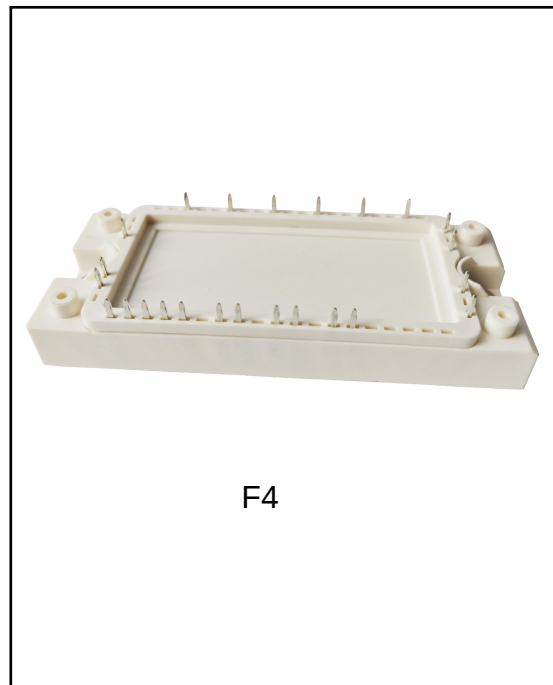


F4 PACK module with Gen.7 Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

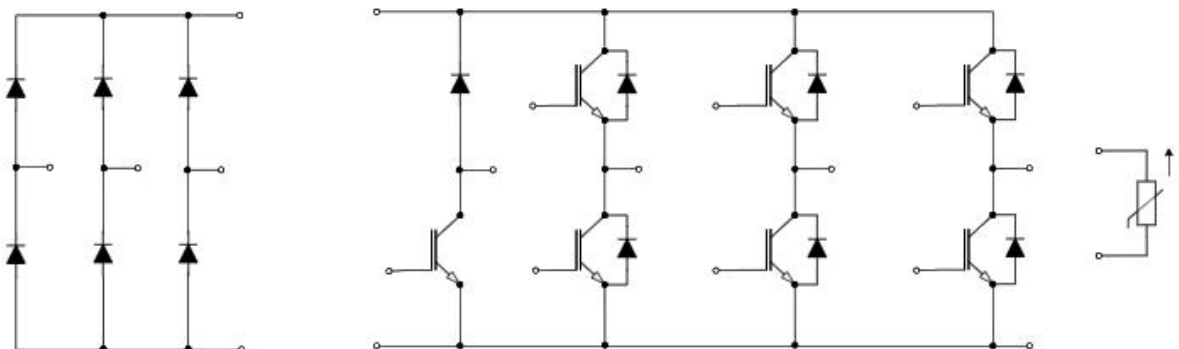
- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_C \text{ nom} = 75\text{ A} / I_{CRM} = 150\text{ A}$
 - Low V_{CEsat}
 - Overload operation up to 175°C
- Mechanical features
 - High power and thermal cycling capability
 - Integrated NTC temperature sensor
 - Copper base plate
 - Al_2O_3 substrate with low thermal resistance



Typical Applications

- Auxiliary inverters
- Motor drives
- Servo drives

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 ₂ O ₃	
Creepage distance	d _{creep}	terminal to heatsink	10.0	mm
Clearance	d _{clear}	terminal to heatsink	7.5	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		--	35	--	nH
Module Lead Resistance, Terminal to Chip	R _{AA'+CC'}	T _C =25°C, per switch	--	5.6	--	mΩ
Module Lead Resistance, Terminal to Chip	R _{CC'+EE'}	T _C =25°C, per switch	--	5.3	--	mΩ
Storage Temperature Range	T _{STG}		-40		125	°C
Mounting Torque, Screw M5	M	M5, Screw	3		6	N.m
Weight	G		--	180	--	g

IGBT, Inverter

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

Symbol	Description	Value	Unit
V _{CES}	Collector-Emitter Voltage	1200	V
V _{GES}	Gate-Emitter Voltage	±30	V
I _C	Collector Current @ T _C =25°C	150	A
	Collector Current @ T _C =80°C	75	A
I _{CM}	Pulsed Collector Current, t _p =1S	225	A

