000771 iCu400MB12I2

FHB Series

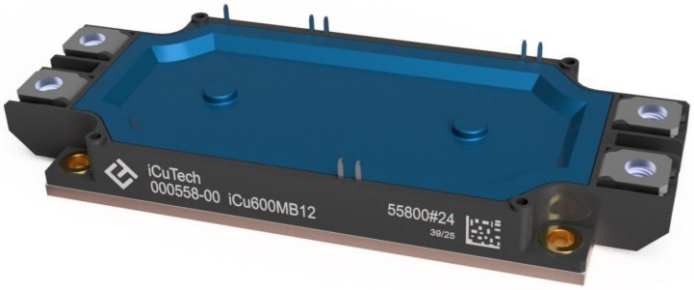
Silicon Carbide Mosfet Half Bridge

TARGET DATASHEET

1. General Description

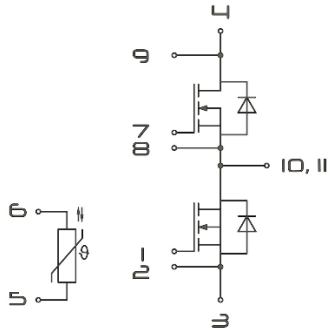
Silicon Carbide Mosfet Half Bridge based on qualified discrete components:

- ✓ $R_{DS(on)}$ = 4.3 mΩ at V_{GS} = 18V, T_{vj} = 25 °C
- ✓ Very low switching losses
- ✓ Short circuit withstand time 2 µs
- ✓ Benchmark gate threshold voltage $V_{GS(th)}$= 4.2 V



2. Features and Benefits

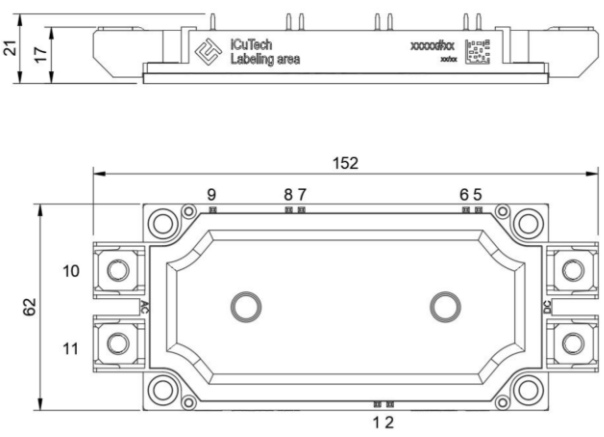
- ✓ V_{DSS} = 1200 V
- ✓ $I_{D\ Nominal}$ = 600 A
- ✓ Integrated temperature sensor
- ✓ Insulation: 2,5 kV AC, 1 min.
- ✓ Industry standard design
- ✓ High performance IMS/IMB copper baseplate



3. Applications

Suitable for:

- ✓ Motor drives
- ✓ High frequency power supplies
- ✓ AC inverters
- ✓ EV chargers
- ✓ Photovoltaic, wind power
- ✓ Induction heating



4. Electrical Ratings

Table 1: Maximum rated values

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-source voltage $T_{vj} \geq 25$ °C	1200	V
V_{GS}	Gate-source voltage	-7 / 23	V
	Gate-source voltage (recommended operating values)	-5 / 18	
	Gate-source transient voltage, $t_p < 0.5$ µs, $D < 0.01$	-10 / 25	
I_D	Drain current (continuous) at $T_C = 25$ °C, $V_{GS} = 18$ V	400	A
	Drain current (continuous) at $T_C = 100$ °C, $V_{GS} = 18$ V	304	
I_{DM} *	Drain current (pulsed), $V_{GS} = 18$ V	912	A
P_{TOT}	Total power dissipation at $T_C = 25$ °C	1880	W
T_{stg}	Storage temperature range	-40 to 125	°C
T_J	Operating junction temperature range	-40 to 175	

