



NGW30T65M3DFP

650 V, 30 A trench field-stop IGBT with full rated silicon diode

Rev. 2 — 11 November 2025

Product data sheet

1. General description

The NGW30T65M3DFP is a robust Insulated-Gate Bipolar Transistor (IGBT) featuring third-generation technology. It combines carrier stored trench-gate and field-stop (FS) structures. The NGW30T65M3DFP is rated to 175 °C with optimized IGBT turn-off losses, and has a short circuit withstand time of 5 µs. This hard-switching 650 V, 30 A IGBT is optimized for high-voltage, high-frequency industrial power inverter applications and servo motor drive applications.

2. Features

- Device current is rated at 30 A
- Low conduction and switching losses
- Stable and tight parameters for easy parallel operation
- Maximum junction temperature 175 °C
- Fully rated and fast reverse recovery diode
- 5 µs short circuit withstand time
- HV-H3TRB qualified

3. Applications

- Motor drives for industrial and consumer appliances
 - Servo motors operating between 5-20 kW (up to 20 kHz) for robotics, elevators, operating grippers, in-line manufacturing, etc.
- Power inverters, such as
 - Uninterruptible Power Supply (UPS) inverter
 - EV charging converter
- Induction heating
- Welding

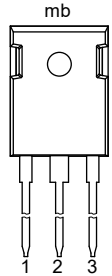
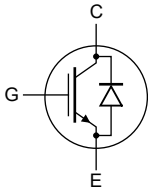
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CES}	collector-emitter voltage	$T_{vj} = 25\text{ °C}$	-	650	V
T_{vj}	operating junction temperature		-40	175	°C
t_{sc}	short circuit withstand time	$V_{GE} = 15\text{ V}; V_{CC} = 400\text{ V}; T_{vj} \leq 150\text{ °C}$	-	5.0	µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		 aaa-036518
2	C	collector		
3	E	emitter		
mb	C	mounting base; connected to collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NGW30T65M3DFP	TO-247-3	Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247-3	SOT429-5

7. Marking

Table 4. Marking codes

Type number	Marking code
NGW30T65M3DFP	W30T65M3DFP

8. Limiting values

Table 5. Limiting values

Symbol	Parameter	Conditions	Min	Max	Unit
IGBT					
V_{CES}	collector-emitter voltage	$T_{vj} = 25\text{ °C}$	-	650	V
I_C	collector current	[1] $T_c = 25\text{ °C}$	-	57	A
		$T_c = 100\text{ °C}$	-	38	A
I_{CRM}	repetitive peak collector current	[2]	-	90	A
t_{sc}	short circuit withstand time	[3] $V_{GE} = 15\text{ V}; V_{CC} = 400\text{ V}; T_{vj} \leq 150\text{ °C}$	-	5.0	μs
V_{GE}	gate-emitter voltage		-20	20	V
P_{tot}	total power dissipation	$T_c = 25\text{ °C}$	-	199	W
		$T_c = 100\text{ °C}$	-	99	W
T_{vj}	operating junction temperature		-40	175	$^{\circ}\text{C}$
T_{stg}	storage temperature		-55	150	$^{\circ}\text{C}$
T_{solder}	soldering temperature		-	260	$^{\circ}\text{C}$

Symbol	Parameter	Conditions	Min	Max	Unit
Diode					
I _F	diode forward current	[1] T _C = 25 °C	-	50	A
		T _C = 100 °C	-	30	A
I _{FRM}	repetitive peak forward current	[2]	-	90	A

- [1] Value is limited by bondwire and T_{vj(max)}.
- [2] Time duration is limited by T_{vj(max)}.
- [3] Short circuit cycles ≤ 1000, time between tests ≥ 1 s.

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
M	mounting torque, M3 screw		-	0.6	-	Nm
R _{th(j-c)}	thermal resistance from junction to case	IGBT	-	0.64	0.75	K/W
		diode	-	1.22	1.44	K/W
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	-	-	40	K/W

