Fuji Electric

Innovating Energy Technology

FGW50XS65

http://www.fujielectric.com/products/semiconductor/

Discrete IGBT

Discrete IGBT (High-Speed XS-series)

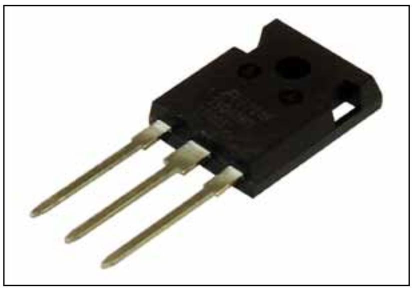
650V / 50A

Features

Low power loss
Low switching surge and noise
High reliability, high ruggedness (RBSOA, SCSOA etc.)

Applications

Uninterruptible power supply
PV Power coditionner
Inverter welding machine



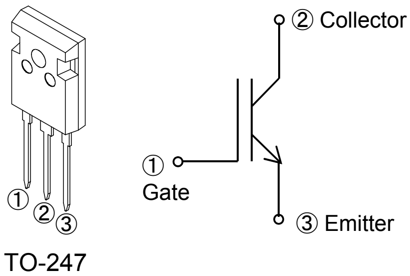
Maximum Ratings and Characteristics

● Absolute Maximum Ratings at T_{vj} = 25 °C (unless otherwise specified)

Parameter	Symbol	Value	Unit	Remarks
Collector-Emitter Voltage	V_{CES}	650	V	
Gate-Emitter Voltage	V_{GES}	± 20	V	
Transient Gate-Emitter Voltage		± 30		t_p < 1 µs
DC Collector Current	$I_{C@25}$	77	A	T_C = 25 °C
	$I_{C@100}$	50	A	T_C = 100 °C
Pulsed Collector Current	I_{CP}	200	A	Note *1
Turn-Off Safe Operating Area	-	200	A	V_{CE} ≤ 650 V T_{vj} ≤ 175 °C
Max. Power Dissipation	P_{tot}	290	W	Tc = 25 °C
Operating Junction Temperature	T_{vj}	-40 ~ +175	°C	
Storage Temperature	T_{stg}	-55 ~ +175	°C	

Note *1 : Pulse width limited by $T_{vj\,max}$.

Equivalent circuit



● Electrical Characteristics at T_{vj} = 25 °C (unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 650 V V_{GE} = 0 V	T_{vj} = 25 °C	-	-	250	µA
			T_{vj} = 175 °C	-	-	2	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0 V V_{GE} = ± 20 V		-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 20 V I_C = 50 mA		3.4	4.0	4.6	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V I_C = 50 A	T_{vj} = 25 °C	1.0	1.35	1.7	V
			T_{vj} = 125 °C	-	1.5	-	
			T_{vj} = 175 °C	-	1.6	-	
Input Capacitance	C_{ies}	V_{CE} = 25 V V_{GE} = 0 V f = 1 MHz		2050	4100	6150	pF
Output Capacitance	C_{oes}			48	96	144	
Reverse Transfer Capacitance	C_{res}			21	42	63	
Gate Charge	Q_G	V_{CC} = 520 V I_C = 50 A V_{GE} = 15 V		105	210	315	nC
Turn-On Delay Time	$t_{d(on)}$	T_{vj}= 25 °C V_{CC} = 400 V I_C = 25 A V_{GE} = 15 V R_G = 10 Ω Energy loss include “tail” and FWD reverse recovery.		16	32	48	ns
Rise Time	t_r			18	36	54	
Turn-Off Delay Time	$t_{d(off)}$			120	240	360	
Fall Time	t_f			10	20	30	
Turn-On Energy	E_{on}			0.3	0.6	0.9	mJ
Turn-Off Energy	E_{off}			0.19	0.38	0.57	
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 150 °C V_{CC} = 400 V I_C = 25 A V_{GE} = 15 V R_G = 10 Ω Energy loss include “tail” and FWD reverse recovery.		16	32	48	ns
Rise Time	t_r			12	24	36	
Turn-Off Delay Time	$t_{d(off)}$			140	280	420	
Fall Time	t_f			11	21	32	
Turn-On Energy	E_{on}			0.38	0.75	1.13	mJ
Turn-Off Energy	E_{off}			0.25	0.5	0.75	

