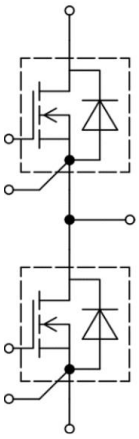
ATS

ATSCM7R0N170HBMP

Half Bridge SiC Module
Preliminary version

Product Summary

Product Type	V_{DSS}	I_D	$R_{DS(on)}$	Package
ATSCM7R0N170HBMP	1700V	335A	7.0mΩ	62mm



Features

- 1700V SiC MOSFET Power Module
- Very Low $R_{DS(on)}$
- Very low switching loss
- 62mm half bridge module
- Halogen Free, RoHS compliant

Typica Applications

- Motor drive
- Servo drive
- UPS / Solar
- Energy storage system

Maximum Ratings (SiC MOSFET, T_j=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DSS}		1700	V
Gate-Source Voltage	V_{GSS}		-8/+22	V
Drain Current	I_D	T_C =25°C T_C=90°C	335 235	A
Pulse Drain Current	I_{DM}		960	A
Maximum Power Dissipation	P_D	T_C =25°C, T_j =150°C	1100	W
Operation junction temperature	T_{vj-op}		-40 to175	°C
Storage temperature	T_{stg}		-40 to 150	°C

Maximum Ratings (diode, Tj =25°C unless otherwise specified)

Parameter	Symbol	Conditions	Value	Unit
Body diode current	I_S	T_C =25°C, V_{GS}=-4V	300	A
Pulse source current	I_{SM}	verified by design, tp limited by T_{vjmax}	960	A

Module information

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t =1min	4	KV
Mounting torque for module mounting	M5, M6	3 to 5	Nm
Weight of Module	G	300	g
Junction to case (MOSFET)	$R_{th(j-c)}$	0.07 max	K/W
Case to heatsink (MOSFET) Case to heatsink (per module)	R_{thCH}	0.02 typ. 0.01 typ.	K/W

MOSFET Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Parameter	Symbol	conditions		Min	Typ	Max	Unit
Drain to source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, ID=100uA		1700			V
Static Drain-Source On-Resistance	$R_{DS(on)}$	I_D=225A, V_{GS}=18V	T_j=25 °C		7.0	8.7	mΩ
			T_j=175 °C		14.7		V
Gate-Source threshold Voltage	$V_{GS(th)}$	I_D =90mA, V_{DS} =V_{GS}	T_j=25 °C	2.3	3.3	4.0	V
			T_j=175 °C		2.5		
Gate charge	Q_G	V_{DS}=1200V, V_{GS}=-4/+18V I_D=255A			627		nC
Gate-Source charge	G_{gs}				225		nC
Gate-Drain charge	Q_{gd}				168		nC
Internal gate resistor	R_{Gint}	V_{AC}=25mV, f=1MHz	T_j=25 °C		1		Ω
Input Capacitance	C_{iss}	V_{GS} =0V, V_{DS} =1400V f =100KHz	T_j=25 °C		15.9		nF
Output Capacitance	C_{oss}				570		pF
Reverse transfer Capacitance	C_{rss}				23		pF
Drain-Source leakage Current	I_{DSS}	V_{DS} =1700V, V_{GS} =0V	T_j=25 °C			30	uA
Gate-Source Leakage Current	I_{GSS}	V_{GS} =18V V_{DS} =0V	T_j=25 °C			100	nA
Turn-on delay time	$t_{d(on)}$	V_{DS} =1200V I_D = 225A V_{GS} =-4V/18V R_G =1.1Ω L=16.7uH	T_j=25 °C		40		ns
Rise time	t_r		T_j=25 °C		21		ns
Turn-off delay time	$t_{d(off)}$		T_j=25 °C		50		ns
Fall time	t_f		T_j=25 °C		14		ns
Turn-on switch loss	E_{on}		T_j=25 °C		6.9		mJ
Turn-off switch loss	E_{off}		T_j=25 °C		1.6		mJ

Diode Electrical characteristics (Tj =25°C unless otherwise specified, chip)

Item	Symbol	Condition		Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{SD}	I_S =150A, V_{GS} =-4V	T_j=25 °C		4.0		V
			$_j$=175 °C		3.5		V
Peak reverse recovery Current	I_{rr}	V_{rr} =1200V, I_F =225A di/dt = 6000A/us V_{GS}=-4V	T_j=175 °C		180		A
Diodes reverse recovery time	trr		T_j=175 °C		60		ns
Recovered charge	Q_{rr}		T_j=175 °C		3.2		uC

