JJMICROELECTRONICS

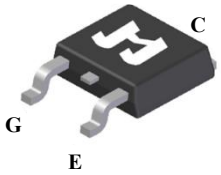
650V 6A Trench and Field Stop IGBT

JJT6N65ST

Key performance:

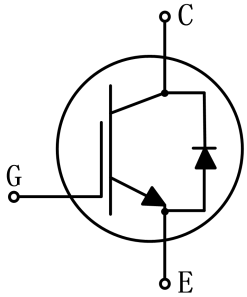
- V_{CE}=650V
- I_C=6A@T_C=100℃
- $V_{CE(sat)}$=1.7 V

TO-252



Features:

- High ruggedness performance
- Very tight parameter distribution
- Positive $V_{CE\ (sat)}$ temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation
- RoHS compliant



Applications:

- Home appliances
- Motor drives
- Fan, Pumps, Vacuum cleaner

Package parameters

Type	Marking	Package	Packaging method
JJT6N65T	T0665ST	TO-252	Tape and reel

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℃)	12	A
	Continuous collector current (T_C=100℃)	6	A
I_{CM}	Pulsed collector current, t_p limited by T_{vjmax}	24	A
I_F	Diode continuous forward current (T_C=100℃)	6	A
I_{FM}	Diode maximum current, t_p limited by T_{vjmax}	24	A
t_{sc}	Short circuit withstand time	10	μs
P_{tot}	Power dissipation (T_C=25℃)	136	W
	Power dissipation (T_C=100℃)	68	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	-	1.1	K/ W
$R_{th(j-c)}$	Thermal resistance, junction to case for Diode	-	3.8	K/ W
$R_{th(j-a)}$	Thermal resistance, junction to ambient	-	90	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	-	-	10	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	5.2	6.2	7.2	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE}=15V, I_C=6A	-	1.7	-	V
		V_{GE}=15V, I_C=6A, T_{vj}=175℃	-	2.2	-	V

Dynamic characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
C_{ies}	Input capacitance	V_{CE}=30V V_{GE}=0V f=1MHz	-	480	-	pF
C_{oes}	Output capacitance		-	22	-	pF
C_{res}	Reverse transfer capacitance		-	8	-	pF
Q_g	Total gate charge	V_{CC}=520V V_{GE}=15V I_C=6A	-	19	-	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=6A R_G=10Ω Inductive load	-	10	-	ns
t_r	Rise time		-	8	-	ns
$t_{d(off)}$	Turn-off delay time		-	56	-	ns
t_f	Fall time		-	79	-	ns
E_{on}	Turn-on energy		-	0.11	-	mJ
E_{off}	Turn-off energy		-	0.10	-	mJ
E_{ts}	Total switching energy		-	0.21	-	mJ
$t_{d(on)}$	Turn-on delay time	V_{CC}=400V V_{GE}=0/15V I_C=6A R_G=10Ω Inductive Load T_{vj}=175℃	-	11	-	ns
t_r	Rise time		-	10	-	ns
$t_{d(off)}$	Turn-off delay time		-	89	-	ns
t_f	Fall time		-	108	-	ns
E_{on}	Turn-on energy		-	0.16	-	mJ
E_{off}	Turn-off energy		-	0.16	-	mJ
E_{ts}	Total switching energy		-	0.32	-	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=6A	-	1.6	-	V
		I_F=6A, T_{vj}=175℃	-	1.4	-	V
t_{rr}	Diode reverse recovery time	V_R=400V I_F=6A di_F/dt=-500A/μs	-	55	-	ns
I_{rrm}	Diode peak reverse recovery current		-	10	-	A
Q_{rr}	Diode reverse recovery charge		-	306	-	nC
t_{rr}	Diode reverse recovery time	V_R=400V I_F=6A di_F/dt=-500A/μs T_{vj}=175℃	-	98	-	ns
I_{rrm}	Diode peak reverse recovery current		-	12	-	A
Q_{rr}	Diode reverse recovery charge		-	529	-	nC

Typical performance characteristics

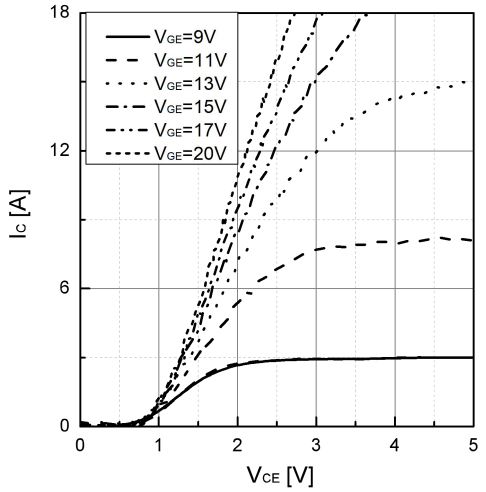


Fig 1. Typical output characteristic (T_{vj}=25℃)