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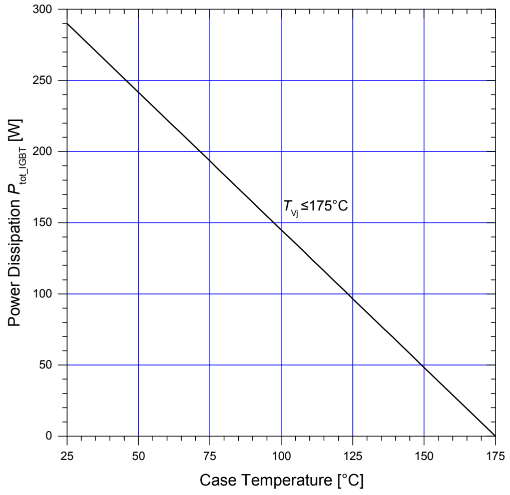
● Thermal Resistance

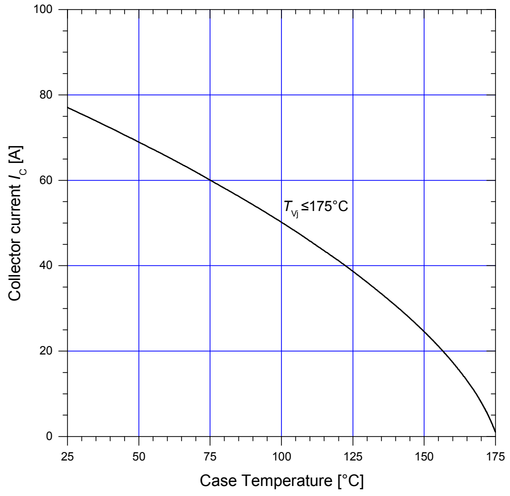
Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	-	-	0.518	°C/W

Characteristics (Representative)

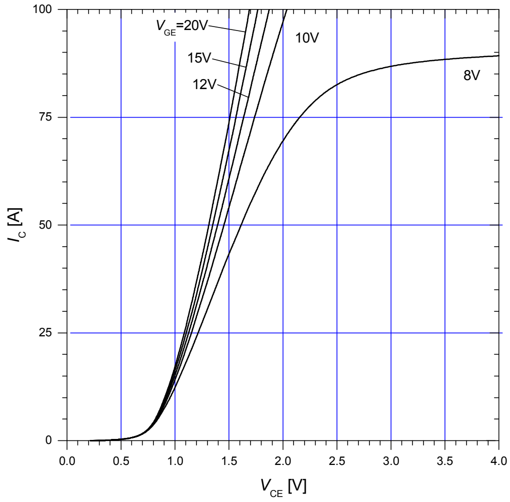
Graph 1
IGBT Power Dissipation vs T_c
T_{vj} ≤ 175°C



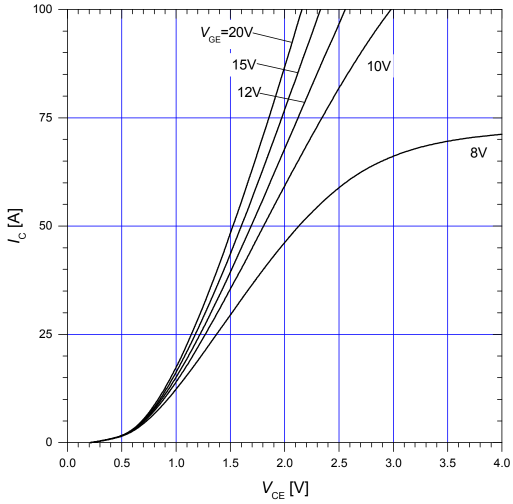
Graph 2
DC Collector Current vs T_c
V_{GE} ≥ +15 V, T_{vj} ≤ 175°C



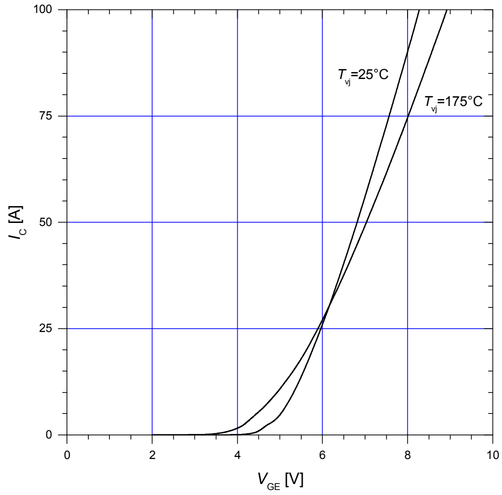
Graph 3
Typical output characteristics
T_{vj} = 25°C