Characteristics graphs:

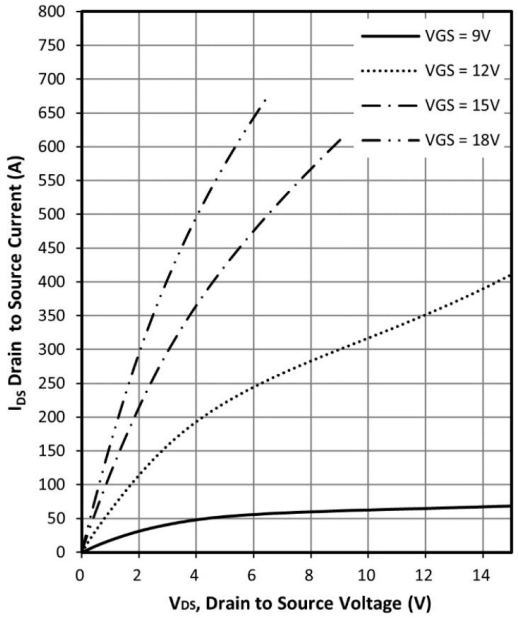


Fig 1: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=-55°C

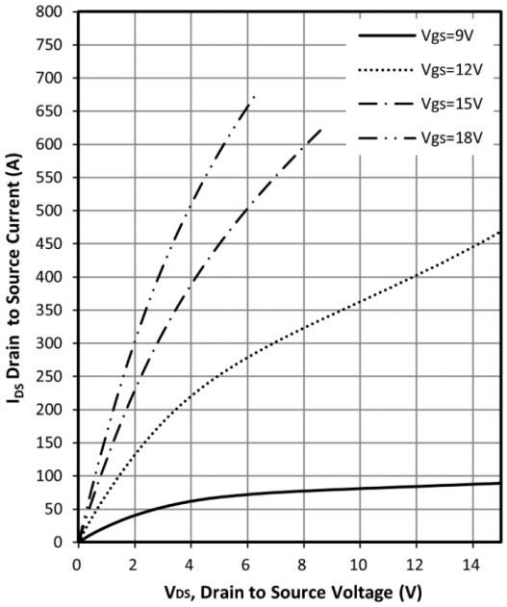


Fig 2: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=25°C

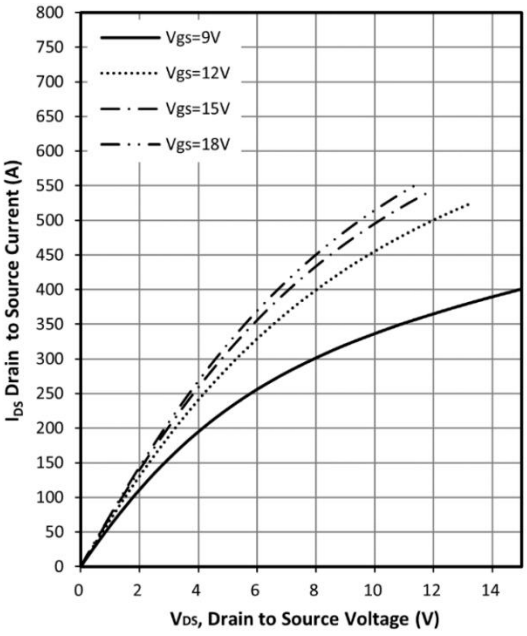


Fig 3: Typical output characteristics, MOSFET

$I_D=f(V_{DS})$, tp<200us, Tj=175°C

