

**Key performance:**

- $V_{CE}=650V$
- $I_C=50A@T_C=100^{\circ}C$
- $V_{CE(sat)}=1.9V$

**Features:**

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

**Benefits:**

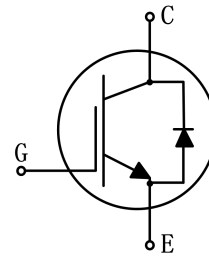
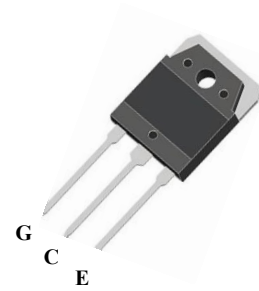
- High efficiency for inverters.
- High ruggedness performance.
- RoHS compliant.

**Applications:**

- PFC applications
- Welding machines

**Package parameters**

Type	Marking	Package	Packaging Method
JJT50N65UH	T5065UH	TO-3P	Tube

**TO-3P**


## Maximum ratings

Symbol	Parameter	Values	Unit
$V_{CES}$	Collector-emitter voltage	650	V
$V_{GES}$	Gate-emitter voltage	$\pm 20$	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 ( $T_C=100^\circ\text{C}$ )	50	A
$I_{FM}$	Diode maximum current, $t_p$ limited by $T_{vjmax}$	200	A
$P_{tot}$	Power dissipation ( $T_C=25^\circ\text{C}$ )	312	W
	Power dissipation ( $T_C=100^\circ\text{C}$ )	156	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	-	0.48	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** ( $T_{vj}=25^{\circ}\text{C}$  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	$\mu\text{A}$
$I_{GES}$	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	$V_{GE}=V_{CE}, I_C=1\text{mA}$	5.0	5.4	5.6	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE}=15\text{V}, I_C=50\text{A}$	-	1.9	-	V
		$V_{GE}=15\text{V}, I_C=50\text{A}, T_{vj}=175^{\circ}\text{C}$	-	2.6	-	V

**Dynamic characteristics**

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$C_{ies}$	Input capacitance	$V_{CE}=30\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$	-	4820	-	pF
$C_{oes}$	Output capacitance		-	136	-	pF
$C_{res}$	Reverse transfer capacitance		-	37	-	pF
$Q_g$	Total gate charge	$V_{CC}=520\text{V}$ $V_{GE}=15\text{V}$ $I_C=50\text{A}$	-	158	-	nC

### Switching characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=50A$ $R_G=10\Omega$ 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	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=50A$ $R_G=10\Omega$ Inductive load $T_{vj}=175^\circ C$	-	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** ( $T_{vj}=25^{\circ}\text{C}$  unless otherwise specified)

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$V_F$	Diode forward voltage	$I_F=50\text{A}$	-	2.5	-	V
		$I_F=50\text{A}, T_{vj}=175^{\circ}\text{C}$	-	2.0	-	V
$t_{rr}$	Diode reverse recovery time	$V_R=400\text{V}$ $I_F=50\text{A}$ $di_F/dt=-800\text{A}/\mu\text{s}$	-	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	$V_R=400\text{V}$ $I_F=50\text{A}$ $di_F/dt=-800\text{A}/\mu\text{s}$ $T_{vj}=175^{\circ}\text{C}$	-	114	-	ns
$I_{rrm}$	Diode peak reverse recovery current		-	22	-	A
$Q_{rr}$	Diode reverse recovery charge		-	1384	-	nC

## Typical performance characteristics

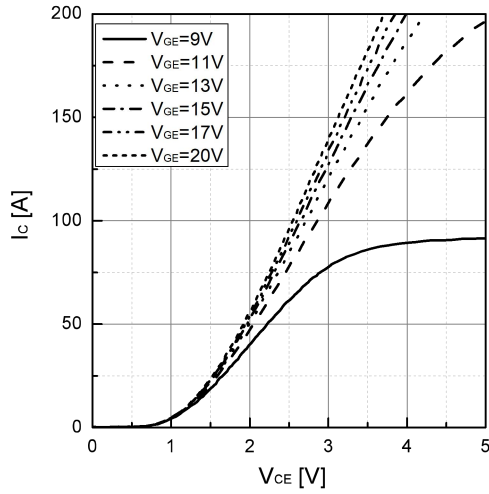


Fig 1. Typical output characteristic ( $T_{vj}=25^{\circ}\text{C}$ )

