JJMICROELECTRONICS

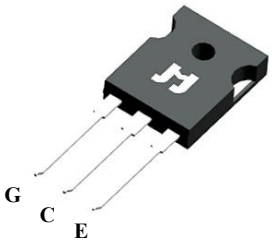
650V 50A Trench and Field Stop IGBT

JJT50N65UK

Key performance:

- V_{CE}=650V
- I_C=50A@T_C=100℃
- $V_{CE(sat)}$=1.7V

TO-247i

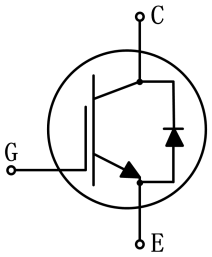


Features:

- 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℃)	100	A
	Continuous collector current (T_C=100℃)	50	A
I_{CM}	Pulsed collector current, t_p limited by T_{vjmax}	200	A
I_F	Diode continuous forward current (T_C=100℃)	30	A
I_{FM}	Diode maximum current, t_p limited by T_{vjmax}	60	A
P_{tot}	Power dissipation (T_C=25℃)	192	W
	Power dissipation (T_C=100℃)	96	W
T_{vj}	Operating junction temperature range	-40 to +175	℃
T_{stg}	Storage temperature range	-55 to +150	℃

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℃ unless otherwise specified)

Static characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-emitter breakdown voltage	V_{GE}=0V, I_C=250μA	650	-	-	V
I_{CES}	Collector-emitter leakage current	V_{CE}=650V, V_{GE}=0V	-	-	50	μA
I_{GES}	Gate leakage current, forward	V_{GE}=20V, V_{CE}=0V	-	-	100	nA
	Gate leakage current, reverse	V_{GE}=-20V, V_{CE}=0V	-	-	-100	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	V_{GE}=V_{CE}, I_C=1mA	4.0	4.4	4.8	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE}=15 V, I_C=50A	1.3	1.6	1.9	V
		V_{GE}=15V, I_C=50A, T_{vj}=175℃	-	2.0	-	V

Dynamic characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
C_{ies}	Input capacitance	V_{CE}=30V V_{GE}=0V f=1MHz	-	5096	-	pF
C_{oes}	Output capacitance		-	106	-	pF
C_{res}	Reverse transfer capacitance		-	30	-	pF
Q_g	Total gate charge	V_{CC}=520V V_{GE}=15V I_C=50A	-	180	-	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=10Ω 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=10Ω Inductive load T_{vj} =175℃	-	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℃ unless otherwise specified)

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
V_F	Diode forward voltage	I_F=50A	2.0	2.3	2.6	V
		I_F=50A,T_{vj}=175℃	-	1.9	-	V
t_{rr}	Diode reverse recovery time	V_R=400V I_F=50A di_F/dt=-450A/μs	-	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=400V I_F=50A di_F/dt=-450A/μs T_{vj}=175℃	-	126	-	ns
I_{rrm}	Diode peak reverse recovery current		-	26	-	A
Q_{rr}	Diode reverse recovery charge		-	2163	-	nC

Typical performance characteristics

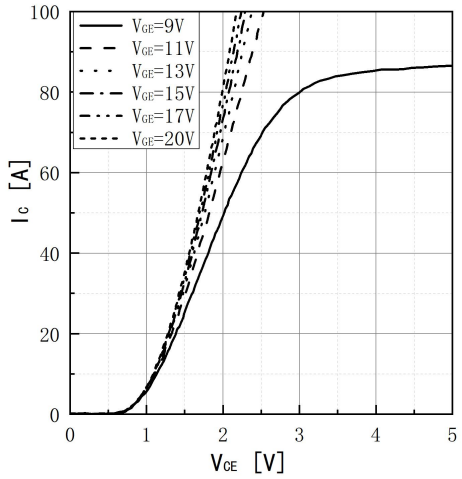


Fig 1. Typical output characteristic (T_{vj}=25℃)

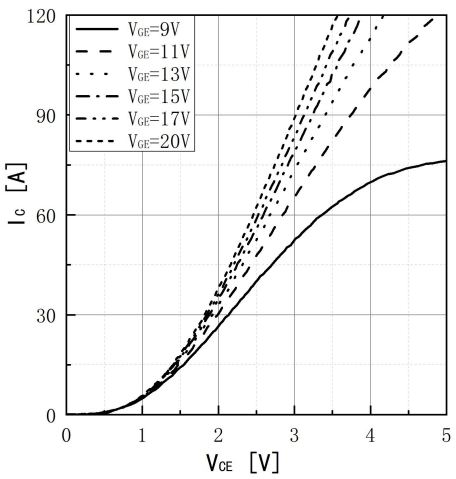


Fig 2. Typical output characteristic(T_{vj}=175℃)