10. Electrical characteristics

Table 7. Characteristics

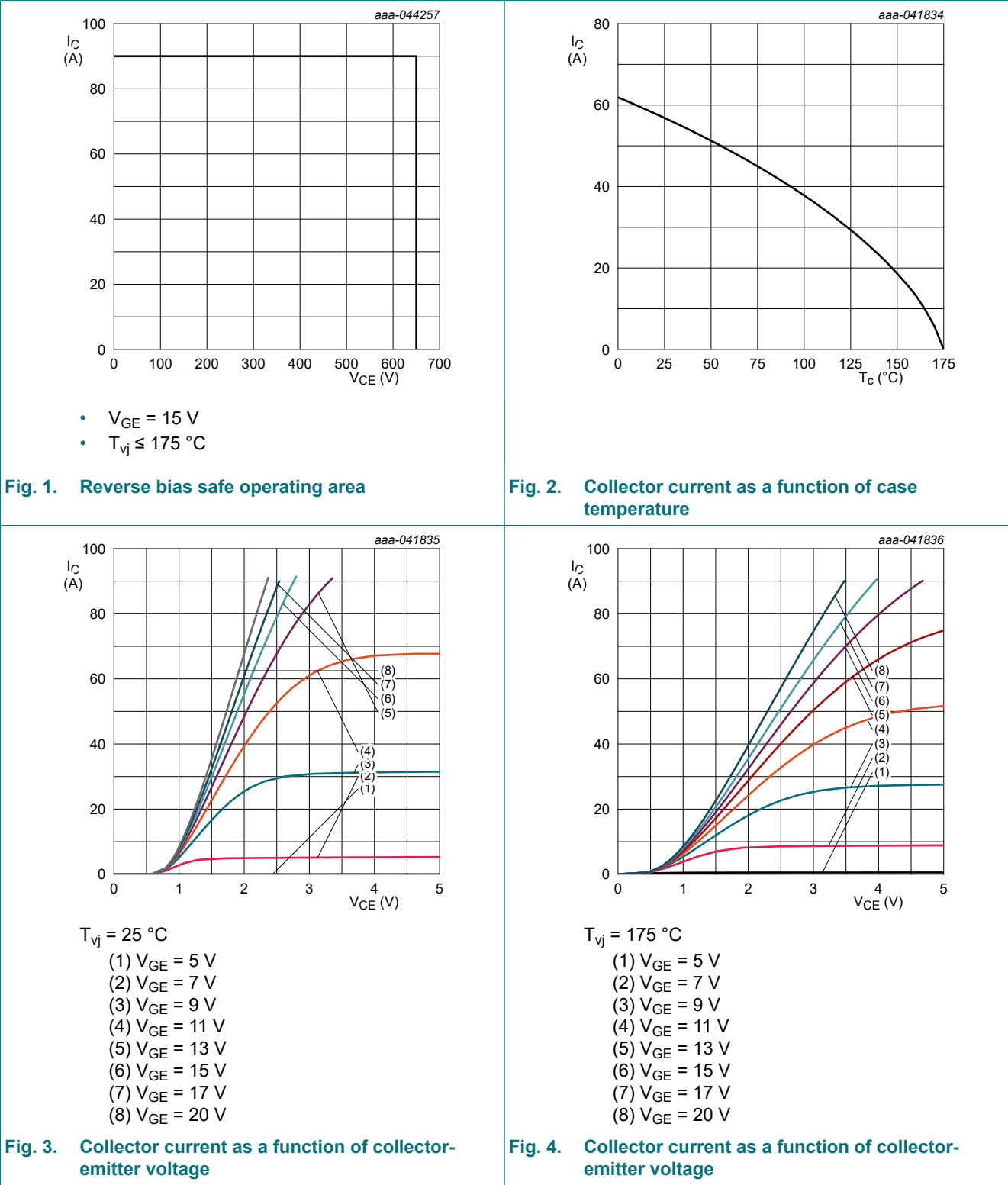
All values at T_{vj} = 25 °C, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)CES}	collector-emitter breakdown voltage	V _{GE} = 0 V; I _C = 0.2 mA	650	-	-	V
V _{CEsat}	collector-emitter saturation voltage	V _{GE} = 15 V; I _C = 30 A; T _{vj} = 25 °C	-	1.50	1.8	V
		V _{GE} = 15 V; I _C = 30 A; T _{vj} = 175 °C	-	1.91	-	V
V _F	diode forward voltage	V _{GE} = 0 V; I _F = 30 A; T _{vj} = 25 °C	-	1.69	2.0	V
		V _{GE} = 0 V; I _F = 30 A; T _{vj} = 175 °C	-	1.46	-	V
V _{GE(th)}	gate-emitter threshold voltage	I _C = 0.3 mA; V _{CE} = V _{GE} ; T _{vj} = 25 °C	4.3	5.0	5.7	V
I _{CES}	zero gate voltage collector current	V _{CE} = 650 V; V _{GE} = 0 V; T _{vj} = 25 °C	-	-	30	µA
		V _{CE} = 650 V; V _{GE} = 0 V; T _{vj} = 175 °C	-	0.3	-	mA
I _{GES}	gate-emitter leakage current	V _{CE} = 0 V; V _{GE} = 20 V	-	-	100	nA
g _{fs}	transconductance	V _{CE} = 20 V; I _C = 30 A; T _{vj} = 25 °C	-	14.6	-	S
r _g	internal gate resistor		-	1.6	-	Ω
Dynamic characteristics						
C _{ies}	input capacitance	V _{CE} = 25 V; V _{GE} = 0 V; f = 1 MHz	-	2196	-	pF
C _{oes}	output capacitance		-	83	-	pF
C _{res}	reverse transfer capacitance		-	22	-	pF
Q _G	gate charge	V _{CC} = 520 V; I _C = 30 A; V _{GE} = 15 V	-	89	-	nC
L _{sCE}	internal stray inductance	measured 5 mm from case	-	7.9	-	nH
I _{C(sc)}	short circuit collector current	V _{GE} = 15 V; V _{CC} = 400 V; t _{sc} ≤ 5 µs; T _{vj} ≤ 150 °C	-	153	-	A

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
IGBT switching characteristics, inductive load							
t _{d(on)}	turn-on delay time	V _{GE} = 15/0 V; V _{CC} = 400 V; I _C = 30 A; R _{G(on)} = 10 Ω; R _{G(off)} = 10 Ω; see Fig. 27 .	T _{vj} = 25 °C	-	16	-	ns
			T _{vj} = 175 °C	-	15	-	ns
t _r	rise time		T _{vj} = 25 °C	-	17	-	ns
			T _{vj} = 175 °C	-	18	-	ns
t _{d(off)}	turn-off delay time		T _{vj} = 25 °C	-	137	-	ns
			T _{vj} = 175 °C	-	168	-	ns
t _f	fall time		T _{vj} = 25 °C	-	36	-	ns
			T _{vj} = 175 °C	-	77	-	ns
E _{on}	turn-on switching energy loss		T _{vj} = 25 °C	-	0.79	-	mJ
			T _{vj} = 175 °C	-	1.58	-	mJ
E _{off}	turn-off switching energy loss		T _{vj} = 25 °C	-	0.42	-	mJ
			T _{vj} = 175 °C	-	0.70	-	mJ
E _{ts}	total switching energy loss		T _{vj} = 25 °C	-	1.21	-	mJ
			T _{vj} = 175 °C	-	2.29	-	mJ
Diode switching characteristics, inductive load							
t _{rr}	reverse recovery time	V _R = 400 V; I _F = 30 A; di _F /dt = 500 A/μs; see Fig. 26 .	T _{vj} = 25 °C	-	105	-	ns
			T _{vj} = 175 °C	-	208	-	ns
Q _{rr}	reverse recovery charge		T _{vj} = 25 °C	-	774	-	nC
			T _{vj} = 175 °C	-	2750	-	nC
I _{rrm}	peak reverse recovery current		T _{vj} = 25 °C	-	18	-	A
			T _{vj} = 175 °C	-	30	-	A
E _{rec}	reverse recovery energy loss		T _{vj} = 25 °C	-	0.08	-	mJ
			T _{vj} = 175 °C	-	0.40	-	mJ
di _{rrf} /dt	fall rate of reverse recovery current		T _{vj} = 25 °C	-	398	-	A/μs
			T _{vj} = 175 °C	-	230	-	A/μs

