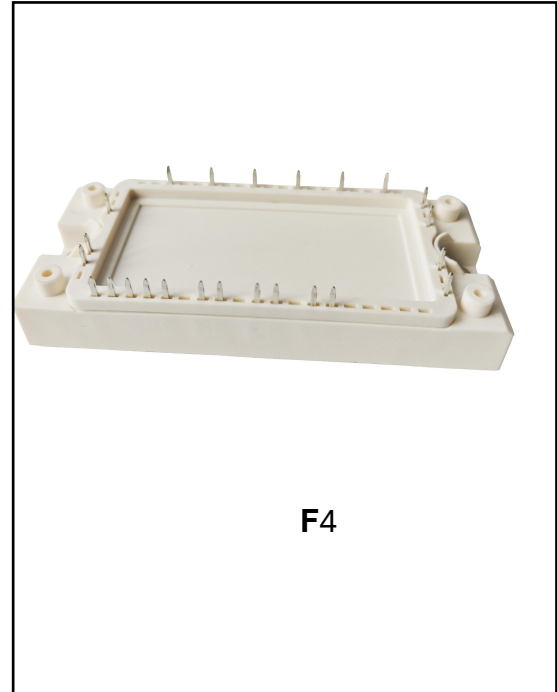


F4 PACK module with Gen.7 Trench/Fieldstop IGBT and Emitter Controlled diode and NTC

Features

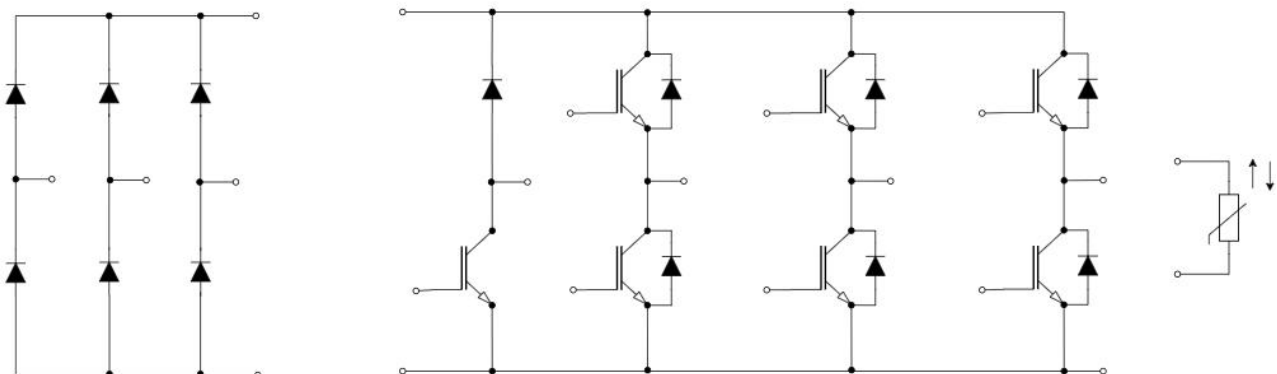
- Electrical features
 - $V_{CES} = 1200\text{ V}$
 - $I_C \text{ nom} = 35\text{ A}$ / $I_{CRM} = 70\text{ A}$
 - Low V_{CEsat}
 - Overload operation up to 175°C
- Mechanical features
 - High power and thermal cycling capability
 - Integrated NTC temperature sensor
 - Copper base plate
 - Al_2O_3 substrate with low thermal resistance
 - Solder contact technology



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_2O_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	$R_{AA'+CC'}$	$T_C=25^{\circ}C$, per switch	--	6.9	--	mΩ
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$	$T_C=25^{\circ}C$, per switch	--	5.9	--	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	70	A
	Collector Current @ T _C =80°C	35	A
I _{CM}	Pulsed Collector Current, t _p =1S	105	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 =35A, V _{GE} =15V	T _{Vj} =25°C	1.50	2.10	V
			T _{Vj} = 175 °C	1.75		
V _{GE(th)}	Gate Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}	5.5	--	7.0	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =1200V	--	--	10	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	3500	4203	4900	pF
C _{oes}	Out Capacitance		--	107	--	pF
C _{res}	Reverse Transfer		--	24	--	pF
Q _G	Gate Charge	V _{CE} =960V, I _C =35A, V _{GE} =15V	--	147	--	nC
t _{d(on)}	Turn-On Delay Time	V _{CE} =600V, I _C =35A, V _{GE} =0/15V, R _g =25Ω, Inductive Load		71		ns
t _r	Rise Time			53		
t _{d(off)}	Turn-off Delay Time			261		
t _f	Fall Time			66.3		
E _{on}	Turn-On Switching Loss per Pulse			2.34		mJ
E _{off}	Turn Off Switching Loss per Pulse			1.44		
t _{d(on)}	Turn-On Delay Time	V _{CE} =600V, I _C =35A, 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			3.64		mJ
E _{off}	Turn Off Switching Loss per Pulse			2.00		
I _{sc}	SC Data	V _{GE} =15V, V _{CC} ≤600V, t _{sc} ≤10us, T _J ≤150°C	--	175	--	A
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)		0.66		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. For detailed specifications please refer to AN 2018-14.

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	35	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	105	A

Characteristics (T_c=25°C unless otherwise noted)

V _F	Diode Forward Voltage	I _F =35A	T _J =25°C	1.80	2.70	V
			T _J =175°C	1.75		
Q _r	Recovered Charge	I _F =35A, R _g =25Ω, T _J =25°C		1.01		μC
I _{RM}	Peak Reverse Recovery Current			37.7		A
T _{rr}	Reverse Recovery Time			120		ns
E _{rec}	Reverse Recovery Energy			0.42		mJ
Q _r	Recovered Charge	I _F =35A, 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)		1.03		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.

