JJMICROELECTRONICS

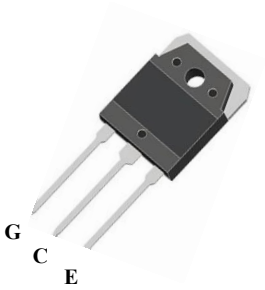
650V 50A Trench and Field Stop IGBT

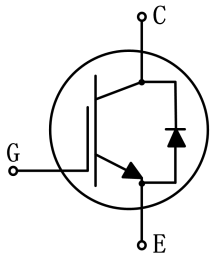
JJT50N65UH

Key performance:

- V_{CE}=650V
- I_C=50A@T_C=100℃
- $V_{CE(sat)}$=1.9V

TO-3P





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
JJT50N65UH	T5065UH	TO-3P	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℃)	50	A
I_{FM}	Diode maximum current, t_p limited by T_{vjmax}	200	A
P_{tot}	Power dissipation (T_C=25℃)	312	W
	Power dissipation (T_C=100℃)	156	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	-	0.48	K/ W
$R_{th(j-c)}$	Thermal resistance, junction to case for Diode	-	0.90	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	5.0	5.4	5.6	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE}=15 V, I_C=50A	-	1.9	-	V
		V_{GE}=15V, I_C=50A, T_{vj}=175℃	-	2.6	-	V

Dynamic characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
C_{ies}	Input capacitance	V_{CE}=30V V_{GE}=0V f=1MHz	-	4820	-	pF
C_{oes}	Output capacitance		-	136	-	pF
C_{res}	Reverse transfer capacitance		-	37	-	pF
Q_g	Total gate charge	V_{CC}=520V V_{GE}=15V I_C=50A	-	158	-	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	-	50	-	ns
t_r	Rise time		-	81	-	ns
$t_{d(off)}$	Turn-off delay time		-	190	-	ns
t_f	Fall time		-	59	-	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℃	-	46	-	ns
t_r	Rise time		-	83	-	ns
$t_{d(off)}$	Turn-off delay time		-	205	-	ns
t_f	Fall time		-	66	-	ns
E_{on}	Turn-on energy		-	2.5	-	mJ
E_{off}	Turn-off energy		-	1.0	-	mJ
E_{ts}	Total switching energy		-	3.5	-	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	-	2.5	-	V
		I_F=50A,T_{vj}=175℃	-	2.0	-	V
t_{rr}	Diode reverse recovery time	V_R=400V I_F=50A di_F/dt=-800A/μs	-	75	-	ns
I_{rrm}	Diode peak reverse recovery current		-	14	-	A
Q_{rr}	Diode reverse recovery charge		-	482	-	nC
t_{rr}	Diode reverse recovery time	V_R=400V I_F=50A di_F/dt=-800A/μs T_{vj}=175℃	-	114	-	ns
I_{rrm}	Diode peak reverse recovery current		-	22	-	A
Q_{rr}	Diode reverse recovery charge		-	1384	-	nC

Typical performance characteristics

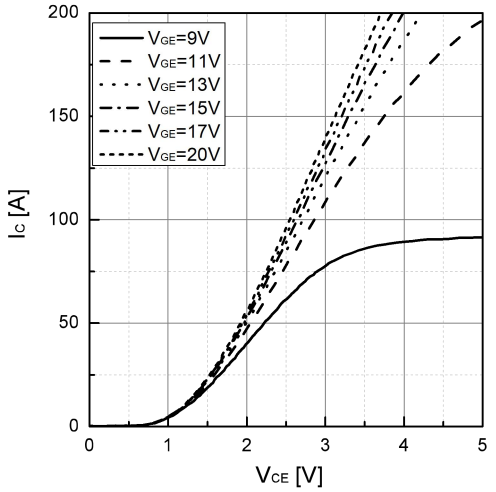


Fig 1. Typical output characteristic (T_{vj}=25℃)

