



GT400TL65A8H

IGBT Module

Preliminary Data

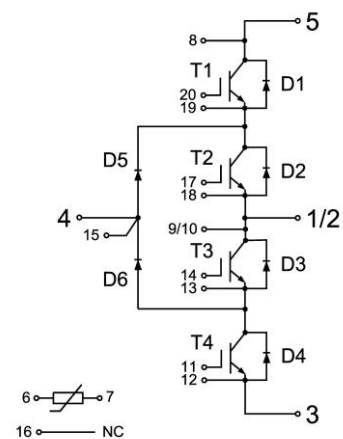
Features:

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

Applications:

- Industrial Inverters
- Motor Drives
- UPS Systems

Circuit Diagram



IGBT, Inverter (T1,T2,T3,T4)

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

V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_c=100^\circ\text{C}$	400	A
		$T_c=25^\circ\text{C}$	425	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	800	A
P_D	Maximum Power Dissipation (IGBT)	$T_c=25^\circ\text{C}$ $T_J=175^\circ\text{C}$	1419	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	$I_C=6.4\text{mA}$, $V_{CE}=V_{GE}$	4.0	4.7	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=400\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.60	2.10	V
			$T_J=125^{\circ}\text{C}$	1.85		V
			$T_J=150^{\circ}\text{C}$	1.90		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		29.08		nF
C_{oes}	Output Capacitance			1.78		nF
C_{res}	Reverse Transfer Capacitance			0.53		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300V, I_C=400A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		545		ns
			$T_J=125^{\circ}C$		564		
			$T_J=150^{\circ}C$		565		
t_r	Rise Time		$T_J=25^{\circ}C$		283		ns
			$T_J=125^{\circ}C$		284		
			$T_J=150^{\circ}C$		285		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		432		ns
			$T_J=125^{\circ}C$		436		
			$T_J=150^{\circ}C$		438		
t_f	Fall Time	$T_J=25^{\circ}C$		513		ns	
		$T_J=125^{\circ}C$		529			
		$T_J=150^{\circ}C$		556			
E_{on}	Turn-on Switching Loss	$V_{CC}=300V, I_C=400A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ $di/dt=1183A/\mu s$ ($T_J=150^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		12.0		mJ
		$T_J=125^{\circ}C$		13.2			
		$T_J=150^{\circ}C$		14.0			



E _{off}	Turn-off Switching Loss	V _{CC} =300V, I _C =400A, R _{Goff} =4.7Ω, V _{GE} =±15V, du/dt=2160V/μs (T _J =150°C) Inductive Load	T _J =25°C		18.0		mJ
			T _J =125°C		23.0		
			T _J =150°C		24.0		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2.01		μC
R _{g internal}	Internal Gate Resistance		T _J =25°C		1		Ω
SCSOA	V _{CC} =300V, V _{GE} =±15V, T _J =150°C			10			μs
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.11	°C/W

Diode, Inverter (D1,D2,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}	Peak Diode Current Repetitive	t _p =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℃		1.65		V
			T _J =125℃		1.70		
			T _J =150℃		1.70		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt=1492A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		140		ns
			T _J =125℃		161		
			T _J =150℃		179		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		100		A
			T _J =125℃		131		
			T _J =150℃		144		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		8.10		μC
			T _J =125℃		14.10		
			T _J =150℃		16.03		



E _{rec}	Reverse Recovery Energy	I _F =400A, -diF/dt=1492/μs(T _J =150°C), V _R =300V, V _{GE} =-15V	T _J =25°C		1.0		mJ
			T _J =125°C		2.4		
			T _J =150°C		2.8		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.15	°C/W

Diode, 3-Level (D5,D6)

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}	Peak Diode Current Repetitive	t _p =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℃		1.65		V
			T _J =125℃		1.70		
			T _J =150℃		1.70		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt=1492A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		140		ns
			T _J =125℃		161		
			T _J =150℃		179		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		100		A
			T _J =125℃		131		
			T _J =150℃		144		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		8.10		μC
			T _J =125℃		14.10		
			T _J =150℃		16.03		
E _{rec}	Reverse Recovery Energy		T _J =25℃		1.0		mJ
			T _J =125℃		2.4		
			T _J =150℃		2.8		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.15	℃/W