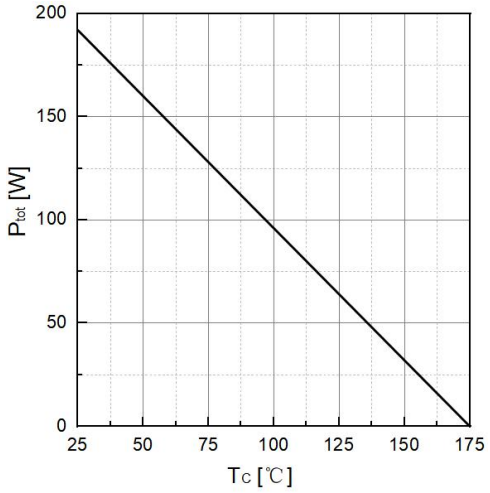


Fig 3. Power dissipation as a function of T_C

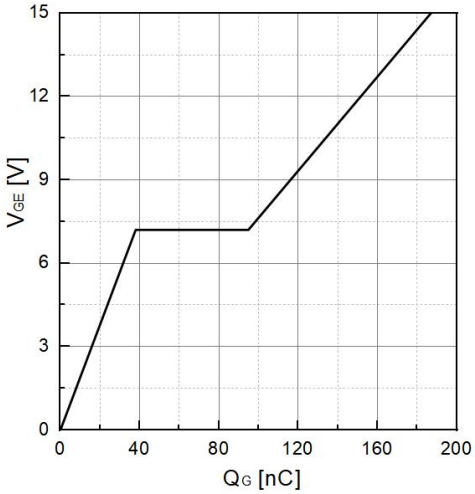


Fig 4. Typical Gate charge

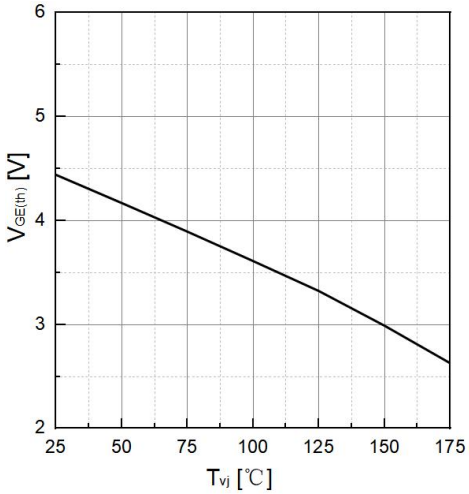


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

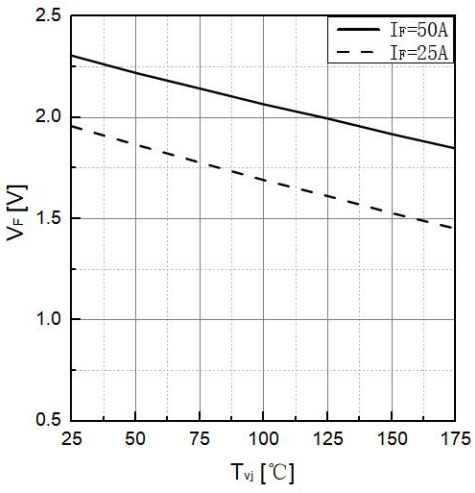


Fig 6. Typical V_F as a function of T_{vj}

Typical performance characteristics

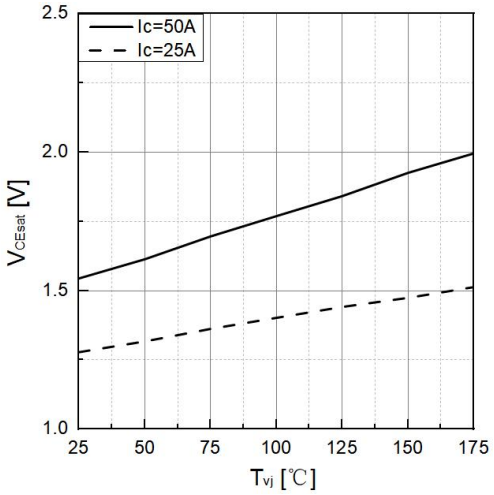


Fig 7. Typical V_{CEsat} as a function of T_{vj}

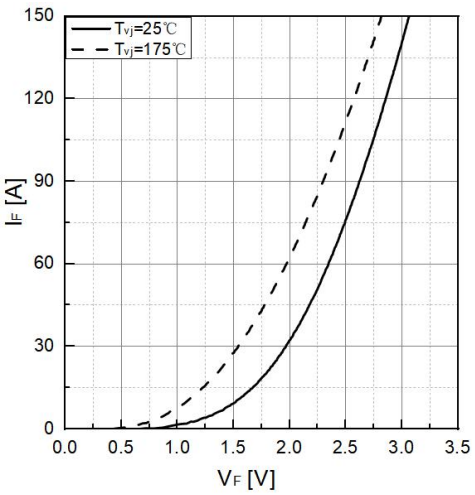


Fig 8. Typical I_F as a function of V_F

