FGW75XS65D

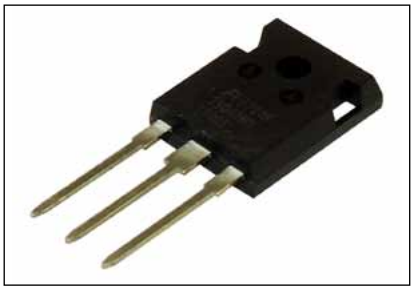
Discrete IGBT (High-Speed XS-series)
650V / 75A

Features

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

Applications

Uninterruptible power supply
PV Power coditionner
Inverter welding machine



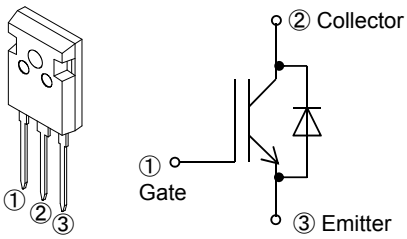
Maximum Ratings and Characteristics

● **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	$I_{C@25}$	115	A	T_C = 25 °C
	$I_{C@100}$	75	A	T_C = 100 °C
Pulsed Collector Current	I_{CP}	300	A	Note *1
Turn-Off Safe Operating Area	-	300	A	V_{CE} ≤ 650 V T_{vj} ≤ 175 °C
Diode Forward Current	$I_{F@25}$	48	A	
	$I_{F@100}$	30	A	
Diode Pulsed Current	I_{FP}	300	A	Note *1
IGBT Max. Power Dissipation	P_{tot_IGBT}	437	W	T_C = 25 °C
FWD Max. Power Dissipation	P_{tot_FWD}	131	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-P2

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

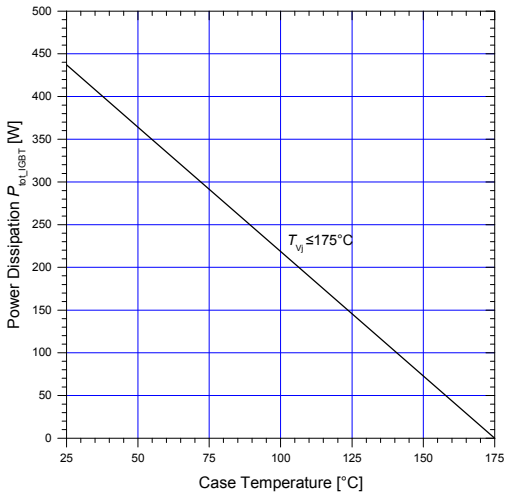
Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 650 V, V_{GE} = 0 V	T_{vj} = 25 °C	-	-	250	µA
			T_{vj} = 175 °C	-	-	2	mA
Gate-Emitter Leakage Current	I_{GES}	V_{CE} = 0 V, V_{GE} = ± 20 V		-	-	200	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE} = 20 V, I_C = 75 mA		3.4	4.0	4.6	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15 V, I_C = 75 A	T_{vj} = 25 °C	1.00	1.35	1.70	V
			T_{vj} = 125 °C	-	1.50	-	
			T_{vj} = 175 °C	-	1.60	-	
Input Capacitance	C_{ies}	V_{CE} = 25 V		2970	5940	8910	pF
Output Capacitance	C_{oes}	V_{GE} = 0 V		67	134	201	
Reverse Transfer Capacitance	C_{res}	f = 1 MHz		30	60	90	
Gate Charge	Q_G	V_{CC} = 520 V, I_C = 75 A, V_{GE} = 15 V		150	300	450	nC
Turn-On Delay Time	$t_{d(on)}$	T_{vj}= 25 °C, V_{CC} = 400 V, I_C = 37.5 A, V_{GE} = 15 V, R_G = 10 Ω, Energy loss include “tail” and FWD reverse recovery.		22	44	66	ns
Rise Time	t_r			26	52	78	
Turn-Off Delay Time	$t_{d(off)}$			170	340	510	
Fall Time	t_f			14	28	42	
Turn-On Energy	E_{on}			0.50	1.00	1.50	mJ
Turn-Off Energy	E_{off}			0.47	0.94	1.41	
Turn-On Delay Time	$t_{d(on)}$	T_{vj} = 150 °C, V_{CC} = 400 V, I_C = 37.5 A, V_{GE} = 15 V, R_G = 10 Ω, Energy loss include “tail” and FWD reverse recovery.		22	44	66	ns
Rise Time	t_r			25	50	75	
Turn-Off Delay Time	$t_{d(off)}$			190	380	570	
Fall Time	t_f			23	46	69	
Turn-On Energy	E_{on}			0.65	1.30	1.95	mJ
Turn-Off Energy	E_{off}			0.50	1.00	1.50	
Forward Voltage Drop	V_F	I_F = 30 A	T_{vj} = 25 °C	1.25	1.70	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		34	68	102	ns
Diode Reverse Recovery Charge	Q_{rr}	I_F = 15 A, -di_F/dt = 700 A/µs, T_{vj} = 25 °C		0.28	0.56	0.84	µC
Diode Reverse Recovery Time	t_{rr}	V_{CC} = 400 V		40	80	120	ns
Diode Reverse Recovery Charge	Q_{rr}	I_F = 15 A, -di_F/dt = 700 A/µs, T_{vj} = 150 °C		0.48	0.96	1.44	µC

