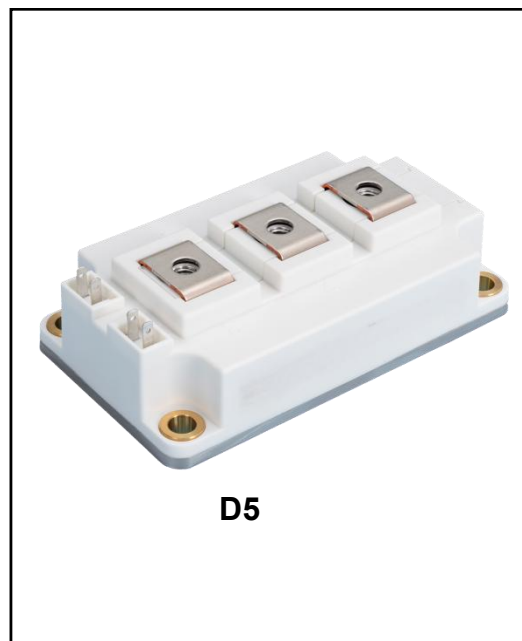


D5 PACK module with Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

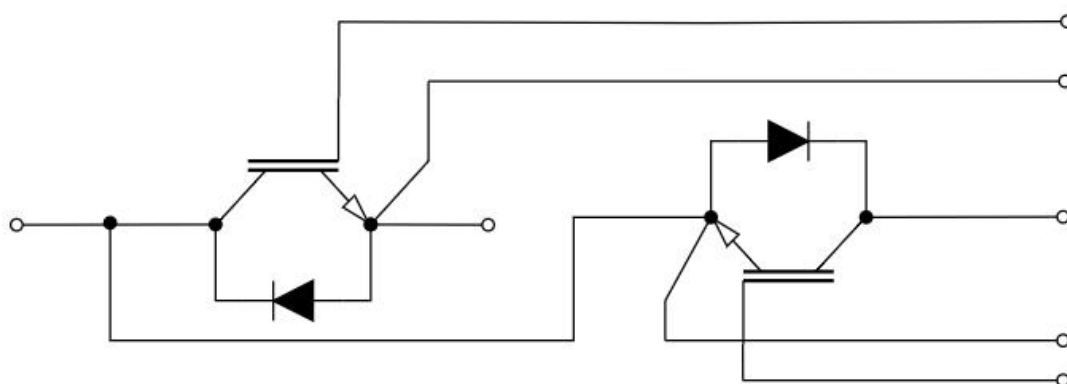
- Low $V_{CE(sat)}$ Trench IGBT technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- 10 μ s short circuit capability
- Al₂O₃ substrate with low thermal resistance



Typical Applications

- 48 V power distribution
- Motor Drives
- High voltage direct current (HVDC)
- Photovoltaic
- Power conversion

