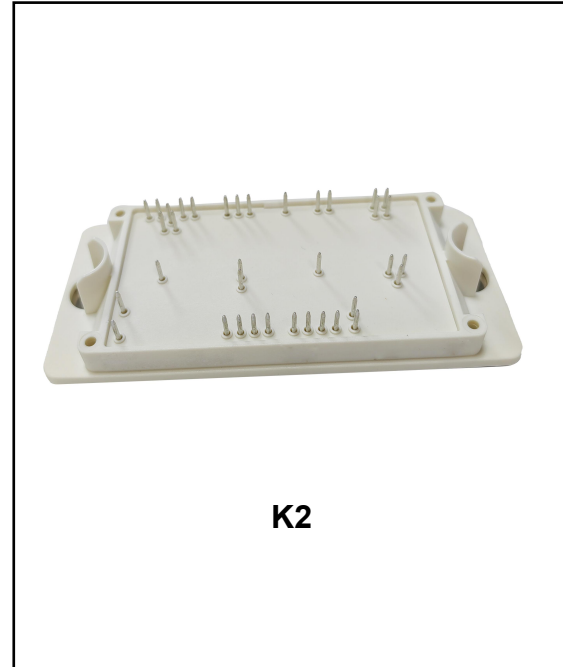


3-Level NPC Inverter Module with 1000V Trench Stop IGBTs

Features

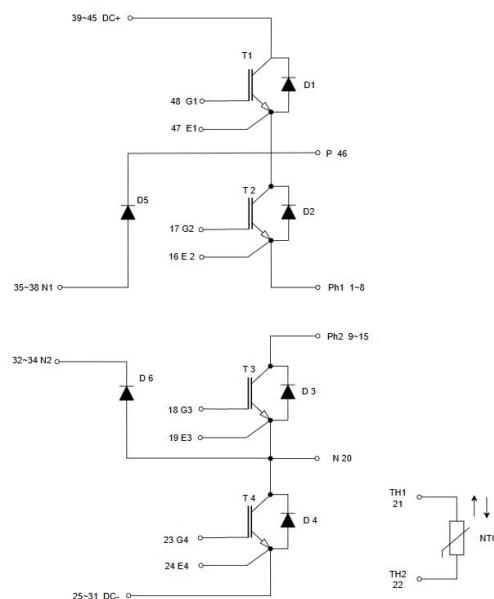
- Electrical features
 - Neutral Point Clamped Three-level Inverter Module
 - 1000V Trench Stop IGBTs
 - $T_{vj\ op}=150^{\circ}\text{C}$
 - Low Inductive Layout
 - Thermistor
- Mechanical features
 - Package with CTI >500
 - Solderable Pins
 - Low Package Height



Typical Applications

- Solar Inverters
- Energy Storage System
- UPS Systems

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V _{ISOL}	RMS,f=50Hz,t=2s	4.0	kV
Internal isolation		basic insulation(class 1,IEC 61140)	Si ₃ N ₄	
Creepage distance	d _{creep}	terminal to heatsink	>12.7	mm
Clearance	d _{clear}	terminal to heatsink	>12.7	mm
Comparative tracking index (electrical)	CTI		>500	
RTI Elec.	RTI	housing	140	°C

Package Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Storage Temperature Range	T _{STG}			-40		125	°C
Mounting torque for module mounting	M	-Mounting according to valid application note	M5, Screw	3	--	5	Nm
Weight	G			--	180	--	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	1000	V
V _{GES}	Gate-Emitter Voltage	±30	V
I _C	Collector Current @ T _C =25°C	800	A
	Collector Current @ T _C =100°C	400	A
I _{CM}	Pulsed Collector Current, t _p limited by T _{vj max}	800	A
T _{jmax}	Maximum Junction Temperature	175	°C
P _D	Power Dissipation @ T _C = 25°C	1450	W
	Power Dissipation @T _C = 100 °C	720	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 =400A, V _{GE} = 15V	T _{vj} = 25 °C	--	1.55	2.15	V
			T _{vj} = 150 °C	--	1.75	--	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	I _C =10mA, V _{CE} =V _{GE}		4.0	--	6.0	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 1000 V		--	--	800	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			--	2.0	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=1MHz		--	29	--	nF
C _{oes}	Output capacitance			--	1.1	--	nF
C _{res}	Reverse Transfer			--	181	--	pF
Q _G	Gate Charge	V _{CC} =550V, I _C =200A, V _{GE} =15V		--	1.06	--	μC
t _{d(on)}	Turn-On Delay Time	T _J = 25°C V _{CE} =550 V, I _C =200A V _{GE} = ± 15 V, R _{Gon} = 4.5Ω, R _{Goff} = 4.5Ω		--	70	--	ns
t _r	Rise Time			--	35	--	
t _{d(off)}	Turn-off Delay Time			--	380	--	
t _f	Fall Time			--	21	--	
E _{on}	Turn-On Switching Loss per Pulse	T _J = 150°C V _{CE} =550 V, I _C =200A V _{GE} = ± 15 V, R _{Gon} = 4.5Ω, R _{Goff} = 4.5Ω		--	5.96	--	mJ
E _{off}	Turn Off Switching Loss per Pulse			--	3.75	--	
t _{d(on)}	Turn-On Delay Time			--	77	--	ns
t _r	Rise Time			--	38	--	
t _{d(off)}	Turn-off Delay Time			--	466	--	
t _f	Fall Time			--	22	--	mJ
E _{on}	Turn-on Switching Loss per Pulse			--	7.23	--	
E _{off}	Turn Off Switching Loss per Pulse			--	4.89	--	
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.092	--	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. For detailed specifications please refer to AN 2018-14.

