



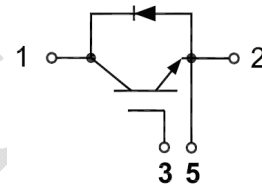
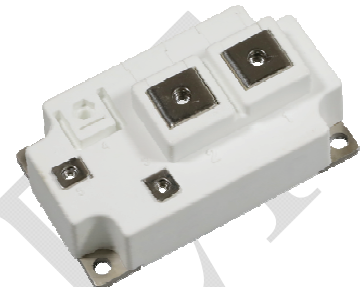
# GT400SD65T2ZH

## IGBT Module

Preliminary Data

### Features:

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



### Applications:

- High Power Converters
- Induction Heating
- UPS Systems

### IGBT, Inverter

Maximum Rated Values of IGBT(T<sub>C</sub>=25 $^{\circ}$ C unless otherwise specified)

V <sub>CES</sub>	Collector-Emitter Blocking Voltage		650	V
V <sub>GES</sub>	Gate-Emitter Voltage		$\pm$ 20	V
I <sub>C</sub>	Continuous Collector Current	T <sub>C</sub> = 100 $^{\circ}$ C	400	A
		T <sub>C</sub> = 25 $^{\circ}$ C	800	A
I <sub>CM</sub>	Repetitive Peak Collector Current	T <sub>J</sub> = 175 $^{\circ}$ C	800	A
t <sub>SC</sub>	Short Circuit Withstand Time		>10	$\mu$ s
P <sub>D</sub>	Maximum Power Dissipation per IGBT	T <sub>C</sub> = 25 $^{\circ}$ C T <sub>Jmax</sub> =175 $^{\circ}$ C	3260	W



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

### Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 6.4\text{mA}$ , $V_{CE} = V_{GE}$	5.0	5.9	6.8	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	2.00	V
			$T_J = 125^\circ\text{C}$	2.00		V
			$T_J = 150^\circ\text{C}$	2.00		
$I_{CES}$	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	$V_{GE} = \pm 20\text{V}$ , $V_{CE} = 0\text{V}$ , $T_J = 25^\circ\text{C}$			300	nA
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$		32.6		nF
$C_{oes}$	Output Capacitance			1.82		nF
$C_{res}$	Reverse Transfer Capacitance			0.50		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 300\text{V}$ , $I_C = 400\text{A}$ , $R_{Gon} = 1\Omega$ , $V_{GE} = \pm 15\text{V}$ Inductive Load	$T_J = 25^\circ\text{C}$	284		ns
			$T_J = 125^\circ\text{C}$	275		
			$T_J = 150^\circ\text{C}$	269		
$t_r$	Rise Time		$T_J = 25^\circ\text{C}$	285		ns
			$T_J = 125^\circ\text{C}$	285		
			$T_J = 150^\circ\text{C}$	284		
$t_{d(off)}$	Turn-off Delay Time		$T_J = 25^\circ\text{C}$	366		ns
			$T_J = 125^\circ\text{C}$	371		
			$T_J = 150^\circ\text{C}$	375		
$t_f$	Fall Time	$T_J = 25^\circ\text{C}$	142		ns	
		$T_J = 125^\circ\text{C}$	152			
		$T_J = 150^\circ\text{C}$	156			
$E_{on}$	Turn-on Switching Loss	$V_{CC} = 300\text{V}$ , $I_C = 400\text{A}$ , $R_{Gon} = 1\Omega$ , $V_{GE} = \pm 15\text{V}$ $di/dt = 1211\text{A}/\mu\text{s}$ ( $T_J = 150^\circ\text{C}$ ), Inductive Load	$T_J = 25^\circ\text{C}$	4.1		mJ
		$T_J = 125^\circ\text{C}$	5.3			
		$T_J = 150^\circ\text{C}$	5.8			