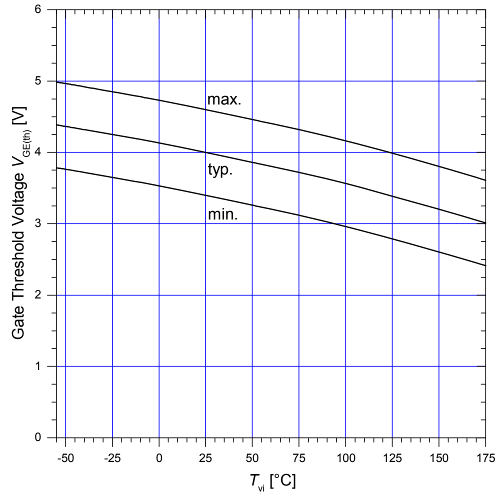
Graph 4
Typical output characteristics
T_{vj} = 175°C



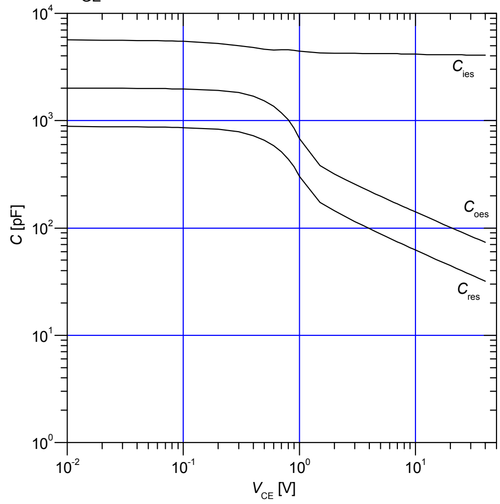
Graph 5
Typical transfer characteristics
V_{CE} = 20 V



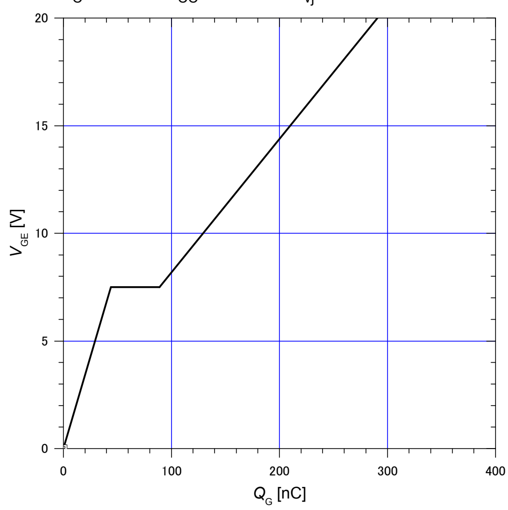
Graph 6
Gate threshold voltage
I_C = 50 mA, V_{CE} = 20 V



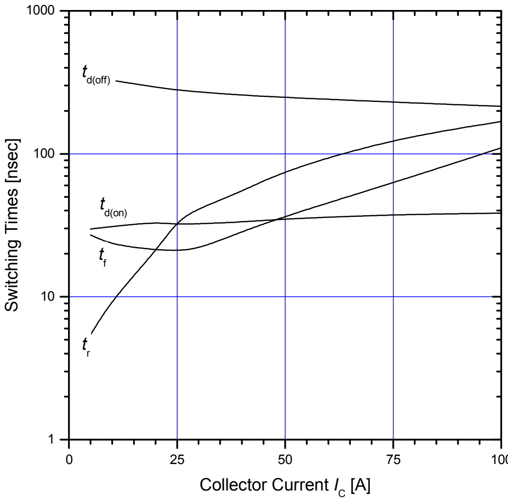
Graph 7
Typical capacitance
V_{GE} = 0 V, f = 1 MHz



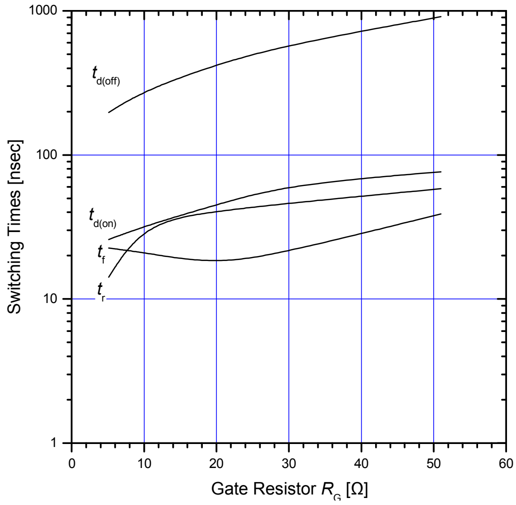
Graph 8
Typical gate charge
I_C = 50 A, V_{CC} = 520 V, T_{vj} = 25°C