● Thermal Resistance

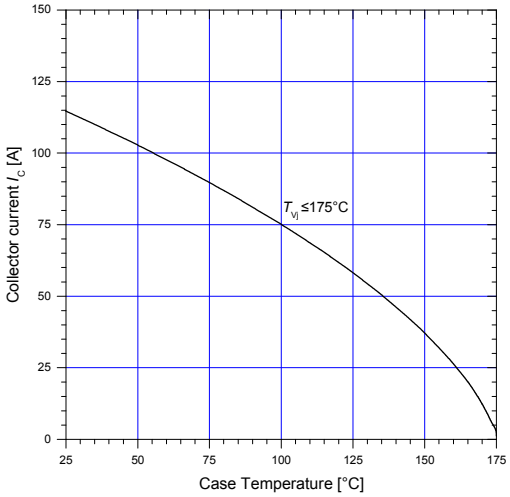
Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal Resistance, IGBT Junction to Case	$R_{th(j-c)_IGBT}$	-	-	0.343	°C/W
Thermal Resistance, FWD Junction to Case	$R_{th(j-c)_FWD}$	-	-	1.148	°C/W

Characteristics (Representative)

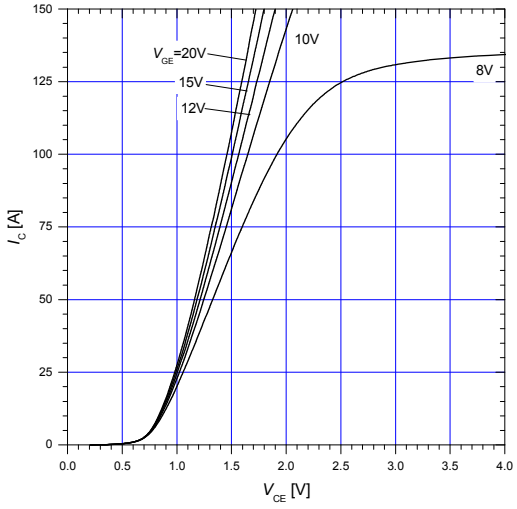
Graph 1
IGBT Power Dissipation vs T_c
T_{vj} ≤ 175 °C



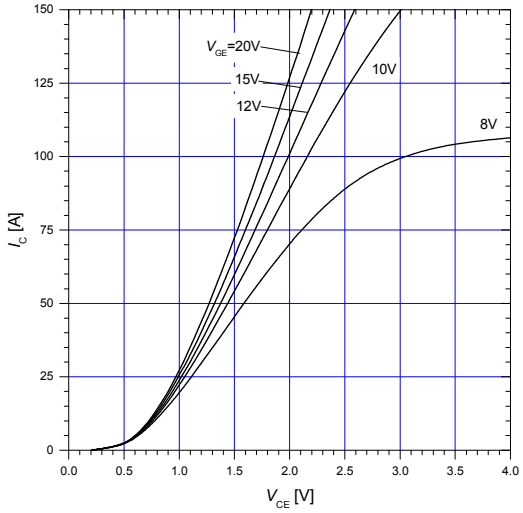
Graph 2
DC Collector Current vs T_c
V_{GE} ≥ +15 V, T_{vj} ≤ 175 °C



