FGW50XS65C

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

Discrete IGBT (XS-series)

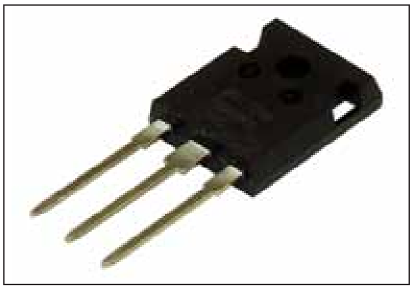
650V / 50A

Features

Low power loss
Low switching surge and noise
High reliability, high ruggedness

Applications

Uninterruptible power supply
PV Power coditionner
Inverter welding machine



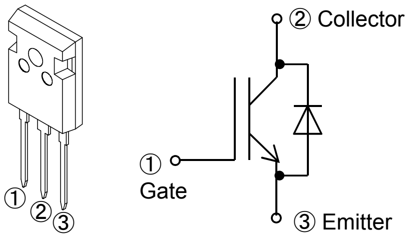
Maximum Ratings and Characteristics

● **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
Diode Forward Current	$I_{F@25}$	80	A	
	$I_{F@100}$	50	A	
Diode Pulsed Current	I_{FP}	200	A	Note *1
IGBT Max. Power Dissipation	P_{tot_IGBT}	290	W	T_C = 25 °C
FWD Max. Power Dissipation	P_{tot_FWD}	216	W	T_C = 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



TO-247-P/TO-247-P2

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

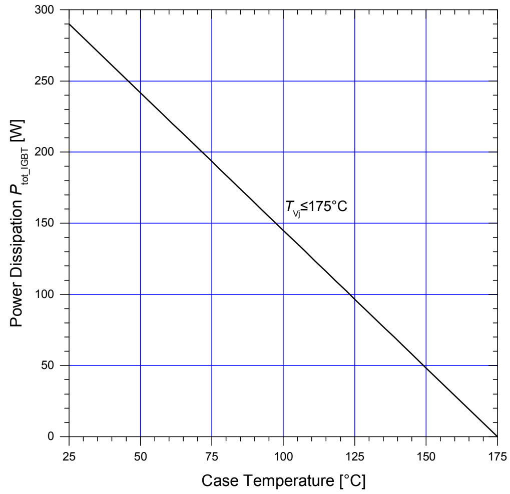
Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 650 V V_{GE} = 0 V	T_{vj} = 25 °C	-	-	250	μA
			T_{vj} = 175 °C	-	-	2	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0 V V_{GE} = ± 20 V		-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 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	-	1.35	1.7	V
			T_{vj} = 125 °C	-	1.5	-	
			T_{vj} = 175 °C	-	1.6	-	
Input Capacitance	C_{ies}	V_{CE} = 25 V		-	4100	-	pF
Output Capacitance	C_{oes}	V_{GE} = 0 V		-	96	-	
Reverse Transfer Capacitance	C_{res}	f = 1 MHz		-	42	-	
Gate Charge	Q_G	V_{CC} = 520 V I_C = 50 A V_{GE} = 15 V		-	210	-	nC
Turn-On Delay Time	$t_{d(on)}$	T_{vj}= 25 °C		-	32	-	ns
Rise Time	t_r	V_{CC} = 400 V		-	36	-	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 25 A		-	240	-	
Fall Time	t_f	V_{GE} = 15 V		-	20	-	
Turn-On Energy	E_{on}	R_G = 10 Ω		-	0.6	-	mJ
Turn-Off Energy	E_{off}	Energy loss include “tail” and FWD reverse recovery.		-	0.38	-	
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 150 °C		-	32	-	ns
Rise Time	t_r	V_{CC} = 400 V		-	24	-	
Turn-Off Delay Time	$t_{d(off)}$	I_C = 25 A		-	280	-	
Fall Time	t_f	V_{GE} = 15 V		-	21	-	
Turn-On Energy	E_{on}	R_G = 10 Ω		-	0.75	-	mJ
Turn-Off Energy	E_{off}	Energy loss include “tail” and FWD reverse recovery.		-	0.5	-	
Forward Voltage Drop	V_F	I_F = 50 A	T_{vj} = 25 °C	-	1.7	2.15	V
			T_{vj} = 125 °C	-	1.78	-	V
			T_{vj} = 175 °C	-	1.78	-	V
Diode Reverse Recovery Time	t_{rr}	V_{CC} = 400 V		-	74	-	ns
Diode Reverse Recovery Charge	Q_{rr}	I_F = 25 A $-di_F/dt$ = 500 A/μs T_{vj} = 25 °C		-	0.8	-	μC
Diode Reverse Recovery Time	t_{rr}	V_{CC} = 400 V		-	115	-	ns
Diode Reverse Recovery Charge	Q_{rr}	I_F = 25 A $-di_F/dt$ = 500 A/μs T_{vj} = 150 °C		-	1.6	-	μC

