

D5 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

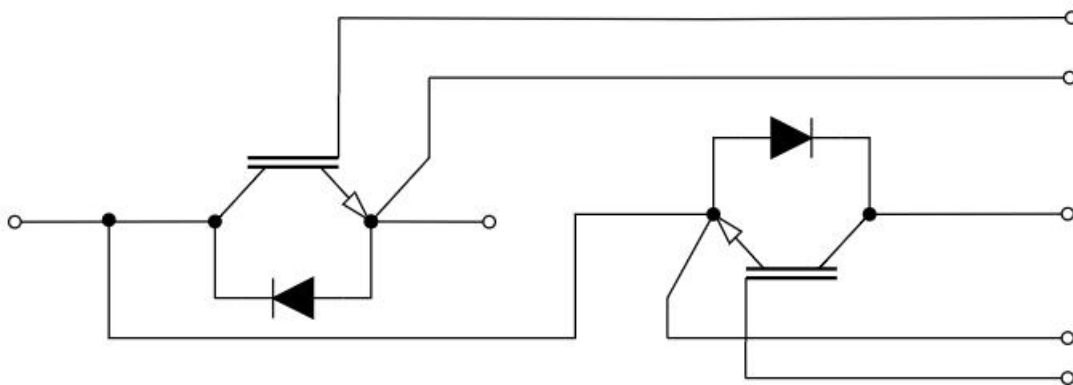
- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Al_2O_3 substrate with low thermal resistance



Typical Applications

- Switched mode power supplies
- Servo Drives
- UPS Systems
- Welding inverters

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, $f = 50 \text{ Hz}$, $t = 60 \text{ s}$	2.5	kV
Internal isolation		basic insulation(class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	29.0	mm
Creepage distance	d_{creep}	terminal to terminal	23.0	mm
Clearance	d_{clear}	terminal to heatsink	23.0	mm
Clearance	d_{clear}	terminal to terminal	11.0	mm
Comparative tracking index (electrical)	CTI		>400	
RTI Elec.	RTI	housing	140	°C

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	L_{CE}			--	20	--	nH
Module Lead Resistance, Terminal to Chip	R_{CC+EE}	$T_C=25^\circ\text{C}$, per switch		--	0.7	--	mΩ
Storage temperature	T_{stg}			-40	--	125	°C
Mounting torque for module mounting	M	-Mounting according to valid application note	M6, Screw	3.00	--	6.00	Nm
Terminal connection torque	M	-Mounting according to valid application note	M6, Screw	2.5	--	5.0	Nm
Weight	G			--	340	--	g

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

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_{CDC}	Continuous Collector Current @ $T_c = 100^\circ\text{C}$	200	A
I_{CM}	Pulsed Collector Current, t_p limited by $T_{vj\text{ max}}$	600	A
P_{tot}	Total power dissipation, $T_c = 25^\circ\text{C}$, $T_{vj\text{ max}} = 175^\circ\text{C}$	608	W