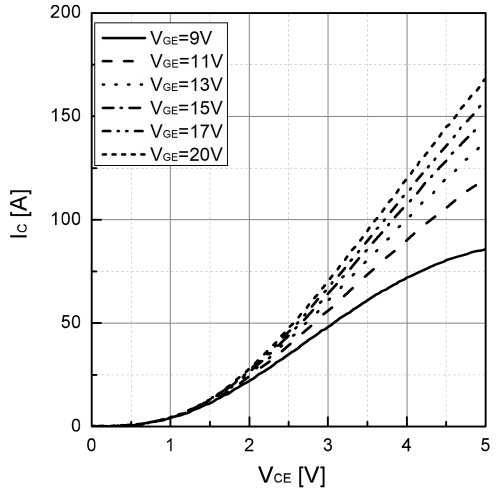


Fig 2. Typical output characteristic(T_{vj}=175℃)

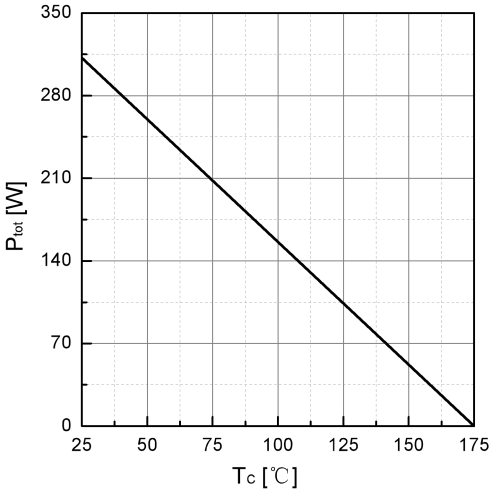


Fig 3. Power dissipation as a function of T_C

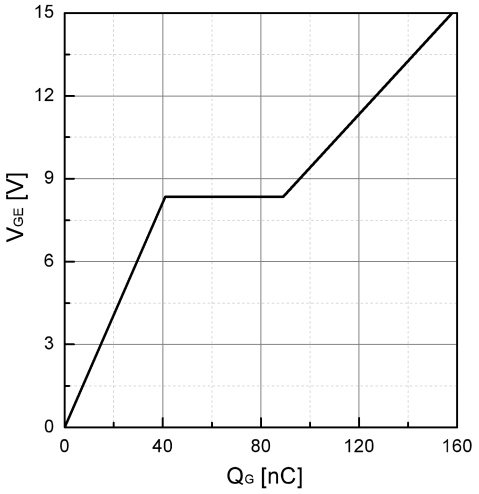


Fig 4. Typical Gate charge

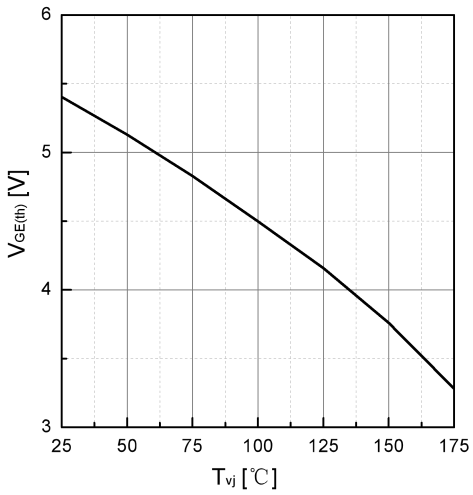


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

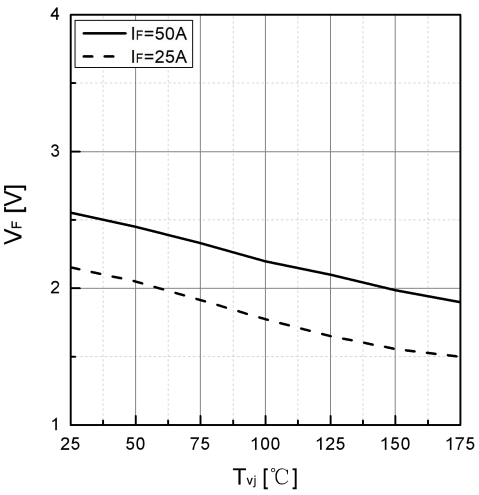


Fig 6. Typical V_F as a function of T_{vj}

Typical performance characteristics

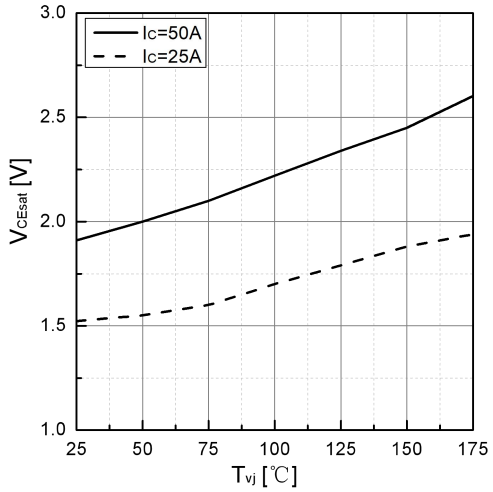


Fig 7. Typical V_{CEsat} as a function of T_{vj}