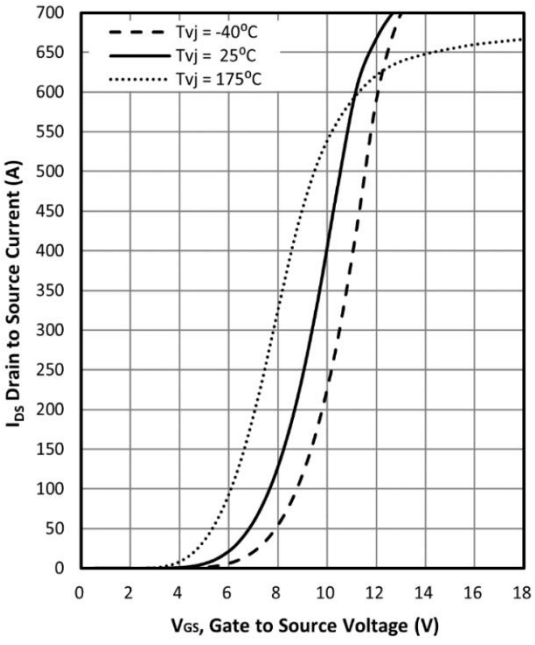


Fig 4: Transfer characteristics versus temperature

$I_D=f(V_{DS})$, tp<200us, V_{DS}=20V

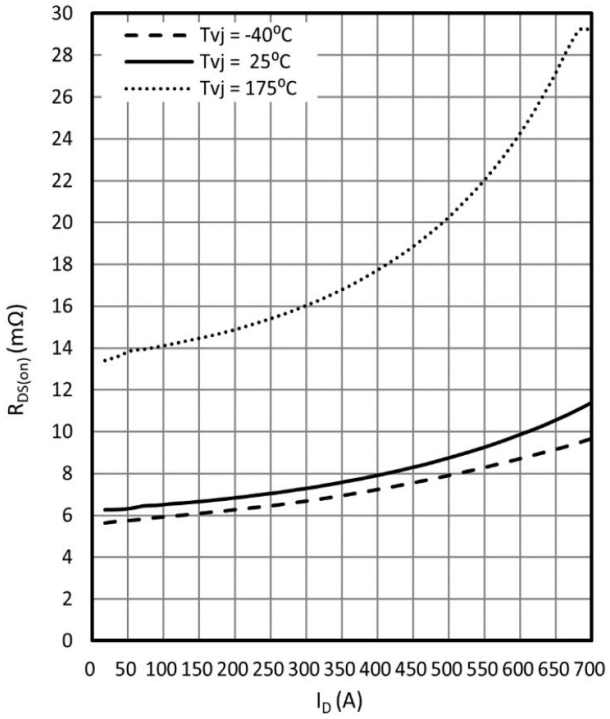


Fig 5: $R_{DS(on)}$ vs Drain current vs Temperature

$R_{DS(on)}=f(I_D)$, tp<200us, V_{GS}=18V

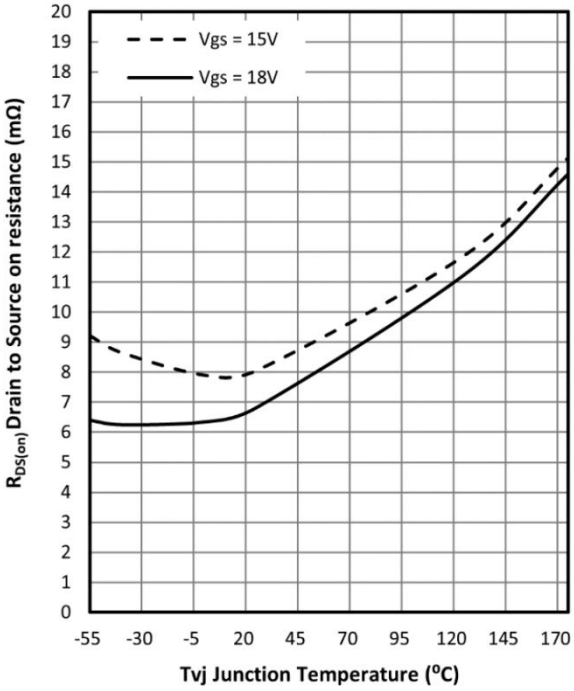


Fig 6: $R_{DS(on)}$ vs gate voltage vs Temperature

