

650V 50A Trench and Field Stop IGBT

JJT50N65UK

Key performance:

- $V_{CE}=650V$
- $I_C=50A@T_C=100^{\circ}C$
- $V_{CE(sat)}=1.7V$

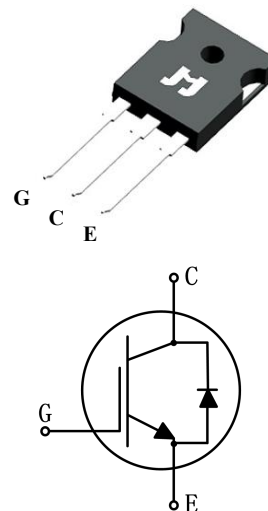
TO-247i

Features:

- Trench and field-stop technology.
- Easy parallel switching capability.

Benefits:

- High efficiency for inverters.
- High ruggedness performance.
- RoHS compliant.



Applications:

- PFC applications
- Welding machines

Package parameters

Type	Marking	Package	Packaging Method
JJT50N65UK	T5065UK	TO-247i	Tube

Maximum ratings

Symbol	Parameter	Values	Unit
V_{CES}	Collector-emitter voltage	650	V
V_{GES}	Gate-emitter voltage	± 20	V
I_C	Continuous collector current ($T_C=25^\circ\text{C}$)	100	A
	Continuous collector current ($T_C=100^\circ\text{C}$)	50	A
I_{CM}	Pulsed collector current, t_p limited by T_{vjmax}	200	A
I_F	Diode continuous forward current ($T_C=100^\circ\text{C}$)	30	A
I_{FM}	Diode maximum current, t_p limited by T_{vjmax}	60	A
P_{tot}	Power dissipation ($T_C=25^\circ\text{C}$)	192	W
	Power dissipation ($T_C=100^\circ\text{C}$)	96	W
T_{vj}	Operating junction temperature range	-40 to +175	$^\circ\text{C}$
T_{stg}	Storage temperature range	-55 to +150	$^\circ\text{C}$

Thermal characteristics

Symbol	Parameter	Values		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance, junction to case for IGBT	0.78	-	K/ W
$R_{th(j-c)}$	Thermal resistance, junction to case for Diode	0.81	-	K/ W
$R_{th(j-a)}$	Thermal resistance, junction to ambient	40	-	K/ W

Electrical characteristics of IGBT ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Static characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-emitter breakdown voltage	$V_{GE}=0\text{V}, I_C=250\mu\text{A}$	650	-	-	V
I_{CES}	Collector-emitter leakage current	$V_{CE}=650\text{V}, V_{GE}=0\text{V}$	-	-	50	μA
I_{GES}	Gate leakage current, forward	$V_{GE}=20\text{V}, V_{CE}=0\text{V}$	-	-	100	nA
	Gate leakage current, reverse	$V_{GE}=-20\text{V}, V_{CE}=0\text{V}$	-	-	-100	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{GE}=V_{CE}, I_C=1\text{mA}$	5.1	5.4	5.7	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE}=15\text{V}, I_C=50\text{A}$	-	1.7	-	V
		$V_{GE}=15\text{V}, I_C=50\text{A}, T_{vj}=175^{\circ}\text{C}$	-	2.1	-	V

Dynamic characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
C_{ies}	Input capacitance	$V_{CE}=30\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$	-	3860	-	pF
C_{oes}	Output capacitance		-	170	-	pF
C_{res}	Reverse transfer capacitance		-	30	-	pF
Q_g	Total gate charge	$V_{CC}=520\text{V}$ $V_{GE}=15\text{V}$ $I_C=50\text{A}$	-	120	-	nC

