



GT400TT120A8H

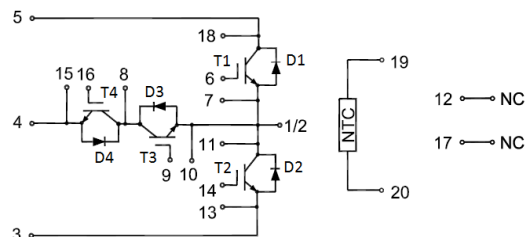
IGBT Module

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
- Mixed Voltage Component Topology
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- Solar Applications
- UPS Systems

IGBT, Buck Switch (T1/T4)

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	400	A
		T _C =25°C	702	A
I _{CM}	Repetitive Peak Collector Current	t _p =1ms	800	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C, T _{Jmax} =175°C	2500	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	$I_C=15\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.4	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=400\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.70		V
			$T_J=125^{\circ}\text{C}$	2.00		V
			$T_J=150^{\circ}\text{C}$	2.20		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	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			400	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		46.9		nF
C_{oes}	Output Capacitance			2.30		nF
C_{res}	Reveres Transfer Capacitance			0.51		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=400A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		162		ns
			$T_J=125^{\circ}C$		174		
			$T_J=150^{\circ}C$		177		
t_r	Rise Time		$T_J=25^{\circ}C$		37		ns
			$T_J=125^{\circ}C$		44		
			$T_J=150^{\circ}C$		45		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600V, I_C=400A,$ $R_{Goff}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		263		ns
			$T_J=125^{\circ}C$		301		
			$T_J=150^{\circ}C$		308		
t_f	Fall Time		$T_J=25^{\circ}C$		214		ns
			$T_J=125^{\circ}C$		301		
			$T_J=150^{\circ}C$		310		
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=400A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ $di/dt=2149(T_J=150^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		22		mJ
			$T_J=125^{\circ}C$		36		
			$T_J=150^{\circ}C$		37		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =400A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=4995V/μs(T _J =150°C), Inductive Load	T _J =25°C		30		mJ
			T _J =125°C		41		
			T _J =150°C		43		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2690		nC
R _{G(int)}	Internal Gate Resistor				1.0		Ω
SCSOA	V _{CC} =600V, V _{GE} =+/-15V, T _J =175°C			10			μs
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.059	°C/W

Buck Diode (D3/D4)

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _F	Diode Continuous Forward Current		400	A
I _{FM}	Diode Maximum Forward Current	tp=1ms	800	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 =400A	T _J =25℃		1.80		V
			T _J =125℃		1.75		
			T _J =150℃		1.75		
I _{rr}	Peak Reverse Recovery Current	I _F =400A, di/dt =1500A/μs (T _J =150℃), V _{rr} =300V, V _{GE} =-15V	T _J =25℃		59		A
			T _J =125℃		108		
			T _J =150℃		119		
t _{rr}	Reverse Recovery Time		T _J =25℃		185		ns
			T _J =125℃		268		
			T _J =150℃		298		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		6.9		μC
			T _J =125℃		17.5		
			T _J =150℃		21.1		



E _{rec}	Reverse Recovery Energy	I _F =400A, di/dt =1500A/μs (T _J =150℃), V _{rr} =300V, V _{GE} =-15V	T _J =25℃		1.3		mJ
			T _J =125℃		3.5		
			T _J =150℃		4.7		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.148	℃/W

IGBT, Boost Switch (T3/T4)

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

V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=100^\circ C$	400	A
		$T_C=25^\circ C$	459	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1ms$	800	A
P_D	Maximum Power Dissipation per IGBT	$T_C=25^\circ C$, $T_{Jmax}=175^\circ C$	1470	W

