

F1 module with Trench/Fieldstop IGBT and Emitter Controlled diode and Press FIT/NTC

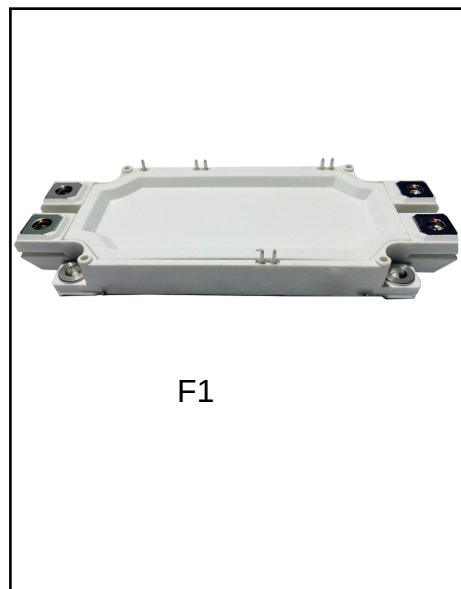
Features

- Electrical features

- Low V_{CEsat}
- $V_{CE(sat)}$ with positive temperature coefficient
- 10 μ s short circuit capability
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD

- Mechanical features

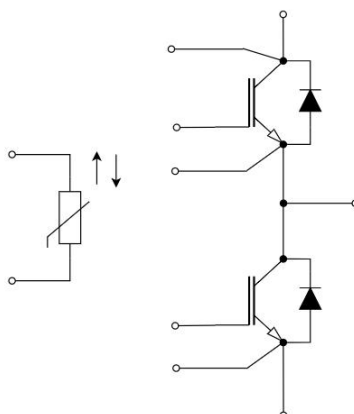
- Isolated Base Plate
- PressFIT Contact Technology



Typical Applications

- Hybrid and electric vehicle
- Inverter for motor drive
- Uninterruptible power supply

Description



Package Insulation coordination

Symbol	Description	Note or test condition	Values	Unit
V_{ISOL}	Isolation test voltage	RMS, f=50Hz, t=60s	3.4	kV
	Material of module baseplate		Cu	
	Internal isolation	basic insulation(class 1, IEC 61140)	Al_2O_3	
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	10.0	mm
CTI	Comparative tracking index (electrical)		>200	

Package Characteristic values

Symbol	Description	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
L_{sCE}	Stray inductance module				20		nH
$R_{CC'+EE'}$	Module lead resistance, terminals - chip	TC = 25 °C, per switch			1.1		mΩ
T_{STG}	Storage Temperature Range			-40		125	°C
M	Mounting torque for module mounting	-Mounting according to valid application note	M5, Screw	3.0	--	6.0	Nm
M	Terminal connection torque	-Mounting according to valid application note	M6, Screw	3.0	--	6.0	Nm
G	Weight			--	345	--	g

IGBT

Absolute Maximum Ratings (T_c = 25°C unless otherwise noted)

Symbol	Description	Value	Unit
V _{CES}	Collector-Emitter Voltage	1200	V
V _{GES}	Gate-Emitter Voltage	±30	V
I _{CDC}	Continuous Collector Current @ T _c = 80°C (T _{JMAX} = 175°C)	450	A
I _{CM}	Pulsed Collector Current, t _p limited by T _{vj max}	900	A
T _{Jmax}	Maximum Junction Temperature	175	°C

Characteristics (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C = 450A, V _{GE} = 15 V	T _{vj} = 25 °C	--	1.50	V
			T _{vj} = 150 °C	--	1.75	
			T _{vj} = 175 °C	--	1.80	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	V _{GE} = V _{CE} , I _C = 5 mA, T _{vj} = 25°C	5.0	5.8	6.5	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1200V, T _{vj} = 25°C	--	--	100	uA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = ±30 V, V _{CE} = 0 V, T _{vj} = 25°C	--	--	±100	nA
R _{Gint}	Internal Gate Resistance	T _{vj} = 25 °C	--	0.67	--	Ω
C _{ies}	Input Capacitance	f = 100 kHz, T _{vj} = 25 °C, V _{CE} = 25 V, V _{GE} = 0 V	--	68	--	nF
C _{oes}	Out Capacitance		--	1.6	--	nF
C _{res}	Reverse Transfer		--	0.24	--	nF
Q _G	Gate Charge	V _{GE} = ±15 V, V _{CC} = 960 V	--	2.2	--	μC
t _{d(on)}	Turn-On Delay Time	I _C = 225A, V _{CC} = 600 V, V _{GE} = 15 /-5V, R _G = 1.0 Ω	T _{vj} = 25 °C	--	0.132	μS
			T _{vj} = 150 °C	--	0.150	
			T _{vj} = 175 °C	--	0.152	
t _r	Rise Time	I _C = 225A, V _{CC} = 600 V, V _{GE} = 15 /-5V, R _G = 1.0 Ω	T _{vj} = 25 °C	--	0.024	μS
			T _{vj} = 150 °C	--	0.029	
			T _{vj} = 175 °C	--	0.030	
t _{d(off)}	Turn-off Delay Time	I _C = 225A, V _{CC} = 600 V, V _{GE} = 15 /-5V, R _{Goff} = 1.0 Ω	T _{vj} = 25 °C	--	0.268	μS
			T _{vj} = 150 °C	--	0.306	
			T _{vj} = 175 °C	--	0.312	
t _f	Fall Time	I _C = 225A, V _{CC} = 600 V, V _{GE} = 15 /-5V, R _G = 1.0 Ω	T _{vj} = 25 °C	--	0.033	μS
			T _{vj} = 150 °C	--	0.073	
			T _{vj} = 175 °C	--	0.074	
E _{on}	Turn-On Switching Loss per Pulse	I _C = 225A, V _{CC} = 600 V, V _{GE} = 15 /-5V, R _G = 1.0 Ω (T _{vj max} = 175 °C)	T _{vj} = 25 °C	--	6.22	mJ
			T _{vj} = 150 °C	--	12.40	
			T _{vj} = 175 °C	--	13.80	
E _{off}	Turn Off Switching Loss per Pulse	I _C = 225A, V _{CC} = 600 V, V _{GE} = 15 /-5V, R _G = 1.0 Ω (T _{vj max} = 175 °C)	T _{vj} = 25 °C	--	27.03	mJ
			T _{vj} = 150 °C	--	36.00	
			T _{vj} = 175 °C	--	24.18	

