WG30N65HJ1

IGBT

Rev.01 - 04 March 2024 Product data sheet

1. General description

WG30N65HJ1 uses advanced Fine Trench Field-stop technology IGBT in TO3PF package to provide extremely low Vce(sat), and excellent switching performance. This device offers Best-in-Class efficiency in hard switching and resonant topology.

2. Features and benefits

- Maximum junction temperature 175 °C
- Positive Temperature efficient for easy paralleling
- High switching speed
- EMI Improved Design

3. Applications

- PFC
- Solar converters
- UPS
- Welding Converters
- Mid to high range switching frequency converters

4. Quick reference data

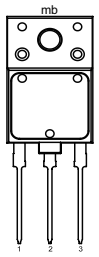
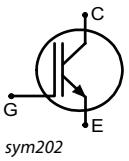
Table 1. Quick reference data

Symbol	Parameter	Notes	Value	Unit
V_{CE}	Collector-emitter voltage, $T_j \geq 25$ °C		650	V
I_C	DC collector current, limited by $T_{j(max)}$ T_C = 100 °C		17	A

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V; I_C = 30 A; T_j = 25 °C		-	1.55	2.1	V

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	C	collector		
3	E	emitter		
mb	C	mounting base; connected to collector		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WG30N65HJ1	TO3PF	WG30N65HJ1Q	Tube	30	SOT1293	16-Mar-2006

7. Marking

Table 4. Marking codes

Type number	Marking codes
WG30N65HJ1	G30N65 HJ1

8. Limiting values

Table 5. Limiting values

Symbol	Parameter	Notes	Value	Unit
V_{CE}	Collector-emitter voltage, $T_j \geq 25$ °C		650	V
I_C	DC collector current, limited by $T_{j(max)}$ $T_C = 25$ °C $T_C = 100$ °C		 28 17	A
$I_{C(puls)}$	Pulsed collector current, t_p limited by $T_{j(max)}$		90	A
-	Turn off safe operating area $V_{CE} \leq 650$ V, $T_j \leq 175$ °C, $t_p = 1$ µs		90	A
V_{GE}	Gate-emitter voltage		±20	V
P_{tot}	Power dissipation $T_C = 25$ °C Power dissipation $T_C = 100$ °C		67 33	W
T_{stg}	Storage temperature		-55 to +150	°C
T_{jmax}	Maximum operating junction temperature		175	°C
-	Peak soldering temperture		260	°C
M	Mounting Torque with washer		0.55	Nm

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-c)}$	IGBT thermal resistance from junction to case			-	2.25	-	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient			-	40	-	K/W

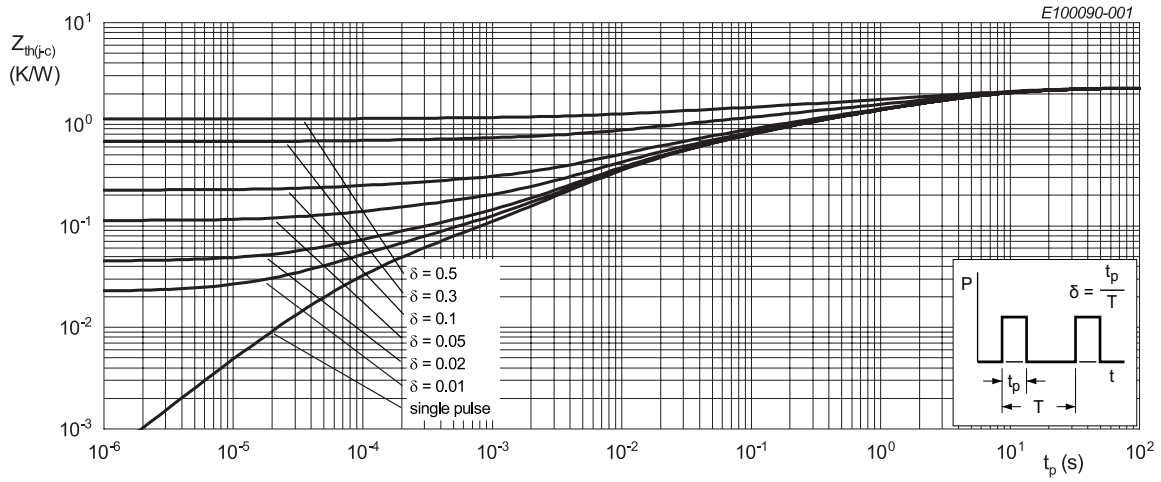


Fig. 1. Transient thermal impedance from junction to case as a function of pulse duration; IGBT

