FGW50XS65C

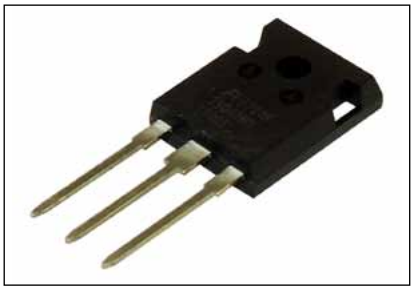
Discrete IGBT (High-Speed XS-series)
650V / 50A

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



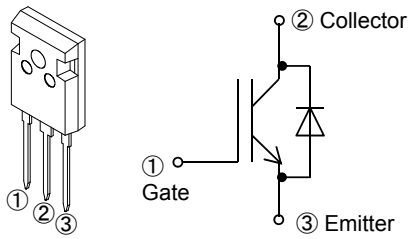
Maximum Ratings and Characteristics

● **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
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



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● **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		2050	4100	6150	pF
Output Capacitance	C_{oes}	V_{GE} = 0 V		48	96	144	
Reverse Transfer Capacitance	C_{res}	f = 1 MHz		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	
Forward Voltage Drop	V_F	I_F = 50 A	T_{vj} = 25 °C	1.25	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		37	74	111	ns
Diode Reverse Recovery Charge	Q_{rr}	I_F = 25 A, $-di_F/dt$ = 500 A/µs, T_{vj} = 25 °C		0.4	0.8	1.2	µC
Diode Reverse Recovery Time	t_{rr}	V_{CC} = 400 V		58	115	173	ns
Diode Reverse Recovery Charge	Q_{rr}	I_F = 25 A, $-di_F/dt$ = 500 A/µs, T_{vj} = 150 °C		0.8	1.6	2.4	µC

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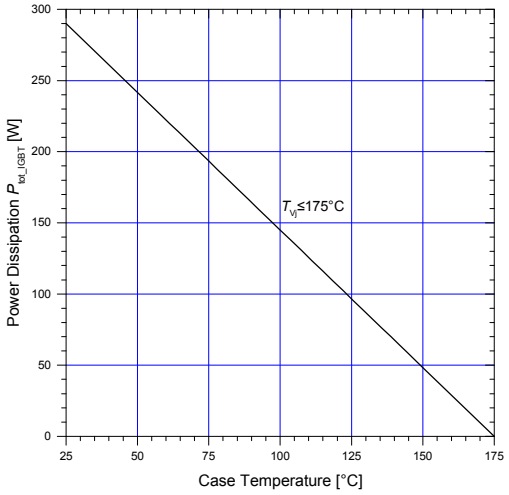
● Thermal Resistance

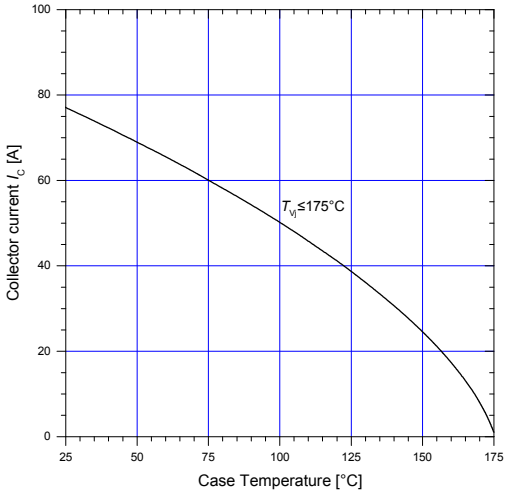
Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)\_IGBT}$	-	-	0.518	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)\_FWD}$	-	-	0.693	°C/W

Characteristics (Representative)

