



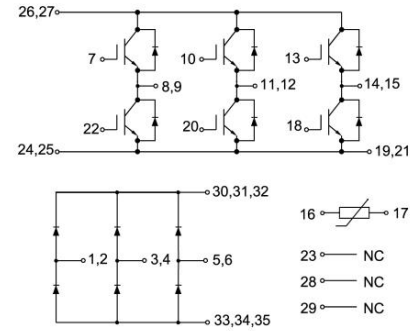
GT50RFF120T6H-T4

IGBT Module

Preliminary Datasheet

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated > 10 μ s
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested (2 $\times$ I_C)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications:

- Motor Drives
- Servo Drives
- Auxiliary Inverters

IGBT, Inverter

Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{CES}	Collector-Emitter Blocking Voltage		1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100°C	50	A
		T _C =25°C	100	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	100	A
P _D	Maximum Power Dissipation (IGBT)	T _C =25°C T _{Jmax} =175°C	391	W



Electrical Characteristics of IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.7\text{mA}$, $V_{CE}=V_{GE}$	4.9	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.73		V
			$T_J=125^{\circ}\text{C}$	2.15		V
			$T_J=175^{\circ}\text{C}$	2.35		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=V_{CES}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		5.41		nF
C_{oes}	Output Capacitance			0.69		nF
C_{res}	Reveres Transfer Capacitance			0.06		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=50A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		85		ns
			$T_J=125^{\circ}C$		87		
			$T_J=175^{\circ}C$		82		
t_r	Rise Time		$T_J=25^{\circ}C$		34		ns
			$T_J=125^{\circ}C$		36		
			$T_J=175^{\circ}C$		40		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		209		ns
			$T_J=125^{\circ}C$		239		
			$T_J=175^{\circ}C$		252		
t_f	Fall Time	$T_J=25^{\circ}C$		151		ns	
		$T_J=125^{\circ}C$		190			
		$T_J=175^{\circ}C$		228			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=50A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ $di/dt=1000A/\mu s(T_J=175^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		4.2		mJ
		$T_J=125^{\circ}C$		5.8			
		$T_J=175^{\circ}C$		6.7			



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=5700V/μs(T _J =175°C), Inductive Load	T _J =25°C		3.3		mJ
			T _J =125°C		4.3		
			T _J =175°C		4.7		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		301		nC
R _{G(int)}	Internal Gate Resistor		T _J =25°C		5.0		Ω
I _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C					10	us
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.38	°C/W

FWD, Inverter

Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current		50	A
I _{FM}	Repetitive Peak Forward Current	tp=1ms	100	A

Electrical Characteristics of Diode (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =50A	T _J =25℃		1.66		V
			T _J =125℃		1.78		
			T _J =175℃		1.74		
t _{rr}	Reverse Recovery Time	I _F =50A, -diF/dt=1200A/μs(T _J =175℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		292		ns
			T _J =125℃		461		
			T _J =175℃		581		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		40		A
			T _J =125℃		42		
			T _J =175℃		44		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		4.5		μC
			T _J =125℃		8.1		
			T _J =175℃		10.3		



E _{rec}	Reverse Recovery Energy	I _F =50A, -diF/dt=1200A/μs(T _J =175°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		1.6		mJ
			T _J =125°C		3.2		
			T _J =175°C		4.1		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.71	°C/W

Diode, Rectifier

Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1600	V
I _{FRMSM}	Maximum RMS Forward Current Per Chip	T _C =80°C	55	A
I _{RMSM}	Maximum RMS Current At Rectifier Output	T _C =80°C	80	A
I _{FSM}	Surge Current @t _p =10 ms	T _J =25°C	630	A
		T _J =150°C	500	
I ² t	I ² t - Value	T _J =25°C	1980	A ² s
		T _J =150°C	1250	

Electrical Characteristics of Diode (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =50A	T _J =25°C		1.22		V
			T _J =150°C		1.21		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.56	°C/W



Internal NTC-Thermistor Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R ₂₅	T _C =25°C		5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =465Ω	-5		5	%
P ₂₅	T _C =25°C			10	mW
B _{25/50}	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
B _{25/80}	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K
B _{25/100}	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$		3545		K

Module

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)				0.03	°C/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			300		g

note3: T_{JOP}> 150°C is only allowed for operation at overload conditions.