$R_{DS(on)}=f(Tj)$, ID=225A, V_{GS}=18V

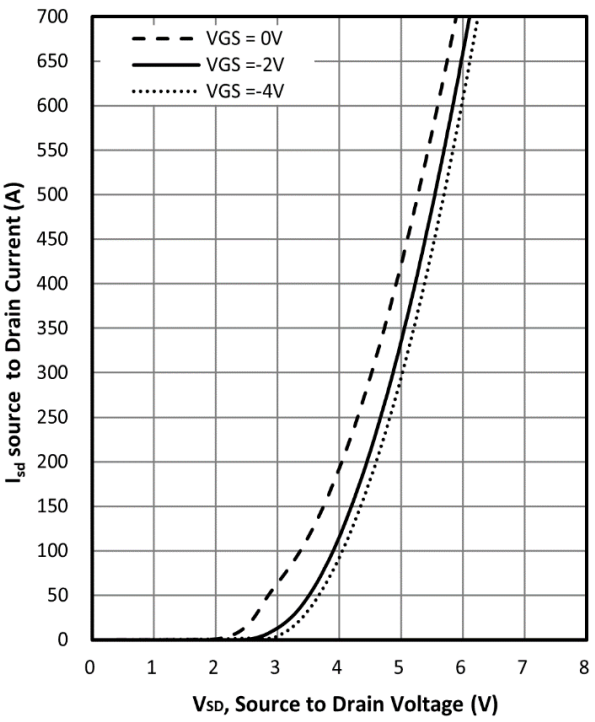


Fig 7: Body diode characteristic vs Temperature

$I_S=f(V_{SD})$, tp<200us, Tj=-55°C

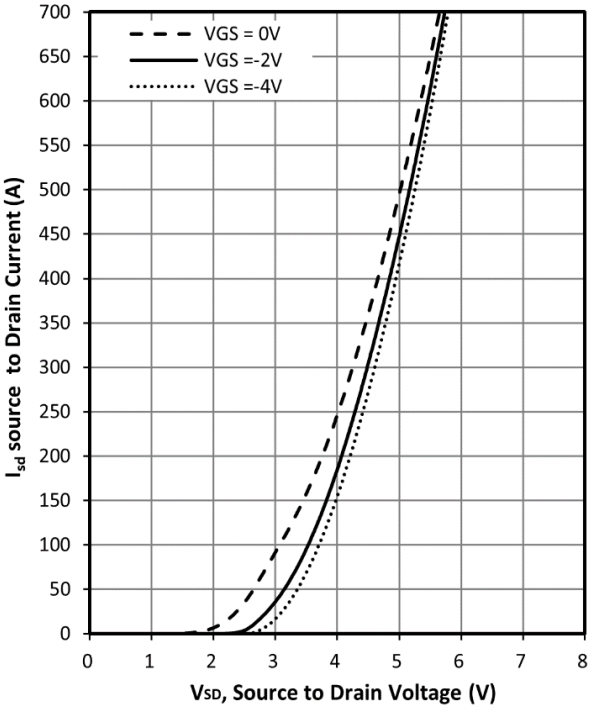


Fig 8: Body diode characteristic vs Temperature

$I_S=f(V_{SD})$, tp<200us, Tj=-55°C

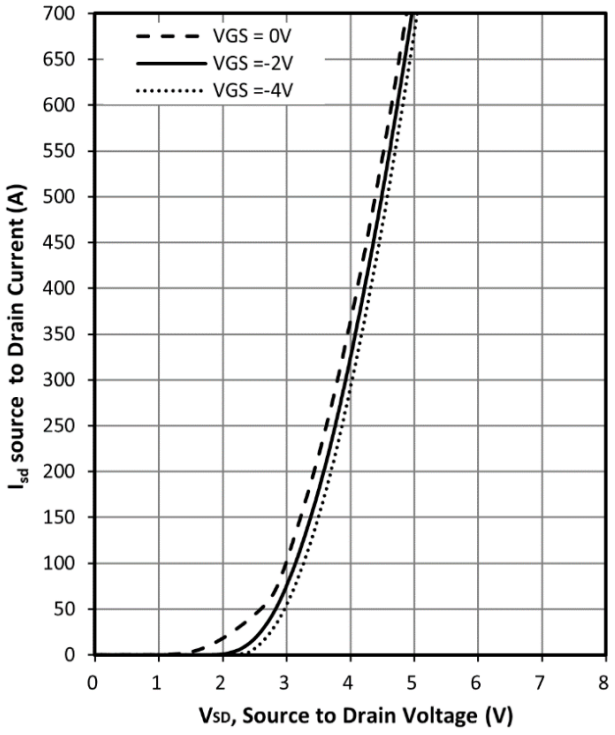