10.1. Characteristic diagrams

Table 8. Waveforms and output characteristics



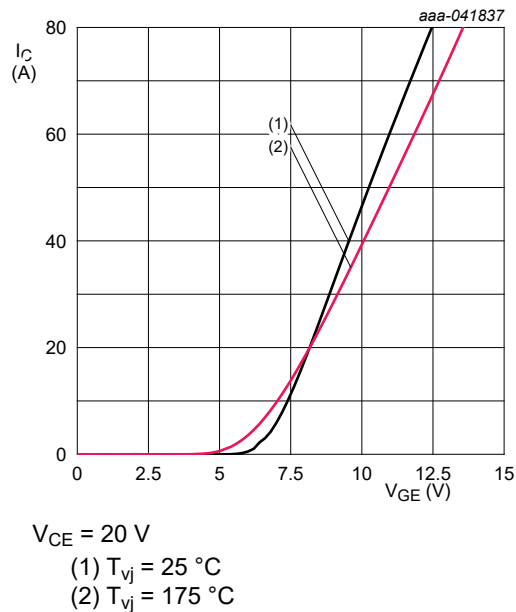


Fig. 5. Collector current as a function of gate-emitter voltage

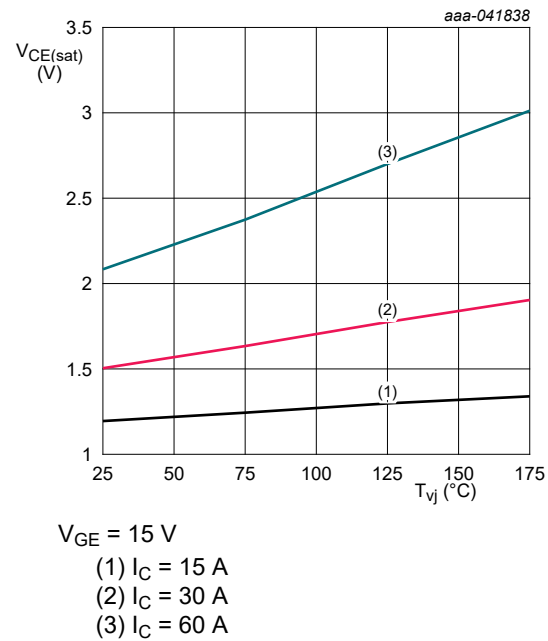


Fig. 6. Collector-emitter saturation voltage as a function of junction temperature

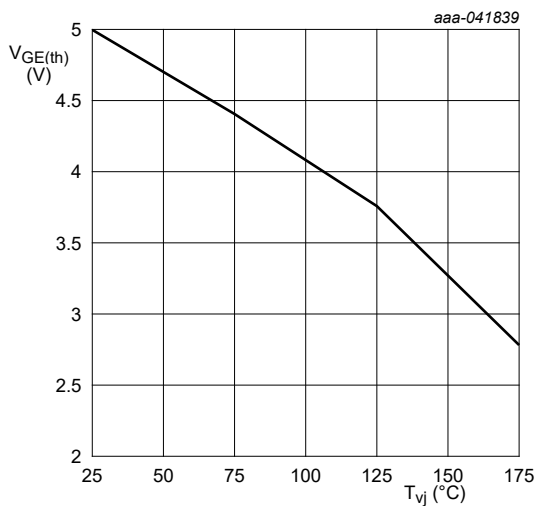


Fig. 7. Gate-emitter threshold voltage as a function of junction temperature

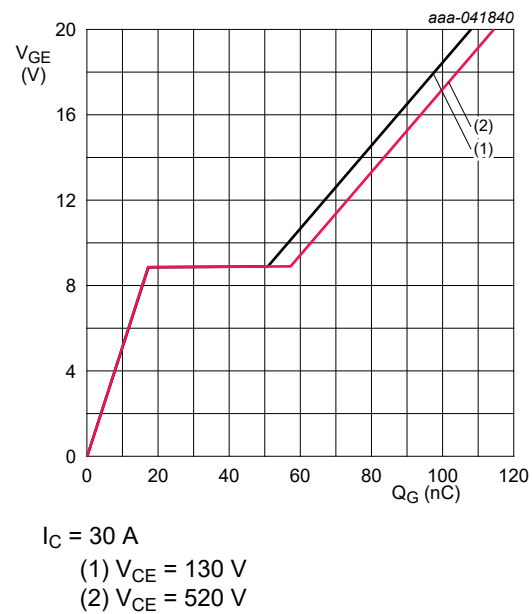
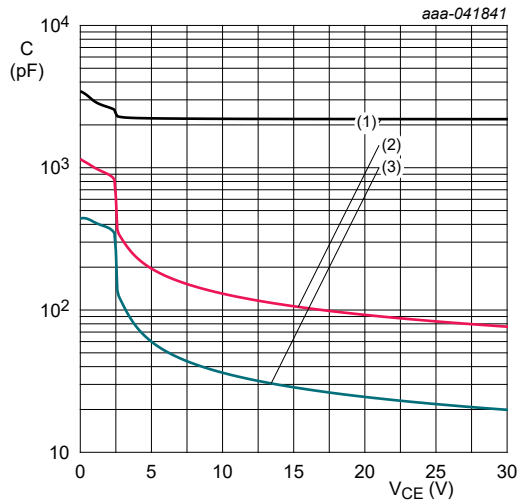