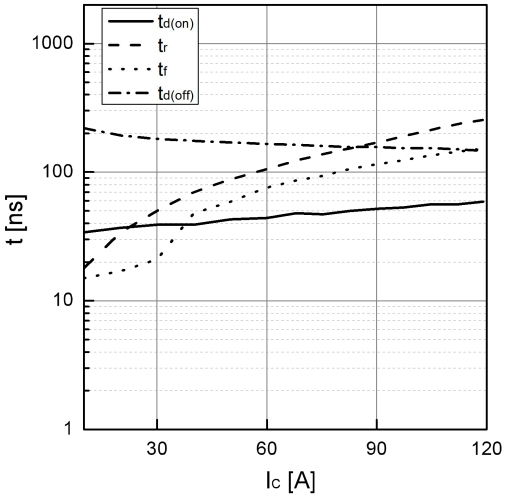


Fig 9. Typical switching time as a function of I_C

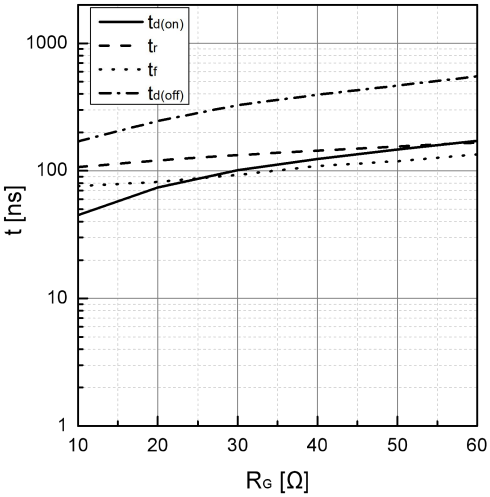


Fig 10. Typical switching times as a function of R_G

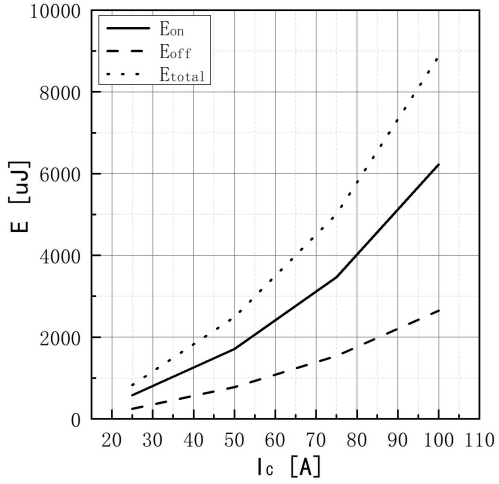


Fig 11. Typical switching energy losses as a function of I_C

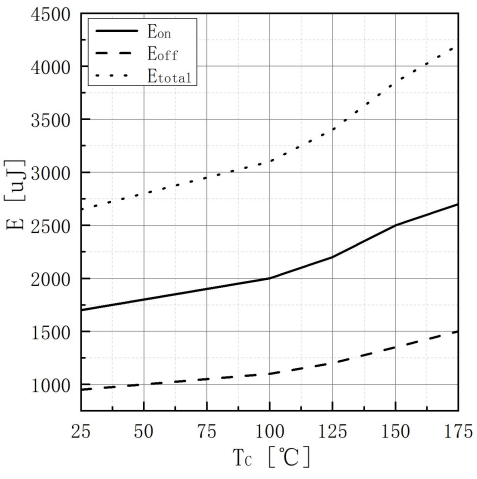
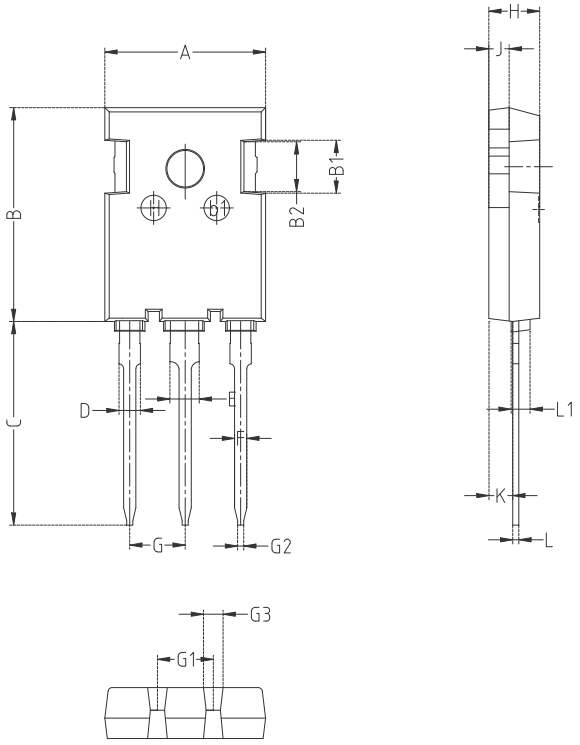


Fig 12. Typical switching energy losses as a function of Tvj

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
2026-02-05	Rev 1.3	Update

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