E <sub>off</sub>	Turn-off Switching Loss	V <sub>CC</sub> = 300V, I <sub>C</sub> = 400A, R <sub>Goff</sub> = 1Ω, V <sub>GE</sub> = ±15V du/dt = 2678V/μs (T <sub>J</sub> = 150°C), Inductive Load	T <sub>J</sub> = 25°C	27.5	mJ
			T <sub>J</sub> = 125°C	29.2	
			T <sub>J</sub> = 150°C	30	
Q <sub>g</sub>	Total Gate Charge	V <sub>GE</sub> = +15V...-15V	T <sub>J</sub> = 25°C	1.72	μC
RBSOA	I <sub>C</sub> = 800A, V <sub>CC</sub> = 600V, V <sub>p</sub> = 650V, R <sub>Goff</sub> = 1Ω, V <sub>GE</sub> = +15V to 0V, T <sub>J</sub> = 150°C			Trapezoid	
SCSOA	V <sub>CC</sub> = 300V, V <sub>GE</sub> = ±15V, T <sub>J</sub> = 150°C			10	μs
R <sub>θJC</sub>	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.046	°C/W

## Diode, Inverter

### Maximum Rated Values of Diode (T<sub>C</sub> = 25°C unless otherwise specified)

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	650	V
I <sub>F</sub>	Diode Continuous Forward Current	400	A
I <sub>FM</sub>	Diode Maximum Forward Current	800	A

### Electrical Characteristics of Diode (T<sub>C</sub> = 25°C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V <sub>FM</sub>	Forward Voltage	I <sub>F</sub> = 400A	T <sub>J</sub> = 25°C	2.00		V
			T <sub>J</sub> = 125°C	2.00		
			T <sub>J</sub> = 150°C	2.10		
t <sub>rr</sub>	Reverse Recovery Time		T <sub>J</sub> = 25°C	184		ns
			T <sub>J</sub> = 125°C	249		
			T <sub>J</sub> = 150°C	277		
I <sub>rr</sub>	Peak Reverse Recovery Current	I <sub>F</sub> = 400A, -di <sub>F</sub> /dt = 1271A/μs (T <sub>J</sub> = 150°C), V <sub>R</sub> = 300V, V <sub>GE</sub> = -15V	T <sub>J</sub> = 25°C	69		A
			T <sub>J</sub> = 125°C	119		
			T <sub>J</sub> = 150°C	131		
Q <sub>rr</sub>	Reverse Recovery Charge		T <sub>J</sub> = 25°C	7.8		μC
			T <sub>J</sub> = 125°C	18.3		
			T <sub>J</sub> = 150°C	22.5		



$E_{rec}$	Reverse Recovery Energy	$I_F=400A,$ $-di_F/dt=1271A/\mu s(T_J=150^\circ C),$ $V_R=300V,$ $V_{GE}=-15V$	$T_J=25^\circ C$	0.86	mJ
			$T_J=125^\circ C$	3.17	
			$T_J=150^\circ C$	4.37	
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)			0.074	$^\circ C/W$

## Module

Symbol	Description	Min	Typ	Max	Unit
$V_{iso}$	Isolation Voltage (All Terminals Shorted)	$f = 50Hz, 1minute$	2500		V
Internal Isolation				Al2O3	
Material of Module Baseplate				Copper	
$d_{creep}$	Terminal to Heatsink		25		mm
	Terminal to Terminal		19		mm
$d_{clear}$	Terminal to Heatsink		25		mm
	Terminal to Terminal		10		mm
$L_{sCE}$	Stray Inductance Module		16		nH
$T_J$	Maximum Junction Temperature			175	$^\circ C$
$T_{JOP}$	Maximum Operating Junction Temperature Range	-40		+150	$^\circ C$
$T_{stg}$	Storage Temperature	-40		+125	$^\circ C$
CTI	Comparative Tracking Index	200			
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)		0.03		$^\circ C/W$
T	Signal Terminals Screw:M4	1.1		2.0	N·m
	Power Terminals Screw:M6	2.5		5.0	N·m
T	Mounting Screw:M6	3.0		6.0	N·m
G	Weight		320		g