10. Characteristics

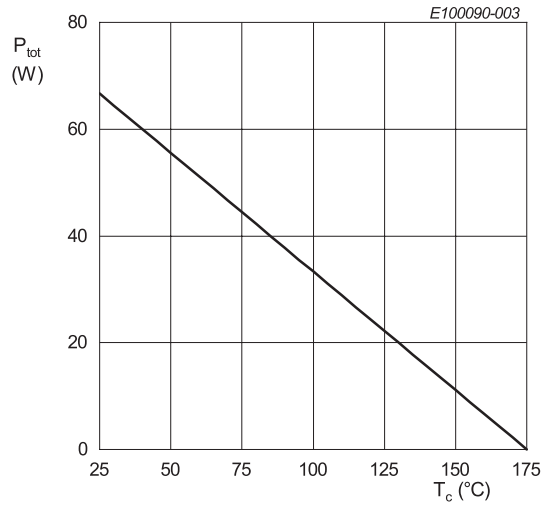
Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
BV_{CES}	Collector-emitter breakdown voltage	V_{GE} = 0 V; I_C = 1.0 mA		650	-	-	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V; I_C = 30 A; T_j = 25 °C		-	1.55	2.1	V
		V_{GE} = 15 V; I_C = 30 A; T_j = 175 °C		-	2.05	-	V
$V_{GE(th)}$	Gate-emitter threhold voltage	I_C = 0.6 mA; V_{CE} = V_{GE}		4.3	5.4	6.5	V
I_{CES}	Zero gate voltage collector current	V_{CE} = 650 V; V_{GE} = 0 V; T_j = 25 °C		-	-	100	μA
		V_{CE} = 650 V; V_{GE} = 0 V; T_j = 175 °C		-	-	1	mA
g_{fs}	Transconductance	V_{CE} = 20 V; I_C = 30 A		-	21	-	S
Dynamic characteristics							
C_{ies}	Input capacitance	V_{CE} = 30 V; V_{GE} = 0 V; f = 1 MHz; T_j = 25 °C		-	1638	-	pF
C_{oes}	Output capacitance			-	65	-	pF
C_{res}	Reverse transfer capacitance			-	19	-	pF
Q_G	Gate charge	V_{CC} = 520 V; I_C = 30 A; V_{GE} = 15 V; T_j = 25 °C		-	74	-	nC

11. Switching Characteristics

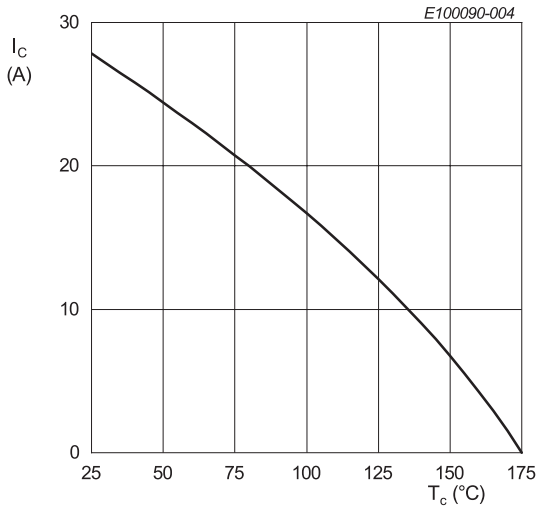
Table 8. Switching Characteristics, Inductive Load