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 =75A, V _{GE} =15V	T _{vj} =25°C	--	1.65	V
			T _{vj} = 175 °C	--	1.95	
V _{GE(th)}	Gate Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}	5.0	6.0	7.0	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =1200V	--	--	100	uA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =30V, V _{CE} =0V	--	--	200	nA
R _{Gint}	Internal Gate Resistance	f=1MHz	--	0.5	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=1MHz	--	7.7	--	nF
C _{oes}	Out Capacitance		--	0.17	--	nF
C _{res}	Reverse Transfer		--	0.04	--	nF
Q _G	Gate Charge	V _{CE} =600V, I _C =50A, V _{GE} =15V	--	0.36	--	μC
t _{d(on)}	Turn-On Delay Time	V _{CC} = 600 V, I _C =75 A, R _{Gon} = 10Ω, R _{Goff} = 15Ω V _{GE} =±15V Inductive Load T _{vj} = 25°C	--	90	--	ns
t _r	Rise Time		--	61	--	
t _{d(off)}	Turn-off Delay Time		--	304	--	
t _f	Fall Time		--	45	--	
E _{on}	Turn-On Switching Loss per Pulse		--	4.17	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	2.1	--	
t _{d(on)}	Turn-On Delay Time	V _{CC} = 600 V, I _C =75 A, R _{Gon} = 10Ω, R _{Goff} = 15Ω V _{GE} =±15V 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		--	TBD	--	mJ
E _{off}	Turn Off Switching Loss per Pulse		--	TBD	--	
I _{sc}	SC Data	t _p ≤10μs, V _{GE} ≤15V, T _{vj} ≤150°C, V _{CC} =800V, V _{CEmax} =V _{CES} -L _s CE·di/dt		330		A
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		0.473		K/W
T _{vj op}		Temperature under switching conditions	-40		175 ¹⁾	°C

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

Diode, Inverter

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	75	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	225	A

Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F =75A	T _J =25°C	--	1.80	2.70	V
			T _J =175°C	--	1.75	--	
Q _r	Recovered Charge	I _F =75A, R _g =25Ω, T _J =25°C		--	1.24	--	μC
I _{RM}	Peak Reverse Recovery Current			--	27	--	A
T _{rr}	Reverse Recovery Time			--	175	--	ns
E _{rec}	Reverse Recovery Energy			--	1.23	--	mJ
Q _r	Recovered Charge	I _F =75A, R _g =25Ω, T _J =175°C		--	TBD	--	μC
I _{RM}	Peak Reverse Recovery Current			--	TBD	--	A
T _{rr}	Reverse Recovery Time			--	TBD	--	ns
E _{rec}	Reverse Recovery Energy			--	TBD	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)			0.79		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.

Diode, Rectifier

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

Symbol	Description	Value	Unit
V _{RRM}	Repetitive Peak Reverse Voltage	1600	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 = 75A, T _J = 150 °C		0.85		V
I _R	Reverse Current	T _J =175 °C, V _R =1600V		1.0		mA
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)		0.54		K/W
T _{vj op}		Temperature under switching conditions	-40		175 ³⁾	°C

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

IGBT, Chopper

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

Symbol	Description	Value	Unit
V _{CES}	Collector-Emitter Voltage	1200	V
V _{GES}	Gate-Emitter Voltage	±30	V
I _C	Collector Current @ T _C =25°C	100	A
	Collector Current @ T _C =80°C	50	A
I _{CM}	Pulsed Collector Current, t _p =1S	150	A