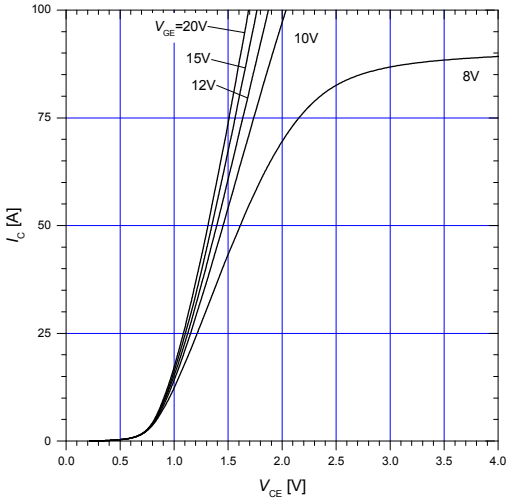
Graph 1
IGBT Power Dissipation vs T_c
$T_{vj} \leq 175°C$



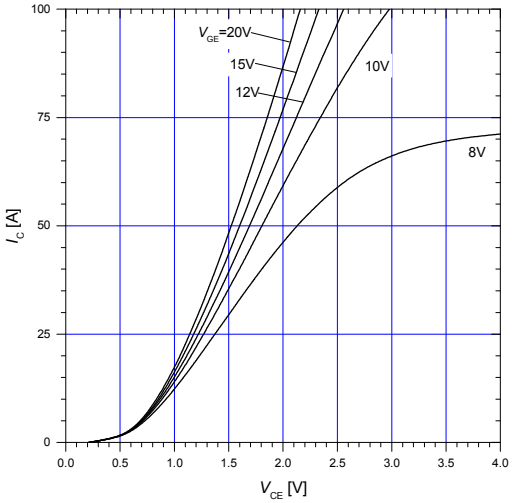
Graph 2
DC Collector Current vs T_c
$V_{GE} \geq +15$ V, $T_{vj} \leq 175°C$



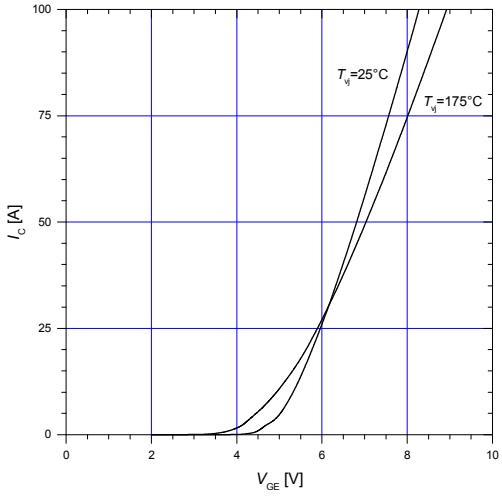
Graph 3
Typical output characteristics
T_{vj} = 25°C



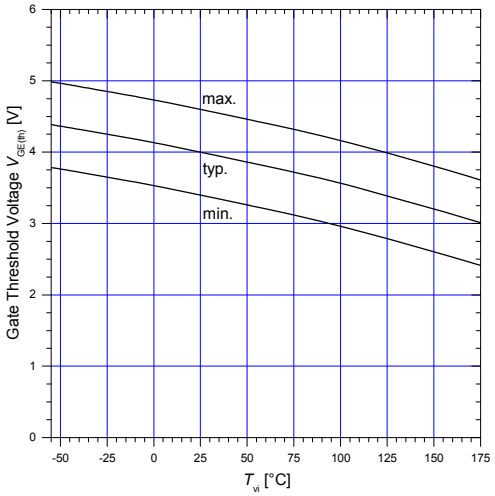
Graph 4
]Typical output characteristics
T_{vj} = 175°C