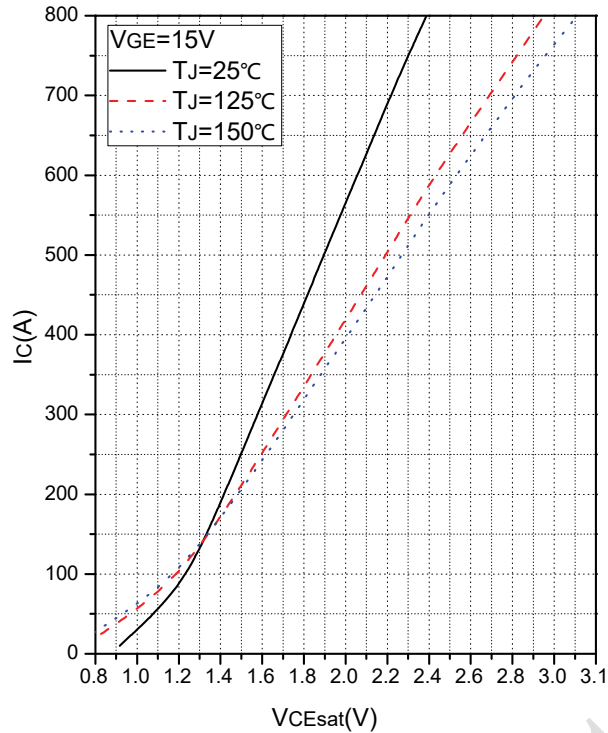


Fig.1 Typical Saturation Voltage Characteristics

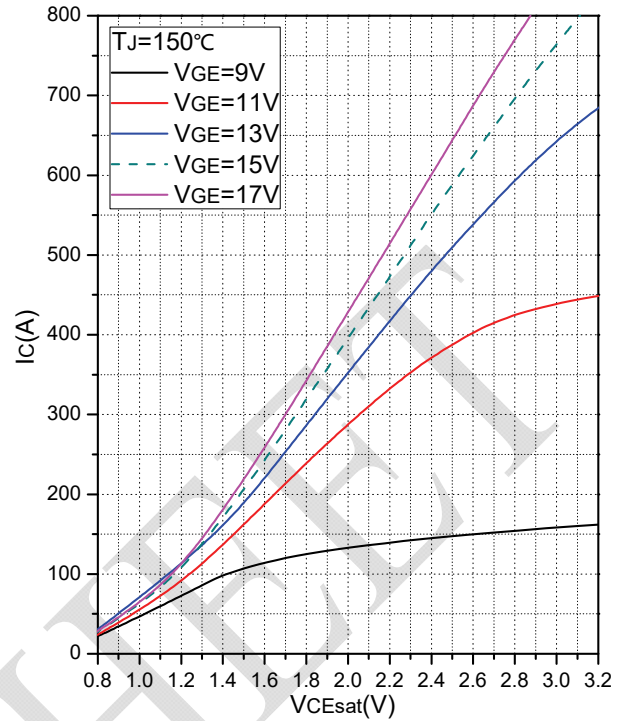


Fig.2 Typical Output Characteristics

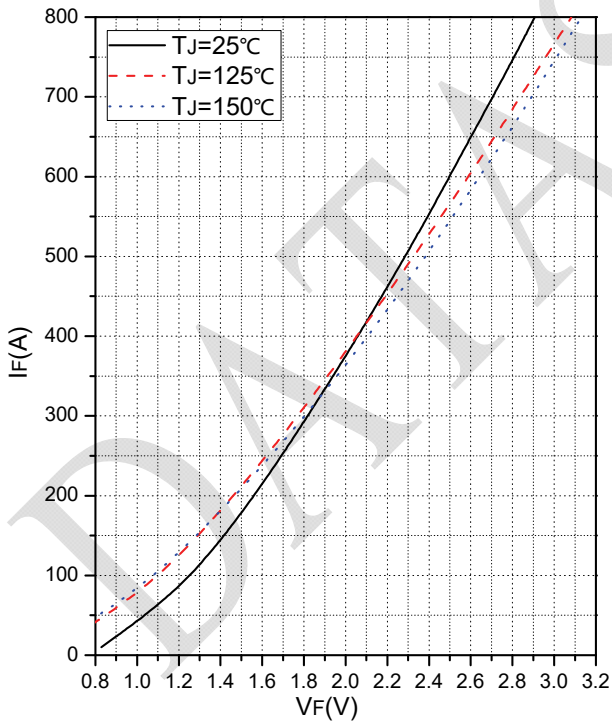


Fig.3 Forward Characteristics of Diode