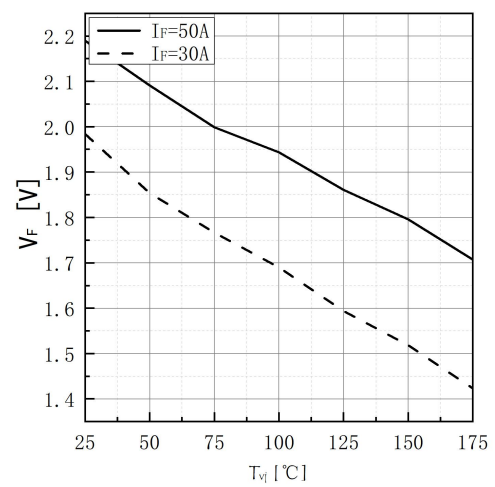
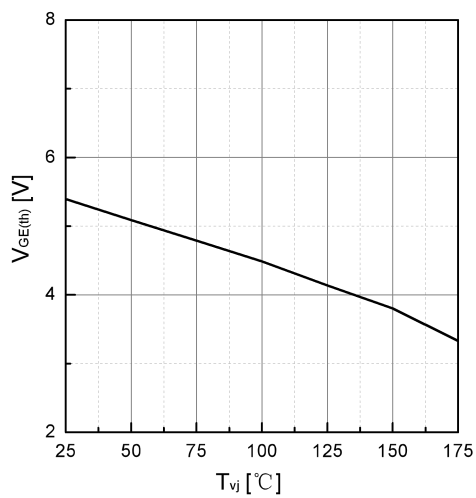
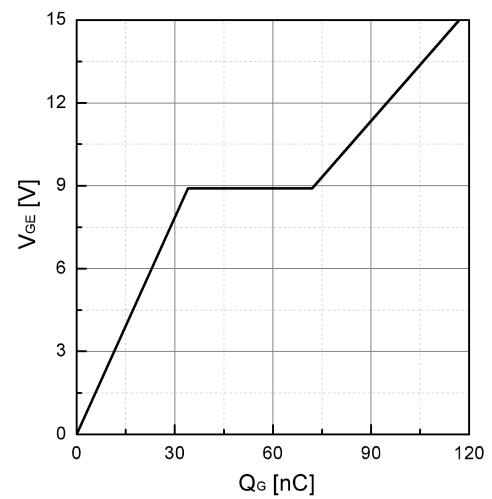
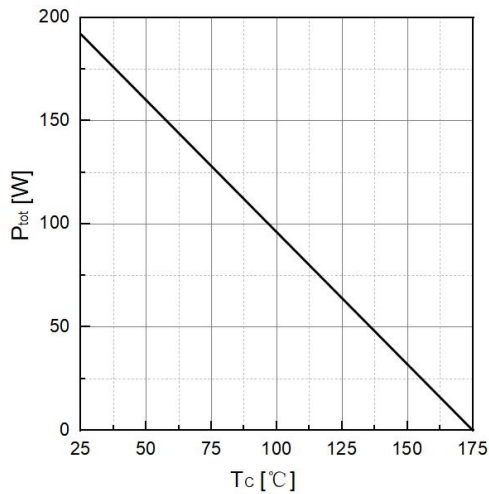
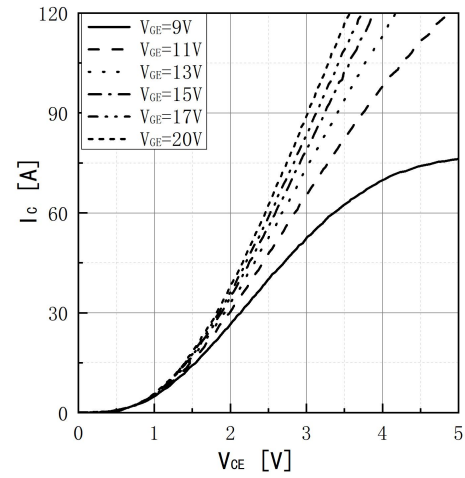
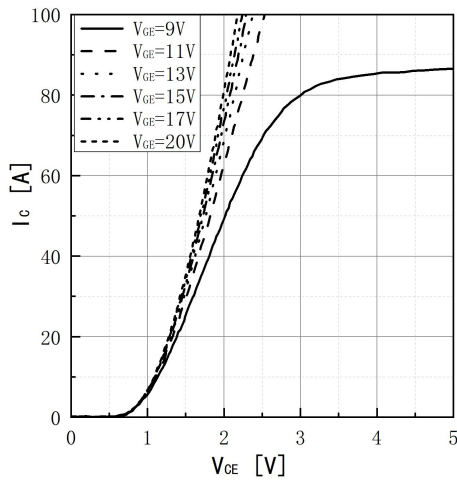
Switching characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=50A$ $R_G=10\Omega$ Inductive load	-	44	-	ns
t_r	Rise time		-	100	-	ns
$t_{d(off)}$	Turn-off delay time		-	166	-	ns
t_f	Fall time		-	75	-	ns
E_{on}	Turn-on energy		-	1.7	-	mJ
E_{off}	Turn-off energy		-	0.9	-	mJ
E_{ts}	Total switching energy		-	2.6	-	mJ
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=50A$ $R_G=10\Omega$ Inductive load $T_{vj}=175^\circ C$	-	45	-	ns
t_r	Rise time		-	105	-	ns
$t_{d(off)}$	Turn-off delay time		-	180	-	ns
t_f	Fall time		-	76	-	ns
E_{on}	Turn-on energy		-	2.3	-	mJ
E_{off}	Turn-off energy		-	1.3	-	mJ
E_{ts}	Total switching energy		-	3.6	-	mJ