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
IGBT characteristics							
$t_{d(on)}$	Turn-on delay time	T_j = 25 °C; V_{CC} = 400 V; I_C = 30 A; V_{GE} = 15V / 0V; R_G = 10 Ω		-	30	-	nS
t_r	Rise time			-	33	-	nS
$t_{d(off)}$	Turn-off delay time			-	120	-	nS
t_f	Fall time			-	23	-	nS
E_{on}	Turn-on energy			-	0.6	-	mJ
E_{off}	Turn-off energy			-	0.3	-	mJ
E_{ts}	Total switching energy			-	0.9	-	mJ
$t_{d(on)}$	Turn-on delay time	T_j = 175 °C; V_{CC} = 400 V; I_C = 30 A; V_{GE} = 15V / 0V; R_G = 10 Ω		-	29	-	nS
t_r	Rise time			-	33	-	nS
$t_{d(off)}$	Turn-off delay time			-	143	-	nS
t_f	Fall time			-	38	-	nS
E_{on}	Turn-on energy			-	0.9	-	mJ
E_{off}	Turn-off energy			-	0.45	-	mJ
E_{ts}	Total switching energy			-	1.35	-	mJ



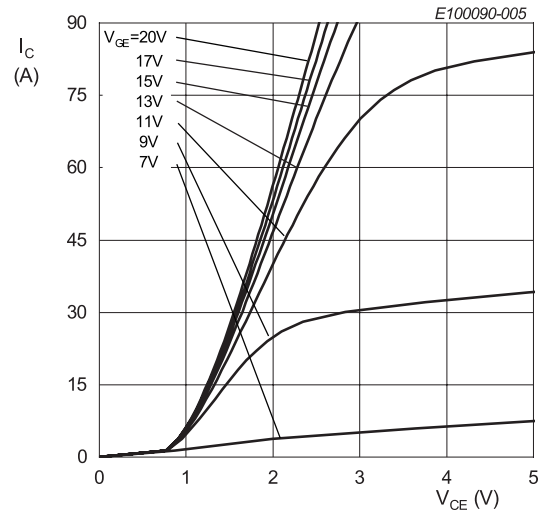
$T_j \leq 175$ °C

Fig. 2. Power dissipation as a function of case temperature



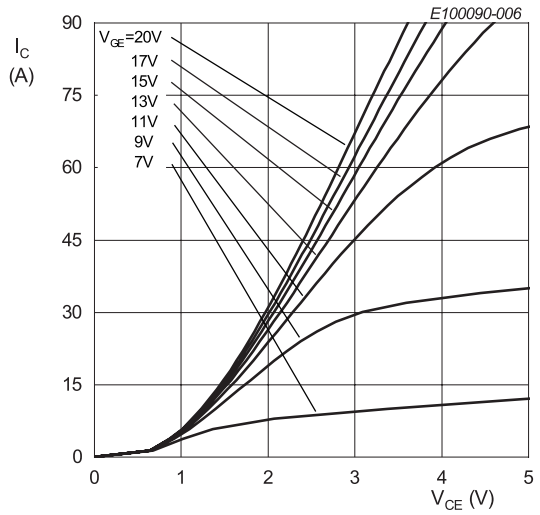
$V_{GE} \geq 15$ V; $T_j \leq 175$ °C

Fig. 3. Collector current as a function of case temperature



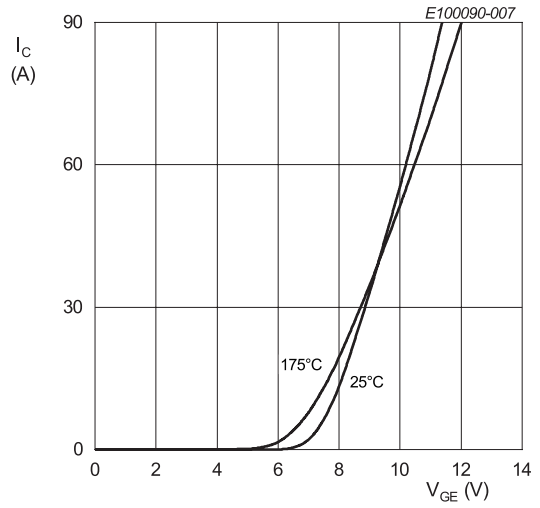
$T_j = 25$ °C

Fig. 4. Typical output characteristic



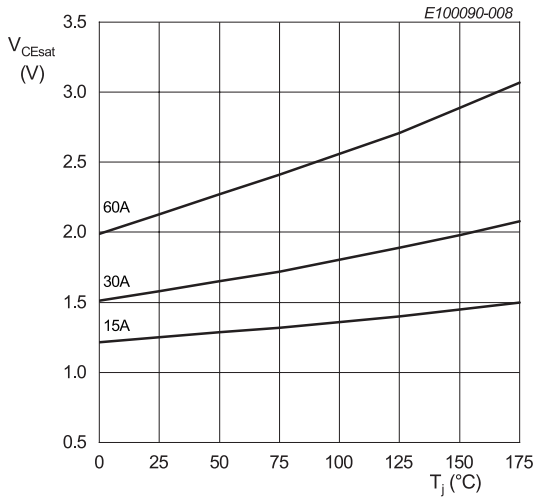
$T_j = 175$ °C

Fig. 5. Typical output characteristic



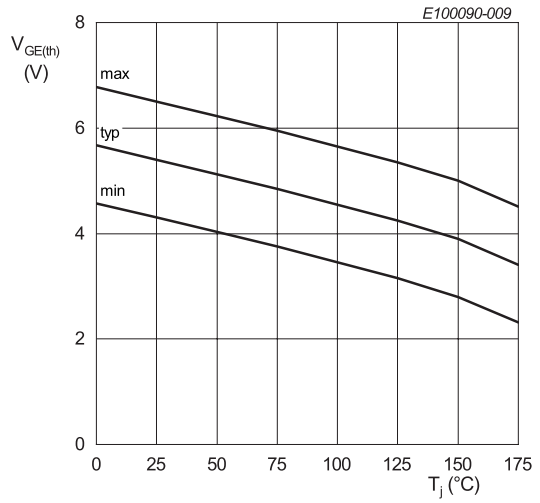
V_{CE} = 20 V

Fig. 6. Typical transfer characteristic



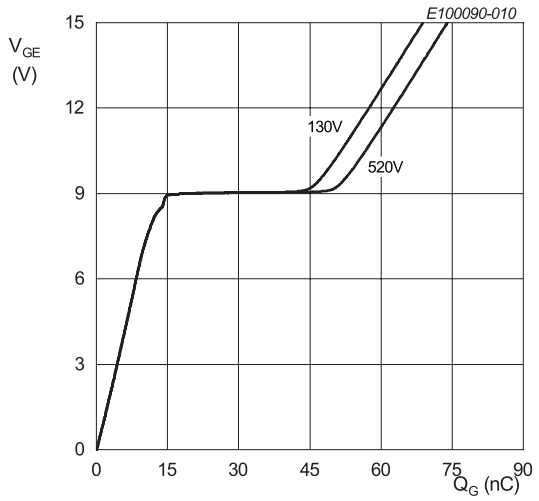
V_{GE} = 15 V

Fig. 7. Typical collector-emitter saturation voltage as a function of junction temperature