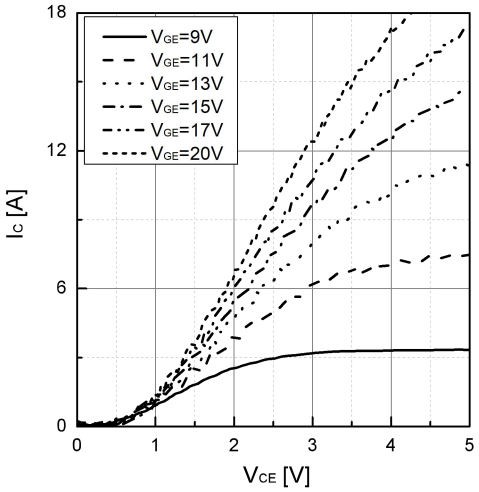


Fig 2. Typical output characteristic(T_{vj}=175℃)

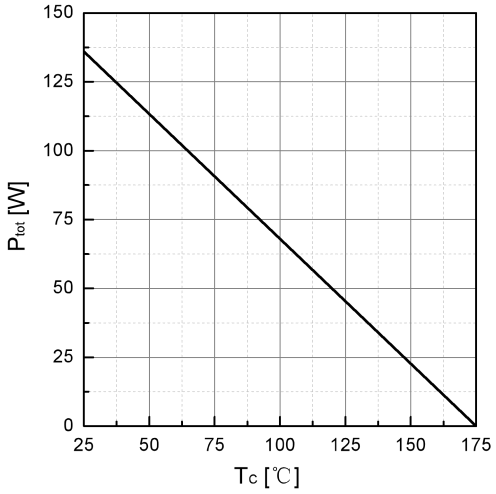


Fig 3.Power dissipation as a function of T_C

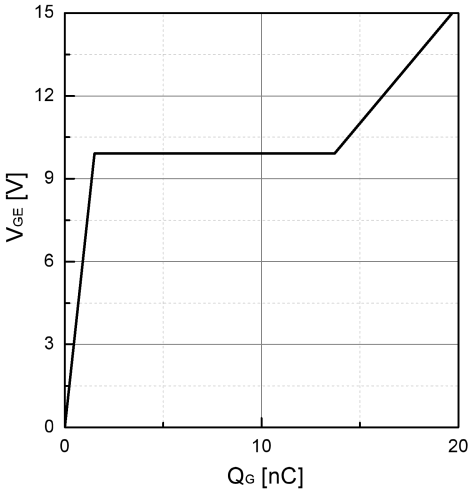


Fig 4. Typical Gate charge

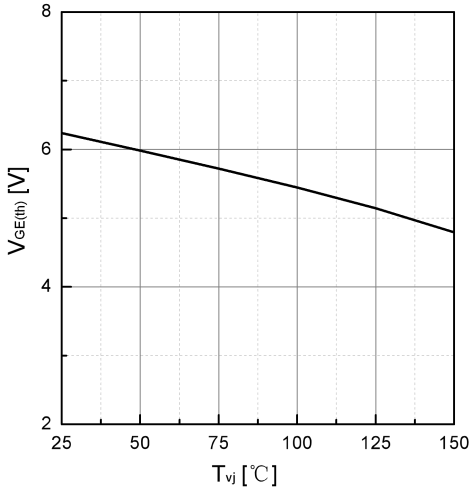


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

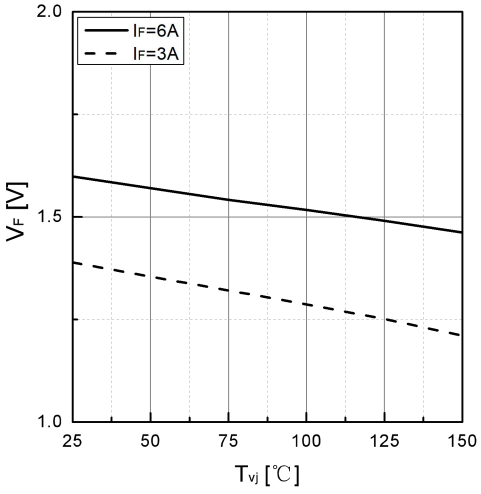


Fig 6. Typical V_F as a function of T_{vj}

Typical performance characteristics

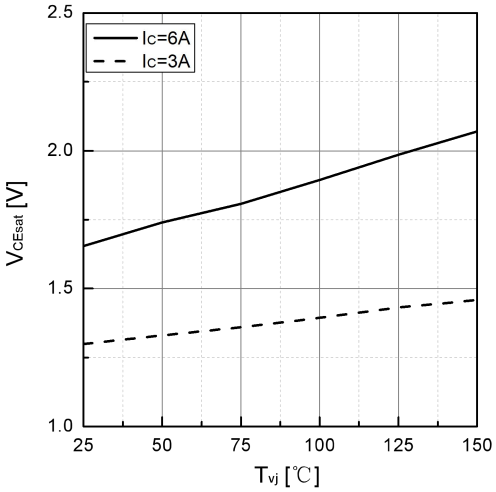


Fig 7. Typical V_{CEsat} as a function of T_{vj}

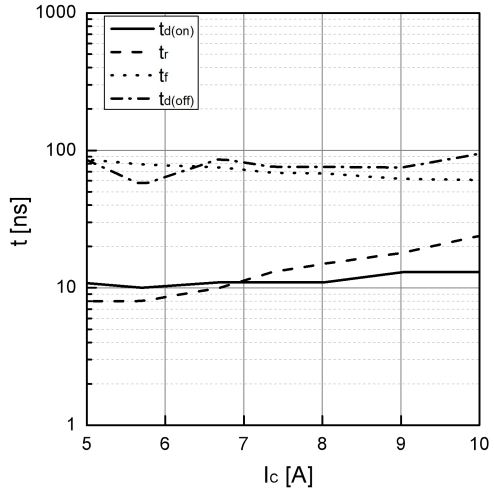


Fig 8. Typical switching time as a function of I_C