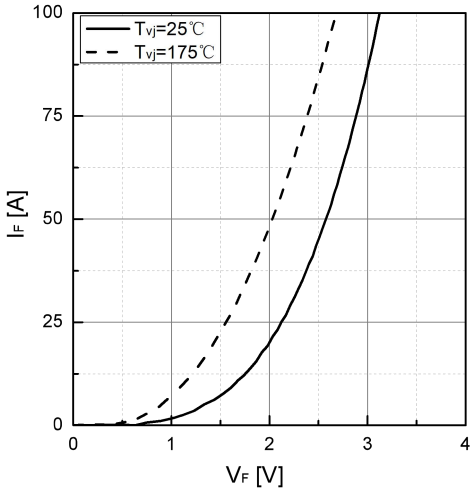


Fig 8. Typical I_F as a function of V_F

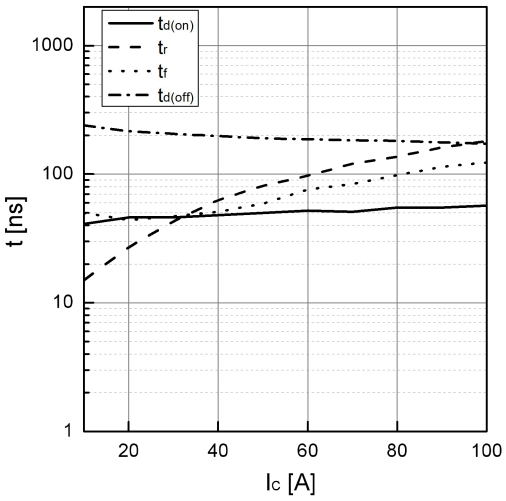


Fig 9. Typical switching time as a function of I_C

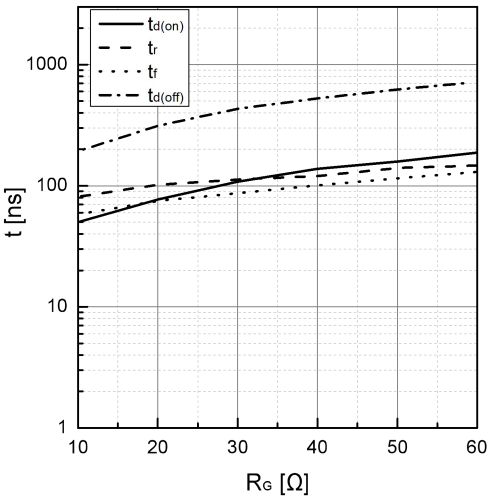


Fig 10. Typical switching times as a function of R_G

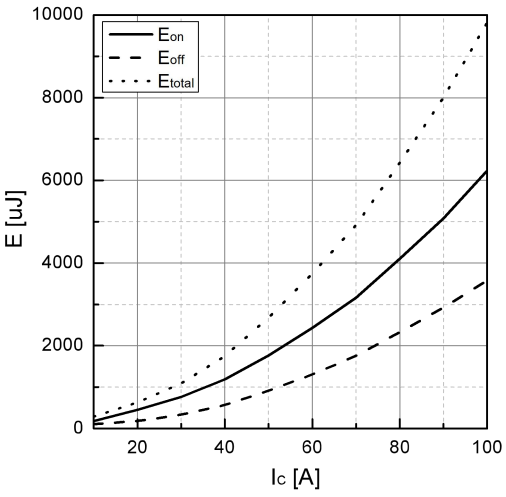


Fig 11. Typical switching energy losses as a function of I_C

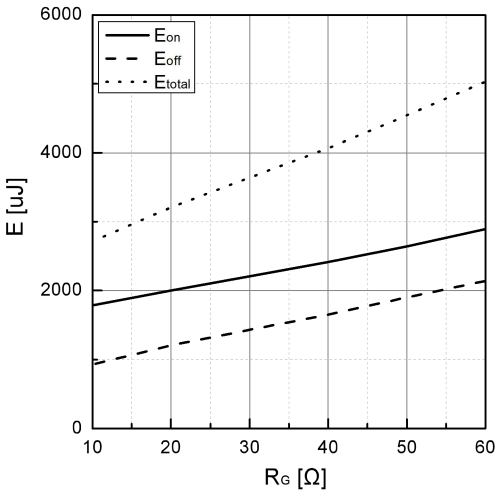


Fig 12. Typical switching energy losses as a function of R_G

Typical performance characteristics

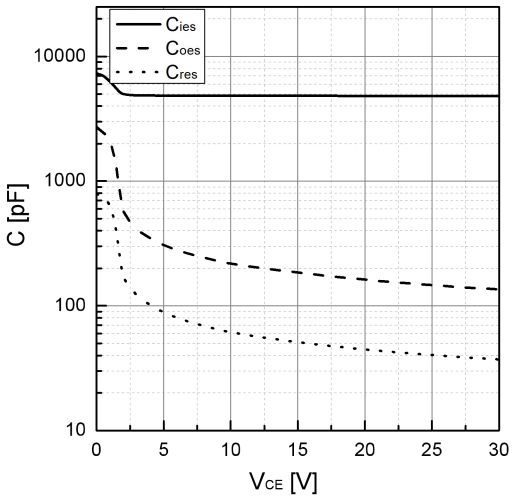