I_{SC}	SC Data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V},$ $V_{CEmax}=V_{CES}-L_{sCE} \cdot di/dt$	$t_P \leq 10\text{ }\mu\text{s},$ $T_{vj}=150\text{ }^\circ\text{C}$	--	2000	--	A
			$t_P \leq 10\text{ }\mu\text{s},$ $T_{vj}=175\text{ }^\circ\text{C}$	--	1880	--	
R_{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.079		K/W
$T_{vj\text{ op}}$		Temperature under switching conditions		-40		175 ¹⁾	$^\circ\text{C}$

¹⁾ $T_{vj\text{ op}} > 150\text{ }^\circ\text{C}$ is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

Diodes

Absolute Maximum Ratings ($T_c = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current @ $T_c=80\text{ }^\circ\text{C}$	450	A
I_{FRM}	Diode Maximum Forward Current $t_p=1\text{ ms}$	900	A

Characteristics ($T_c=25\text{ }^\circ\text{C}$ unless otherwise noted)

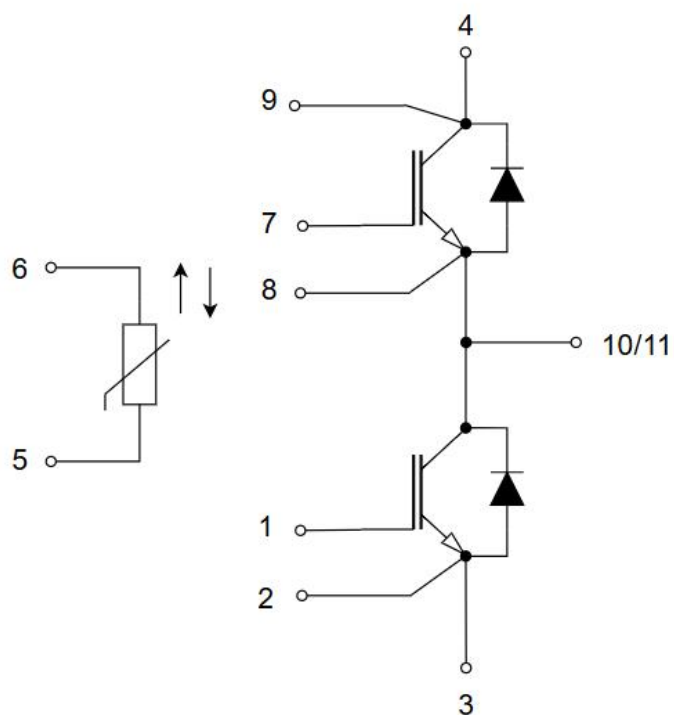
Symbol	Parameter	Note or Test Condition	Min	Typ	Max	Unit
V_F	Diode Forward Voltage	$I_F = 450\text{ A}$	$T_{vj} = 25\text{ }^\circ\text{C}$	--	2.00	V
			$T_{vj} = 150\text{ }^\circ\text{C}$	--	1.95	
			$T_{vj} = 175\text{ }^\circ\text{C}$	--	1.85	
Q_r	Recovered Charge	$I_F = 450\text{ A}, V_R = 600\text{ V},$ $R_G = 1.0\text{ }\Omega$ ($T_{vj\text{ max}} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	--	7.58	μC
			$T_{vj} = 150\text{ }^\circ\text{C}$	--	24.97	
			$T_{vj} = 175\text{ }^\circ\text{C}$	--	30.52	
I_{RM}	Peak Reverse Recovery Current	$I_F = 450\text{ A}, V_R = 600\text{ V},$ $R_G = 1.0\text{ }\Omega$ ($T_{vj\text{ max}} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	--	259	A
			$T_{vj} = 150\text{ }^\circ\text{C}$	--	325	
			$T_{vj} = 175\text{ }^\circ\text{C}$	--	342	
E_{rec}	Reverse recovery energy	$I_F = 450\text{ A}, V_R = 600\text{ V},$ $R_G = 1.0\text{ }\Omega$ ($T_{vj\text{ max}} = 175\text{ }^\circ\text{C}$)	$T_{vj} = 25\text{ }^\circ\text{C}$	--	8.14	mJ
			$T_{vj} = 150\text{ }^\circ\text{C}$	--	22.2	
			$T_{vj} = 175\text{ }^\circ\text{C}$	--	25.9	
R_{thJC}	Thermal resistance, junction to case	per diode	--	0.098	--	K/W
$T_{vj\text{ op}}$		Temperature under switching conditions	-40		175 ²⁾	$^\circ\text{C}$