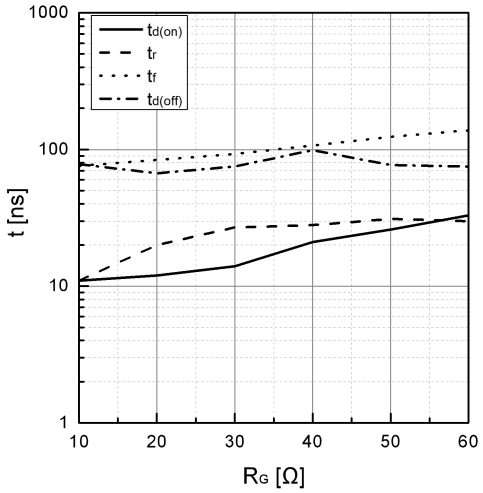


Fig 9. Typical switching times as a function of R_G

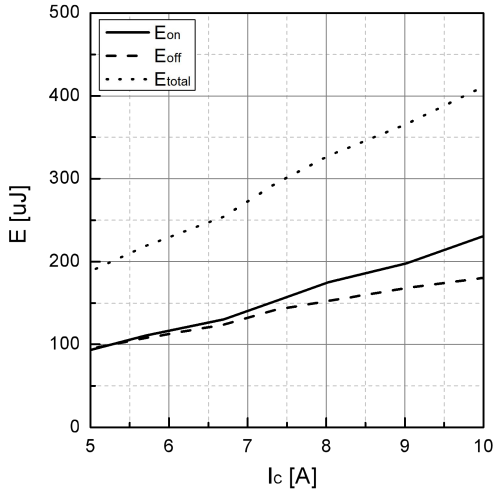


Fig 10. Typical switching energy losses as a function of I_C

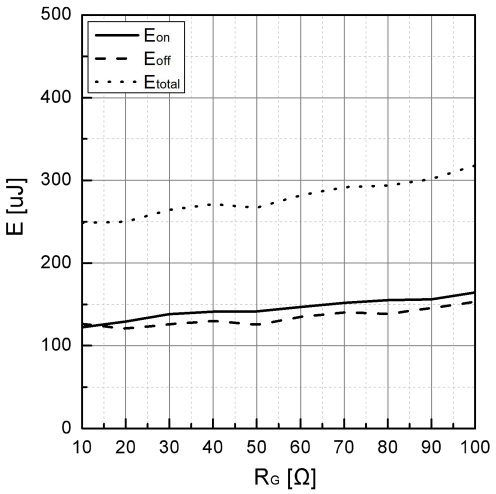


Fig 11. Typical switching energy losses as a function of R_G

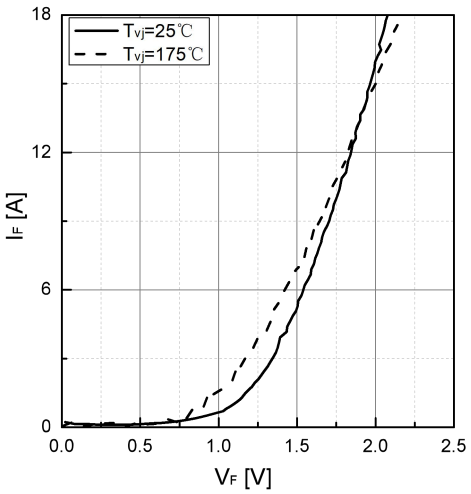


Fig 12. Typical I_F as a function of V_F

Typical performance characteristics

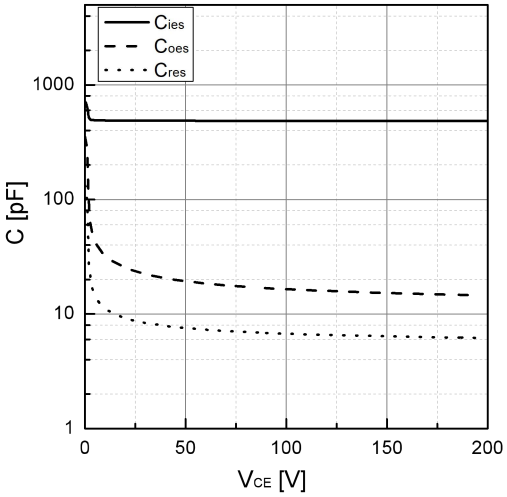


Fig 13. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

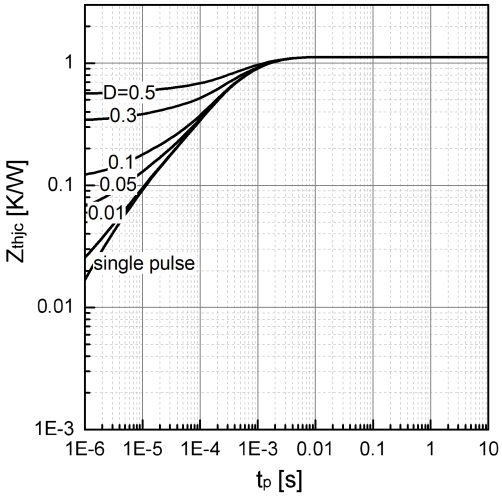
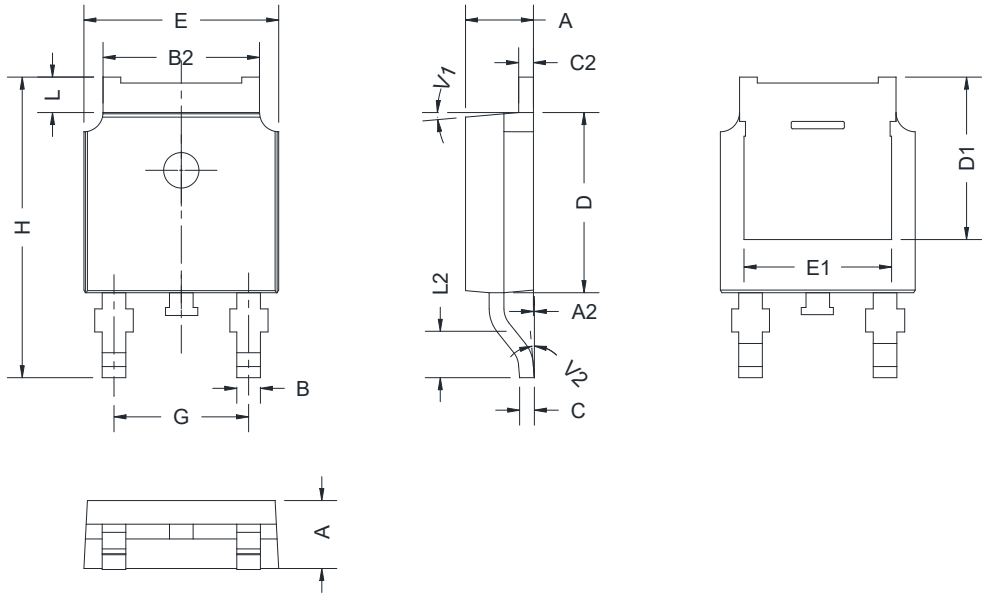


Fig 14. Transient thermal impedance of IGBT

Package dimension

TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10	-	2.50	0.083	-	0.098
A2	0	-	0.10	0	-	0.004
B	0.66	-	0.86	0.026	-	0.034
B2	5.18	-	5.48	0.202	-	0.216
C	0.40	-	0.60	0.016	-	0.024
C2	0.44	-	0.58	0.017	-	0.023
D	5.90	-	6.30	0.232	-	0.248
D1	5.30 REF			0.209 REF		
E	6.40	-	6.80	0.252	-	0.268
E1	4.63	-	-	0.182	-	-
G	4.47	-	4.67	0.176	-	0.184
H	9.50	-	10.70	0.374	-	0.421
L	1.09	-	1.21	0.043	-	0.048
L2	1.35	-	1.65	0.053	-	0.065
V1	-	7°	-	-	7°	-
V2	0°	-	6°	0°	-	6°

Revision history

Date	Revision	Changes
2023-12-15	Rev 1.0	Release of the datasheet
2024-04-17	Rev 1.1	Update
2025-01-13	Rev 1.2	Update

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