● **Thermal Resistance**

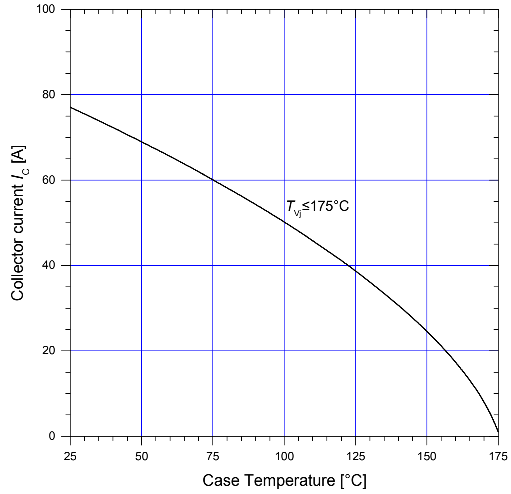
Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	0.518	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	0.693	°C/W

Characteristics (Representative)

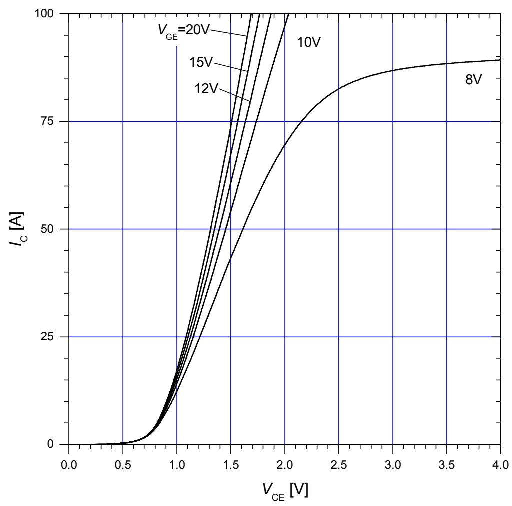
Graph 1
IGBT Power Dissipation vs T_c
$T_{vj} \leq 175°C$



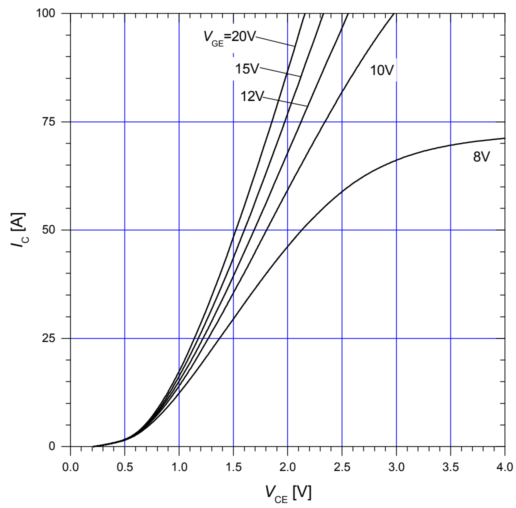
Graph 2
DC Collector Current vs T_c
$V_{GE} \geq +15$ V, $T_{vj} \leq 175°C$



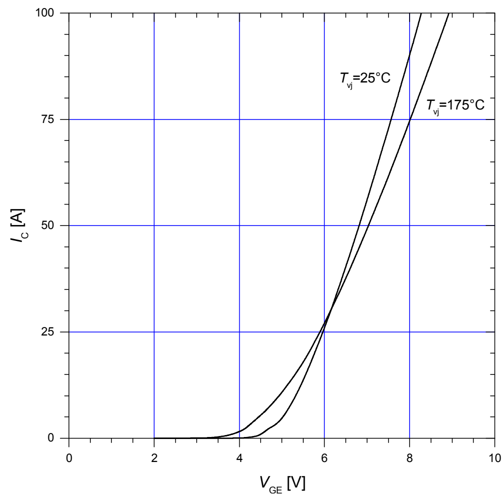
Graph 3
Typical output characteristics
$T_{vj} = 25°C$



