



GT150PI120T6H-T4

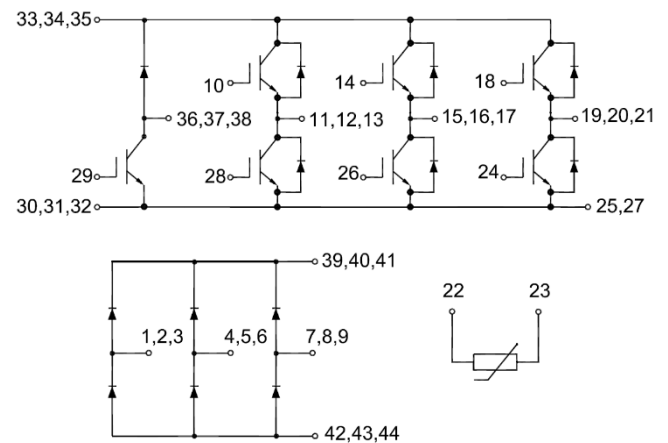
IGBT Module

Preliminary Datasheet

Features:

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

Circuit Diagram



Applications:

- Industrial Inverters
- Servo Applications

IGBT, Inverter

Maximum Rated Values of IGBT ($T_C=25^\circ\text{C}$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=100^\circ\text{C}$	150	A
		$T_C=25^\circ\text{C}$	180	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation (per IGBT)	$T_C=25^\circ\text{C}$ $T_{Jmax}=150^\circ\text{C}$	796	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	$I_C=6\text{mA}$, $V_{CE}=V_{GE}$	4.5		6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=150\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	2.20		V
			$T_J=125^{\circ}\text{C}$	2.90		V
			$T_J=150^{\circ}\text{C}$	3.05		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		17.1		nF
C_{oes}	Output Capacitance			0.86		nF
C_{res}	Reverse Transfer Capacitance			0.17		nF

Switching Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units	
t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =150A, R _{Gon} =10Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		517		ns	
			T _J =125℃		519			
			T _J =150℃		521			
t _r	Rise Time		T _J =25℃		137		ns	
			T _J =125℃		153			
			T _J =150℃		160			
t _{d(off)}	Turn-off Delay Time		T _J =25℃		311		ns	
			T _J =125℃		333			
			T _J =150℃		340			
t _f	Fall Time		T _J =25℃		125		ns	
			T _J =125℃		143			
			T _J =150℃		169			
E _{on}	Turn-on Switching Loss		V _{CC} =600V, I _C =150A, R _{Gon} =10Ω, V _{GE} =±15V, di/dt=801A/μs(T _J =150℃), Inductive Load	T _J =25℃		11.5		mJ
			T _J =125℃		18.5			
			T _J =150℃		18.8			



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =150A, R _{Goff} =10Ω, V _{GE} =±15V, du/dt=7207V/μs(T _J =150°C), Inductive Load	T _J =25°C		4.2		mJ
			T _J =125°C		5.5		
			T _J =150°C		6.3		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		885		nC
R _{g internal}	Internal Gate Resistor		T _J =25°C		3		Ω
I _{SC}	V _{CC} =600V, t _p =10us, V _{GE} =+/-15V, T _J =150°C				675		A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.16	°C/W

FWD, Inverter

Maximum Rated Values of Diode (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		150	A
I _{FM}	Peak FWD Current Repetitive	t _p =1ms	300	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 =150A	T _J =25°C		1.85		V
			T _J =125°C		2.00		
			T _J =150°C		2.05		
t _{rr}	Reverse Recovery Time	I _F =150A, -diF/dt=2085A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		160		ns
			T _J =125°C		290		
			T _J =150°C		322		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		130		A
			T _J =125°C		131		
			T _J =150°C		135		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		12.4		μC
			T _J =125°C		20.3		
			T _J =150°C		22.8		



E _{rec}	Reverse Recovery Energy	I _F =150A, -diF/dt=2085A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		4.6		mJ
			T _J =125°C		7.0		
			T _J =150°C		7.4		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.33	°C/W

IGBT, Brake-Chopper

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	100	A
		T _C =25°C	145	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	200	A
P _D	Maximum Power Dissipation (IGBT)	T _C =25°C T _{Jmax} =150°C	581	W