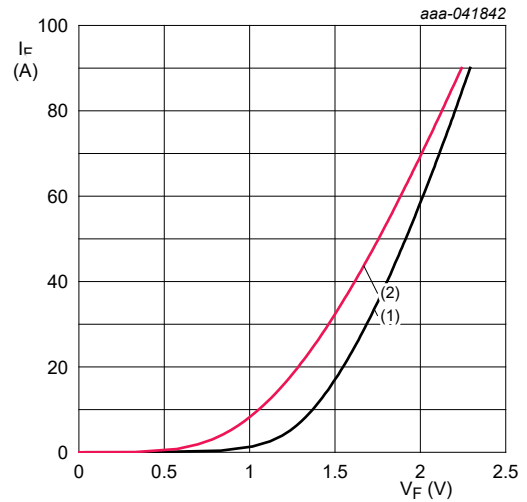
Fig. 8. Gate-emitter voltage as a function of gate charge



$V_{GE} = 0 \text{ V}$; $f = 1 \text{ MHz}$

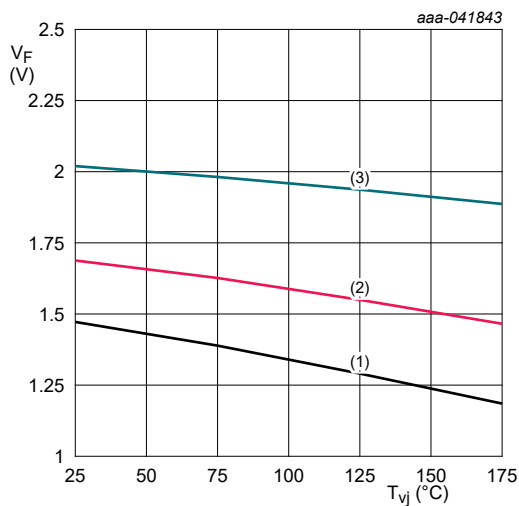
- (1) C_{ies}
- (2) C_{oes}
- (3) C_{res}

Fig. 9. Typical capacitance as a function of collector-emitter voltage



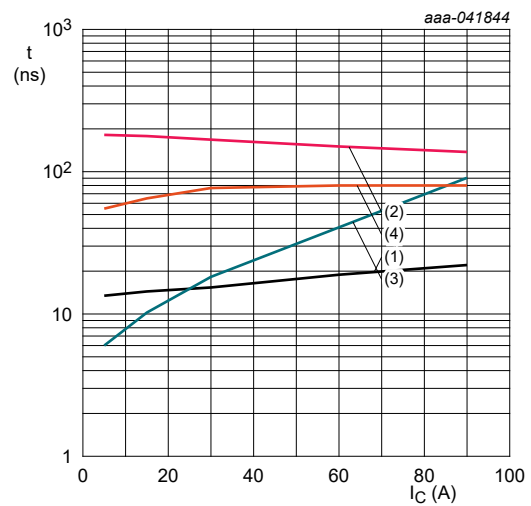
- (1) $T_{vj} = 25 \text{ °C}$
- (2) $T_{vj} = 175 \text{ °C}$

Fig. 10. Typical diode forward current as a function of forward voltage



- (1) $I_F = 15 \text{ A}$
- (2) $I_F = 30 \text{ A}$
- (3) $I_F = 60 \text{ A}$

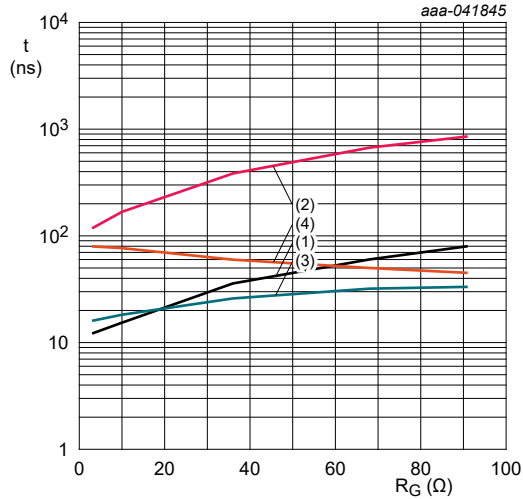
Fig. 11. Typical diode forward voltage as a function of junction temperature



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $V_{CC} = 400 \text{ V}$; $R_{G(on)} = 10 \text{ } \Omega$;
 $R_{G(off)} = 10 \text{ } \Omega$; $T_{vj} = 175 \text{ °C}$

- (1) $t_{d(on)}$
- (2) $t_{d(off)}$
- (3) t_r
- (4) t_f

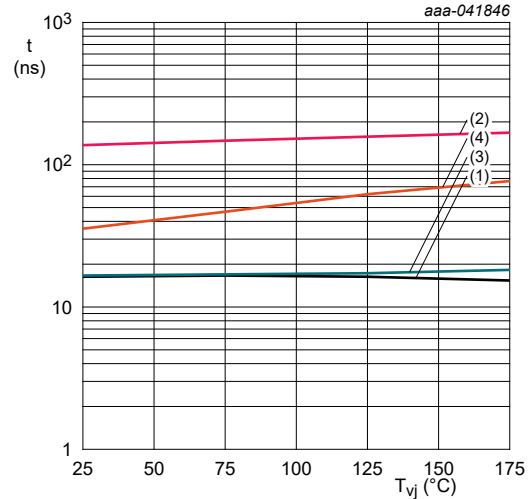
Fig. 12. Typical switching times as a function of collector current



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $V_{CC} = 400 \text{ V}$; $I_C = 30 \text{ A}$;
 $T_{vj} = 175 \text{ }^\circ\text{C}$

- (1) $t_{d(on)}$
- (2) $t_{d(off)}$
- (3) t_r
- (4) t_f

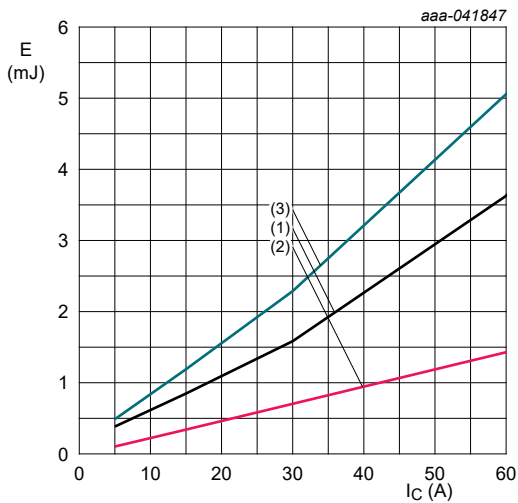
Fig. 13. Typical switching times as a function of gate resistance