* *Pulse width is limited by safe operating area.*

Table 2: Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.060	°C/W
R_{thCH}	Thermal resistance, case-to-heatsink	t.b.d.	°C/W

5. Package

Table 3: Insulation coordination				
Symbol	**Parameter**	**Test conditions**	**Value**	**Unit**
V_{ISOL}	Isolation test voltage	AC RMS, f =50 Hz, t = 1 min	2.5	kV
	Baseplate	Copper	3	mm
	Internal isolation	IMS Insulation sheet	110	µm
d_{Creep}	Creepage distance	Terminal to heatsink	14.5	mm
d_{Creep}	Creepage distance	Terminal to terminal	13.0	mm
d_{Clear}	Clearance	Terminal to heatsink	12.5	mm
d_{Clear}	Clearance	Terminal to terminal	10	mm
CTI	Comparative Tracking Index	IEC 60112	>600	V
	Case		PBT (UL-V0)	

Table 4: Characteristic values						
Symbol	**Parameter**	**Test conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
L_{sDS}	Module stray inductance			14		nH
$R_{DD'+SS'}$	Internal lead resistance	T_c = 25 °C		t.b.d.		mΩ
R_{25}	NTC Temperature sensor resistance	T_c = 25 °C		4.7		kΩ
$B_{25/50}$	NTC Temperature sensor B value			3590		K
$B_{25/85}$	NTC Temperature sensor B value			3635		K
$B_{25/100}$	NTC Temperature sensor B value			3650		K
M	Mounting torque	M6 screw Main Terminals	3		6	Nm
M	Mounting torque	M5 screw mounting to heatsink	3		5	Nm
G	Weight			375		g

6. Electrical Characteristics

Table 5: On/off states (chip level)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 1 mA	1200			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 1200 V, T_{vj} = 25 °C			350	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = -10 / + 23 V			±120	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 50.8 mA, T_{vj} = 25 °C	3.5	4.2	5.1	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 18 V, I_D = 162 A, T_{vj} = 25 °C		2.85		mΩ
		V_{GS} = 18 V, I_D = 162 A, T_{vj} = 150 °C		5.8	7.5	
		V_{GS} = 18 V, I_D = 162 A, T_{vJ} = 175 °C		6.8		

Table 6: Dynamic (chip level)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 800 V, f = 100 kHz, V_{GS} = 0 V, V_{AC} = 25mV		12		nF
C_{oss}	Output capacitance			504		pF
C_{rss}	Reverse transfer capacitance			44		pF
Q_g	Total gate charge	V_{DS} = 800 V, V_{GS} = -2 / 18 V, I_D = 162 A		356		nC
$Q_{gs(pl)}$	Plateau gate-source charge			76		nC
Q_{gd}	Gate-drain charge			96		nC
R_g	Internal Gate input resistance	f = 1 MHz, I_D = 0 A, included internal gate PCB		1.9		Ω

Table 7: Switching energy (inductive load) (chip level)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on}	Turn-on switching energy	V_{DD} = 800 V, I_D = 162 A, R_G = 2.3 Ω, V_{GS} = 0 V to 18 V		1480		µJ
E_{off}	Turn-off switching energy			440		µJ

Table 8: Switching times (chip level)						
Symbol	**Parameter**	**Test conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
$t_{d(on)}$	Turn-on delay time	V_{DD} = 400 V, I_D = 162 A, R_G = 2.3 Ω, V_{GS} = 0 / 18 V		7		ns
t_r	Rise time			18		ns
$t_{d(off)}$	Turn-off delay time			14		ns
t_f	Fall time			9		ns

Table 9: Reverse SiC diode characteristics (chip level)						
Symbol	**Parameter**	**Test conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
I_{SD*}	Continuous diode forward current	T_C = 25 °C			600	A
		Tc = 100°C				
V_{SD}	Diode forward voltage	I_{SD} = 162 A, V_{GS} = 0 V, T_{vj} = 25 °C		4.2	5.5	V

I_{SD} is limited by package.

7. Package Outlines