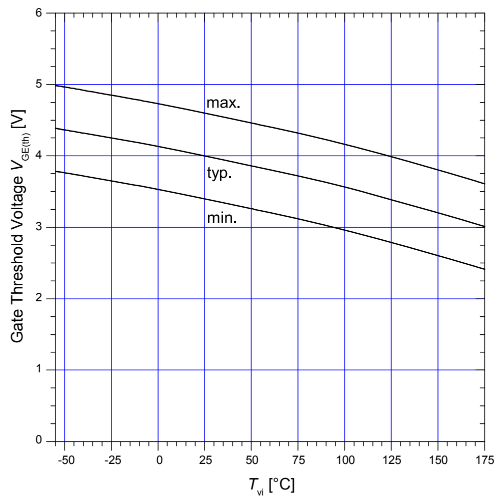
Graph 4
]Typical output characteristics
$T_{vj} = 175°C$



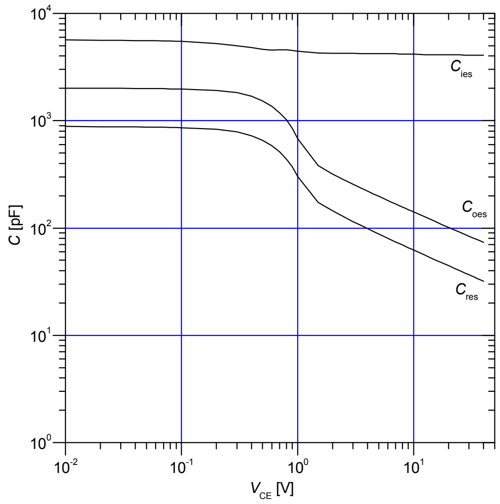
Graph 5
Typical transfer characteristics
$V_{CE} = 20$ V



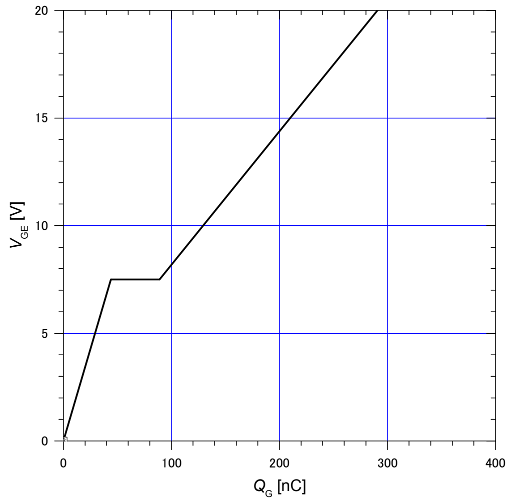
Graph 6
Gate threshold voltage
$I_C = 50$ mA, $V_{CE} = 20$ V



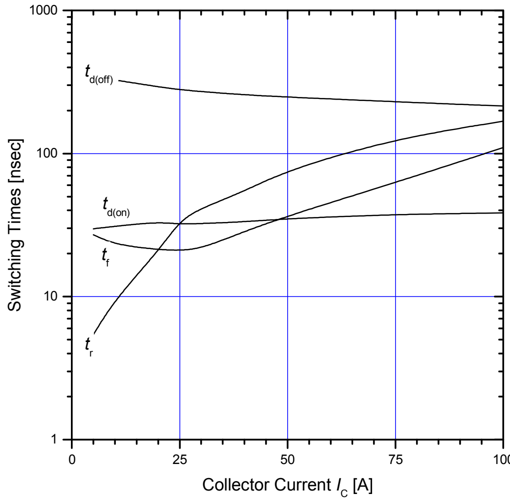
Graph 7
Typical capacitance
V_{GE} = 0 V, f = 1 MHz