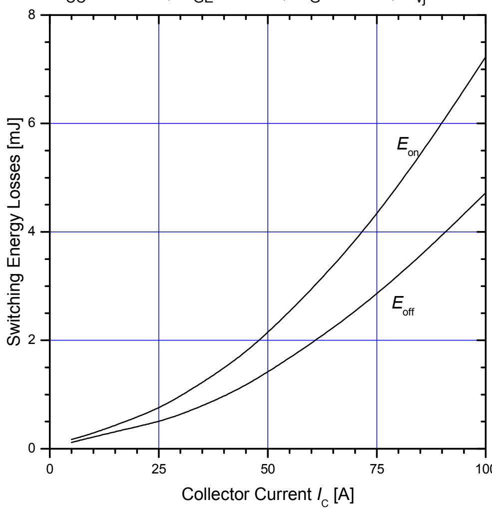
Graph 9
Typical switching times vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



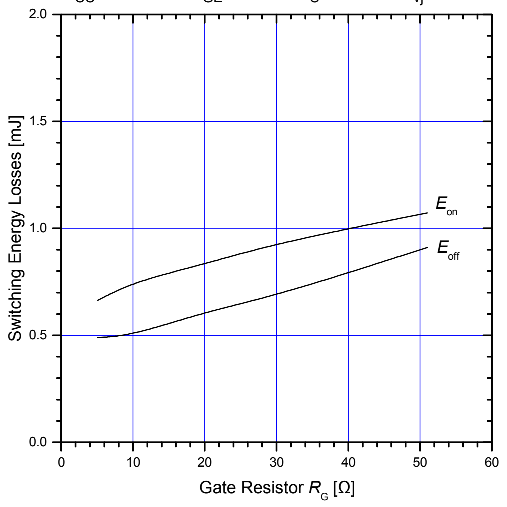
Graph 10
Typical switching times vs. R_G
V_{CC} = 400 V, V_{GE} = 15 V, I_C = 25 A, T_{vj} = 150°C



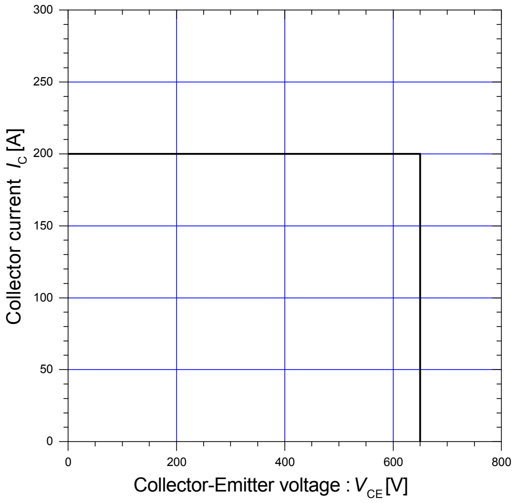
Graph 11
Typical switching losses vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



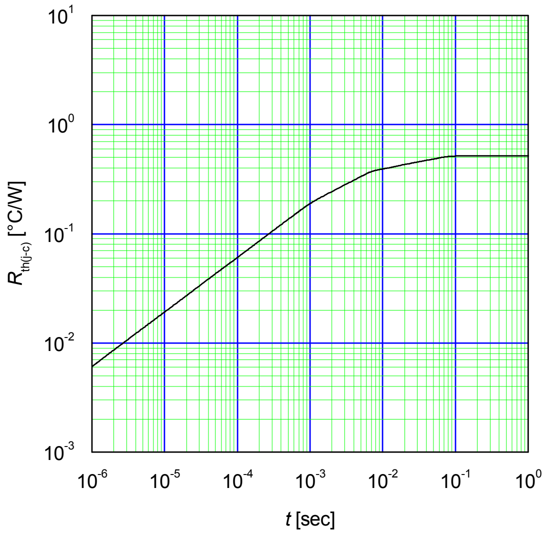
Graph 12
Typical switching losses vs. R_G
V_{CC} = 400 V, V_{GE} = 15 V, I_C = 25 A, T_{vj} = 150°C