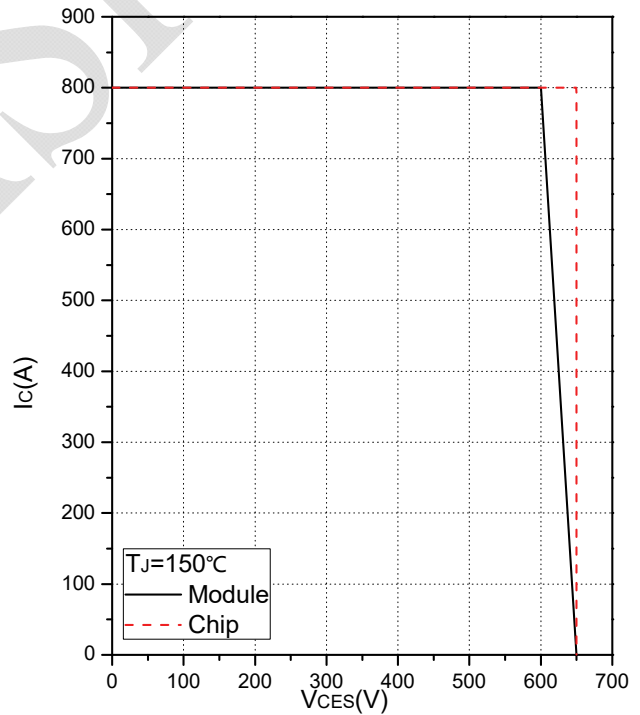


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

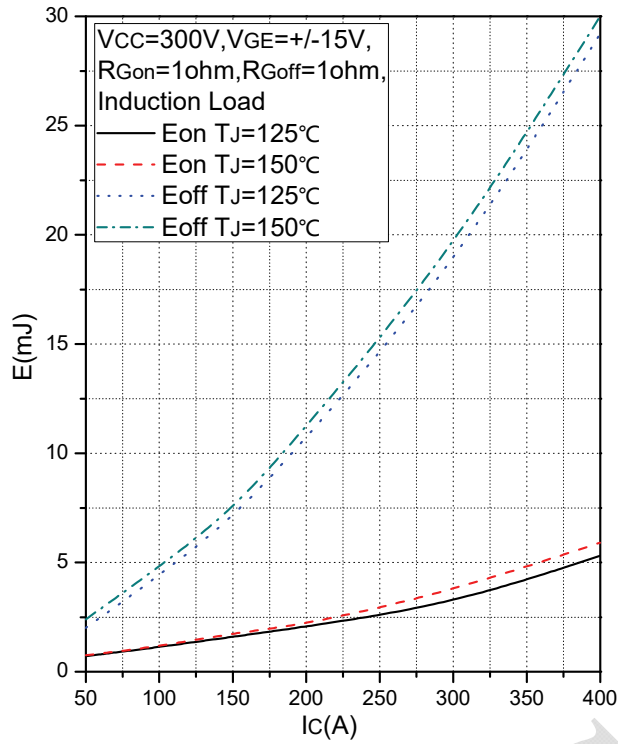


Fig.5 Typical Switching Loss vs. Collector Current

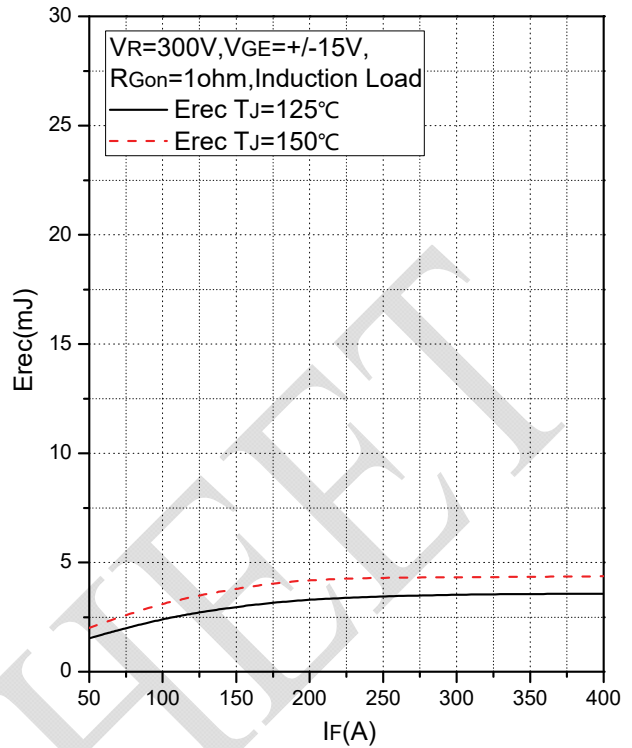


Fig.6 Typical Switching Loss vs. Forward Current