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

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{GE(th)}	Gate-Emitter Threshold Voltage	I _C =3.8mA, V _{CE} =V _{GE}		5.0		6.8	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =100A, V _{GE} =15V	T _J =25°C		2.00		V
			T _J =125°C		2.55		V
			T _J =150°C		2.80		V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =V _{CES} , T _J =25°C				1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =20V, V _{CE} =0V, T _J =25°C				200	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz			11.26		nF
C _{oes}	Output Capacitance				0.59		nF
C _{res}	Reveres Transfer Capacitance				0.11		nF



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =100A, R _{Gon} =1Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		114		ns
			T _J =125℃		124		
			T _J =150℃		129		
t _r	Rise Time		T _J =25℃		26		ns
			T _J =125℃		31		
			T _J =150℃		35		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =100A, R _{Goff} =1Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		155		ns
			T _J =125℃		184		
			T _J =150℃		195		
t _f	Fall Time		T _J =25℃		86		ns
			T _J =125℃		119		
			T _J =150℃		136		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =100A, R _{Gon} =1Ω, V _{GE} =±15V, di/dt=2286A/μs(T _J =150℃), Inductive Load	T _J =25℃		4.4		mJ
			T _J =125℃		6.9		
			T _J =150℃		8.8		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =100A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=7164V/μs(T _J =150℃), Inductive Load	T _J =25℃		3.8		mJ
			T _J =125℃		5.1		
			T _J =150℃		5.7		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25℃		632		nC
R _{g internal}	Internal Gate Resistor		T _J =25℃		5		Ω
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.21	℃/W

Diode, Brake-Chopper

Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	$T_C=25^\circ C$	1200	V
I_F	Diode Continuous Forward Current		50	A
I_{FM}	Diode Maximum Forward Current	$t_p=1ms$	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°C		1.75		V
			T _J =125°C		1.90		
			T _J =150°C		1.90		
t _{rr}	Reverse Recovery Time	I _F =50A, -diF/dt=593A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		270		ns
			T _J =125°C		474		
			T _J =150°C		482		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		45		A
			T _J =125°C		47		
			T _J =150°C		47		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		6.9		μC
			T _J =125°C		8.8		
			T _J =150°C		9.4		
E _{rec}	Reverse Recovery Energy		T _J =25°C		2.33		mJ
			T _J =125°C		3.22		
			T _J =150°C		3.43		
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	1800	V
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _C =80°C	150	A
I _{RMSM}	Maximum RMS Current at Rectifier Output	T _C =80°C	150	A
I _{FSM}	Surge Current @t _p =10ms	T _J =25°C	1800	A
		T _J =150°C	1575	
I ² t	I ² t - value	T _J =25°C	16200	A ² s
		T _J =150°C	12400	



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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =150A	T _J =25°C		1.20		V
			T _J =125°C		1.15		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Diode Thermal Resistance: Junction-to-Case					0.23	°C/W

Internal NTC-Thermistor Characteristics

Symbol	Conditions	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		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature				150	°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