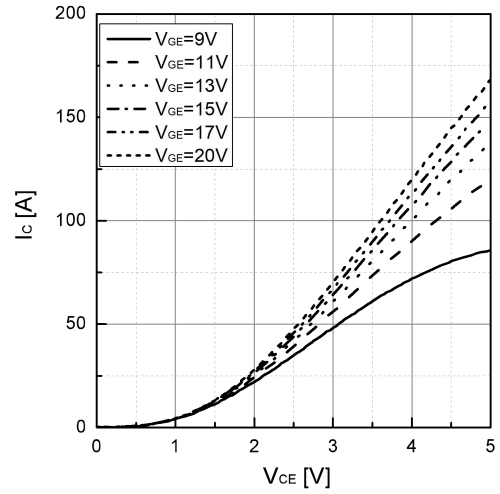


Fig 2. Typical output characteristic ( $T_{vj}=175^{\circ}\text{C}$ )

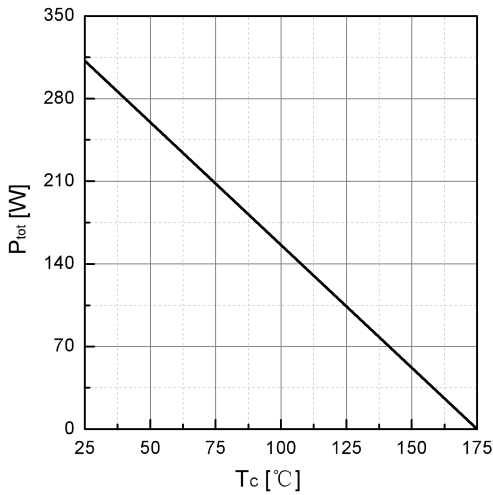


Fig 3. Power dissipation as a function of  $T_c$

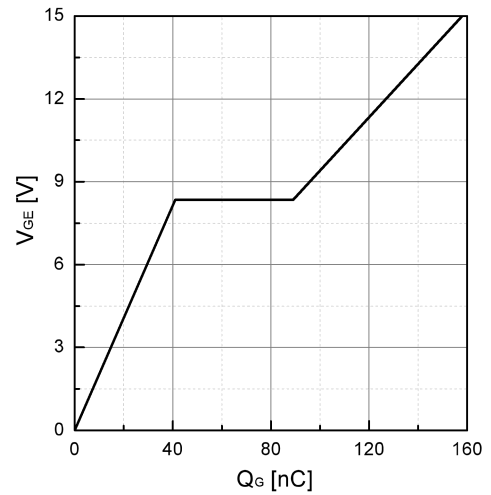


Fig 4. Typical Gate charge

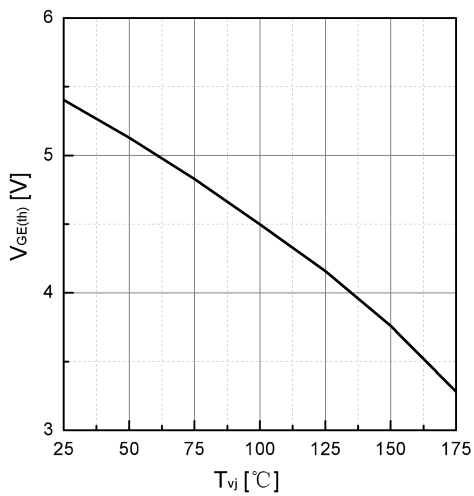


Fig 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}$   
( $I_C=1\text{mA}$ )