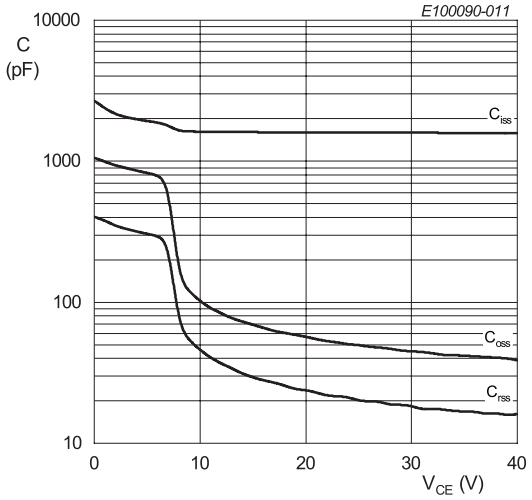
I_C = 600 µA

Fig. 8. Gate-emitter threshold voltage as a function of junction temperature



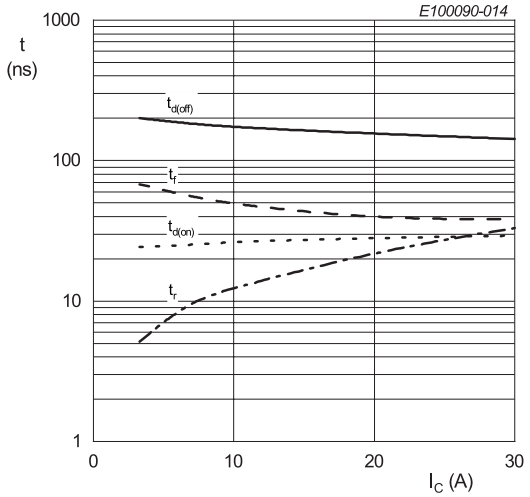
I_C = 30 A

Fig. 9. Typical gate charge



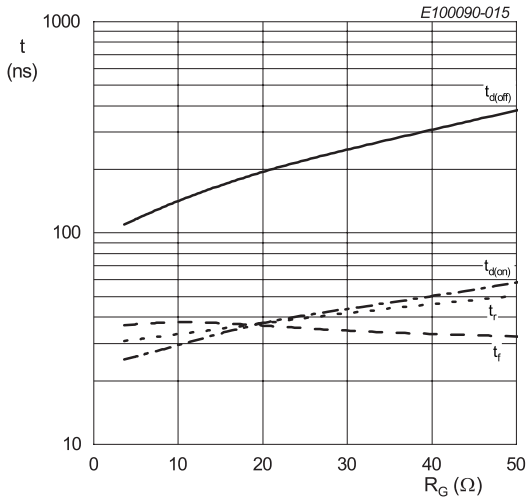
V_{GE} = 0 V; f = 1 MHz

Fig. 10. Typical capacitance as a function of collector-emitter voltage



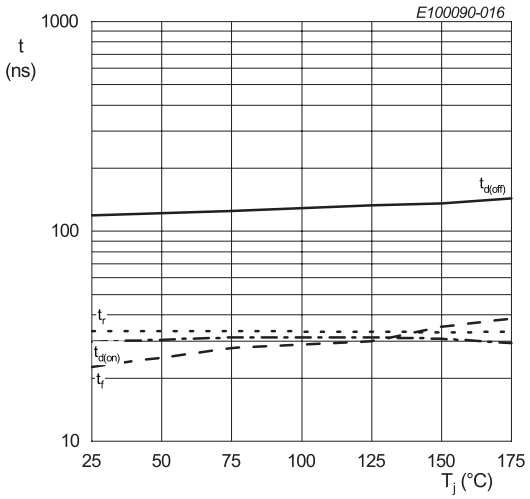
R_g = 10 Ω; V_{GE} = 15V/0V; T_j = 175 °C;
V_{CE} = 400 V; inductive load

Fig. 11. Typical switching times as a function of collector current



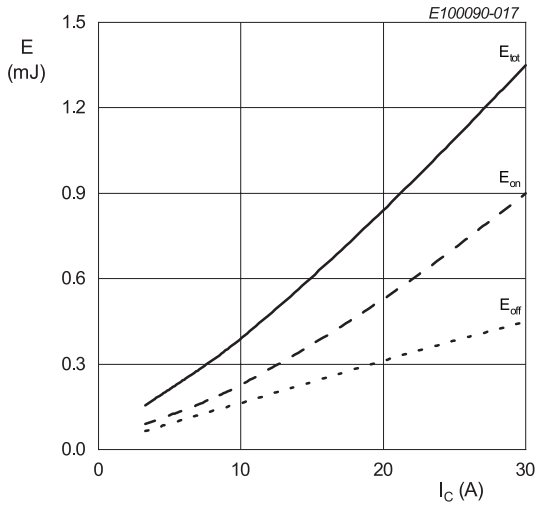
I_C = 30 A; V_{GE} = 15V/0V; T_j = 175 °C;
V_{CE} = 400 V; inductive load