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	--	1.55	2.20	V
			T _{Vj} = 175 °C	--	1.80	--	
V _{GE(th)}	Gate Threshold Voltage	I _C =1mA,V _{CE} =V _{GE}		5.0	6.0	7.0	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V,V _{CE} =1200V		--	--	30	uA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =30V,V _{CE} =0V		--	--	100	nA
R _{Gint}	Internal Gate Resistance	f=1MHz		--	0.6	--	Ω
C _{ies}	Input Capacitance	V _{CE} =25V,V _{GE} =0V, f=1MHz		4690	5632	6566	nF
C _{oes}	Out Capacitance			--	143.3	--	nF
C _{res}	Reverse Transfer			--	32.1	--	nF
Q _G	Gate Charge	V _{CE} =960V, I _C =50A,V _{GE} =15V		--	196	--	μC
t _{d(on)}	Turn-On Delay Time	V _{CE} =600V,I _C =50A, V _{GE} =0/15V, R _g =25Ω, Inductive Load		--	95	--	ns
t _r	Rise Time			--	71	--	
t _{d(off)}	Turn-off Delay Time			--	349	--	
t _f	Fall Time			--	88	--	
E _{on}	Turn-On Switching Loss per Pulse			--	3.13	--	mJ
E _{off}	Turn Off Switching Loss per Pulse			--	1.92	--	
t _{d(on)}	Turn-On Delay Time	V _{CE} =600V,I _C =50A, V _{GE} =0/15V,R _g =25Ω, Inductive Load, 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			--	4.87	--	mJ
E _{off}	Turn Off Switching Loss per Pulse			--	2.68	--	
I _{SC}	SC Data	V _{GE} =15V,V _{CC} ≤600V, t _{sc} ≤10us,T _J ≤150°C		--	220	--	A
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		--	0.596	--	K/W
T _{Vj op}		Temperature under switching conditions		-40		175 ⁴⁾	°C

⁴⁾T_{Vj op} > 150°C is only allowed for operation at overload conditions.

Diode, Chopper

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	25	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	50	A

Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Condition		Min	Typ	Max	Unit
V _F	Diode Forward Voltage	I _F =25A	T _{vj} =25°C	--	1.70	2.50	V
			T _{vj} =175°C	--	1.65	--	
Q _r	Recovered Charge	I _F =25A, R _g =25Ω, T _{vj} =25°C		--	0.47	--	μC
I _{RM}	Peak Reverse Recovery Current			--	18.2	--	A
T _{rr}	Reverse Recovery Time			--	58	--	ns
E _{rec}	Reverse Recovery Energy			--	0.19	--	mJ
Q _r	Recovered Charge	I _F =25A, R _g =25Ω, T _{vj} =175°C		--	TBD	--	μC
I _{RM}	Peak Reverse Recovery Current			--	TBD	--	A
T _{rr}	Reverse Recovery Time			--	TBD	--	ns
E _{rec}	Reverse Recovery Energy			--	TBD	--	mJ
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)		--	0.97	--	K/W
T _{vj op}		Temperature under switching conditions		-40		175 ⁵⁾	°C

⁵⁾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 R100	T _C =100 °C, R100=493.3Ω	-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

Technical drawing of a rectangular electronic component, showing dimensions and tolerances. The drawing includes a top view and a side view.

Top View Dimensions:

- Overall width: 107.7 ± 0.5
- Overall height: 45.3 ± 0.5
- Internal width: 93 ± 0.3
- Internal height: 32 ± 0.3
- Pin pitch (horizontal): 1.15 ± 0.04
- Pin pitch (vertical): 0.8 ± 0.04
- Pin diameter: $\phi 0.4$
- Pin length: 20.7 ± 1
- Pin spacing (horizontal): 16.7 ± 0.5
- Pin spacing (vertical): 4 ± 0.5

Side View Dimensions:

- Overall width: 107.7 ± 0.5
- Overall height: 45.3 ± 0.5
- Internal width: 93 ± 0.3
- Internal height: 32 ± 0.3
- Pin pitch (horizontal): 1.15 ± 0.04
- Pin pitch (vertical): 0.8 ± 0.04
- Pin diameter: $\phi 0.4$
- Pin length: 20.7 ± 1
- Pin spacing (horizontal): 16.7 ± 0.5
- Pin spacing (vertical): 4 ± 0.5

Pin Locations (Top View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Side View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Bottom View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Front View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Back View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Left View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Right View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Top View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Side View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Bottom View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
- Pin 5: 23.64
- Pin 6: 27.45
- Pin 7: 35.07
- Pin 8: 38.88
- Pin 9: 46.50
- Pin 10: 50.31
- Pin 11: 54.12
- Pin 12: 61.74
- Pin 13: 65.55
- Pin 14: 69.36
- Pin 15: 86.10

Pin Locations (Front View):

- Pin 1: 0.00
- Pin 2: 6.90
- Pin 3: 12.21
- Pin 4: 16.02
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