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	35	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	70	A

Characteristics (T_c=25°C unless otherwise noted)

V _F	Diode Forward Voltage	I _F = 35 A, T _J = 150 °C	0.9		V
I _R	Reverse Current	T _J =175 °C, V _R =1600V	1		mA
R _{thJC}	Thermal resistance	Junction-to-Case (per diode)		0.65	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. For detailed specifications please refer to AN 2018-14.

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	70	A
	Collector Current @ T _C =80°C	35	A
I _{CM}	Pulsed Collector Current, t _p =1S	105	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 =35A, V _{GE} =15V	T _{vj} =25°C		1.50	2.10	V
			T _{vj} = 175 °C		1.75		
V _{GE(th)}	Gate Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}		5.5	--	7.0	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =1200V		--	--	10	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		3500	4203	4900	nF
C _{oes}	Out Capacitance			--	107	--	nF
C _{res}	Reverse Transfer			--	24	--	nF
Q _G	Gate Charge	V _{CE} =960V, I _C =35A, V _{GE} =15V		--	147	--	μC
t _{d(on)}	Turn-On Delay Time	V _{CE} =600V, I _C =35A, V _{GE} =0/15V, R _g =25Ω, Inductive Load			71		ns
t _r	Rise Time				53		
t _{d(off)}	Turn-off Delay Time				261		
t _f	Fall Time				66.3		
E _{on}	Turn-On Switching Loss per Pulse	V _{CE} =600V, I _C =35A, V _{GE} =0/15V, R _g =25Ω, Inductive Load, T _j =175°C			2.34		mJ
E _{off}	Turn Off Switching Loss per Pulse				1.44		
t _{d(on)}	Turn-On Delay Time				TBD		
t _r	Rise Time				TBD		
t _{d(off)}	Turn-off Delay Time	V _{CE} =600V, I _C =35A, V _{GE} =0/15V, R _g =25Ω, Inductive Load, T _j =175°C			TBD		ns
t _f	Fall Time				TBD		
E _{on}	Turn-on Switching Loss per Pulse				3.64		
E _{off}	Turn Off Switching Loss per Pulse				2.00		
I _{sc}	SC Data	V _{GE} =15V, V _{CC} ≤600V, t _{sc} ≤10us, T _j ≤150°C		--	175	--	A
R _{thJC}	Thermal resistance	Junction-to-Case (per IGBT)			0.66		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. For detailed specifications please refer to AN 2018-14.

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	15	A
I _{FM}	Diode Maximum Forward Current t _p =1ms	30	A

Characteristics (T_c=25°C unless otherwise noted)

V _F	Diode Forward Voltage	I _F =15A	T _j =25°C		1.50	2.3	V
			T _j =175°C		1.45		
Q _r	Recovered Charge	I _F =15A, R _g =25Ω, T _j =25°C			0.43		μC
I _{RM}	Peak Reverse Recovery Current				16.3		A
T _{rr}	Reverse Recovery Time				52		ns
E _{rec}	Reverse Recovery Energy				0.18		mJ

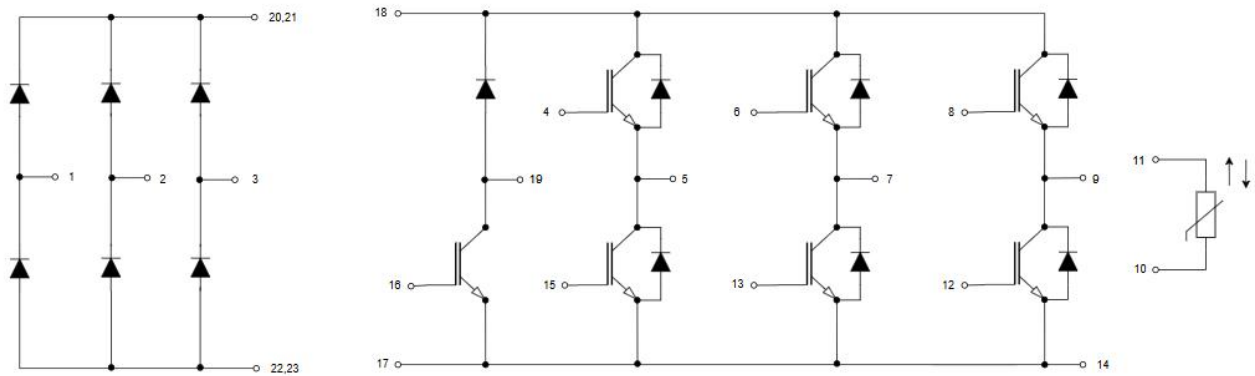
Q_r	Recovered Charge	$I_F=15A, R_g=25\Omega,$ $T_J=175^\circ C$		TBD		μC
I_{RM}	Peak Reverse Recovery Current			TBD		A
T_{rr}	Reverse Recovery Time			TBD		ns
E_{rec}	Reverse Recovery Energy			TBD		mJ
R_{thJC}	Thermal resistance	Junction-to-Case (per diode)		0.97		K/W
$T_{vj\ op}$		Temperature under switching conditions	-40		175 ⁵⁾	$^\circ C$

⁵⁾ $T_{vj\ op} > 150^\circ C$ is only allowed for operation at overload conditions. For detailed specifications please refer to AN 2018-14.

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
R_{25}	Rated Resistance		--	5.0	--	k Ω
$\Delta R/R$	Deviation of R100	$T_C=100^\circ C, R_{100}=493.3\Omega$	-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



PACKAGE DIMENSION