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

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
V _{CE(sat)}	Collector–Emitter Saturation Voltage	I _C =200 A, V _{GE} = 15 V	T _{vj} = 25 °C	--	1.45	2.10	V
			T _{vj} = 125 °C	--	1.60	--	
			T _{vj} = 175 °C	--	1.65	--	
V _{GE(TH)}	Gate–Emitter Threshold Voltage	I _C =5 mA,V _{CE} =V _{GE}		4.00	4.75	5.50	V
I _{CES}	Collector–Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1200 V		--	--	500	μA
I _{GES}	Gate-Emitt _{er} Leakage Current	V _{GE} = ±30 V, V _{CE} = 0 V, T _{vj} = 25 °C		--	--	100	nA
R _{Gint}	Internal Gate Resistance	f=1 MHz		--	0.25	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25 V,V _{GE} =0 V, f=1 MHz		--	11.80	--	nF
C _{oes}	Output Capacitance			--	0.40	--	nF
C _{res}	Reverse Transfer			--	0.08	--	nF
Q _G	Gate Charge	V _{CC} =480V, V _{GE} =15V, I _C =200 A		--	0.416	--	μC
t _{d(on)}	Turn–On Delay Time	V _{CC} =400V,I _C =200 A V _{GE} =0/15V, R _g =5.7Ω, Inductive Load T _{vj} = 25 °C		--	172	--	ns
t _r	Rise Time			--	64	--	
t _{d(off)}	Turn–off Delay Time			--	544	--	
t _f	Fall Time			--	80	--	
E _{on}	Turn–On Switching Loss per Pulse			--	4.36	--	mJ
E _{off}	Turn Off Switching Loss per Pulse			--	1.36	--	
t _{d(on)}	Turn–On Delay Time	V _{CC} =400V,I _C =200 A, V _{GE} =0/15V, R _g =5.7Ω, Inductive Load T _{vj} = 125 °C		--	TBD	--	ns
t _r	Rise Time			--	TBD	--	
t _{d(off)}	Turn–off Delay Time			--	TBD	--	
t _f	Fall Time			--	TBD	--	
E _{on}	Turn–on Switching Loss per Pulse			--	TBD	--	mJ
E _{off}	Turn Off Switching Loss per Pulse			--	TBD	--	
t _{d(on)}	Turn–On Delay Time	V _{CC} =400V,I _C =200 A, V _{GE} =0/15V, R _g =5.7Ω, Inductive Load T _{vj} = 175 °C		--	TBD	--	ns
t _r	Rise Time			--	TBD	--	
t _{d(off)}	Turn–off Delay Time			--	TBD	--	
t _f	Fall Time			--	TBD	--	
E _{on}	Turn–on Switching Loss per Pulse			--	6.72	--	mJ
E _{off}	Turn Off Switching Loss per Pulse			--	3.32	--	
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.22	-	K/W
T _{vj op}	Temperature under switching conditions			–40		175 ¹⁾	°C

¹⁾ $T_{vj\text{ op}} > 150^\circ\text{C}$ is only allowed for operation at overload conditions.

Diode

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

Symbol	Description	Value	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	650	V
I _F	Diode Continuous Forward Current	200	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	600	A

Characteristics (T_C=25°C unless otherwise noted)

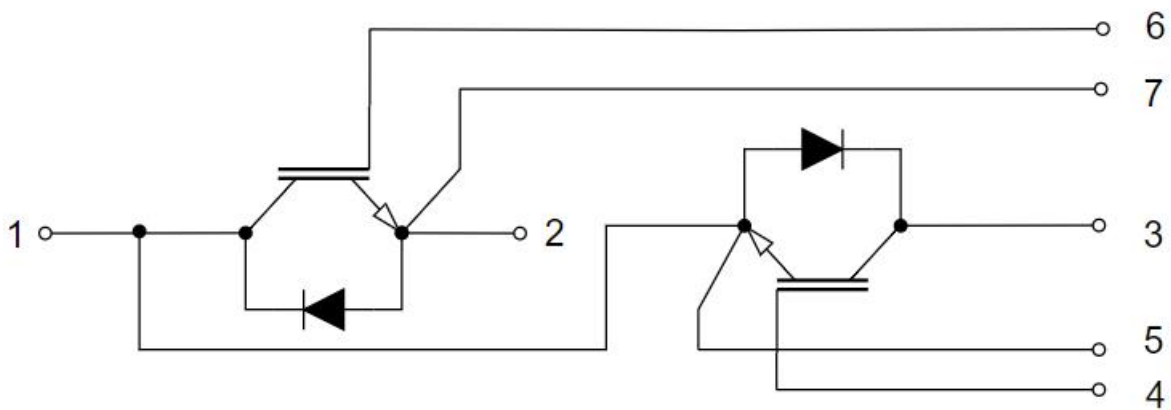
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 200 A, T _{vj} = 25 °C	--	1.70	2.40	V
		I _F = 200 A, T _{vj} = 125 °C	--	1.60	--	
		I _F = 200 A, T _{vj} = 175 °C	--	1.55	--	
T _{rr}	Reverse Recovery Time	I _F =200 A, R _G =5.7 Ω T _{vj} = 25 °C	--	360	--	ns
I _{RM}	Peak Reverse Recovery Current		--	104	--	A
Q _{rr}	Recovered Charge		--	4.92	--	μC
E _{rec}	Reverse Recovery Energy		--	0.64	--	mJ
T _{rr}	Reverse Recovery Time	I _F =200 A, R _G =5.7 Ω T _{vj} = 125 °C	--	TBD	--	ns
I _{RM}	Peak Reverse Recovery Current		--	TBD	--	A
Q _{rr}	Recovered Charge		--	TBD	--	μC
E _{rec}	Reverse Recovery Energy		--	TBD	--	mJ
T _{rr}	Reverse Recovery Time	I _F =200 A, R _G =5.7 Ω T _{vj} = 175 °C	--	TBD	--	ns
I _{RM}	Peak Reverse Recovery Current		--	TBD	--	A
Q _{rr}	Recovered Charge		--	TBD	--	μC
E _{rec}	Reverse Recovery Energy		--	TBD	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.23	--	K/W
T _{vj op}	Temperature under switching conditions		-40		175 ²⁾	°C

