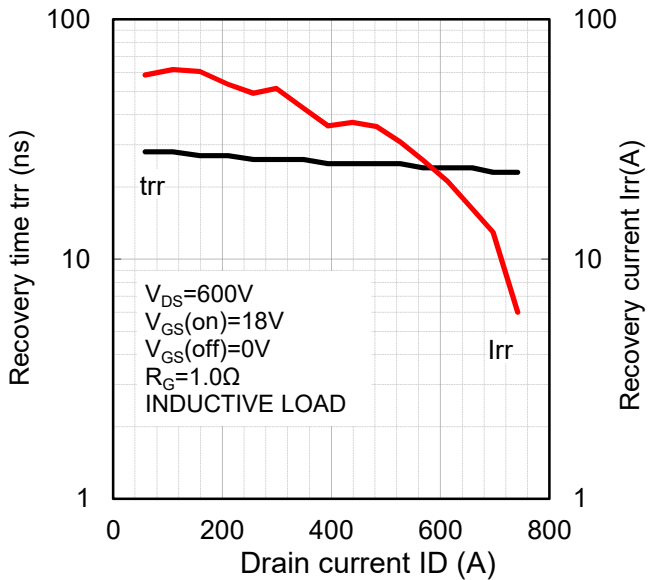
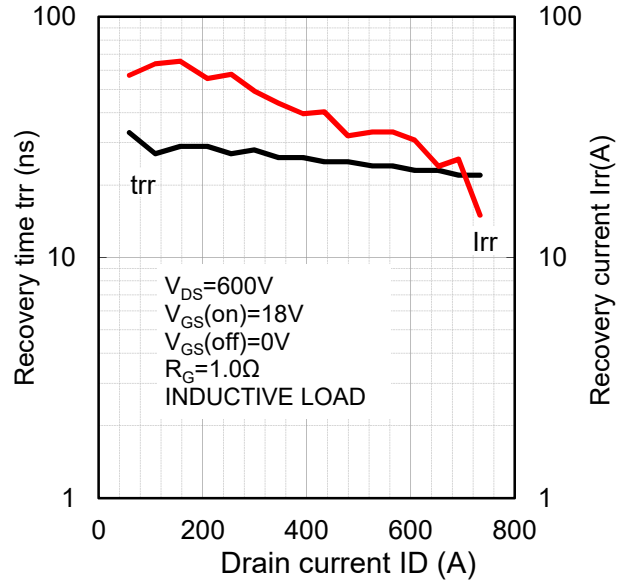


Fig.16 Recovery characteristic vs drain current at 125°C (TYP)



●Electrical characteristic curves (Typical)

Fig.17 Recovery characteristic vs drain current at 150°C (TYP)

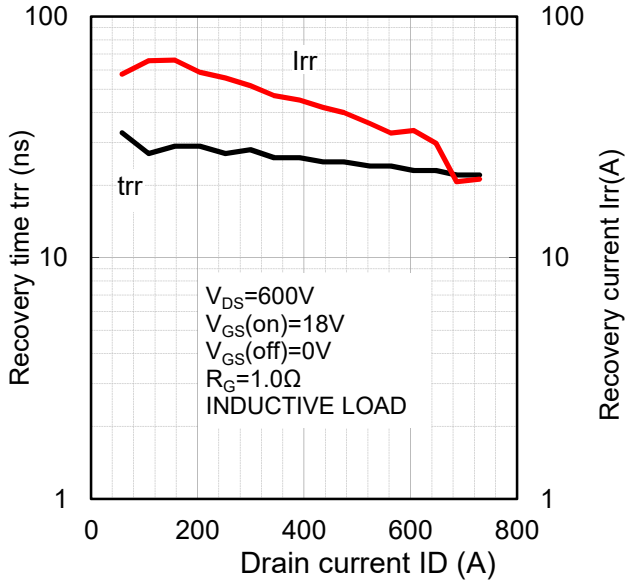


Fig.18 Switching time vs gate resistance at 25°C (TYP)

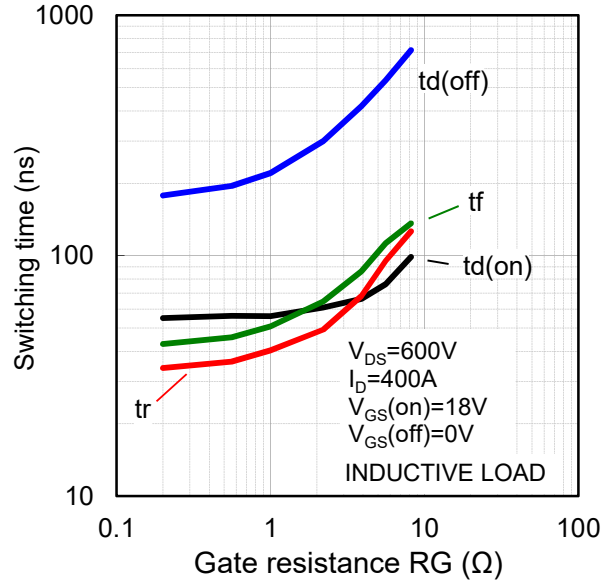


Fig.19 Switching time vs gate resistance at 125°C (TYP)