²⁾ $T_{vj\text{ op}} > 150\text{ }^\circ\text{C}$ is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

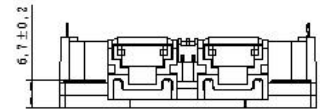
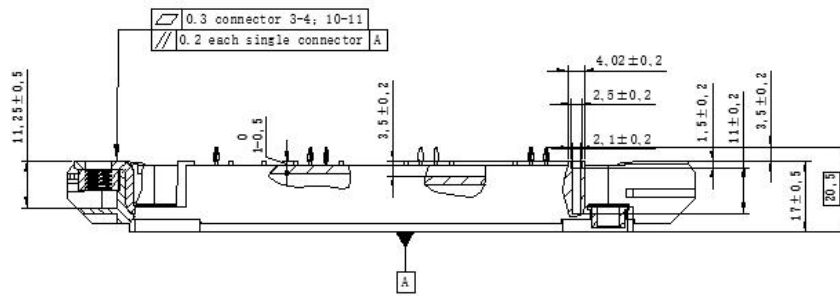
NTC Characteristics ($T_c = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R_{25}	Rated Resistance		--	5.0	--	k Ω
$\Delta R/R$	Deviation of R100	$T_c=100\text{ }^\circ\text{C}, R_{100}=493.3\Omega$	-5	--	5	%
P_{25}	Power Dissipation		--	--	20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2 - 1/(298.15\text{ K}))]$	--	3375	--	K
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2 - 1/(298.15\text{ K}))]$	--	3411	--	K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2 - 1/(298.15\text{ K}))]$	--	3433	--	K

CIRCUIT DIAGRAM

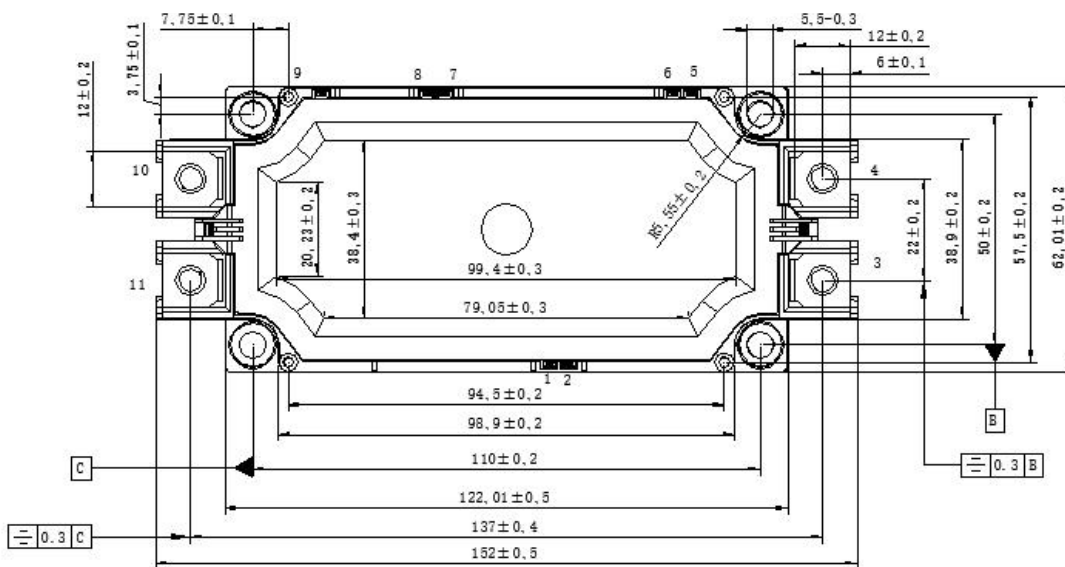


PACKAGE DIMENSION



SIDE VIEW

SIDE VIEW



PCB孔位图