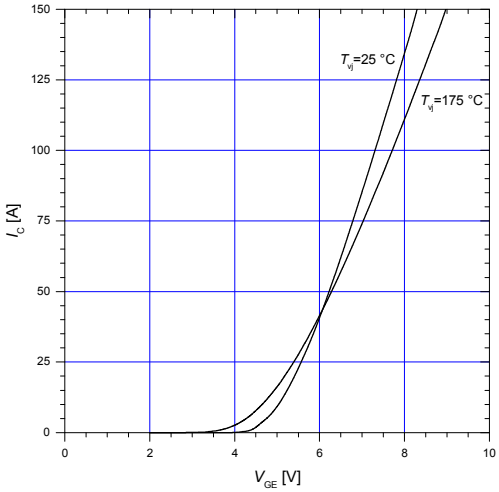
Graph 3
Typical output characteristics
T_{vj} = 25 °C



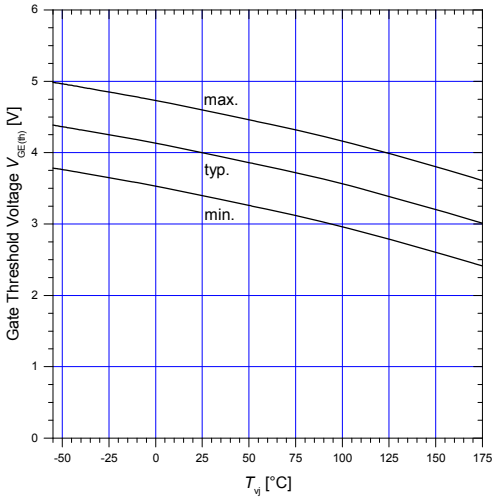
Graph 4
Typical output characteristics
T_{vj} = 175 °C



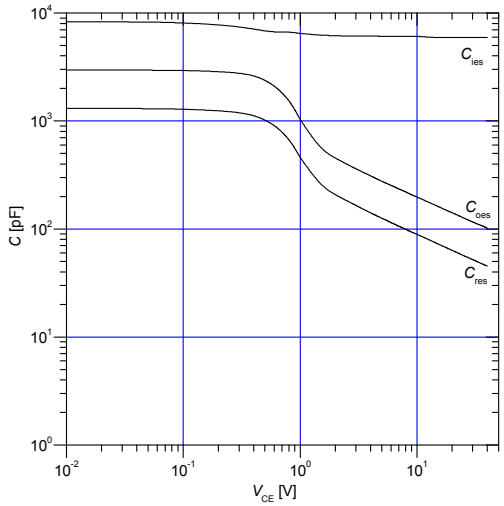
Graph 5
Typical transfer characteristics
V_{CE} = 20 V



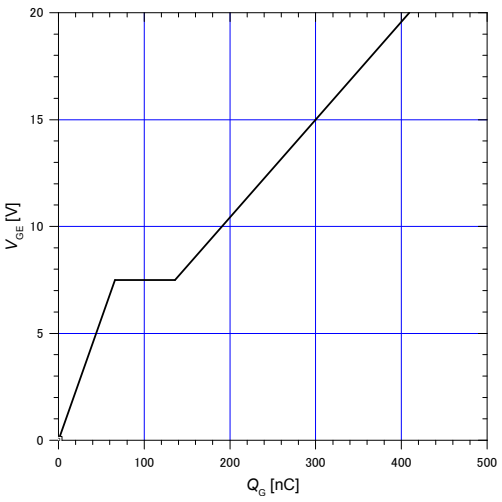
Graph 6
Gate threshold voltage
I_C = 75 mA, V_{CE} = 20 V



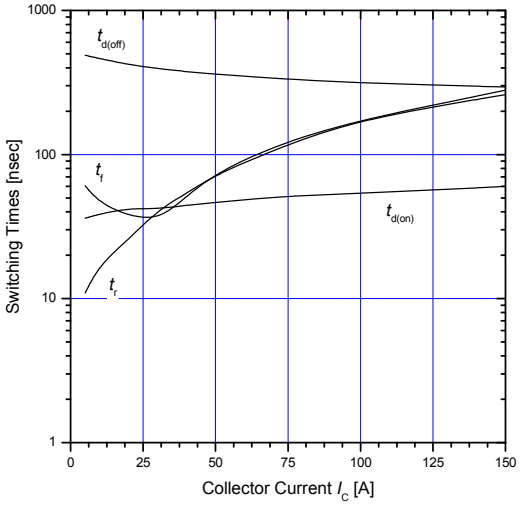
Graph 7
Typical capacitance
V_{GE} = 0 V, f = 1 MHz