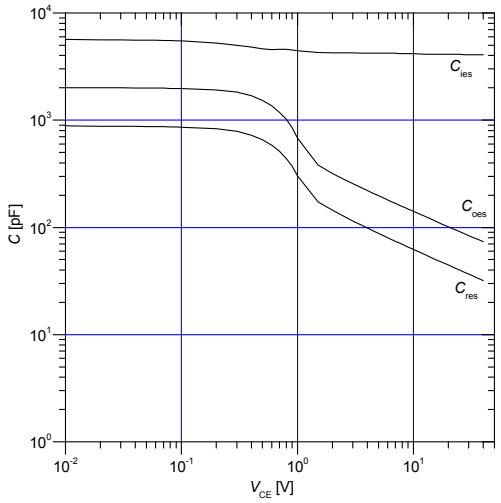
Graph 5
Typical transfer characteristics
V_{CE} = 20 V



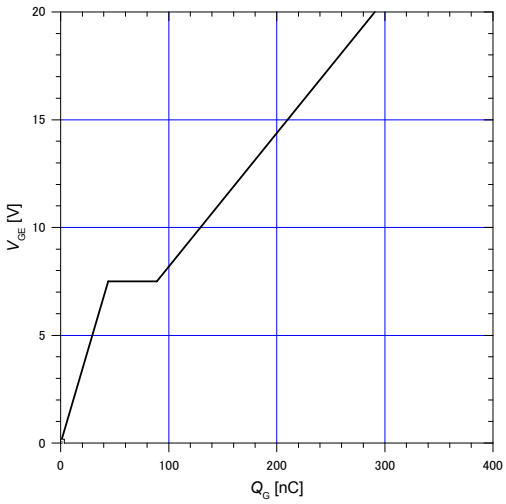
Graph 6
Gate threshold voltage
I_C = 50 mA, V_{CE} = 20 V



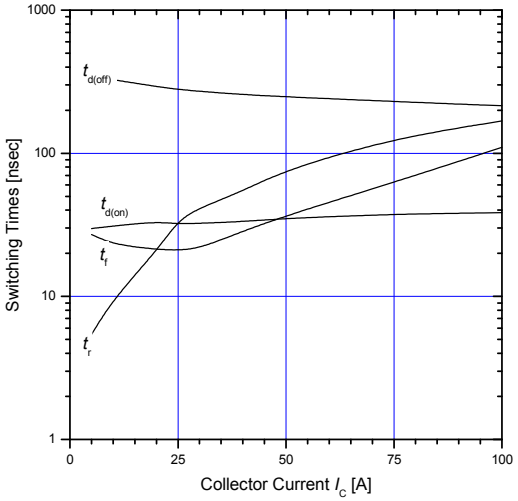
Graph 7
Typical capacitance
V_{GE} = 0 V, f = 1 MHz



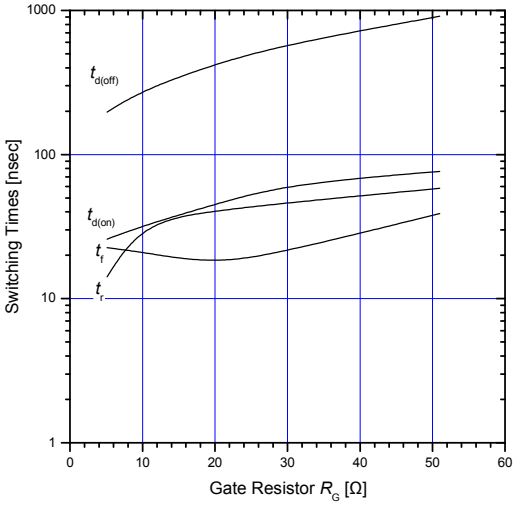
Graph 8
Typical gate charge
I_C = 50 A, V_{CC} = 520 V, T_{vj} = 25°C