Diode(D1,D2,D3,D4,D5,D6)

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

Symbol	Description	Value	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	1000	V
I _F	Diode Continuous Forward Current	400	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	800	A

Characteristics (T_c = 25°C unless otherwise noted)

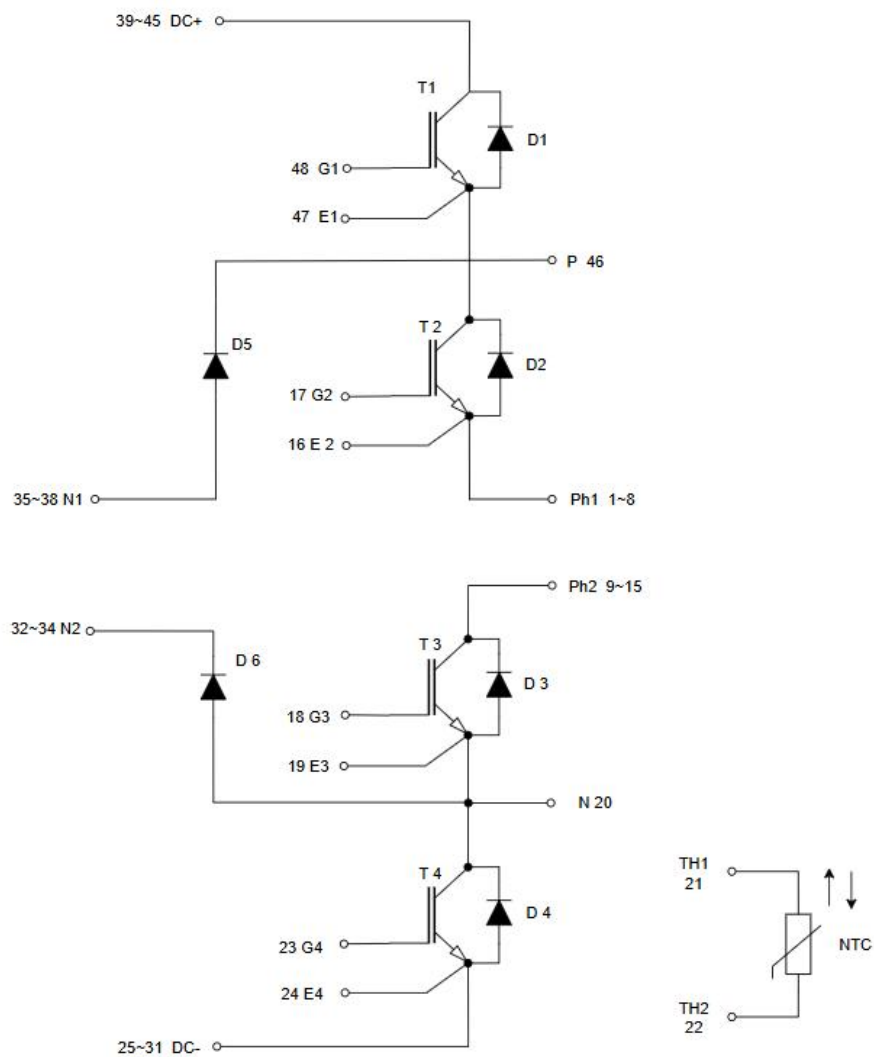
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F = 200 A, T _J = 25°C	--	1.5	2.4	V
		I _F = 200 A, T _J = 175°C	--	1.4	--	
Q _{rr}	Recovered Charge	T _J = 25°C V _R = 550 V, I _F = 200A	--	5.26	--	μC
I _{RM}	Peak Reverse Recovery Current	V _{GE} = ± 15 V, R _{Gon} = 4.5Ω, R _{Goff} = 4.5Ω	--	113	--	A
E _{rec}	Reverse Recovery Energy		--	1.41	--	mJ
Q _{rr}	Recovered Charge	T _J = 150°C V _R = 550 V, I _F = 200A	--	12.02	--	μC
I _{RM}	Peak Reverse Recovery Current	V _{GE} = ± 15 V, R _{Gon} = 4.5Ω, R _{Goff} = 4.5Ω	--	146	--	A
E _{rec}	Reverse Recovery Energy		--	3.83	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)	--	0.135	--	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. For detailed specifications please refer to AN 2018-14.