Ordering Information Table

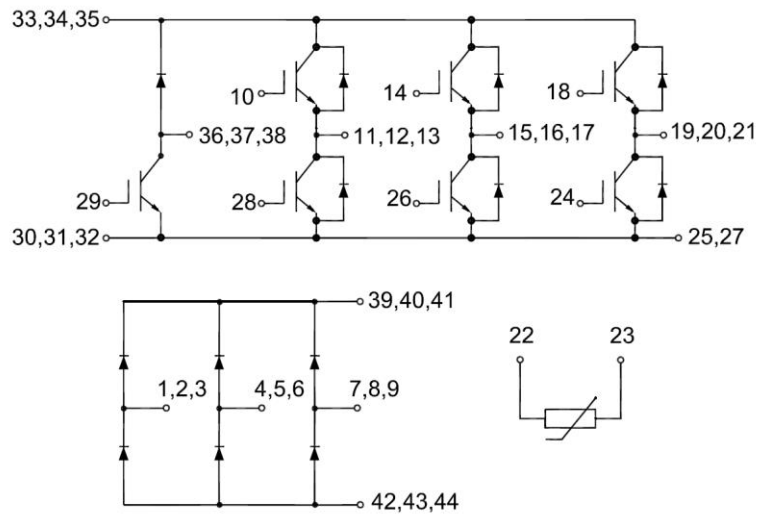
Device code

G	T	150	PI	120	T6	H	-	T4
①	②	③	④	⑤	⑥	⑦		⑧

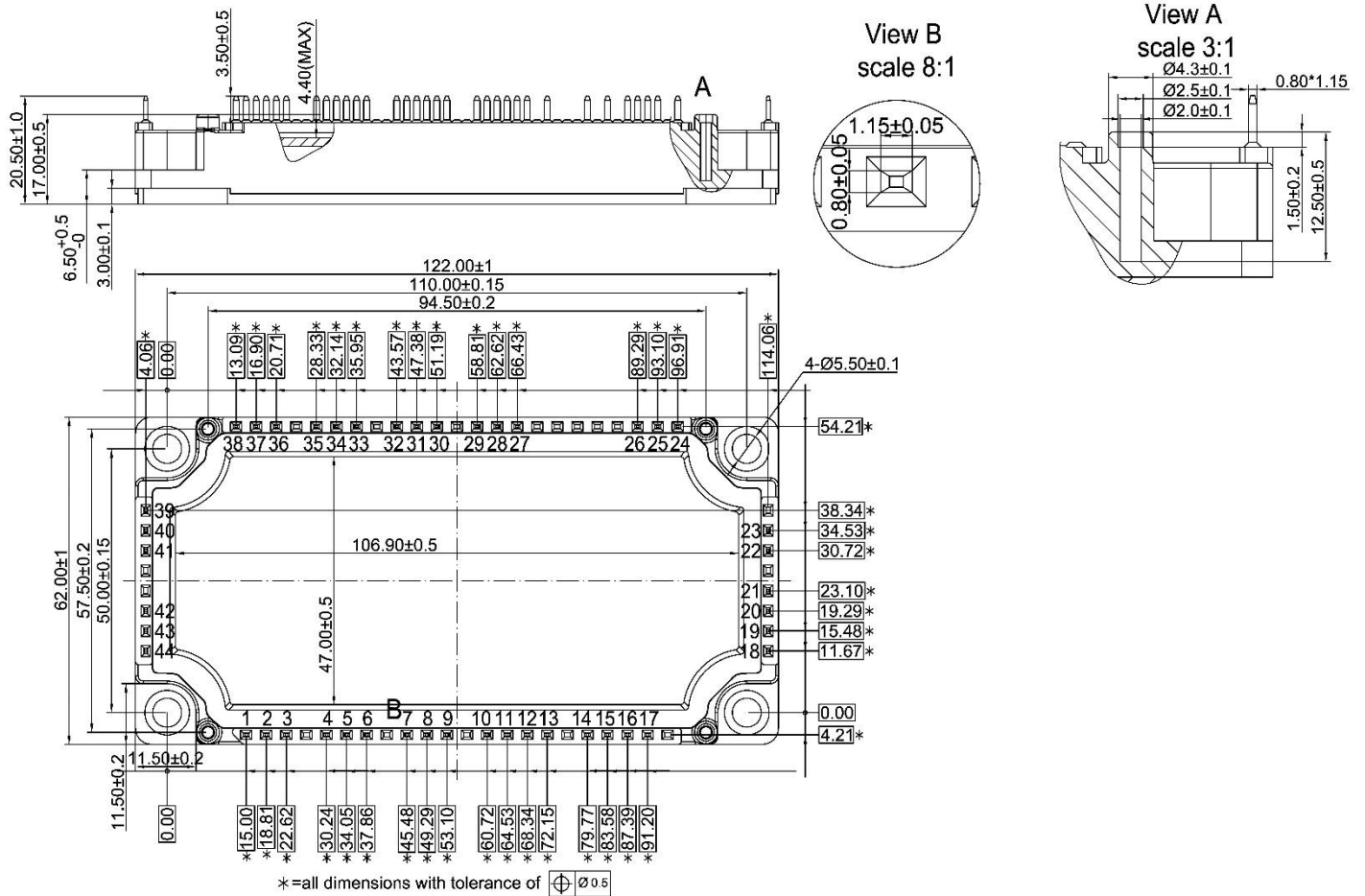
- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (150=150A)
- ④ - Circuit Configuration: Power Integrated
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Code



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcements

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The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

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