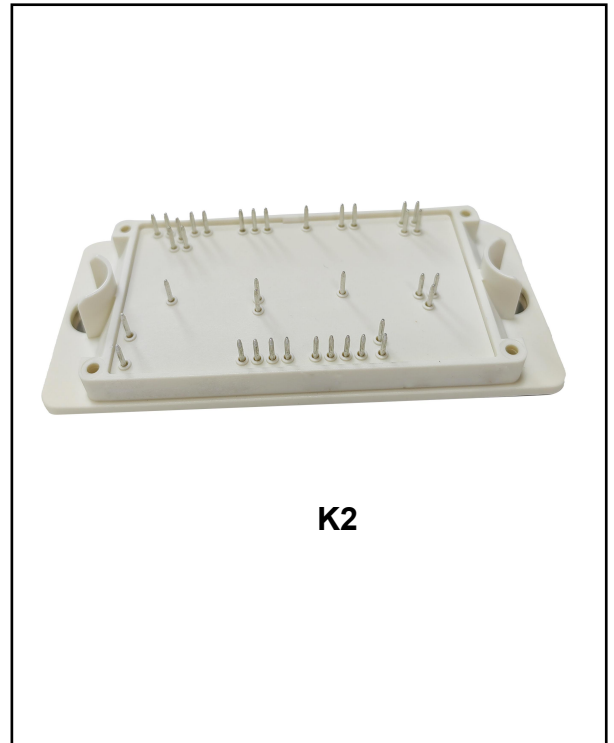


3-Level NPC Inverter Module with 650V Trench Stop IGBTs

Features

- Electrical features
 - Neutral Point Clamped Three-Level Inverter Module
 - 650V Trench Stop IGBTs
 - $T_{vj\ op}=175^{\circ}\text{C}$
 - Low Inductive Layout
 - Thermistor
- Mechanical features
 - Package with CTI >500
 - Solderable Pins

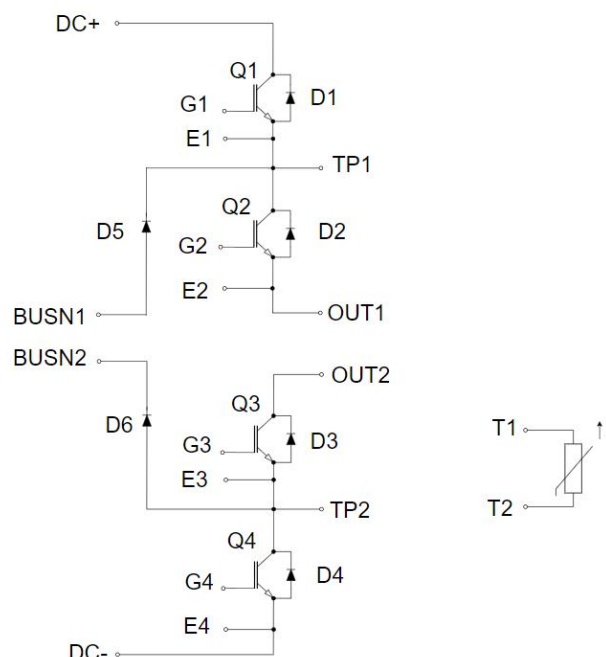


K2

Typical Applications

- Solar Inverters
- UPS Systems
- Energy Storage System

Description



Package Insulation coordination

Parameter	Symbol	Note or test condition	Values	Unit
Isolation test voltage	V _{ISOL}	RMS, f=50Hz, t=60s	4.0	kV
Internal isolation		basic insulation(class 1, IEC 61140)	Al ₂ O ₃	
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			--	179.7	--	g

IGBT

Absolute Maximum Ratings Q1,Q2,Q3,Q4 (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 _{CN}		400	A
I _C	Collector Current @ T _c =65°C	300	A
I _{CM}	Pulsed Collector Current, t _p =1ms	800	A
T _{Jmax}	Maximum Junction Temperature	175	°C