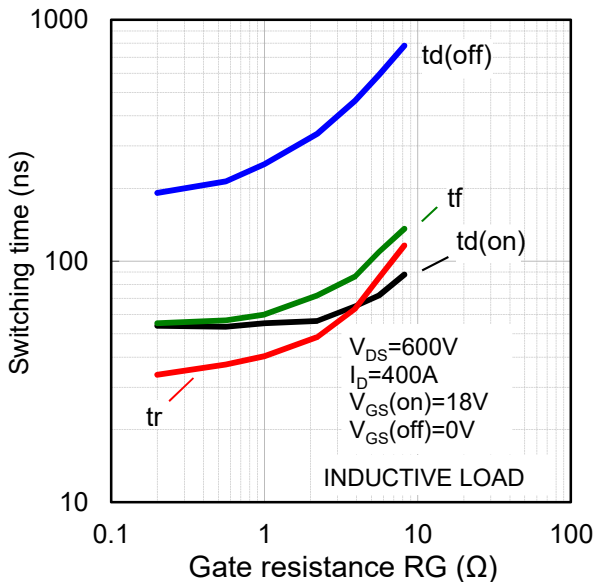
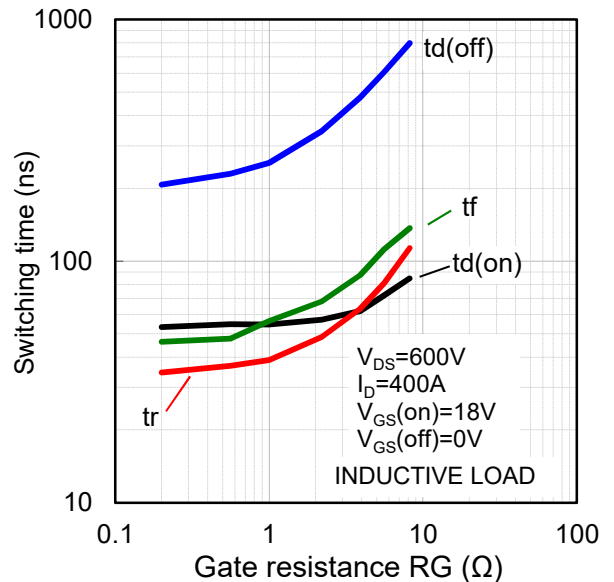


Fig.20 Switching time vs gate resistance at 150°C (TYP)



●Electrical characteristic curves (Typical)

Fig.21 Switching loss vs gate resistance at 25°C (TYP)

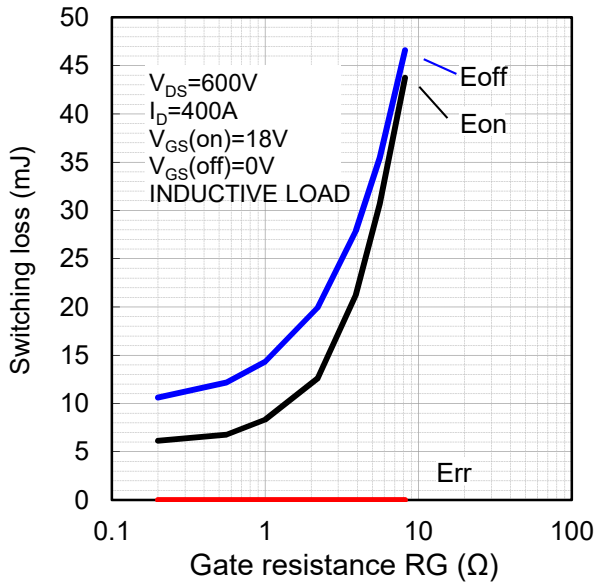


Fig.22 Switching loss vs gate resistance at 125°C (TYP)