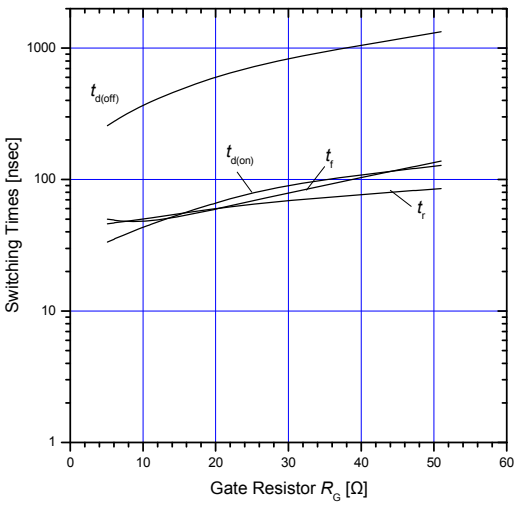
Graph 8
Typical gate charge
I_C = 75 A, V_{CC} = 520 V, T_{vj} = 25 °C



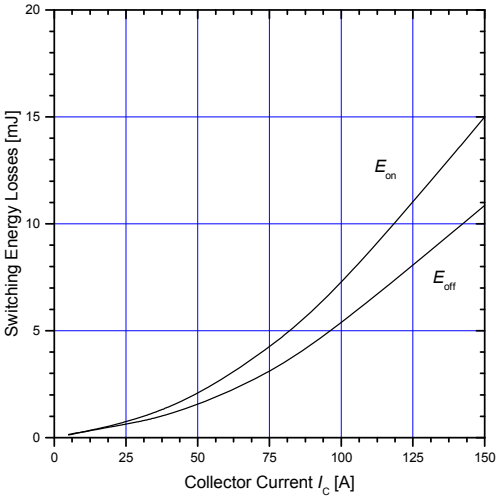
Graph 9
Typical switching times vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150 °C



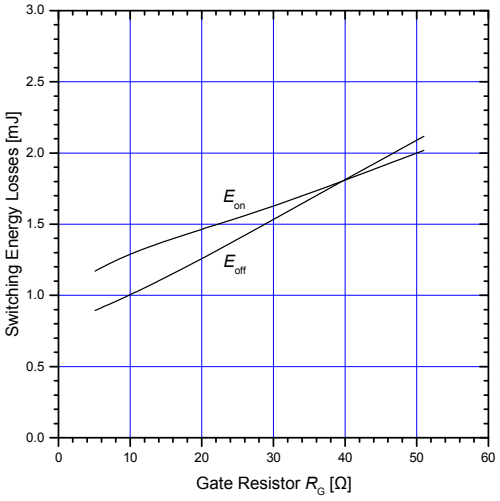
Graph 10
Typical switching times vs. R_G
V_{CC} = 400 V, V_{GE} = 15 V, I_C = 37.5 A, T_{vj} = 150 °C



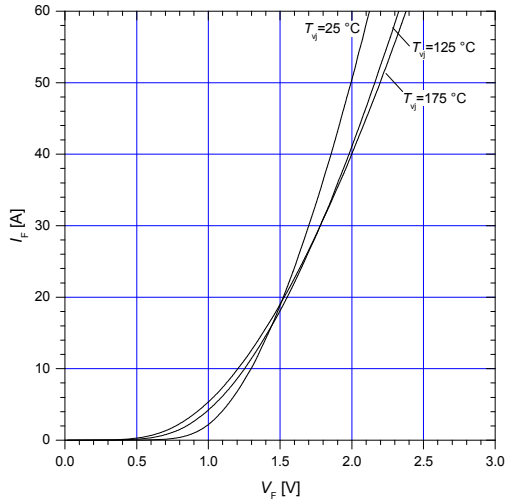
Graph 11
Typical switching losses vs. I_C
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150 °C



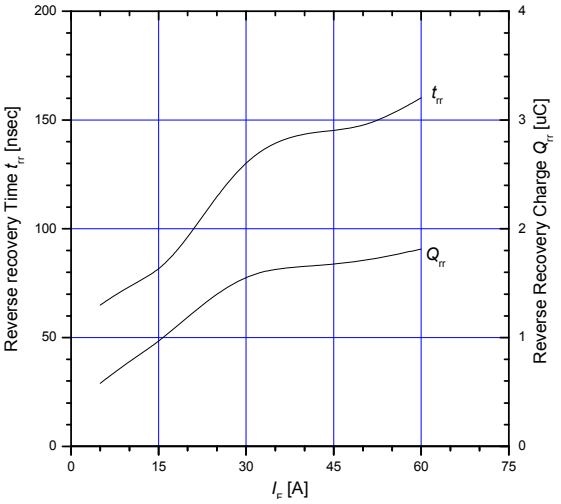
Graph 12
Typical switching losses vs. R_G
V_{CC} = 400 V, V_{GE} = 15 V, I_C = 37.5 A, T_{vj} = 150 °C