²⁾T_{vj op} > 150°C is only allowed for operation at overload conditions.

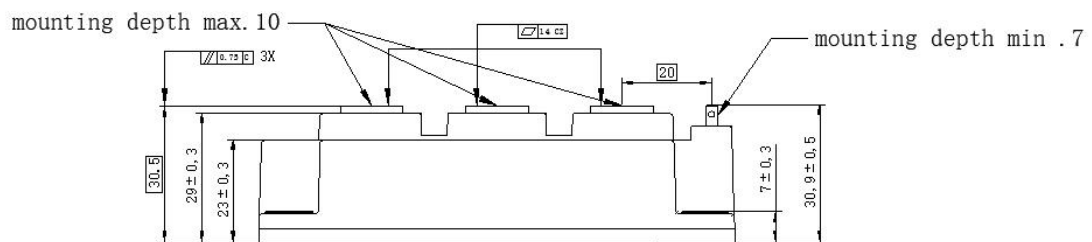
NTC Characteristics (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R ₂₅	Rated Resistance		--	5.0	--	kΩ
ΔR/R	Deviation of R ₁₀₀	T _C =100 °C, R ₁₀₀ =493.3 Ω	-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/(298.15K))]	--	3375	--	K
B _{25/80}	B-value	R ₂ =R ₂₅ exp[B _{25/80} (1/T ₂ - 1/(298.15K))]	--	3411	--	K
B _{25/100}	B-value	R ₂ =R ₂₅ exp[B _{25/100} (1/T ₂ - 1/(298.15K))]	--	3433	--	K

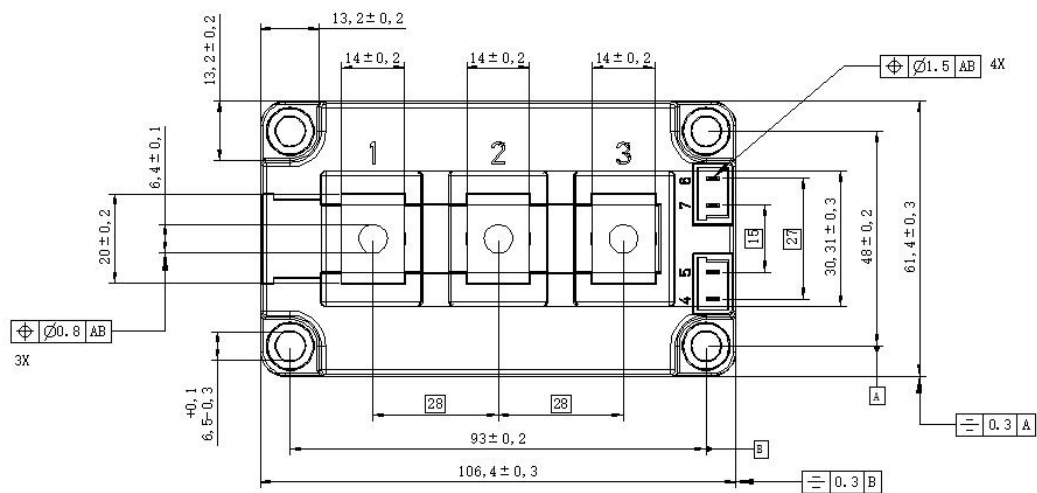
CIRCUIT DIAGRAM



PACKAGE DIMENSION



SIDE VIEW



TOP VIEW