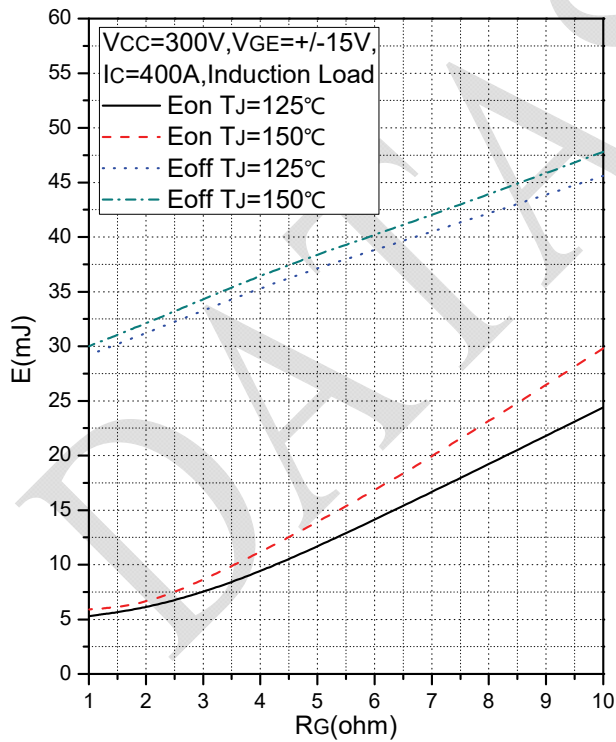


Fig.7 Typical Switching Loss vs. Gate Resistance

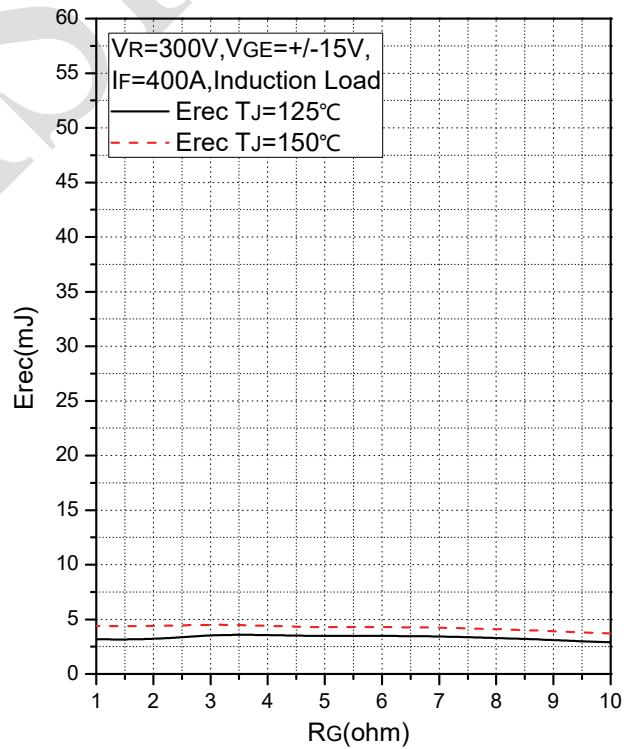


Fig.8 Typical Switching Loss vs. Gate Resistance

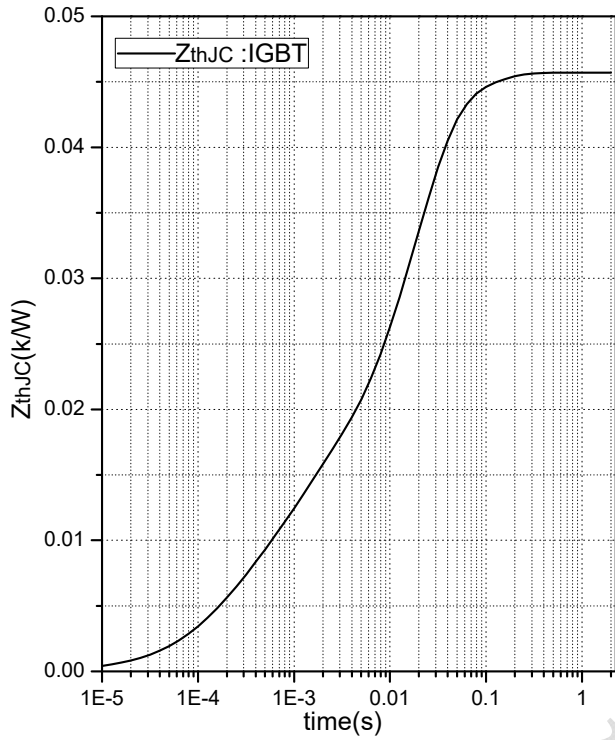