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $V_{CC} = 400 \text{ V}$; $I_C = 30 \text{ A}$;
 $R_{G(on)} = 10 \text{ } \Omega$; $R_{G(off)} = 10 \text{ } \Omega$

- (1) $t_{d(on)}$
- (2) $t_{d(off)}$
- (3) t_r
- (4) t_f

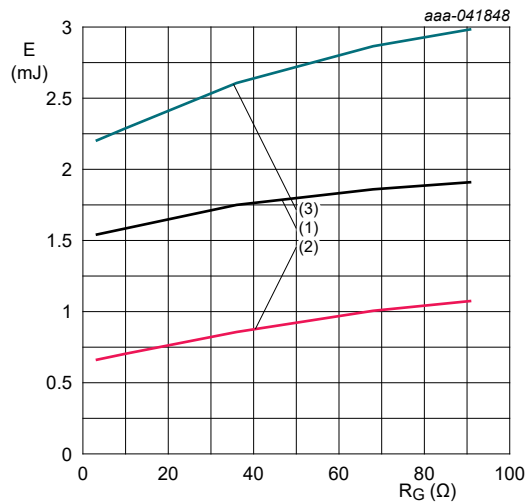
Fig. 14. Typical switching times as a function of junction temperature



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $V_{CC} = 400 \text{ V}$; $R_{G(on)} = 10 \text{ } \Omega$;
 $R_{G(off)} = 10 \text{ } \Omega$; $T_{vj} = 175 \text{ }^\circ\text{C}$

- (1) E_{on}
- (2) E_{off}
- (3) E_{ts}

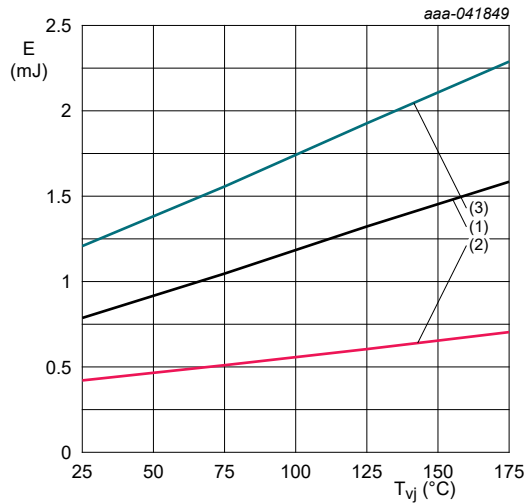
Fig. 15. Typical switching energy losses as a function of collector current



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $V_{CC} = 400 \text{ V}$; $I_C = 30 \text{ A}$;
 $T_{vj} = 175 \text{ }^\circ\text{C}$

- (1) E_{on}
- (2) E_{off}
- (3) E_{ts}

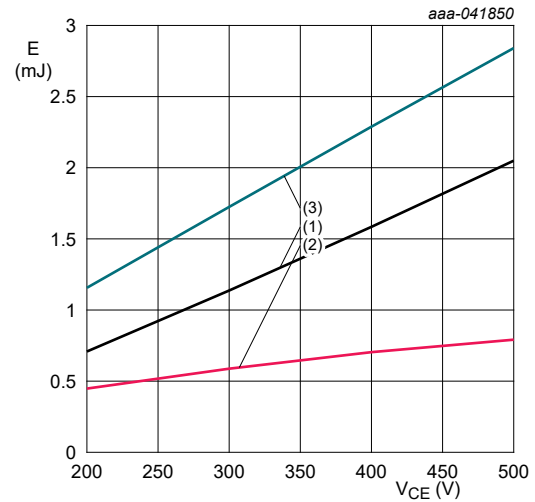
Fig. 16. Typical switching energy losses as a function of gate resistance



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $V_{CC} = 400 \text{ V}$; $I_C = 30 \text{ A}$;
 $R_{G(on)} = 10 \Omega$; $R_{G(off)} = 10 \Omega$

- (1) E_{on}
- (2) E_{off}
- (3) E_{ts}

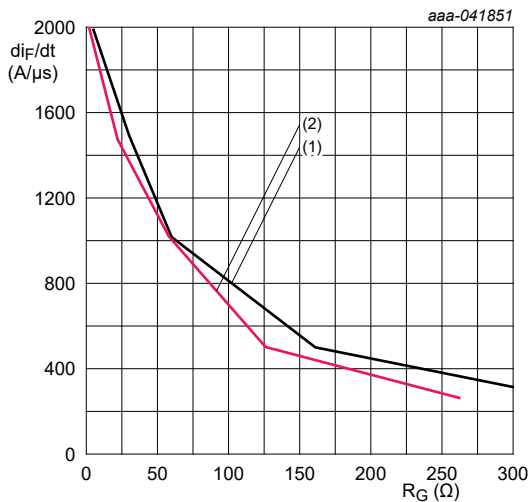
Fig. 17. Typical switching energy losses as a function of junction temperature



$V_{GE} = 15 \text{ V to } 0 \text{ V}$; $I_C = 30 \text{ A}$; $R_{G(on)} = 10 \Omega$;
 $R_{G(off)} = 10 \Omega$; $T_{vj} = 175 \text{ °C}$