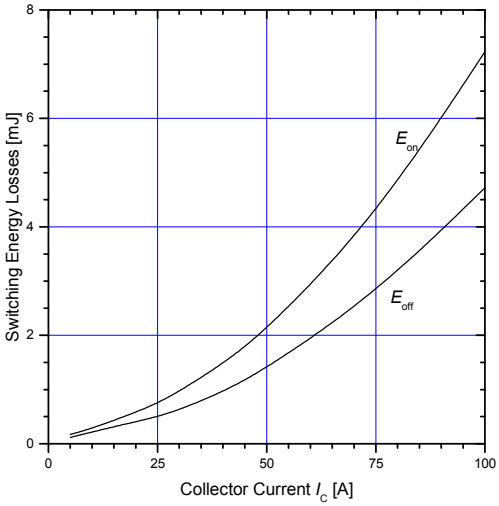
Graph 9
Typical switching times vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



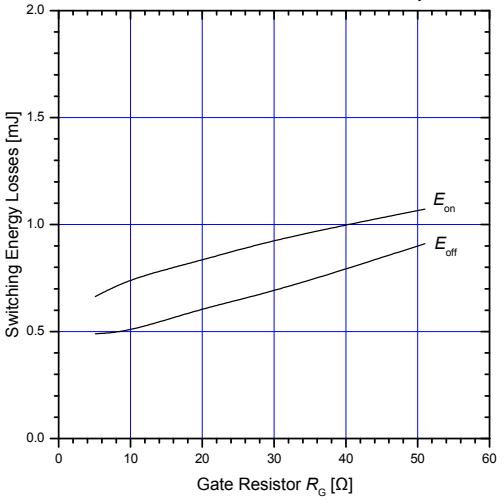
Graph 10
Typical switching times vs. R_G
V_{CC} = 400 V, V_{GE} = 15 V, I_C = 25 A, T_{vj} = 150°C



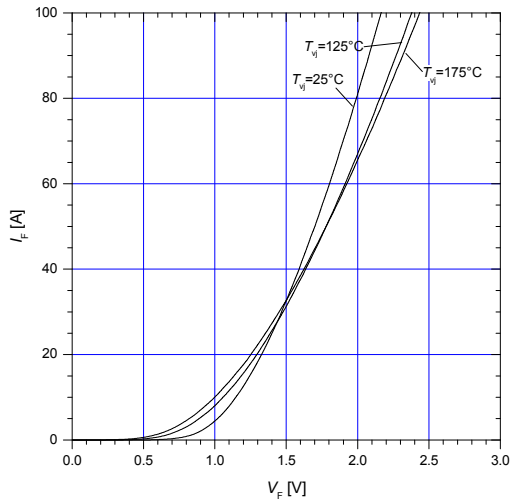
Graph 11
Typical switching losses vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150°C



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

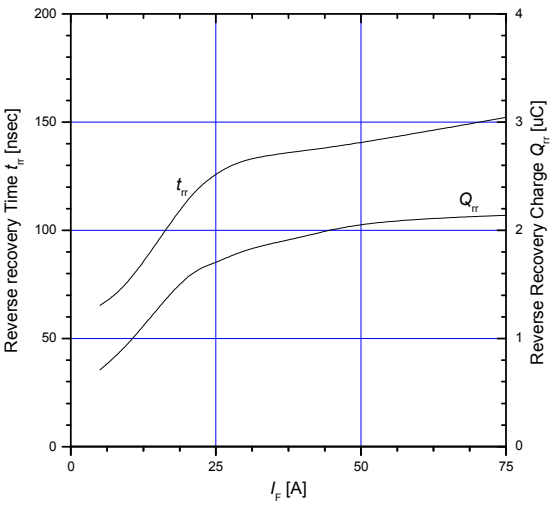


Graph 13
Typical forward characteristics of FWD



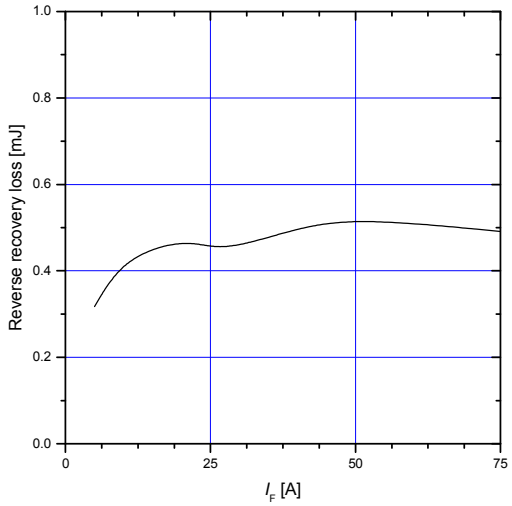
Graph 14
Typical reverse recovery characteristics vs. I_F