Fig 9: Body diode characteristic vs Temperature

$I_S=f(V_{SD})$, tp<200us, Tj=175°C

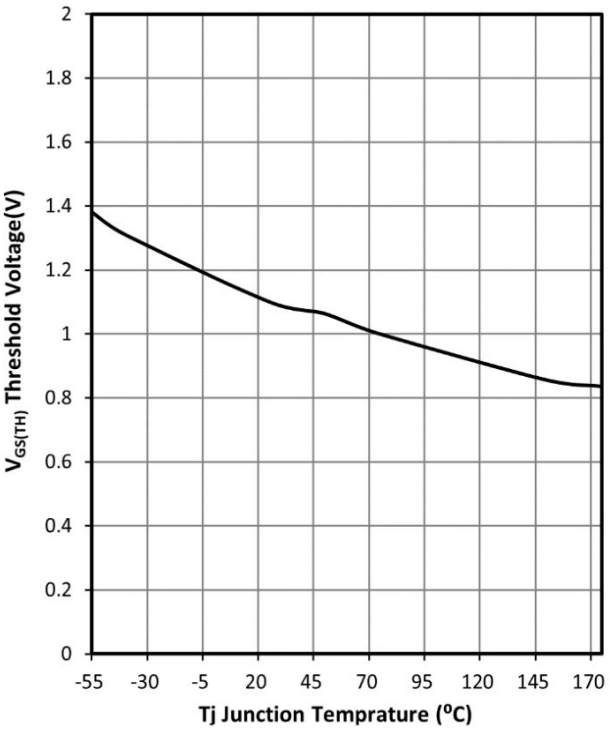


Fig 10: Threshold voltage vs Temperature

$V_{GS}=V_{DS}$, tp<200us, I_D=90mA

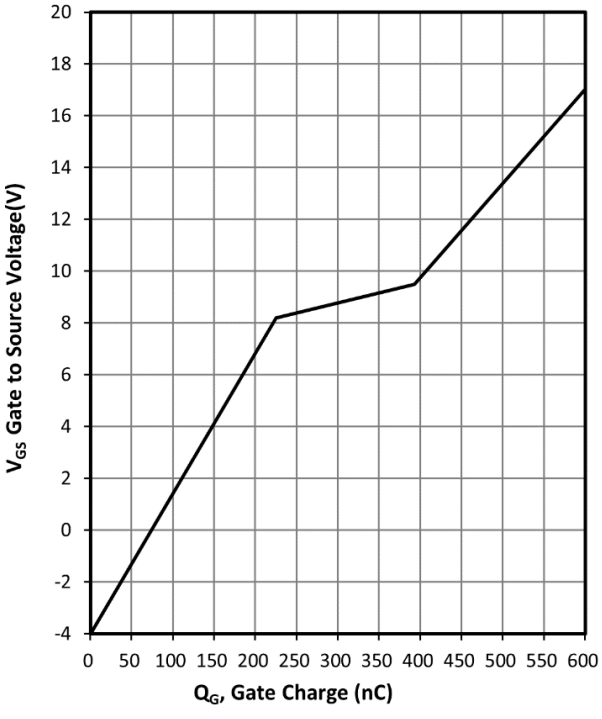


Fig 11: Gate characteristic

V_{DS}=1200V, tp<200us, I_D=225A, Tj=25°C

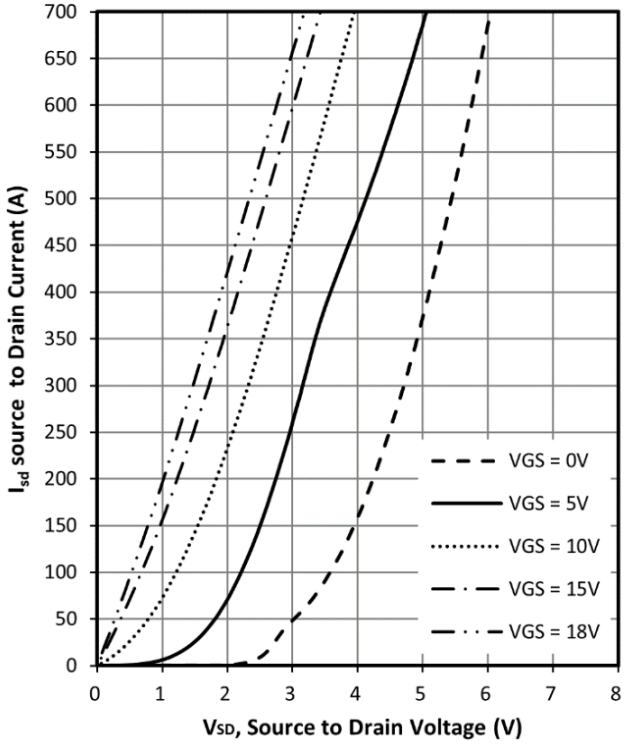