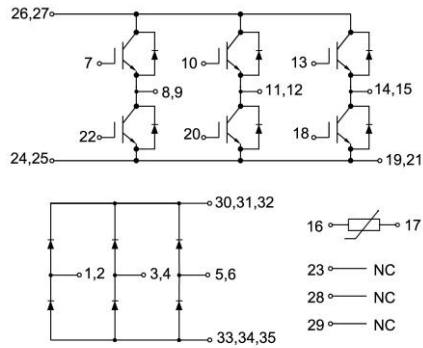
Ordering Information Table

Device code	G	T	50	RFF	120	T6	H	-	T4
	①	②	③	④	⑤	⑥	⑦		⑧

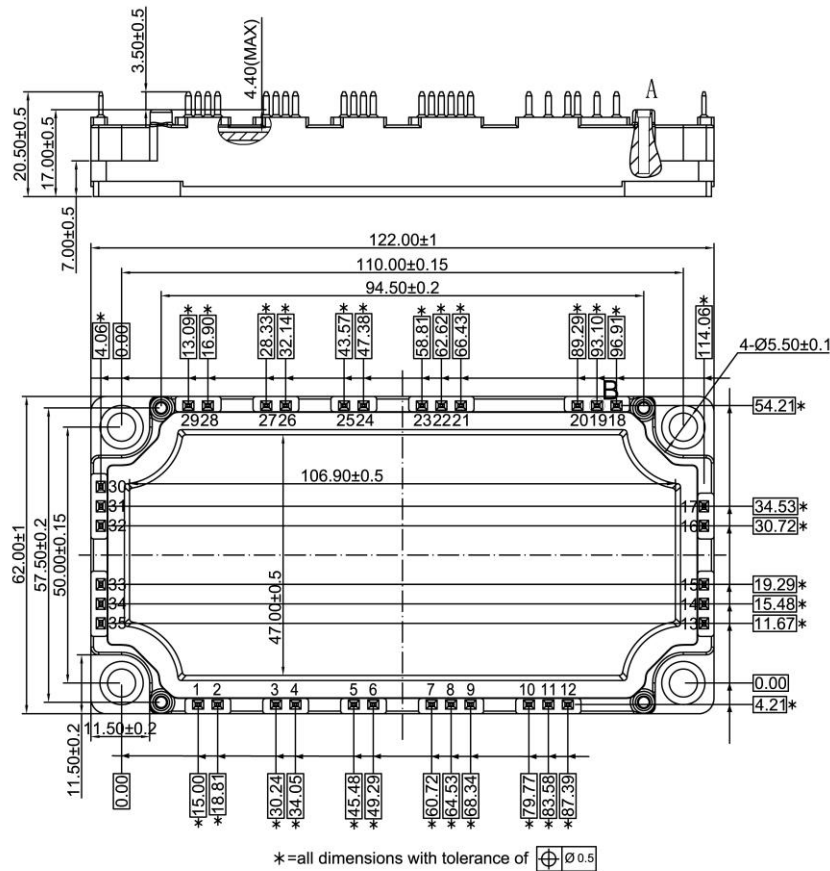
- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (50=50A)
- ④ - Circuit Configuration: RFF (Rectifier + Full Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Control Code



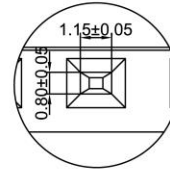
Internal Circuit:



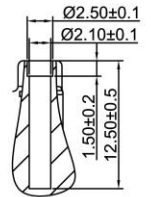
Package Outline (Unit: mm):



View B
scale 8:1



View A
scale 3:1





Revision	Notes
01	Initial Release

Announcement

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The released datasheet would be issued with “REV.” + “alphabet characters”.