Characteristics Q1,Q2,Q3,Q4 (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	--	1.45	1.80	V
			T _{vj} = 175 °C	--	1.75	--	
V _{GE(TH)}	Gate-Emitter Threshold Voltage	I _C =5mA,V _{CE} =V _{GE}		4.0	5.0	6.0	V
I _{CES}	Collector-Emitter Cutoff Current	V _{GE} = 0 V, V _{CE} = 650 V		--	--	± 100	nA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = ± 30 V, V _{CE} = 0 V, T _{vj} = 25°C		--	--	± 100	nA
C _{ies}	Input Capacitance	V _{CE} =25V,V _{GE} =0V, f=1MHz		--	25.62	--	nF
C _{oes}	Output capacitance			--	0.82	--	nF
C _{res}	Reverse Transfer			--	0.16	--	nF
Q _G	Gate Charge	V _{CC} =480V, I _C =400A,V _{GE} =15V		--	0.78	--	μC
td(on)	Turn-On Delay Time	T _J = 25°C V _{CE} = 400 V, I _C = 400 A V _{GE} = -5 V to +15 V, R _G = 25Ω		--	585	--	ns
tr	Rise Time			--	162	--	
td(off)	Turn-off Delay Time			--	2915	--	
tf	Fall Time			--	530	--	
Eon	Turn-On Switching Loss per Pulse			--	17.44	--	mJ
Eoff	Turn Off Switching Loss per Pulse			--	15.80	--	
td(on)	Turn-On Delay Time	T _J = 125°C V _{CE} = 400 V, I _C = 400 A V _{GE} = -5 V to +15 V, R _G = 25Ω		--	487	--	ns
tr	Rise Time			--	205	--	
td(off)	Turn-off Delay Time			--	3095	--	
tf	Fall Time			--	655	--	
Eon	Turn-on Switching Loss per Pulse			--	24.04	--	mJ
Eoff	Turn Off Switching Loss per Pulse			--	23.16	--	
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.183	--	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.

Inverse Diodes D1,D2,D3,D4

Absolute Maximum Ratings D1,D2,D3,D4 (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 @ T _c =65°C	400	A
I _{FRM}	Diode Maximum Forward Current t _p =1ms	800	A

Characteristics D1,D2,D3,D4 (T_c=25°C unless otherwise noted)

V _F	Diode Forward Voltage	I _F = 400 A, T _J = 25°C	--	1.60	2.40	V
		I _F = 400 A, T _J = 150°C	--	1.50	--	
t _{rr}	Reverse Recovery Time	T _J = 25°C V _{CE} = 400 V, I _C = 400 A V _{GE} = -5 V to +15 V, R _G = 25Ω	--	304	--	ns
Q _{rr}	Reverse Recovery Charge		--	7.9	--	μC
I _{RRM}	Peak Reverse Recovery Current		--	140	--	A
E _{rr}	Reverse Recovery Energy		--	2.4	--	mJ
t _{rr}	Reverse Recovery Time	T _J = 125°C V _{CE} = 400 V, I _C = 400 A V _{GE} = -5 V to +15 V, R _G = 25Ω	--	464	--	ns
Q _{rr}	Reverse Recovery Charge		--	18.0	--	μC
I _{RRM}	Peak Reverse Recovery Current		--	220	--	A
E _{rr}	Reverse Recovery Energy		--	5.8	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)		0.194		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.

Neutral Point Diodes D5, D6

Absolute Maximum Ratings D5, D6 (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 @ T _c =65°C	400	A
I _{FRM}	Diode Maximum Forward Current t _p =1ms	800	A

Characteristics D5, D6 (T_c=25°C unless otherwise noted)