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

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4.8mA$, $V_{CE}=V_{GE}$		5.0	5.9	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=400A$, $V_{GE}=15V$	$T_J=25^\circ C$		1.60		V
			$T_J=125^\circ C$		1.65		V
			$T_J=150^\circ C$		1.65		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V$, $V_{CE}=V_{CES}$				1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20V$, $V_{CE}=0V$				400	nA
C_{ies}	Input Capacitance	$V_{CE}=25V$, $V_{GE}=0V$, $f=100kHz$			31.6		nF
C_{oes}	Output Capacitance				1.93		nF
C_{res}	Reverse Transfer Capacitance				1.32		nF



Switching Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
t _{d(on)}	Turn-on Delay Time	V _{CC} =300V, I _C =400A, R _{Gon} =2Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		410		ns
			T _J =125℃		437		
			T _J =150℃		438		
t _r	Rise Time		T _J =25℃		260		ns
			T _J =125℃		255		
			T _J =150℃		249		
t _{d(off)}	Turn-off Delay Time		T _J =25℃		444		ns
			T _J =125℃		429		
			T _J =150℃		424		
t _f	Fall Time	T _J =25℃		132		ns	
		T _J =125℃		167			
		T _J =150℃		181			
E _{on}	Turn-on Switching Loss	V _{CC} =300V, I _C =400A, R _{Gon} =2Ω, V _{GE} =±15V, di/dt=1340A/μs(T _J =150℃), Inductive Load	T _J =25℃		3.6		mJ
		T _J =125℃		6.3			
		T _J =150℃		6.8			
E _{off}	Turn-off Switching Loss	V _{CC} =300V, I _C =400A, R _{Goff} =2Ω, V _{GE} =±15V, du/dt=2100V/μs(T _J =150℃), Inductive Load	T _J =25℃		14.0		mJ
		T _J =125℃		27.8			
		T _J =150℃		28.0			
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25℃		2.24		μC
R _{G(int)}	Internal Gate Resistor		T _J =25℃		0.9		Ω
SCSOA	Vcc=300V, t _p =10us, V _{GE} =+/-15V, T _J =150℃			10			μs
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.102	℃/W

Boost Diode (D1/D2)

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ C$	1200	V
I_F	Diode Continuous Forward Current		400	A
I_{FP}	Peak Diode Current Repetitive	$t_p=1ms$	800	A



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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =400A	T _J =25°C		1.64		V
			T _J =125°C		1.74		
			T _J =150°C		1.74		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt=2477A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		225		ns
			T _J =125°C		361		
			T _J =150°C		401		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		408		A
			T _J =125°C		416		
			T _J =150°C		440		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		36		μC
			T _J =125°C		57		
			T _J =150°C		65		
E _{rec}	Reverse Recovery Energy		T _J =25°C		14		mJ
			T _J =125°C		22		
			T _J =150°C		25		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.128	°C/W

Internal NTC-Thermistor Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R_{25}	$T_C=25^\circ\text{C}$		5		$\text{k}\Omega$
$\Delta R/R$	$T_C=100^\circ\text{C}$, $R_{100}=465\Omega$	-5		+5	%
P_{25}	$T_C=25^\circ\text{C}$			10	mW
$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3380		K
$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3440		K
$B_{25/100}$	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3545		K



Module

Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 60s	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)				0.026	°C/W
M	Power Terminals Screw:M6		3.0		6.0	N·m
M	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			390		g