Fig. 12. Typical switching times as a function of gate resistance



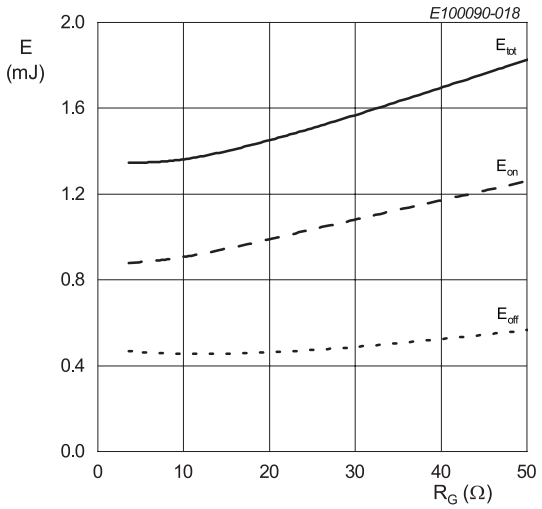
I_C = 30 A; V_{GE} = 15V/0V; R_g = 10 Ω;
V_{CE} = 400 V; inductive load

Fig. 13. Typical switching times as a function of junction temperature



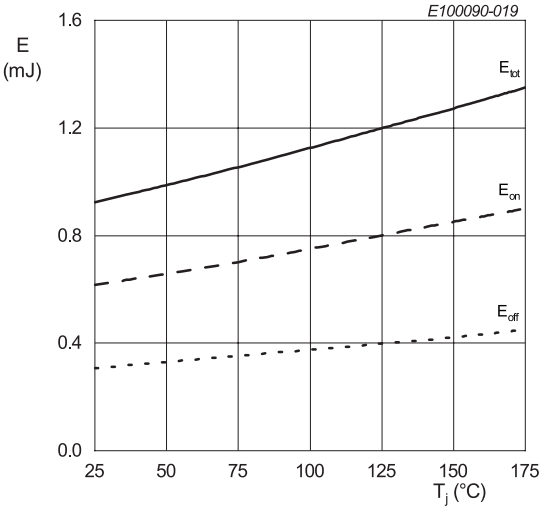
R_g = 10 Ω; V_{GE} = 15V/0V; T_j = 175 °C;
V_{CE} = 400 V; inductive load