Fig.9 Transient Thermal Impedance (IGBT)

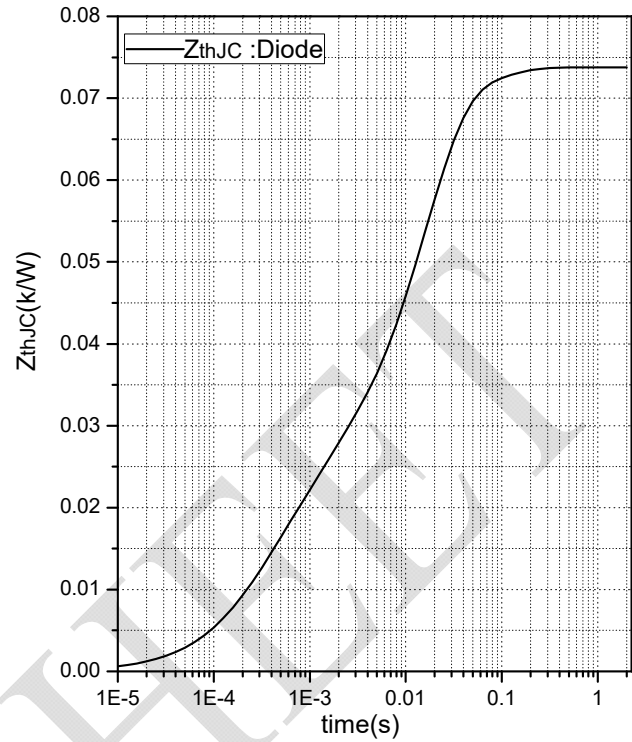


Fig.10 Transient Thermal Impedance (Diode)







Date	Revision	Notes
03/06/2020	01	Initial release

## Announcement

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DATA SHEET