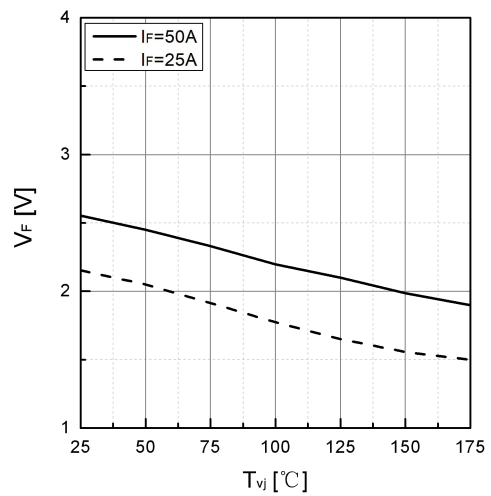


Fig 6. Typical  $V_F$  as a function of  $T_{vj}$

## Typical performance characteristics

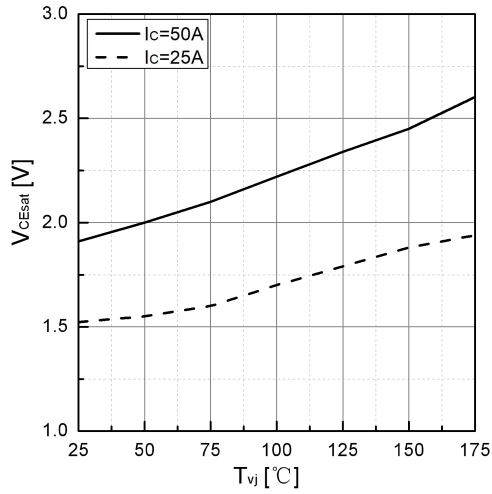


Fig 7. Typical  $V_{CEsat}$  as a function of  $T_{vj}$

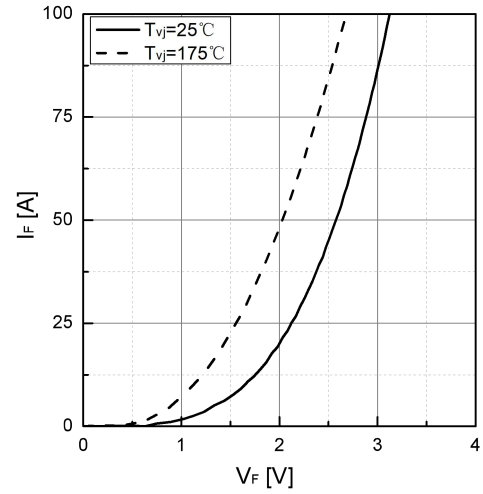


Fig 8. Typical  $I_F$  as a function of  $V_F$

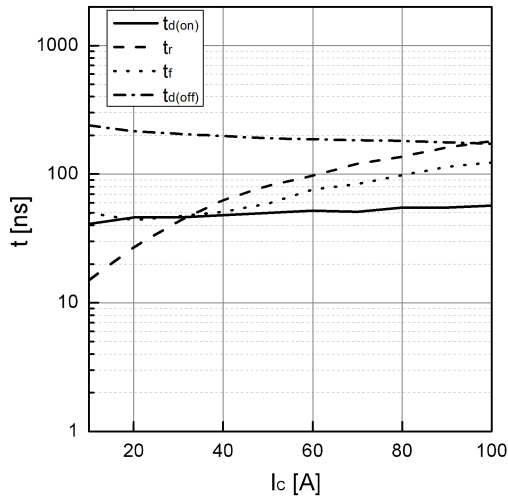


Fig 9. Typical switching time as a function of  $I_c$

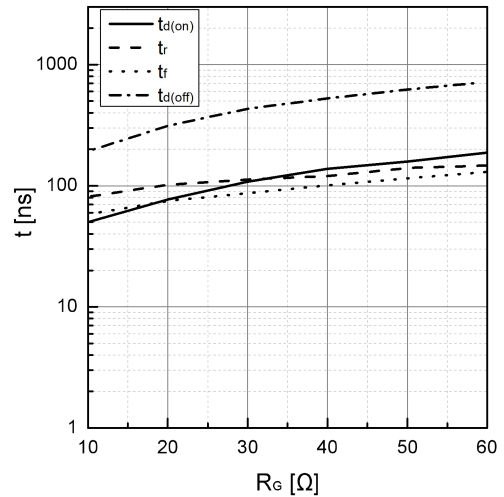