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



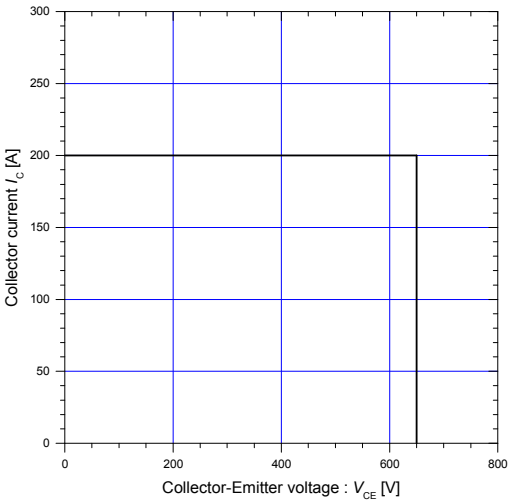
Graph 15
Typical reverse recovery loss vs. I_F

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



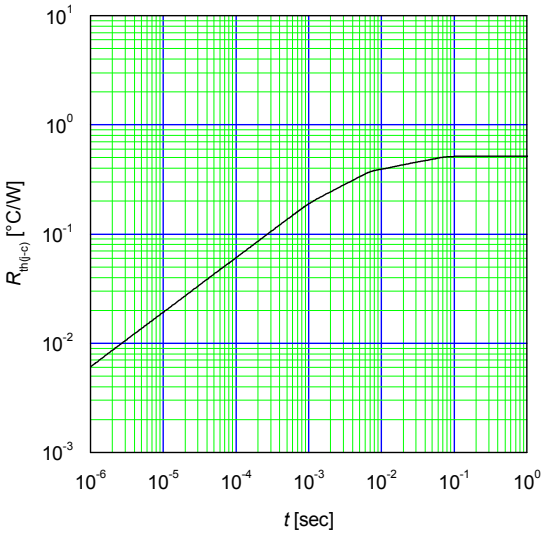
Graph 16
Reverse biased safe operating area

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



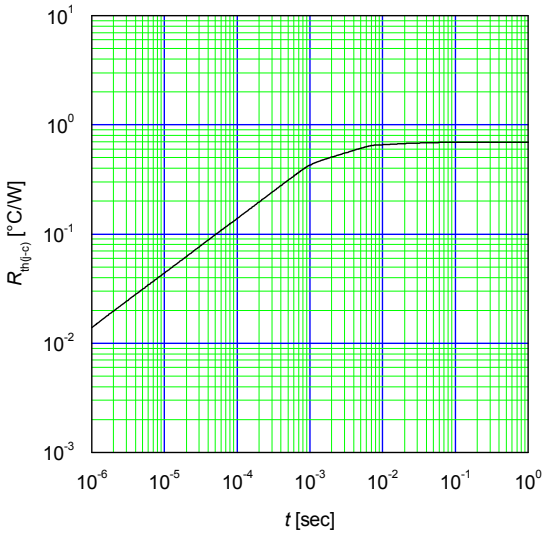
Graph 17
Transient Thermal Impedance of IGBT