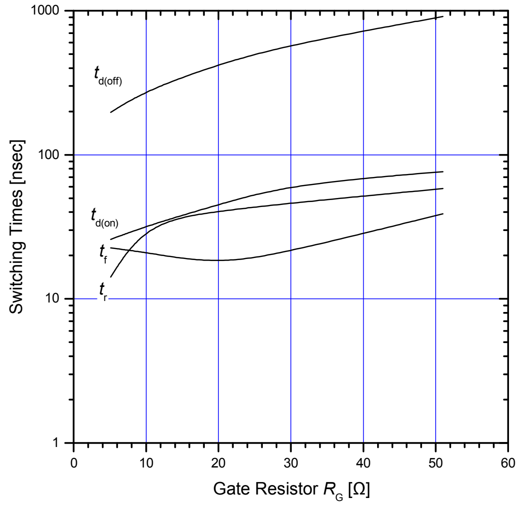
Graph 8
Typical gate charge
I_C = 50 A, V_{CC} = 520 V, T_{vj} = 25°C



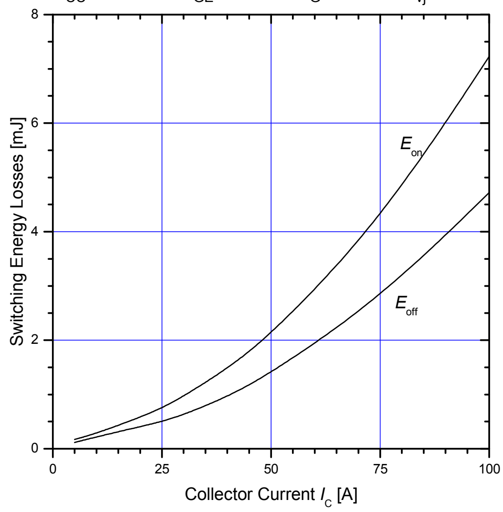
Graph 9
Typical switching times vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



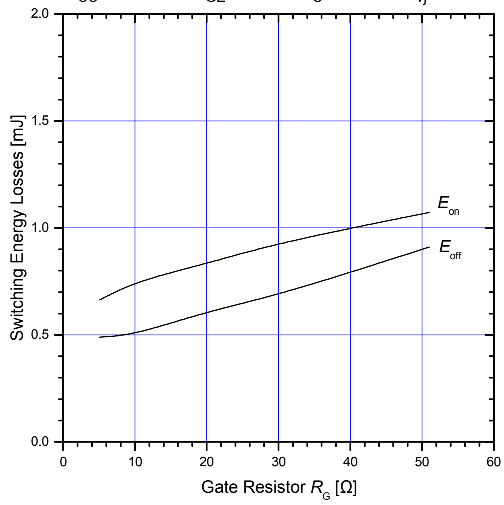
Graph 10
Typical switching times vs. R_G
V_{CC} = 400 V, V_{GE} = 15 V, I_C = 25 A, T_{vj} = 150°C



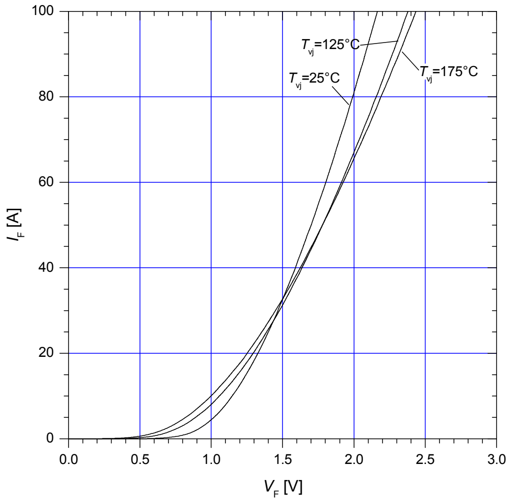
Graph 11
Typical switching losses vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