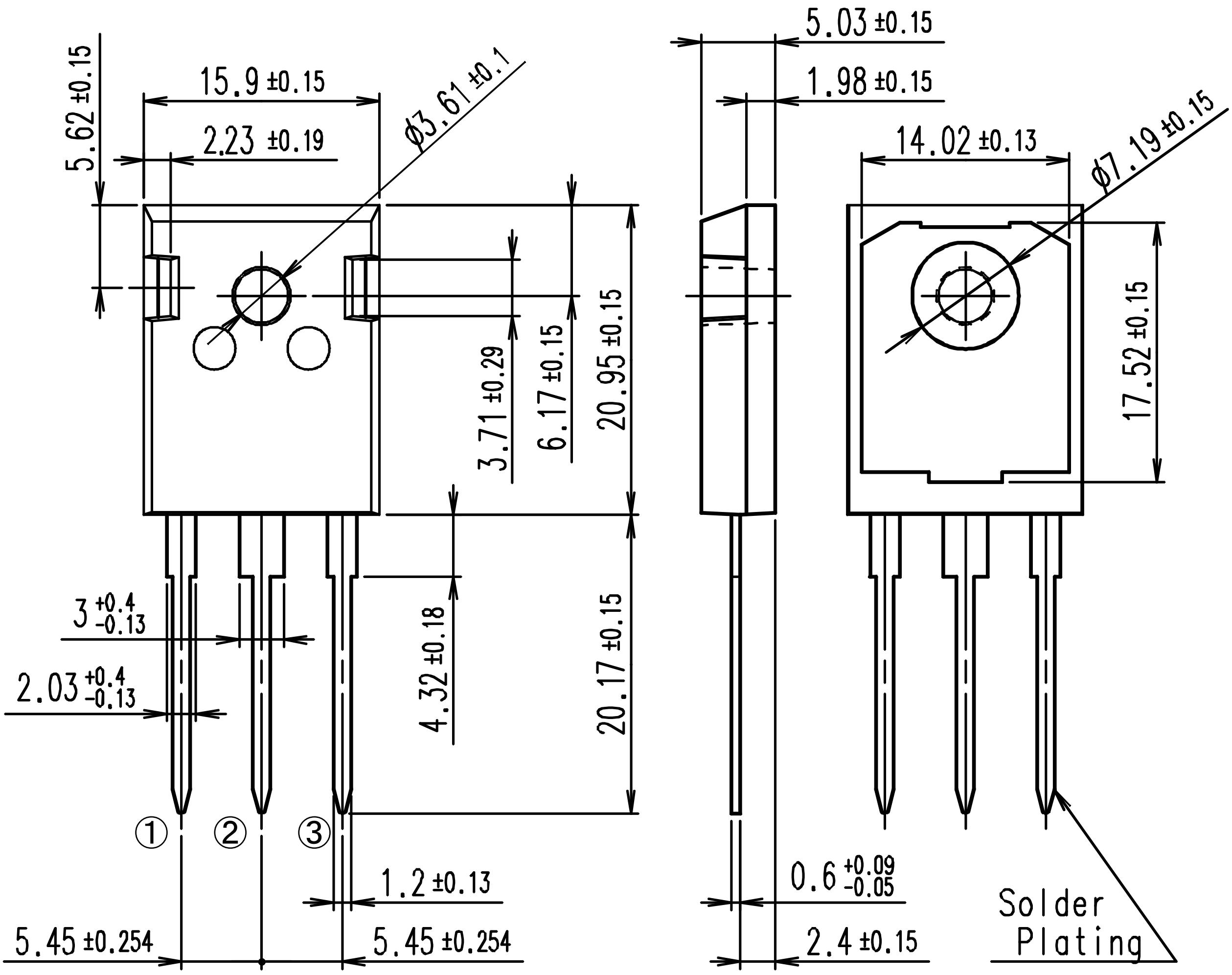
Graph 13
Reverse biased safe operating area
V_{GE} = 15 V / 0 V, R_G = 10 Ω, T_{vj} ≤ 175°C

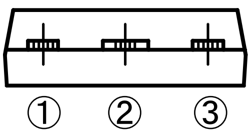


Graph 14
Transient Thermal Impedance
D = 0



Outline Drawings, mm





CONNECTION
① GATE
② COLLECTOR
③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of September 2018. The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sur to obtain the latest specifications.

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4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
   - Computers
   - OA equipment
   - Communications equipment (terminal devices)
   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
   - Transportation equipment (mounted on cars and ships)
   - Trunk communications equipment
   - Traffic-signal control equipment
   - Gas leakage detectors with an auto-shut-off feature
   - Emergency equipment for responding to disasters and anti-burglary devices
   - Safety devices
   - Medical equipment

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
   - Space equipment
   - Aeronautic equipment
   - Nuclear control equipment
   - Submarine repeater equipment

8. If you have any question about any portion in this Catalog, ask Fuji Electric Co., Ltd. or its sales agents before using the product. Neither Fuji Electric Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.

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IGBT Modules

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