Fig 13. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

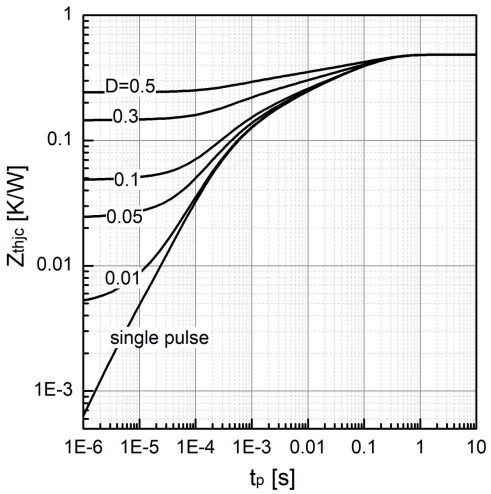
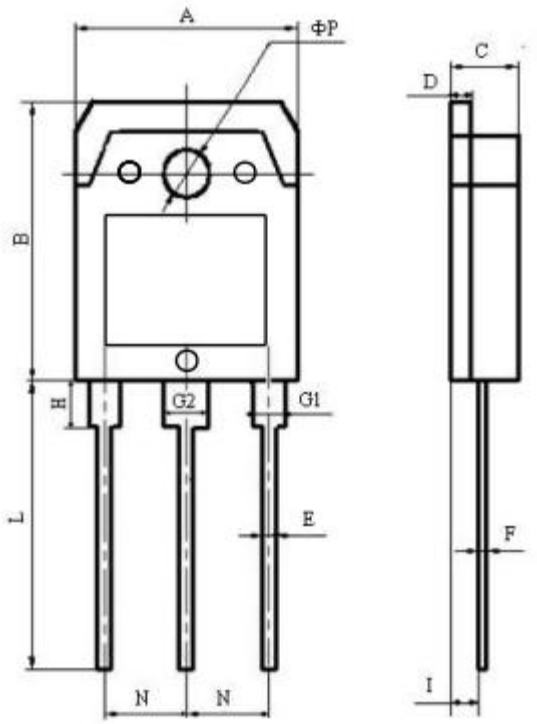


Fig 14. Transient thermal impedance of IGBT

Package dimension

TO-3P



Items	Values(mm)	
	MIN	MAX
A	15.00	16.00
B	19.20	20.60
C	4.60	5.00
D	1.40	1.60
E	0.90	1.10
F	0.50	0.70
G1	2.00	2.20
G2	3.00	3.20
H	3.00	3.70
I	2.30	2.50
L*	19.00	21.00
N	5.25	5.65
ΦP	3.10	3.30

Revision history

Date	Revision	Changes
2023-12-12	Rev 1.0	Release of the datasheet
2023-12-27	Rev 1.1	Update
2024-06-06	Rev 1.2	Update

Disclaimer