Electrical characteristics of Diode ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
V_F	Diode forward voltage	$I_F=50\text{A}$	-	2.3	-	V
		$I_F=50\text{A}, T_{vj}=175^{\circ}\text{C}$	-	1.9	-	V
t_{rr}	Diode reverse recovery time	$V_R=400\text{V}$ $I_F=50\text{A}$ $di_F/dt=-450\text{A}/\mu\text{s}$	-	78	-	ns
I_{rrm}	Diode peak reverse recovery current		-	15	-	A
Q_{rr}	Diode reverse recovery charge		-	511	-	nC
t_{rr}	Diode reverse recovery time	$V_R=400\text{V}$ $I_F=50\text{A}$ $di_F/dt=-450\text{A}/\mu\text{s}$ $T_{vj}=175^{\circ}\text{C}$	-	126	-	ns
I_{rrm}	Diode peak reverse recovery current		-	26	-	A
Q_{rr}	Diode reverse recovery charge		-	2163	-	nC

Typical performance characteristics



Typical performance characteristics

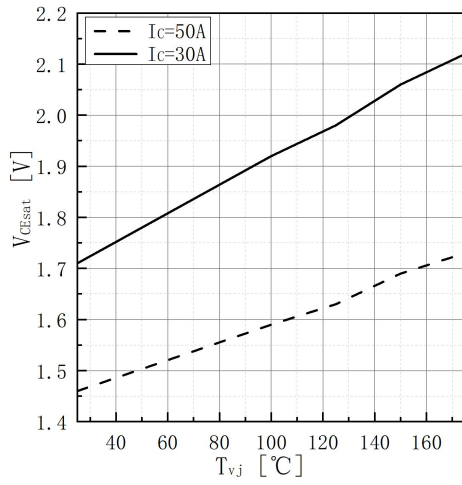


Fig 7. Typical V_{CEsat} as a function of T_{vj}

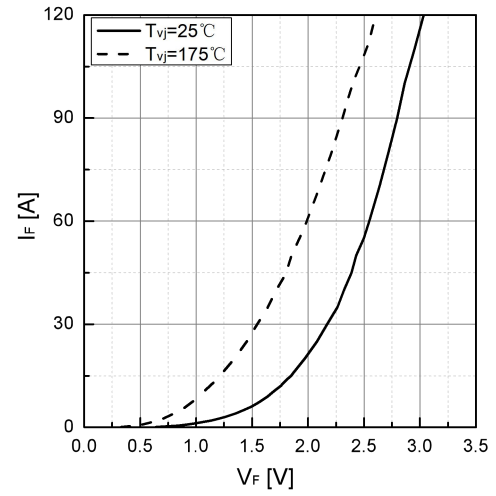


Fig 8. Typical I_F as a function of V_F

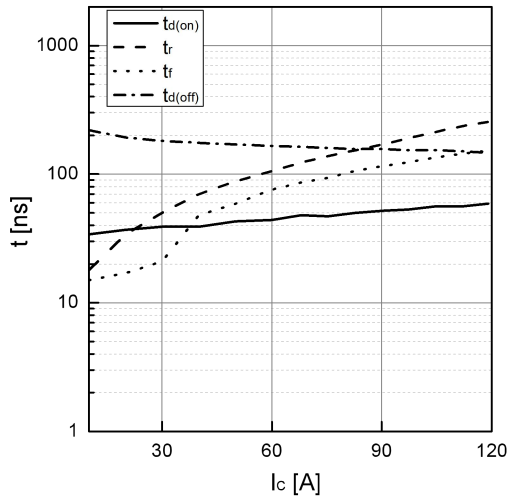


Fig 9. Typical switching time as a function of I_c

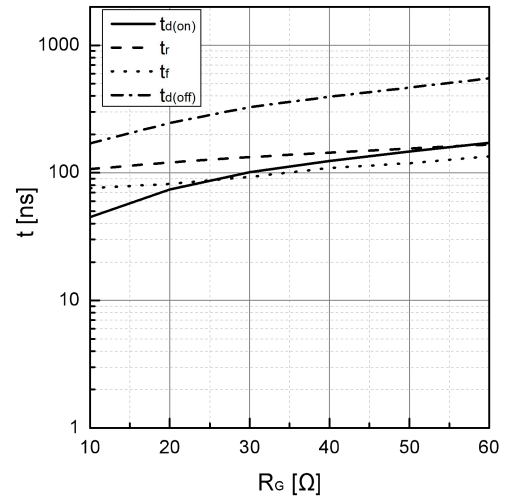


