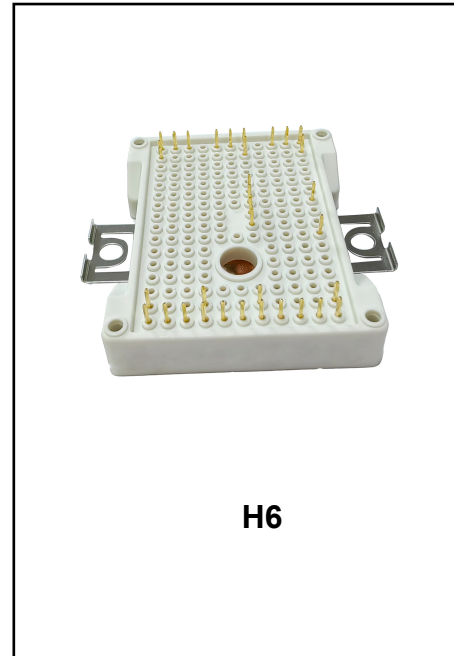


3-Level NPC Inverter Module with 650V Trench Stop IGBTs

Features

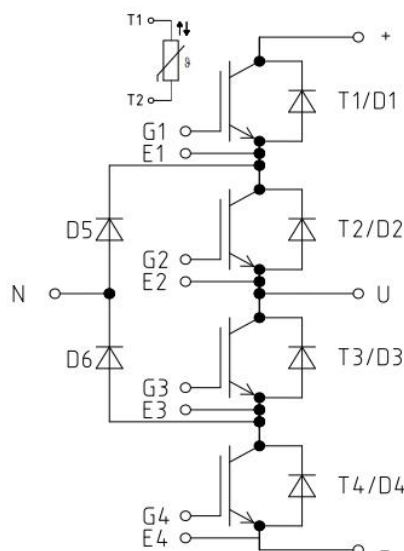
- Electrical features
 - 650V Trench Stop IGBTs
 - Low Inductive Design
 - Low Switching Losses
 - Low Inductive Layout
 - Thermistor
- Mechanical features
 - Compact Design
 - Solderable Pins
 - Al₂O₃ Substrate with Low Thermal Resistance



Typical Applications

- 3-Level-Applications
- Solar Applications
- UPS Systems

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V_{ISOL}	RMS, f=50Hz, t=60s	2.5	kV
Internal isolation		basic insulation(class 1, IEC 61140)	Al_2O_3	
Creepage distance	d_{creep}	terminal to heatsink	11.5	mm
Clearance	d_{clear}	terminal to heatsink	10	mm
Comparative tracking index (electrical)	CTI		>200	
RTI Elec.	RTI	housing	140	°C

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Stray Inductance	LCE			--	15	--	nH
Module Lead Resistance, Terminal to Chip	RCC'+EE'			--	2.00	--	mΩ
Storage Temperature Range	T _{STG}			-40		125	°C
Mounting torque for module mounting	M	-Mounting according to valid application note		40	--	80	N
Weight	G			--	39	--	g

IGBT (T1、T2、T3、T4)

Absolute Maximum Ratings (T_C = 25°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 = 80°C (T _{JMAX} = 175°C)	75	A
I _{CM}	Pulsed Collector Current, t _p limited by T _{vj max}	150	A
T _{jmax}	Maximum Junction Temperature	175	°C
P _D	Power Dissipation @ T _C = 25°C	270	W
	Power Dissipation @ T _C = 100 °C	135	W

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 = 50A, V _{GE} = 15V	T _{vj} = 25 °C		--	V
			T _{vj} = 150 °C		--	
		I _C = 75A, V _{GE} = 15V	T _{vj} = 25 °C		--	
			T _{vj} = 150 °C		--	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}	4.0	4.75	5.5	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 650 V	--	--	500	μA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = ±30 V, V _{CE} = 0 V, T _{vj} = 25°C	--	--	±200	nA
R _{Gint}	Internal Gate Resistance	T _{vj} = 25°C	--	0.8	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=1MHz	--	5800	--	pF
C _{oes}	Output capacitance		--	206	--	pF
C _{res}	Reverse Transfer		--	40	--	pF
Q _G	Gate Charge	V _{CE} = 480 V, I _C = 75 A V _{GE} = -5 V to +15 V	--	0.197	--	μC
t _{d(on)}	Turn-On Delay Time	V _{CE} =400V, I _C =75A, V _{GE} = -5 V to +15 V, R _g =5Ω Inductive Load T _{vj} =25°C	--	62	--	ns
t _r	Rise Time		--	30	--	
t _{d(off)}	Turn-off Delay Time		--	261	--	
t _f	Fall Time		--	45	--	
E _{on}	Turn-On Switching Loss per Pulse		--	3.9	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	1.4	--	
t _{d(on)}	Turn-On Delay Time	V _{CE} =400V, I _C =75A, V _{GE} = -5 V to +15 V, R _g =5Ω T _J =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		--	5.1	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	2.5	--	
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)	--	0.48	--	K/W
T _{vj op}		Temperature under switching conditions	-40		150 ¹⁾	°C

¹⁾T_{vj op} > 150°C is only allowed for operation at overload conditions.