Fig. 14. Typical switching energy losses as a function of collector current



I_C = 30 A; V_{GE} = 15V/0V; T_j = 175 °C;
V_{CE} = 400 V; inductive load

Fig. 15. Typical switching energy losses as a function of gate resistance



I_C = 30 A; V_{GE} = 15V/0V; R_g = 10 Ω;
V_{CE} = 400 V; inductive load

Fig. 16. Typical switching energy losses as a function of junction temperature

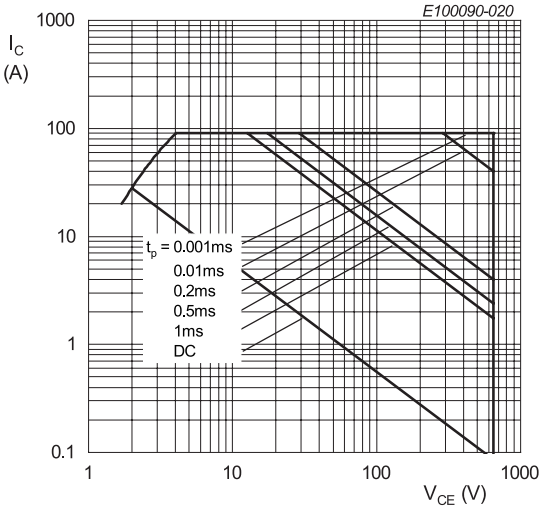
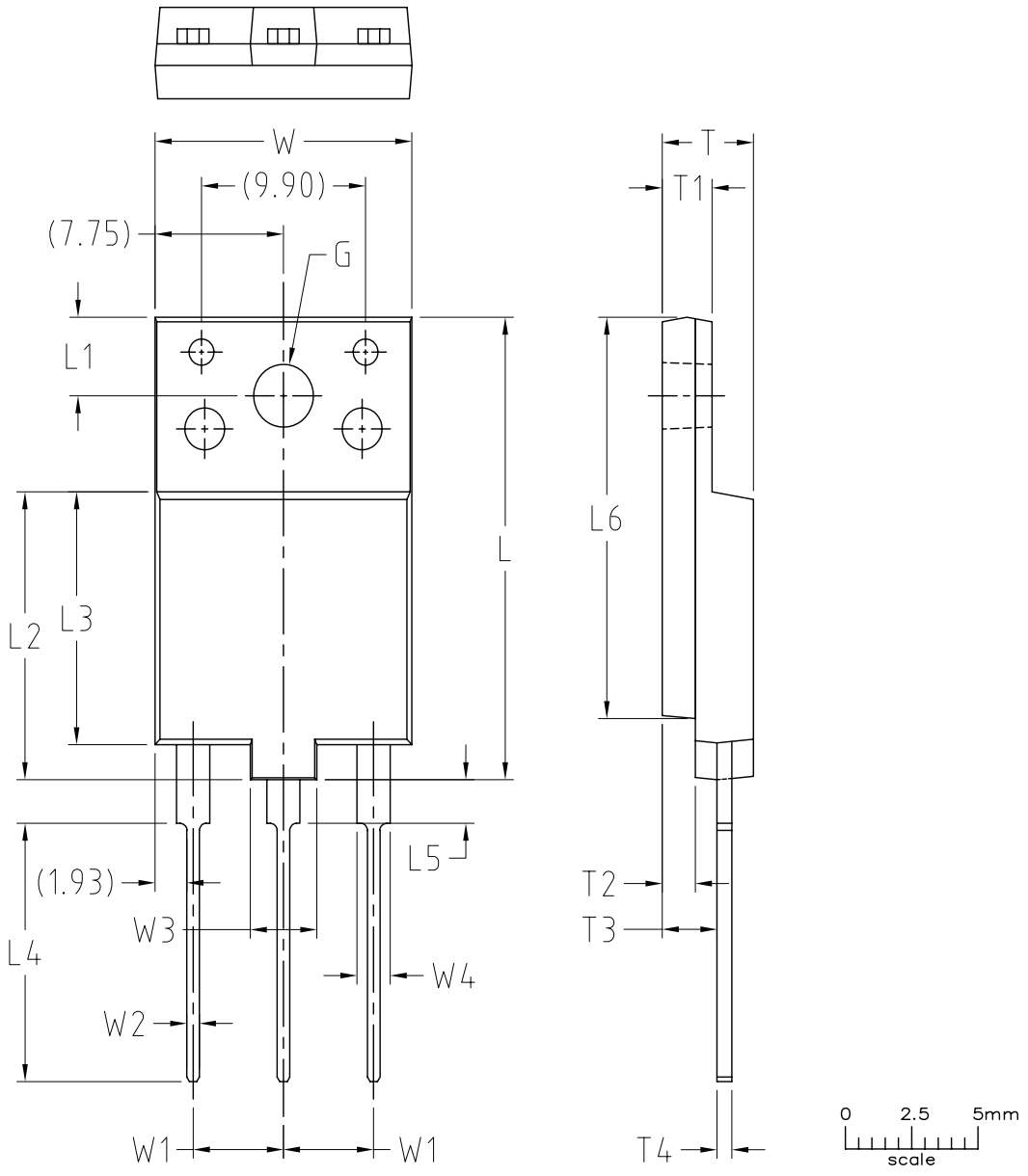


Fig. 17. Forward bias safe operating area

12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-3P 'full pack' TO3PF



RemarK : (X) the dimension X in blackets is for reference

UNIT	W	W1	W2	W3	W4	L	L1	L2	L3	L4	L5	L6	T	T1	T2	T3	T4	G(ø)
mm	15.7	5.75	0.95	4.20	2.20	26.7	4.6	16.7	14.7	15.0	2.7	23.2	5.7	3.2	2.2	3.5	1.1	3.8
	15.3	5.15	0.65	3.80	1.80	26.3	4.4	16.3	14.3	14.6	2.3	22.8	5.3	2.8	1.8	3.1	0.8	3.4

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
		TO−3PF				

13. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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