- (1) E_{on}
- (2) E_{off}
- (3) E_{ts}

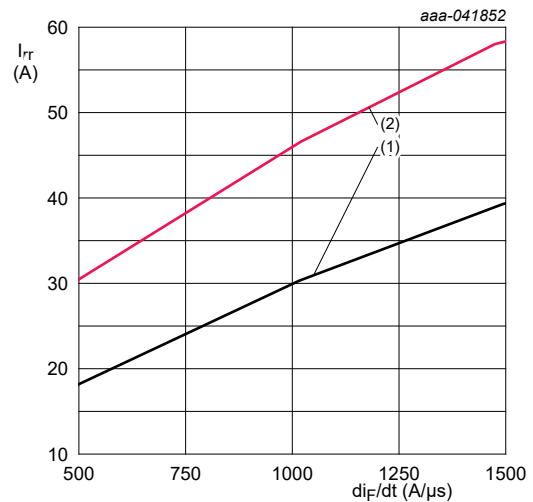
Fig. 18. Typical switching energy losses as a function of collector-emitter voltage



$V_R = 400 \text{ V}$; $I_F = 30 \text{ A}$

- (1) $T_{vj} = 25 \text{ °C}$
- (2) $T_{vj} = 175 \text{ °C}$

Fig. 19. Typical rate of change of forward current as a function of gate resistance



$V_R = 400 \text{ V}$; $I_F = 30 \text{ A}$

- (1) $T_{vj} = 25 \text{ °C}$
- (2) $T_{vj} = 175 \text{ °C}$

Fig. 20. Typical reverse recovery current as a function of rate of change of forward current

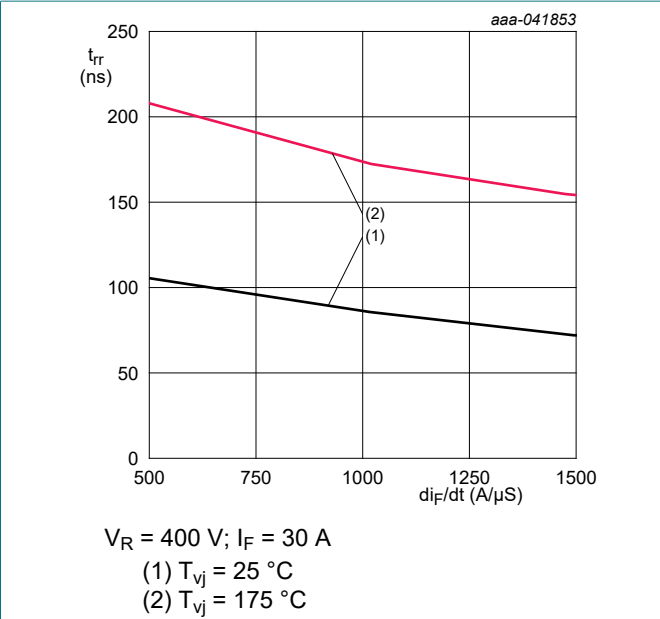


Fig. 21. Typical reverse recovery time as a function of rate of change of forward current

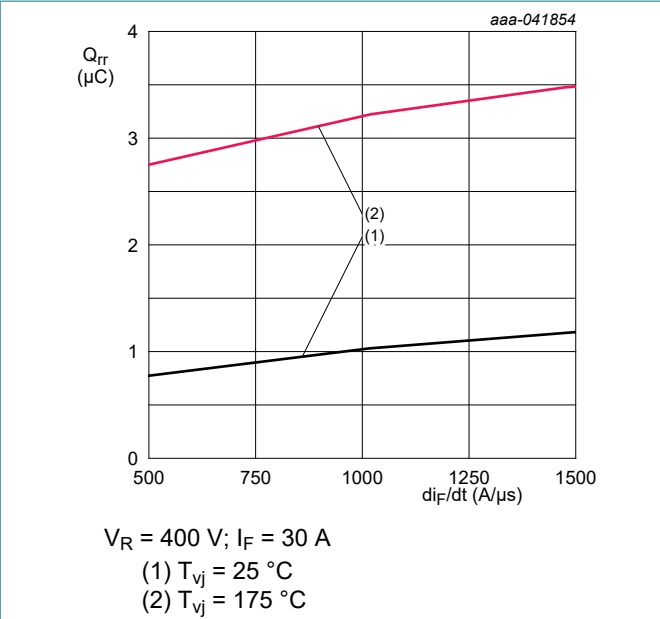


Fig. 22. Typical reverse recovery charge as a function of rate of change of forward current