Fig 12: Reverse conduct characteristic @ different V_{GS}

$I_S=f(V_{SD})$, tp<200us, Tj=-55°C

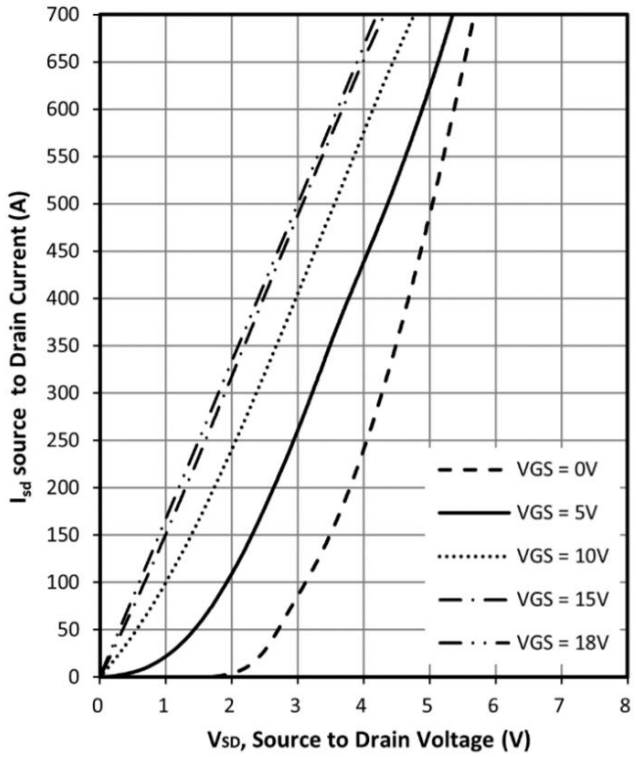


Fig 13: Reverse conduct characteristic @ different V_{GS}

$I_S=f(V_{SD})$, tp<200us, Tj=25°C

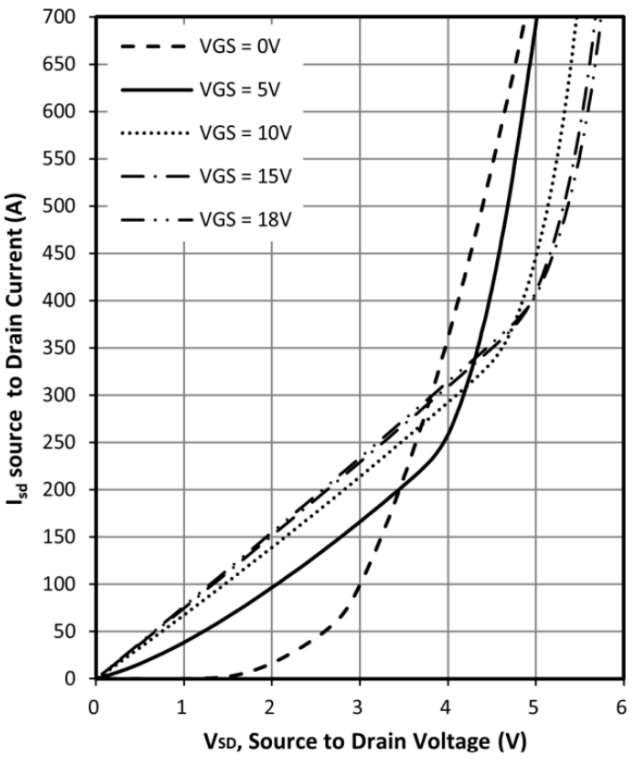


Fig 14: Reverse conduct characteristic @ different V_{GS}

$I_S=f(V_{SD})$, tp<200us, Tj=175°C