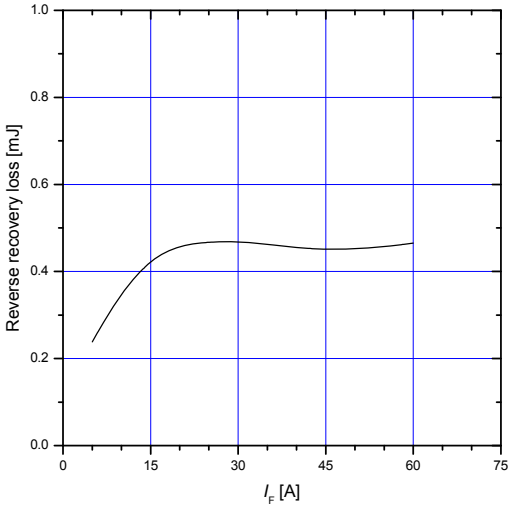
Graph 13
Typical forward characteristics of FWD



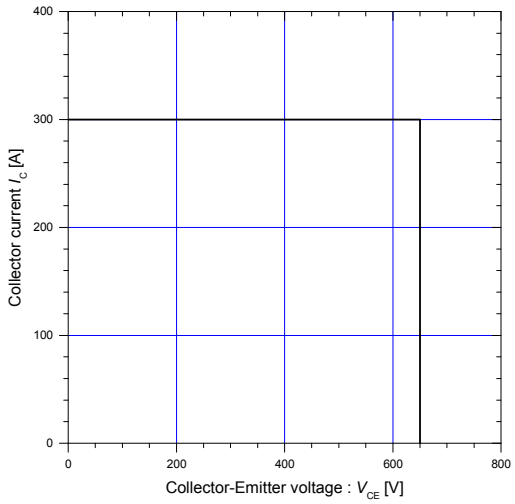
Graph 14
Typical reverse recovery characteristics vs. I_F
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150 °C



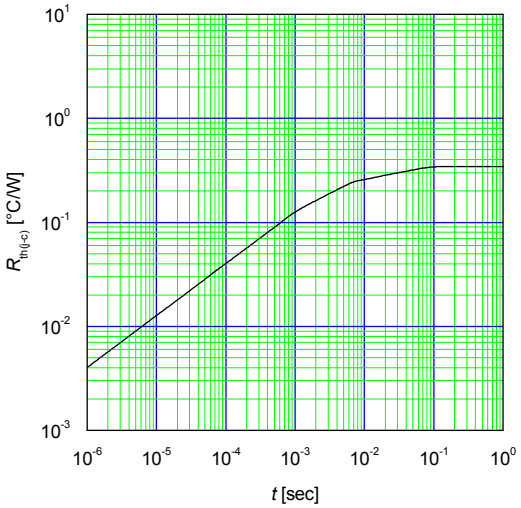
Graph 15
Typical reverse recovery loss vs. I_F
V_{CC} = 400 V, V_{GE} = 15 V, R_G = 10 Ω, T_{vj} = 150 °C



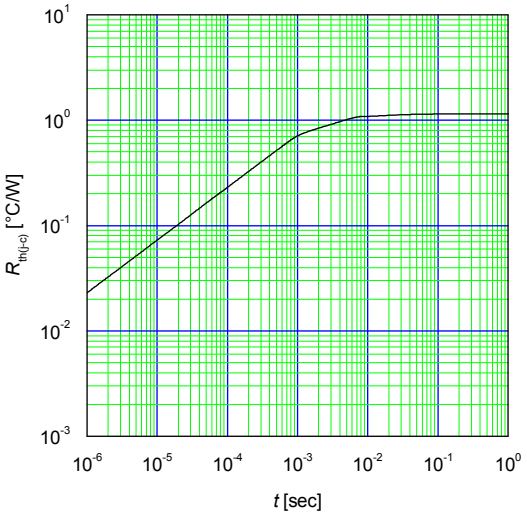
Graph 16
Reverse biased safe operating area
V_{GE} = 15 V / 0 V, R_G = 10 Ω, T_{vj} ≤ 175 °C