Internal NTC-Thermistor Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R ₂₅	T _C =25℃		5		kΩ
△R/R	T _C =100℃, R ₁₀₀ =465Ω	-5		+5	%
P ₂₅	T _C =25℃			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			175	℃
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	℃
T _{stg}	Storage Temperature	-40		+125	℃
CTI	Comparative Tracking Index		200		
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)			0.026	℃/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

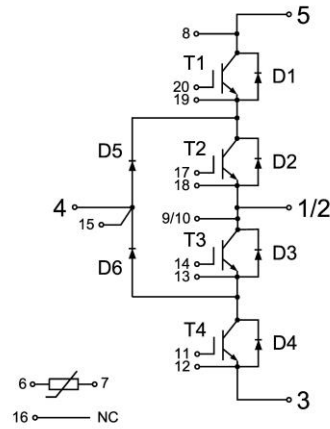
Device code

G	T	400	TL	65	A8	H
①	②	③	④	⑤	⑥	⑦

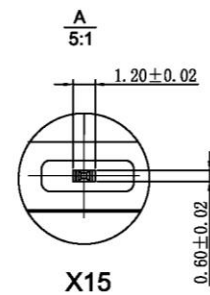
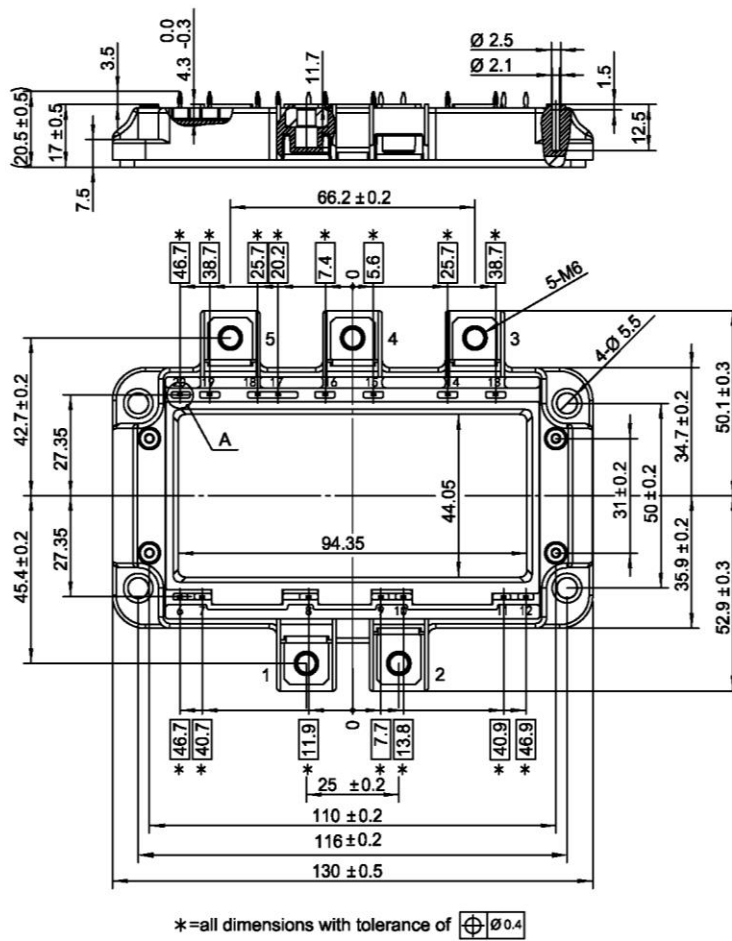
- ① - IGBT Module
- ② - Field Stop Trench Gate IGBT
- ③ - Rated Current (400=400A)
- ④ - Circuit Configuration (Three Level, I Type)
- ⑤ - Rated Voltage (65=650V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial release

Announcement

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