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

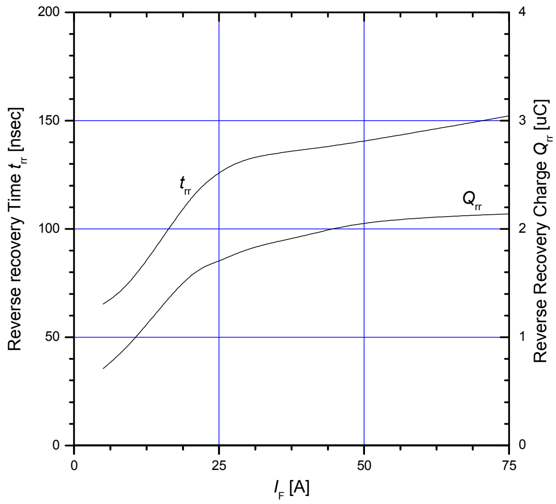


Graph 13
Typical forward characteristics of FWD



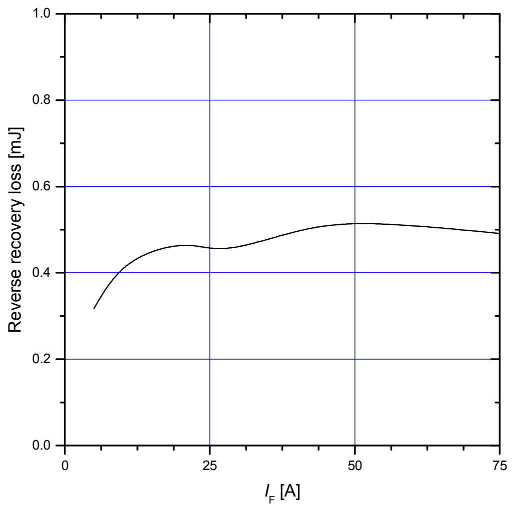
Graph 14
Typical reverse recovery characteristics vs. I_F

V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



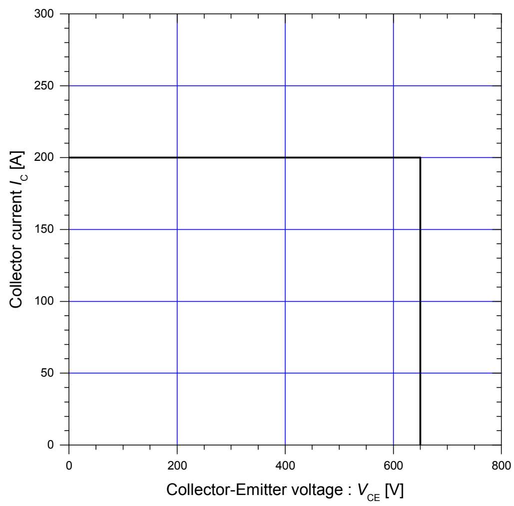
Graph 15
Typical reverse recovery loss vs. I_F

V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



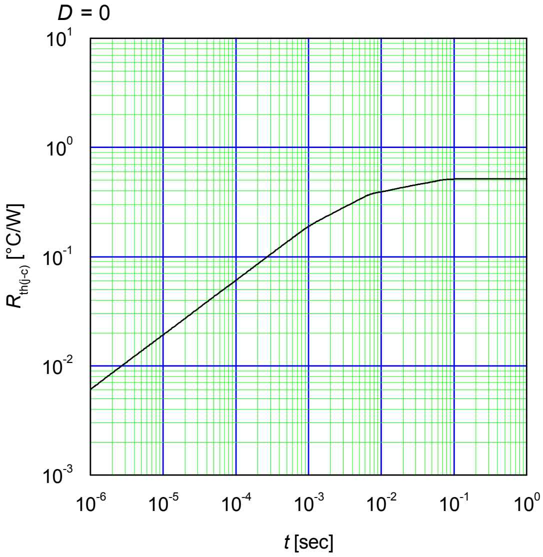
Graph 16
Reverse biased safe operating area

V_{GE} = 15 V / 0 V, R_G = 10 Ω, T_{vj} ≤ 175°C



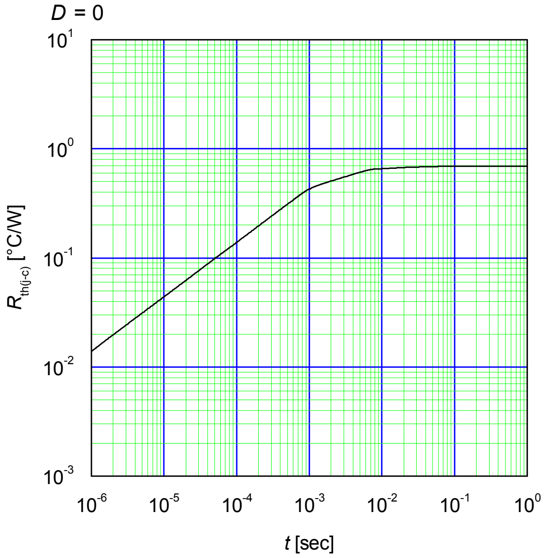
Graph 17
Transient Thermal Impedance of IGBT