Diode (D1、D2、D3、D4)

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	75	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	150	A

Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 75 A, T _J = 25°C	--	1.50	2.50	V
		I _F = 75 A, T _J = 175°C	--	1.40	--	
T _{rr}	Reverse Recovery Time	V _{CE} =400V V _{GE} = -5 V to +15 V I _F =75A, R _g =5Ω T _{vj} =25°C	--	142	--	ns
IRM	Peak Reverse Recovery Current		--	40	--	A
Q _{rr}	Recovered Charge		--	2.35	--	μC
E _{rec}	Reverse Recovery Energy		--	0.32	--	mJ
T _{rr}	Reverse Recovery Time	V _{CE} =400V V _{GE} = -5 V to +15 V I _F =75A, R _g =5Ω, T _{vj} =175°C	--	213	--	ns
IRM	Peak Reverse Recovery Current		--	60	--	A
Q _{rr}	Recovered Charge		--	5.78	--	μC
E _{rec}	Reverse Recovery Energy		--	0.48	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.53	--	K/W
T _{vj op}		Temperature under switching conditions	-40		150 ²⁾	°C

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

Diode (D5、D6)

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	75	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	150	A

Characteristics (T_c=25°C unless otherwise noted)

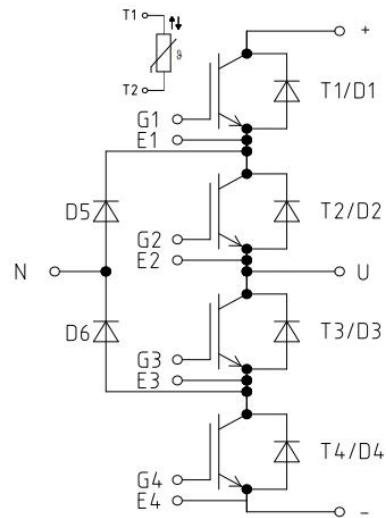
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 75 A, T _J = 25°C	--	1.50	2.50	V
		I _F = 75 A, T _J = 175°C	--	1.40	--	
T _{rr}	Reverse Recovery Time	V _{CE} =400V V _{GE} =-5 V to +15 V I _F =75A, R _g =5Ω T _{vj} =25°C	--	142	--	ns
IRM	Peak Reverse Recovery Current		--	40	--	A
Q _{rr}	Recovered Charge		--	2.35	--	μC
E _{rec}	Reverse Recovery Energy		--	0.32	--	mJ
T _{rr}	Reverse Recovery Time	V _{CE} =400V V _{GE} = -5 V to +15 V I _F =75A, R _g =5Ω, T _{vj} =175°C	--	213	--	ns
IRM	Peak Reverse Recovery Current		--	60	--	A
Q _{rr}	Recovered Charge		--	5.78	--	μC
E _{rec}	Reverse Recovery Energy		--	0.48	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.53	--	K/W
T _{vj op}		Temperature under switching conditions	-40		150 ³⁾	°C

³⁾T_{vj op} > 150°C is only allowed for operation at overload conditions.

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

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

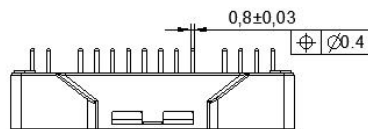
CIRCUIT DIAGRAM



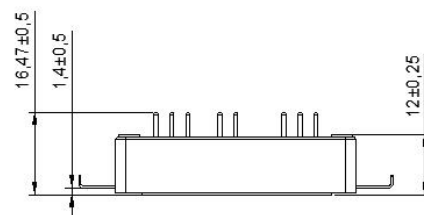
Preliminary data

PACKAGE DIMENSION

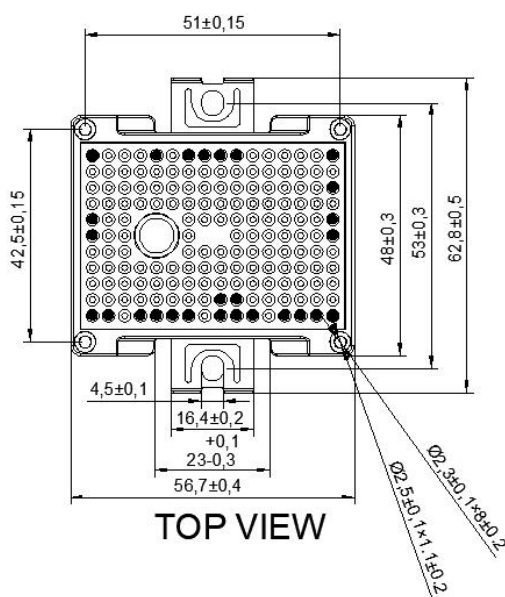
Dimensions in Millimeters



SIDE VIEW



SIDE VIEW



TOP VIEW