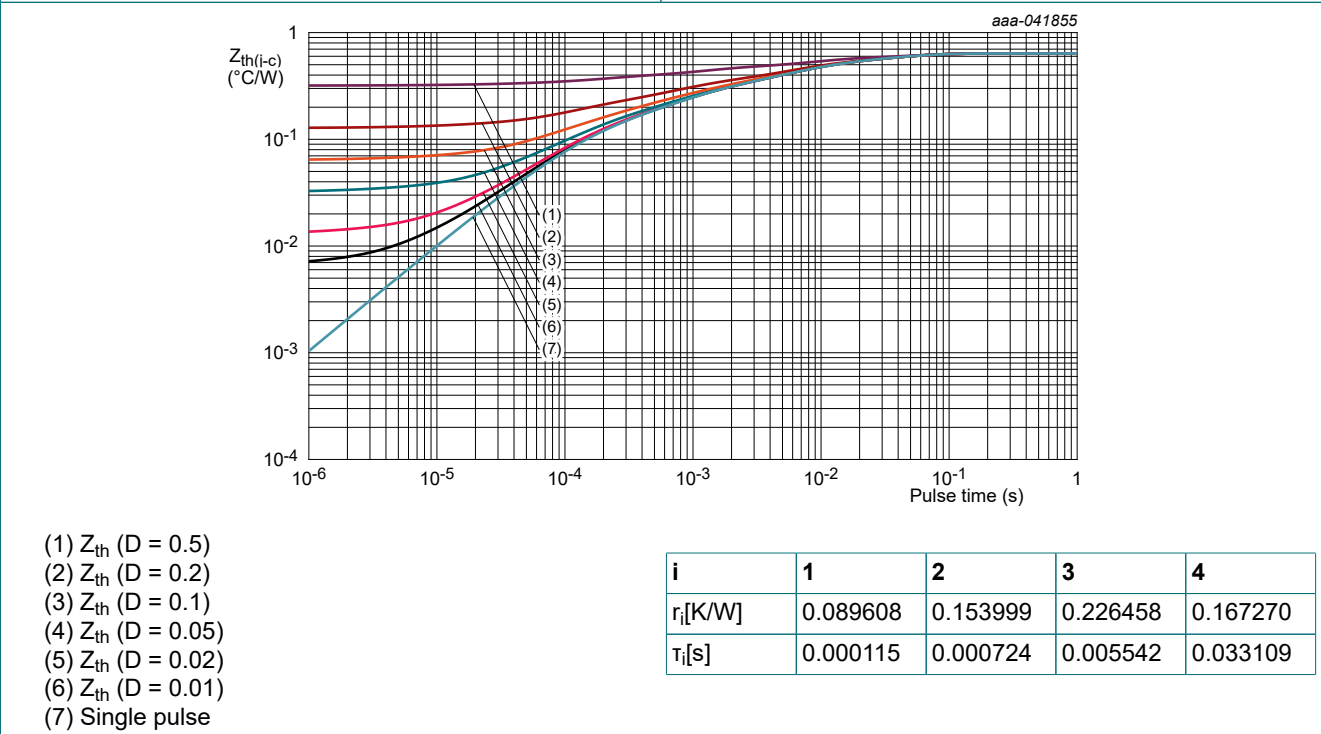
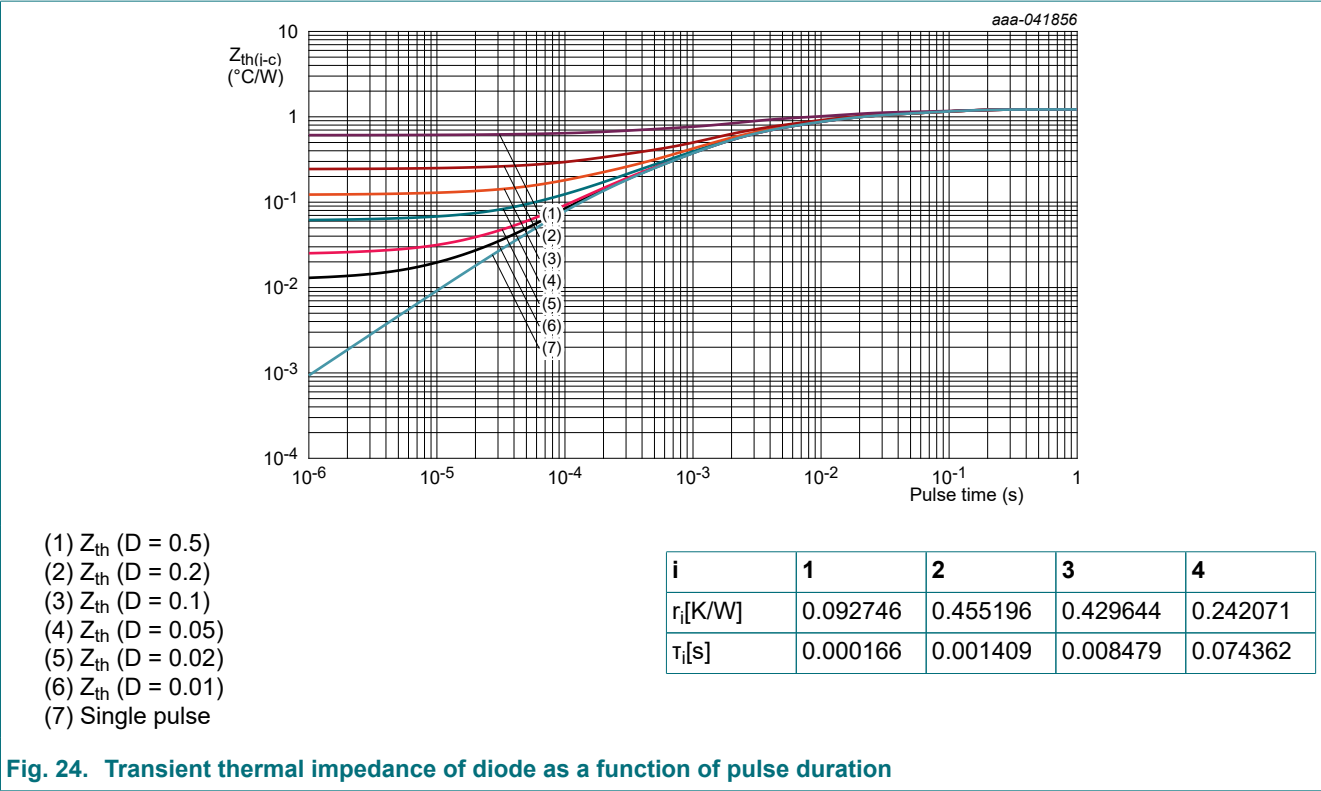
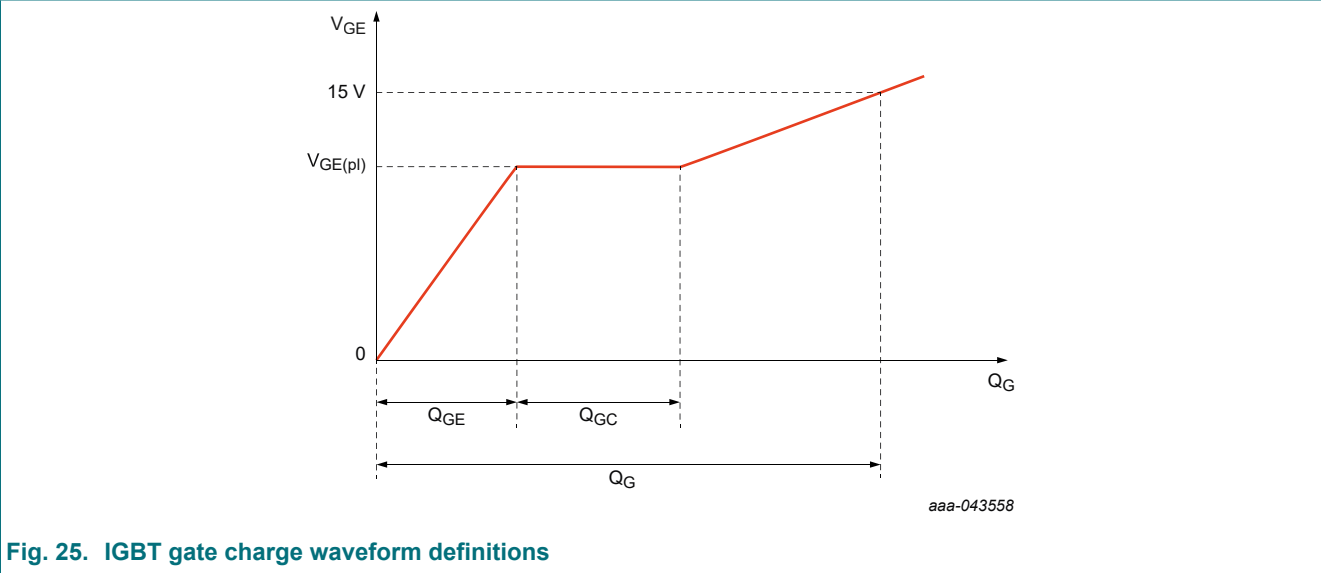