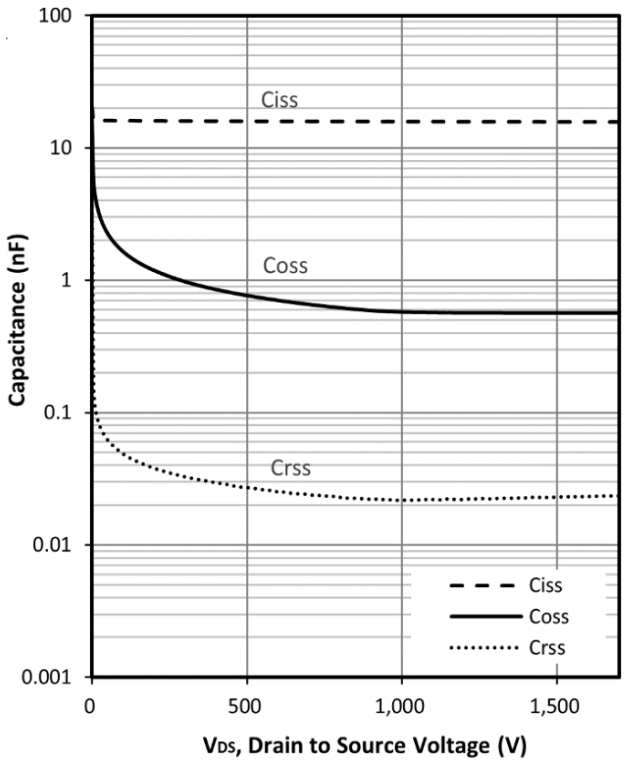


Fig 15: Capacitance vs drain source voltage

V_{AC}=25mV, f=100kHz, T_j=25°C

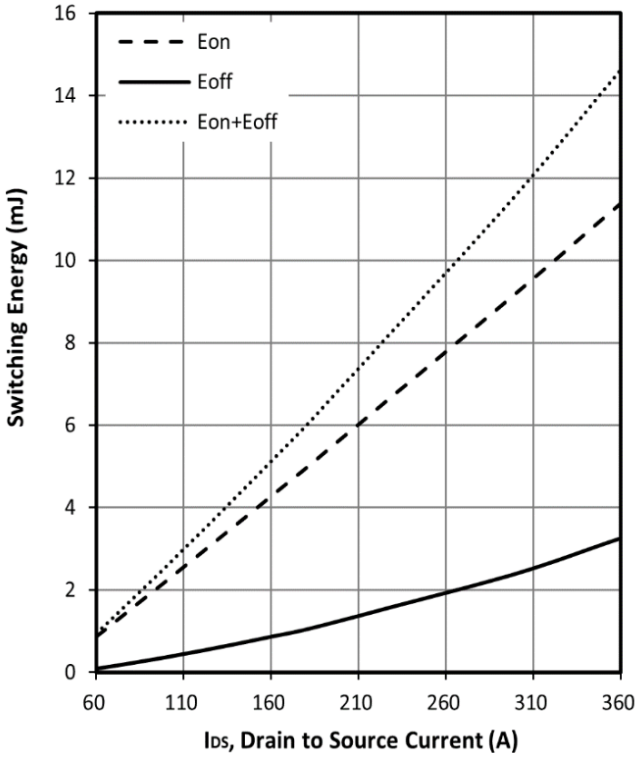


Fig 16: Switch energy vs. drain current

V_{bus}=1200V, V_{GS}=-4V/+18V, Rg=2.5Ω

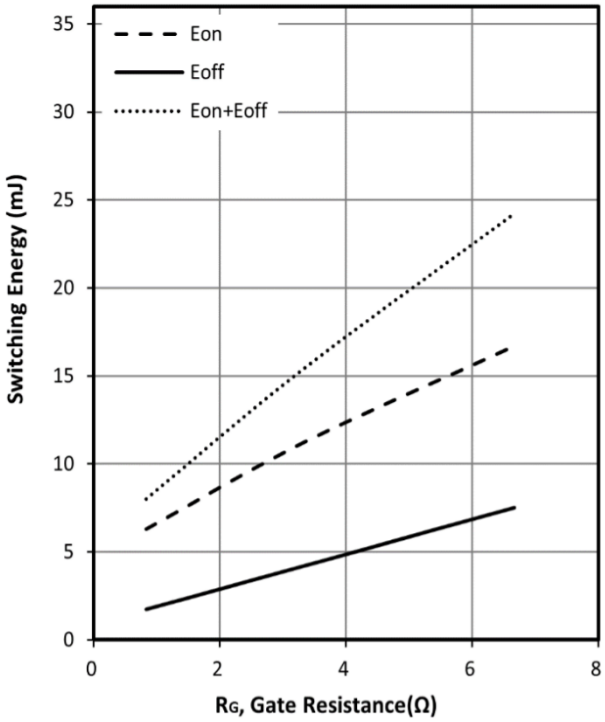


Fig 17: Switch energy vs. R_G

V_{bus}=1200V, V_{GS}=-4V/+18V, Rg=2.5Ω