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	--	6	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	1200	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_{CDC}	Continuous Collector Current @ $T_c = 100^\circ\text{C}$	350	A
I_{CM}	Pulsed Collector Current, $t_p = 1\text{ms}$	700	A
P_{tot}	Total power dissipation, $T_c = 25^\circ\text{C}$, $T_{vj\max} = 175^\circ\text{C}$	1700	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 =350 A, V _{GE} = 15 V	T _{vj} = 25 °C	--	1.50	2.20	V		
			T _{vj} = 125 °C	--	1.65	--			
			T _{vj} = 175 °C	--	1.70	--			
V _{GE(TH)}	Gate-Emitter Threshold Voltage	I _C =3 mA, V _{CE} =V _{GE}		5.0	6.0	7.0	V		
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1200 V		--	--	500	μA		
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	f=1 MHz		--	0.2	--	Ω		
C _{ies}	Input Capacitance	V _{CE} =30 V, V _{GE} =0 V, f=1 MHz			47.2		nF		
C _{oes}	Output Capacitance			--	1.12	--	nF		
C _{res}	Reverse Transfer			--	0.268	--	nF		
Q _G	Gate Charge	V _{CC} =960V, V _{GE} =15V, I _C =350A		--	1.46	--	μC		
t _{d(on)}	Turn-On Delay Time	V _{CC} =600V, I _C =350A, V _{GE} =0/15V, R _g =25Ω, Inductive Load T _{vj} = 25 °C		--	287	--	ns		
t _r	Rise Time			--	196	--			
t _{d(off)}	Turn-off Delay Time			--	907	--			
t _f	Fall Time			--	148	--			
E _{on}	Turn-On Switching Loss per Pulse	V _{CC} =600V, I _C =350A, V _{GE} =0/15V, R _g =25Ω, Inductive Load T _{vj} = 125 °C		--	22.17	--	mJ		
E _{off}	Turn Off Switching Loss per Pulse			--	15.37	--			
t _{d(on)}	Turn-On Delay Time			V _{CC} =600V, I _C =350A, V _{GE} =0/15V, R _g =25Ω, 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	V _{CC} =600V, I _C =350A, V _{GE} =0/15V, R _g =25Ω, Inductive Load T _{vj} = 175 °C		--	TBD	--	mJ		
E _{off}	Turn Off Switching Loss per Pulse			--	TBD	--			
t _{d(on)}	Turn-On Delay Time			V _{CC} =600V, I _C =350A, V _{GE} =0/15V, R _g =25Ω, 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	V _{GE} =15V, V _{CC} ≤600V, t _{sc} ≤10us, T _j ≤150°C		--	TBD	--	mJ		
E _{off}	Turn Off Switching Loss per Pulse			--	TBD	--			
I _{C(sc)}	Short circuit collector current Max.1000 Short circuits Time between short circuits:≥1.0s			V _{GE} =15V, V _{CC} ≤600V, t _{sc} ≤10us, T _j ≤150°C		--	2400	--	A
R _{thJC}	Thermal resistance			Junction-to-Case (per IGBT)		--	0.078	-	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. For detailed specifications please refer to AN 2018-14.

Diode

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

Symbol	Description	Value	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	1200	V
I _F	Diode Continuous Forward Current	350	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	700	A

Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 350 A, T _{vj} = 25 °C	--	1.90	2.90	V
		I _F = 350 A, T _{vj} = 125 °C	--	1.80	--	
		I _F = 350 A, T _{vj} = 175 °C	--	1.85	--	
T _{rr}	Reverse Recovery Time	I _F =350 A, R _G =25 Ω T _{vj} = 25 °C	--	307	--	ns
I _{RM}	Peak Reverse Recovery Current		--	45.3	--	A
Q _{rr}	Recovered Charge		--	2.11	--	μC
E _{rec}	Reverse Recovery Energy		--	1.814	--	mJ
T _{rr}	Reverse Recovery Time	I _F =350 A, R _G =25 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 =350 A, R _G =25 Ω T _{vj} = 175 °C	--	183	--	ns
I _{RM}	Peak Reverse Recovery Current		--	30	--	A
Q _{rr}	Recovered Charge		--	3.01	--	μC
E _{rec}	Reverse Recovery Energy		--	1.06	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.15	--	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. For detailed specifications please refer to AN 2018-14.

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

The circuit diagram shows a full-wave bridge rectifier. It consists of four diodes connected in a bridge configuration. The input terminals are labeled 1 and 2. The output terminals are labeled 3, 4, 5, and 6. The bridge is connected such that the positive output is taken from terminal 3 and the negative output is taken from terminal 4. The bridge is connected to a load resistor (represented by a rectangle) and a filter capacitor (represented by two parallel lines). The filter capacitor is connected between the output terminals 3 and 4. The input terminals 1 and 2 are connected to the bridge. The output terminals 3, 4, 5, and 6 are connected to the bridge.

mounting depth max. 10

mounting depth min. 7

30.5

29 ± 0.3

23 ± 0.3

10

7

30.9 ± 0.5

C

3X

1.4 02

SIDE VIEW