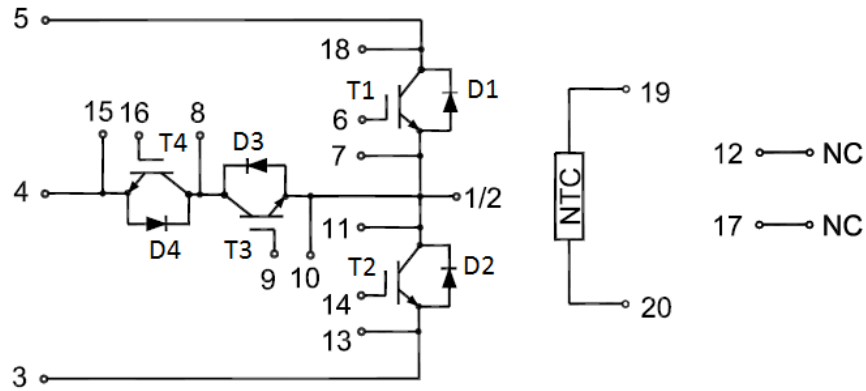
Ordering Information Table

Device code	G	T	400	TT	120	A8	H
	①	②	③	④	⑤	⑥	⑦

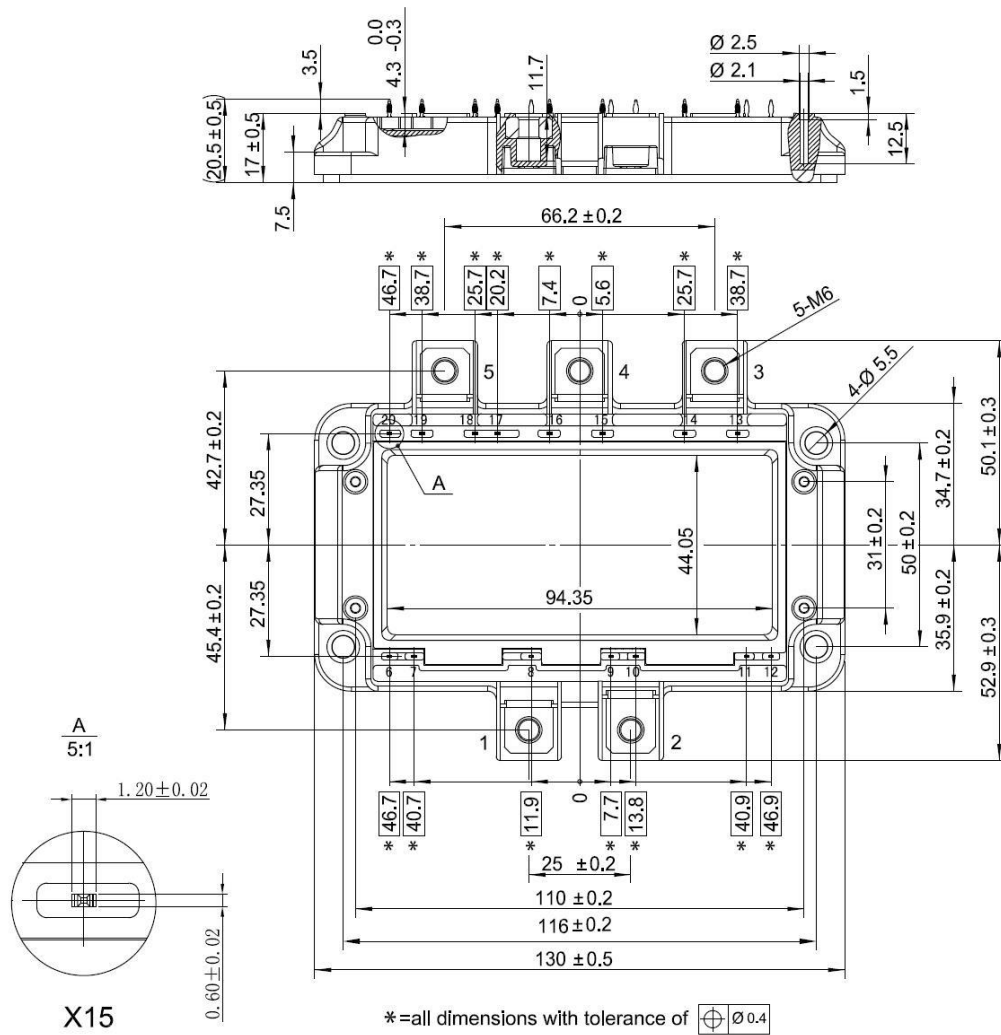
- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (400=400A)
- ④ - Circuit Configuration (Three Level, T Type)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial release

Announcement

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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”.