Fig 10. Typical switching times as a function of R_G

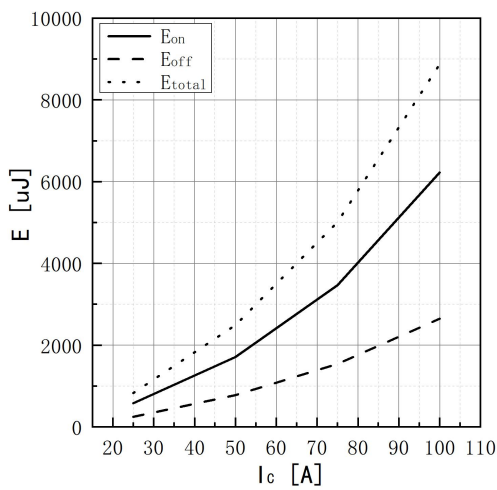


Fig 11. Typical switching energy losses as a function of I_c

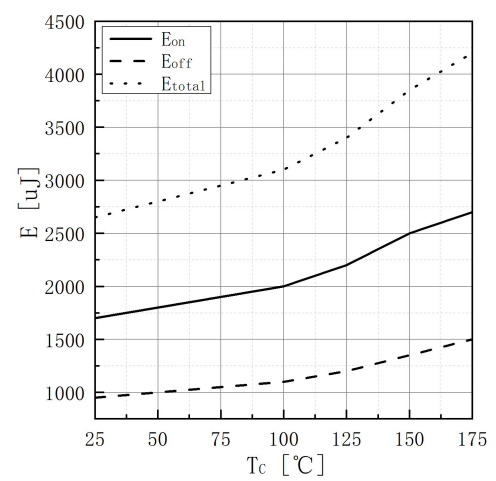
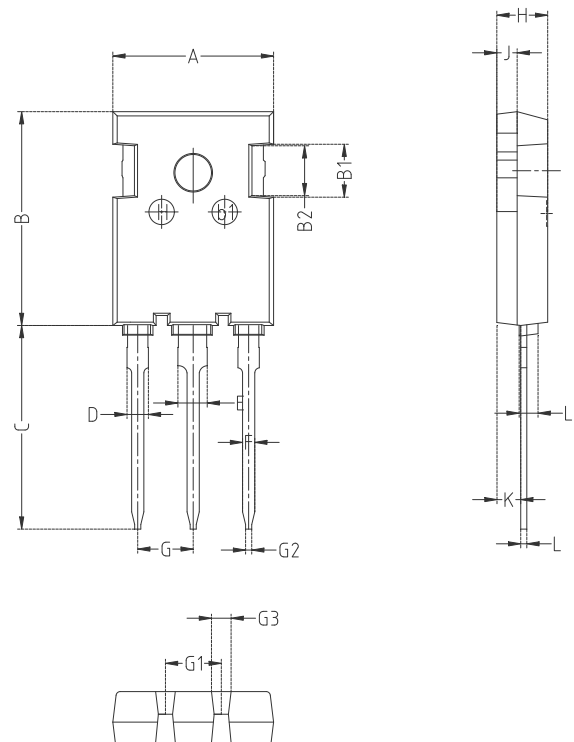


Fig 12. Typical switching energy losses as a function of T_{vj}

Package dimension

TO-247i



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.95	16.00	16.05	0.627	0.629	0.631
B	21.85	21.90	21.92	0.860	0.862	0.864
B1	5.15	5.20	5.25	0.202	0.204	0.206
B2	4.32	4.37	4.42	0.170	0.172	0.174
C	19.01	19.11	19.21	0.748	0.752	0.756
D	2.07	2.10	2.13	0.081	0.082	0.083
E	3.07	3.10	3.13	0.120	0.122	0.123
F	1.15	1.20	1.25	0.045	0.047	0.049
G	5.45REF			0.214REF		
G1	5.85	5.90	5.95	0.230	0.232	0.234
G2	-	0.60	-	-	0.023	-
G3	1.76	1.81	1.86	0.069	0.071	0.073
H	4.95	5.00	5.05	0.194	0.196	0.198
J	1.44	1.49	1.54	0.056	0.058	0.060
K	2.30	2.35	2.40	0.090	0.092	0.094
L	0.59	0.60	0.61	0.023	0.023	0.024
L1	1.85	1.90	1.95	0.072	0.074	0.076



Revision history

Date	Revision	Changes
2025-05-17	Rev A.1.2	Update

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