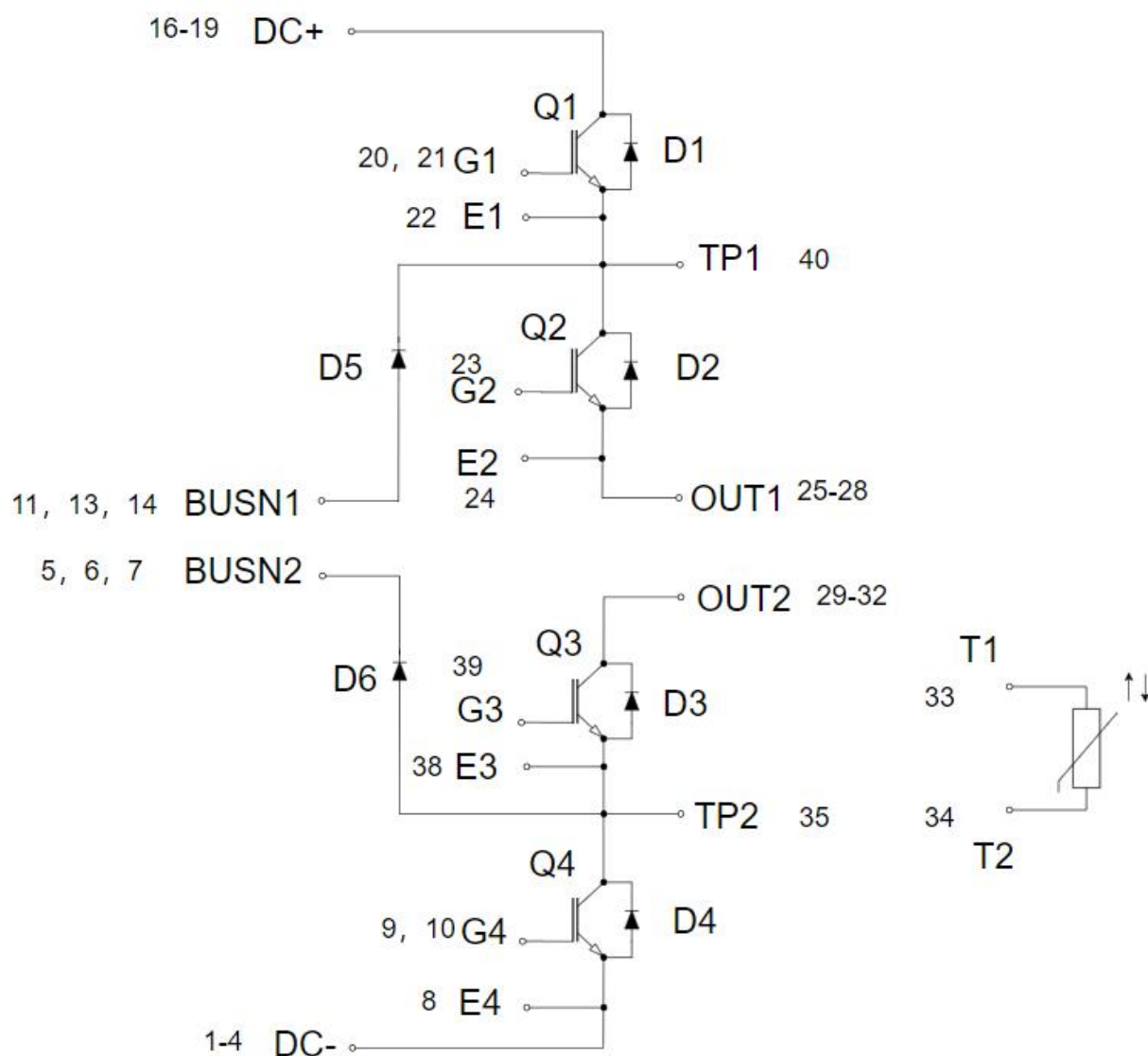
V _F	Diode Forward Voltage	I _F = 400 A, T _J = 25°C	--	1.60	2.40	V
		I _F = 400 A, T _J = 150°C	--	1.50	--	
t _{rr}	Reverse Recovery Time	T _J = 25°C V _{CE} = 400 V, I _C = 400 A V _{GE} = -5 V to +15 V, R _G = 25Ω	--	304	--	ns
Q _{rr}	Reverse Recovery Charge		--	7.9	--	μC
I _{RRM}	Peak Reverse Recovery Current		--	140	--	A
E _{rr}	Reverse Recovery Energy		--	2.4	--	mJ
t _{rr}	Reverse Recovery Time	T _J = 125°C V _{CE} = 400 V, I _C = 400 A V _{GE} = -5 V to +15 V, R _G = 25Ω	--	464	--	ns
Q _{rr}	Reverse Recovery Charge		--	18.0	--	μC
I _{RRM}	Peak Reverse Recovery Current		--	220	--	A
E _{rr}	Reverse Recovery Energy		--	5.8	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)		0.174		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. For detailed specifications please refer to AN 2018-14.

NTC Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R ₂₅	Nominal Resistance	T=25℃	--	22	--	kΩ
R ₁₀₀	Nominal Resistance	T=100℃		1486		Ω
R/R	Deviation of R ₂₅		-5	--	5	%
P ₀	Power Dissipation		--	200	--	mW
	Power Dissipation Constant		--	2	--	mW/K
B _{25/50}	B-value	tolerance ±3%	--	3950	--	K
B _{25/100}	B-value	tolerance ±3%	--	3998	--	K

CIRCUIT DIAGRAM



PACKAGE DIMENSION