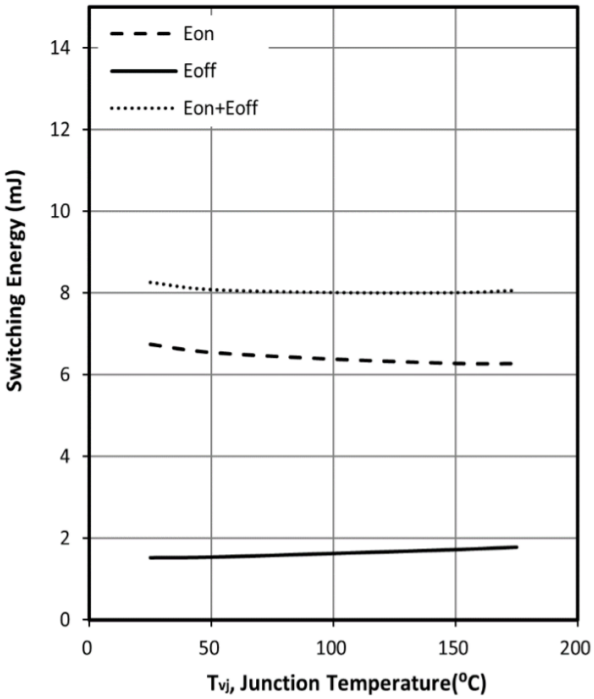


Fig 18: Switch energy vs. Temperature

V_{bus}=1200V, V_{GS}=-4V/+18V, Rg=2.5Ω, I_D=225A

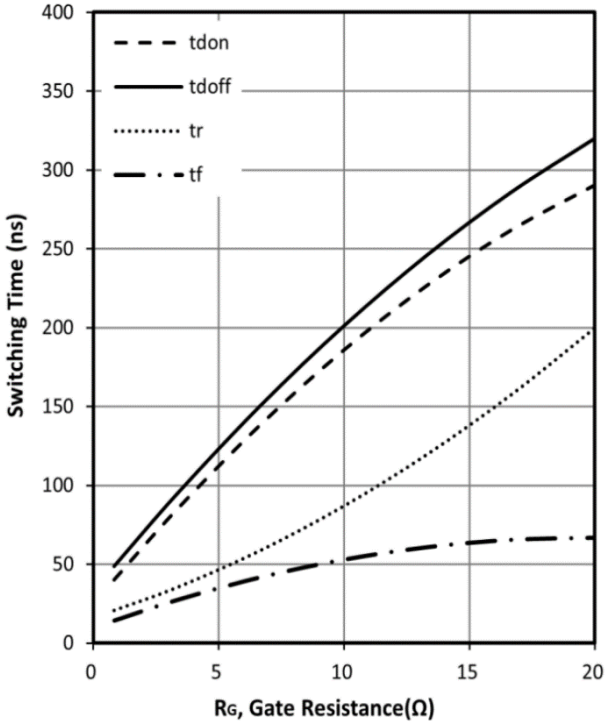
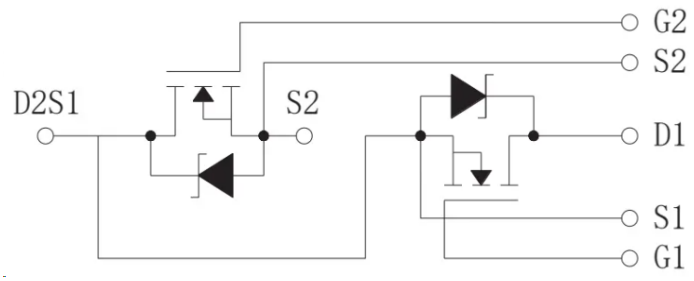


Fig 19: Switch time vs. R_G

V_{bus}=1200V, V_{GS}=-4V/+18V, Rg=2.5Ω, I_D=225A

Package Information: 62mm module



Dimensions in millimeters