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

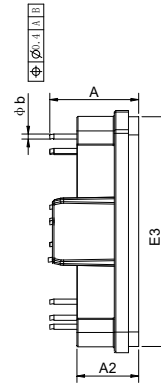
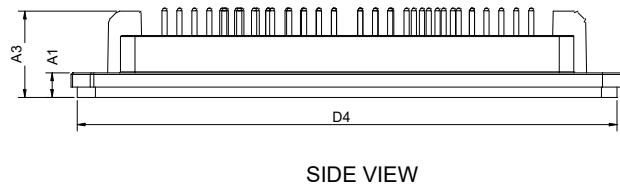
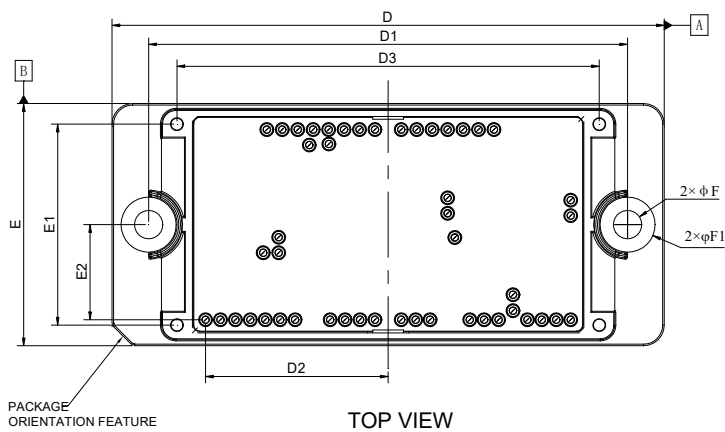
Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R ₂₅	Rated Resistance	T=25°C	-	5	-	KΩ
R ₁₀₀	Rated Resistance	T=100°C	-	478.5	-	Ω
▲ R/R	Deviation of R25		-1	-	1	%
P ₂₅	Power Dissipation			210		mW
	Power Dissipation Constant			3.5		mW/K
B _{25/85}	B-value	B(25/80), tolerance ±1%	-	3480	-	K
B _{25/50}	B-value	B(25/50), tolerance ±1%	-	3473	-	K
B _{25/100}	B-value	B(25/100), tolerance ±1%	-	3481	-	K

CIRCUIT DIAGRAM

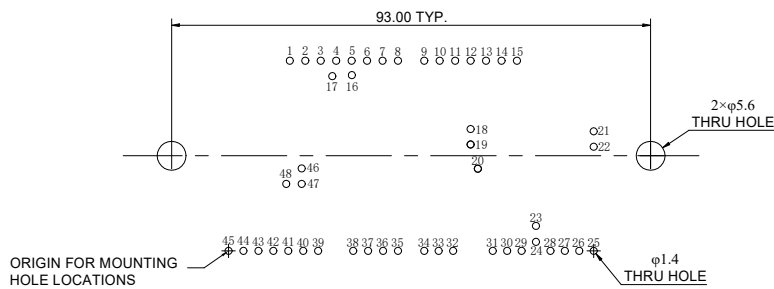


PACKAGE DIMENSION

Dimensions in Millimeters



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	16.63	17.23	17.83
A1	4.50	4.70	4.90
A2	11.60	12.00	12.40
A3	16.40	16.70	17.00
b	0.95	1.00	1.05
D	106.80	107.20	107.60
D1	92.90	93.00	93.10
D2	35.25	35.45	35.65
D3	81.80	82.00	82.20
D4	104.35	104.75	105.15
E	46.60	47.00	47.40
E1	38.80	39.00	39.20
E2	18.15	18.45	18.75
E3	44.30	44.60	44.90
F	5.40	5.50	5.60
F1	10.70 REF		



PIN	PIN POSITION		PIN	PIN POSITION	
	X	Y		X	Y
1	11.9	36.9	25	70.9	0.00
2	14.9	36.9	26	68.1	0.00
3	17.9	36.9	27	65.3	0.00
4	20.9	36.9	28	62.5	0.00
5	23.9	36.9	29	56.9	0.00
6	26.9	36.9	30	54.1	0.00
7	29.9	36.9	31	51.3	0.00
8	32.9	36.9	32	43.6	0.00
9	38	36.9	33	40.8	0.00
10	41	36.9	34	38	0.00
11	44	36.9	35	32.9	0.00
12	47	36.9	36	30	0.00
13	50	36.9	37	27.1	0.00
14	53	36.9	38	24.2	0.00
15	56	36.9	39	17.4	0.00
16	23.95	34.1	40	14.5	0.00
17	20.15	33.9	41	11.6	0.00
18	47	23.65	42	8.7	0.00
19	47	20.65	43	5.8	0.00
20	48.4	15.95	44	2.9	0.00
21	70.9	23.2	45	0.00	0.00
22	70.9	20.2	46	14.2	16
23	59.7	4.85	47	14.2	13
24	59.7	1.75	48	11.2	13