Fig. 23. Transient thermal impedance of IGBT as a function of pulse duration



10.2. Waveform definitions



11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247-3 SOT429-5

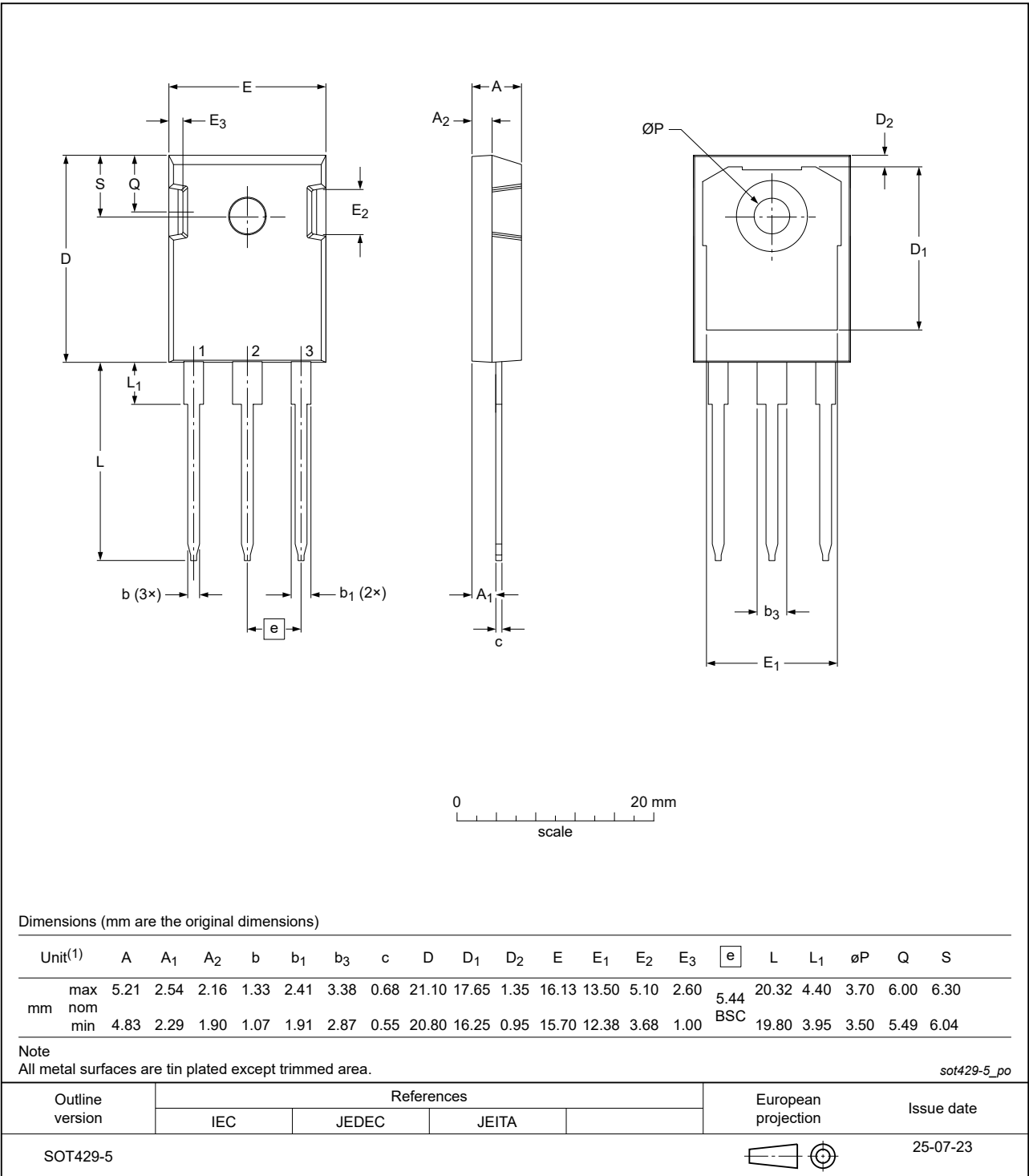


Fig. 28. Package outline TO-247-3 (SOT429-5)

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
NGW30T65M3DFP v. 2	20251111	Product data sheet	-	NGW30T65M3DFP v. 1
Modifications	- Updated the 3D package on the first page. - Added new section Section 7. - Replaced "Power dissipation as a function of case temperature" chart with "Reverse bias safe operating area" in Section 10.1. - Updated the value of I_{CES} in Section 10. - Updated the package information in Section 6. - Updated the waveform definitions in Section 10.2. - Updated the package outline in Section 11.			
NGW30T65M3DFP v. 1	20250117	Product data sheet	-	-

13. Legal information

Data sheet status

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

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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