D = 0

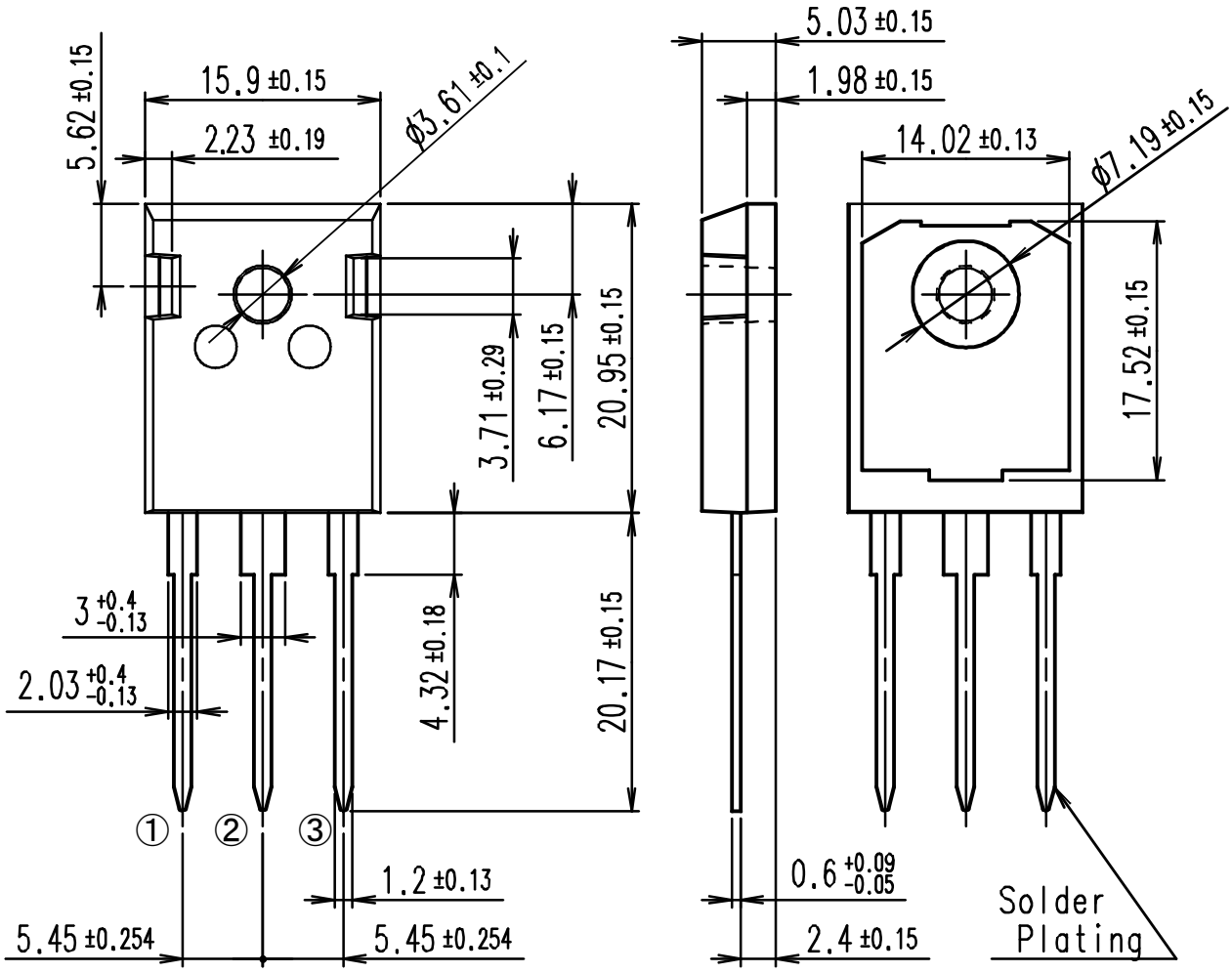


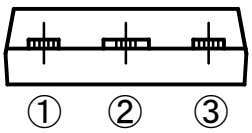
Graph 18
Transient Thermal Impedance of FWD

D = 0



Outline Drawings, mm





CONNECTION
① GATE
② COLLECTOR
③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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