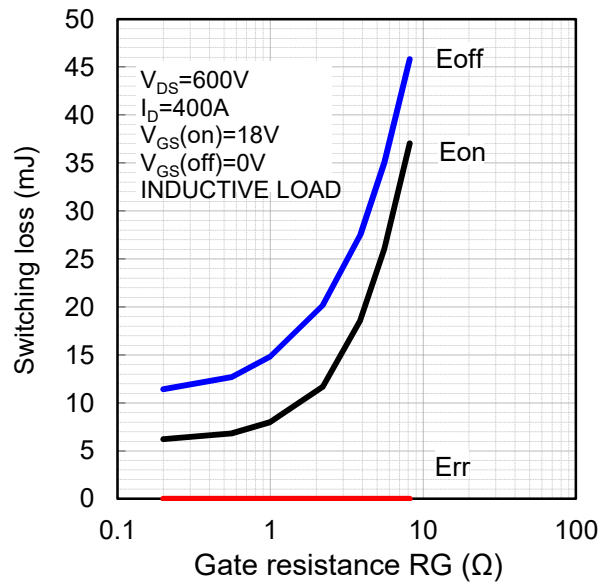
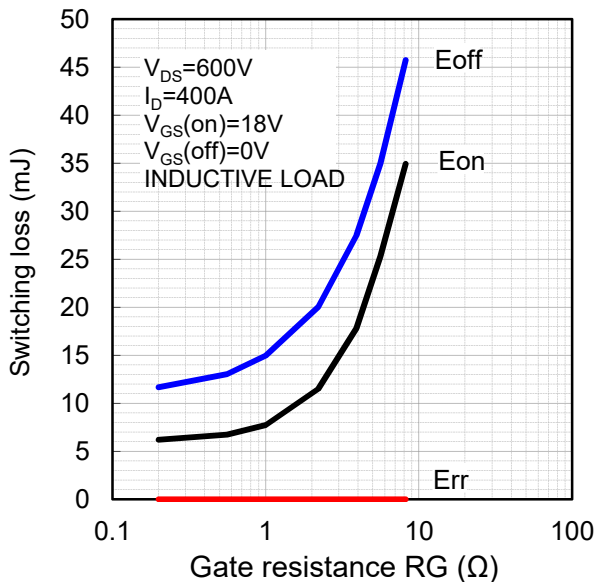


Fig.23 Switching loss vs gate resistance at 150°C (TYP)



●Electrical characteristic curves (Typical)

Fig.24 Capacitance vs Drain source voltage (TYP)

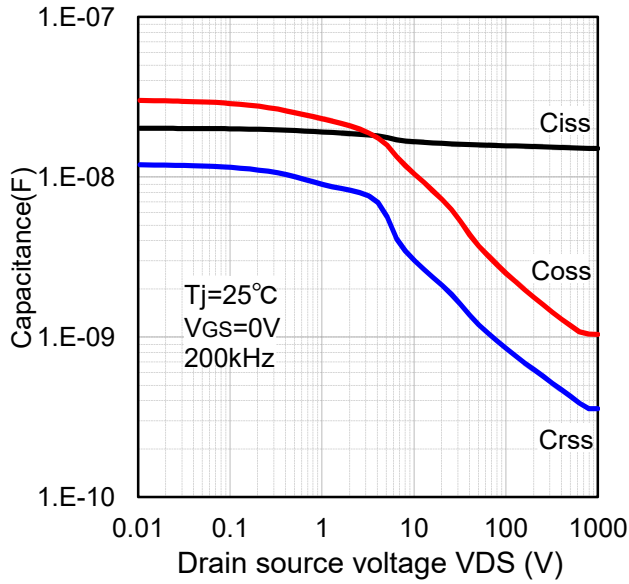


Fig.25 Gate charge characteristic (TYP)

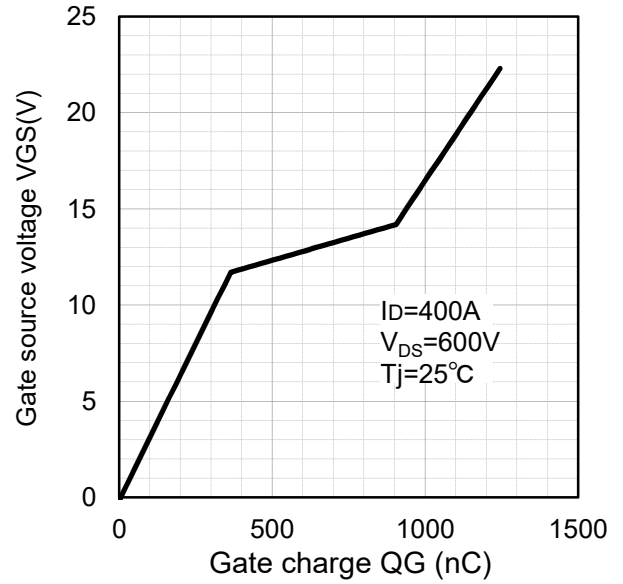
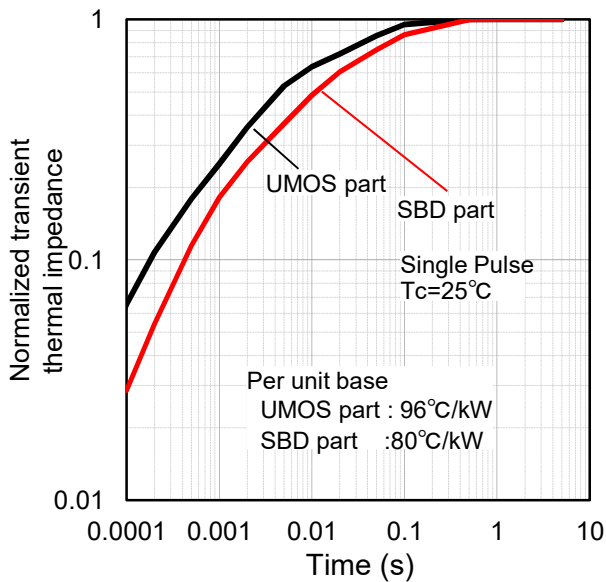


Fig.26 Transient thermal impedance (TYP)



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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А