D = 0

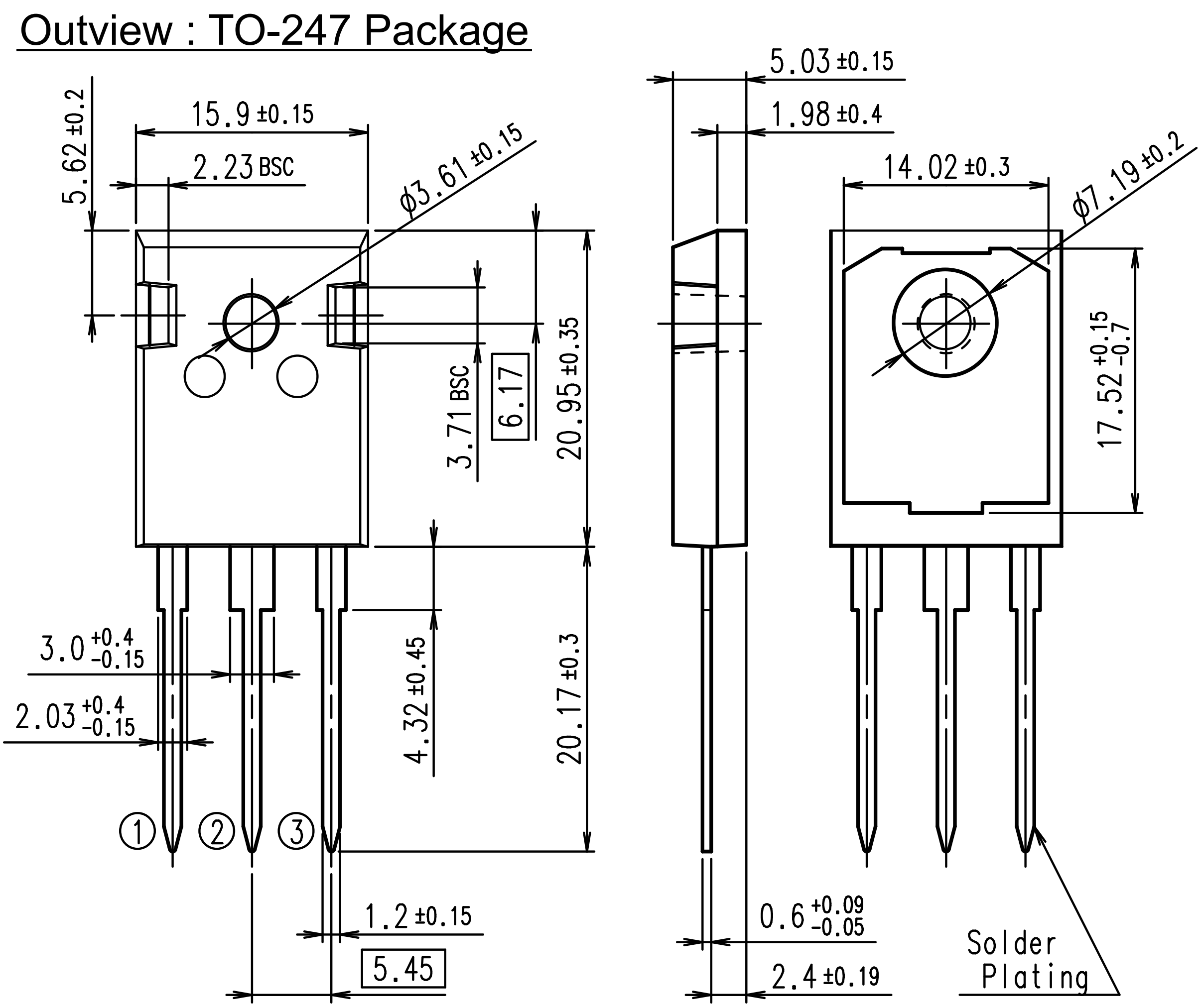


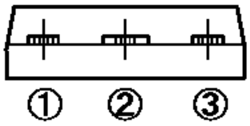
Graph 18
Transient Thermal Impedance of FWD

D = 0



Outline Drawings, mm





CONNECTION
① GATE
② COLLECTOR
③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

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   - 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
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Innovating ***Energy Technology***

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