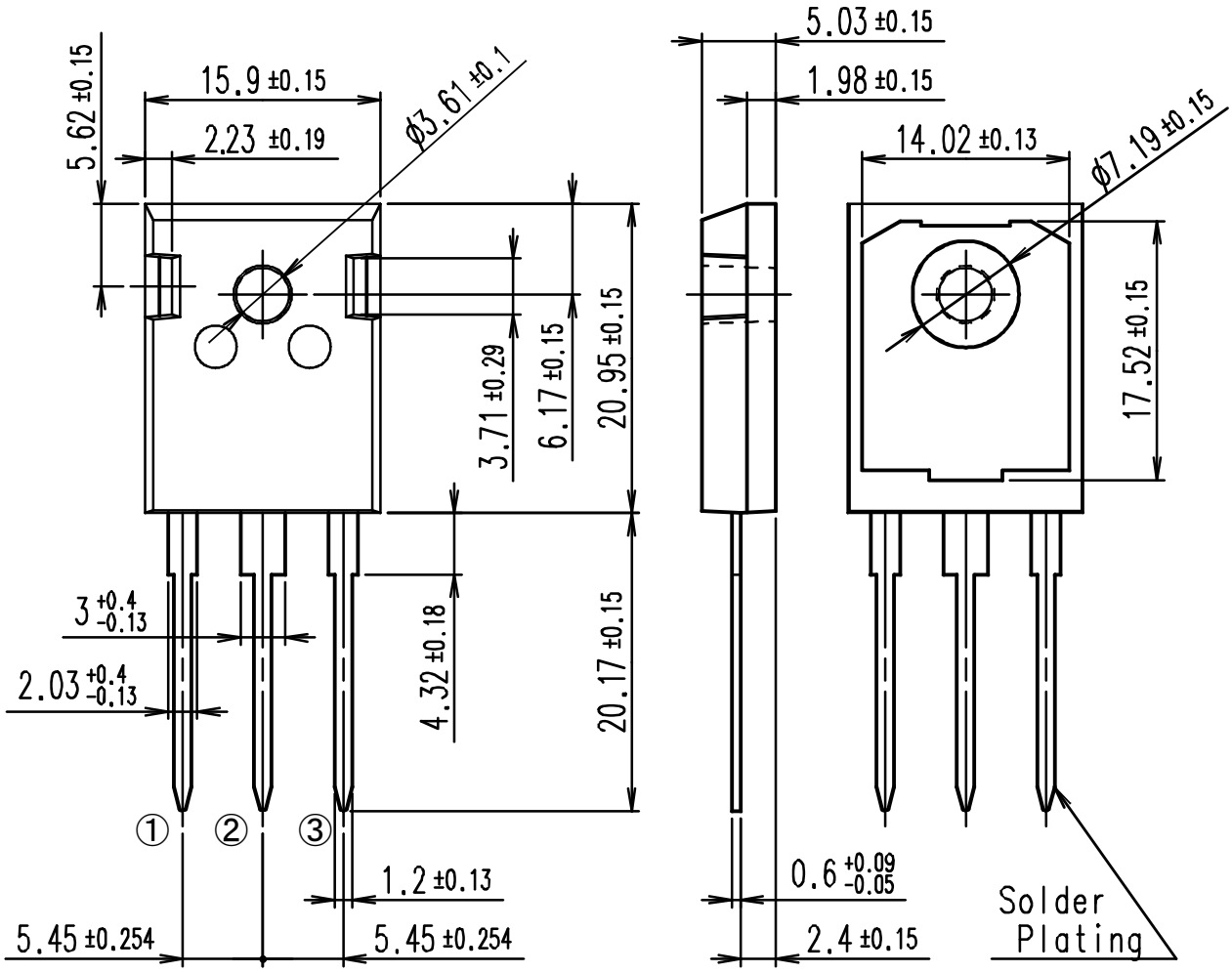
Graph 17
Transient Thermal Impedance of IGBT
D = 0

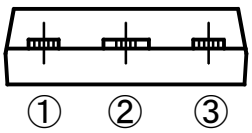


Graph 18
Transient Thermal Impedance of FWD
D = 0



Outline Drawings, mm





CONNECTION
① GATE
② COLLECTOR
③ EMITTER

DIMENSIONS ARE IN MILLIMETERS.

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