Fig 10. Typical switching times as a function of  $R_G$

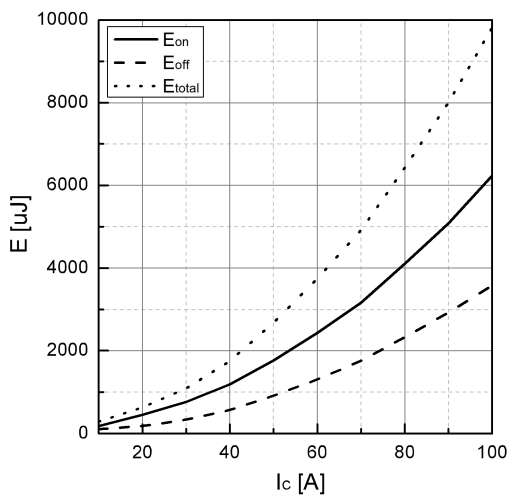


Fig 11. Typical switching energy losses as a function of  $I_c$

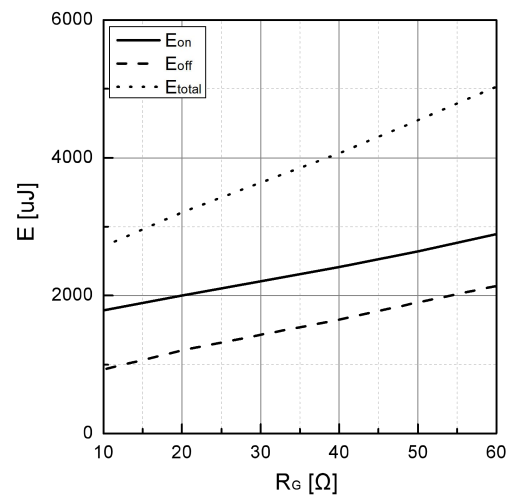


Fig 12. Typical switching energy losses as a function of  $R_G$

### Typical performance characteristics

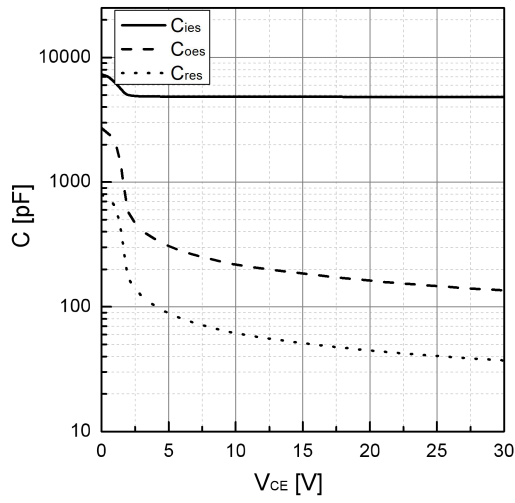


Fig 13. Typical capacitance as a function of  $V_{CE}$   
( $f=1\text{MHz}$ ,  $V_{GE}=0\text{V}$ )

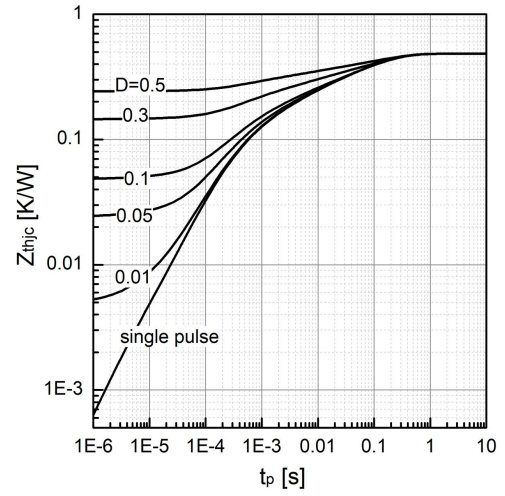
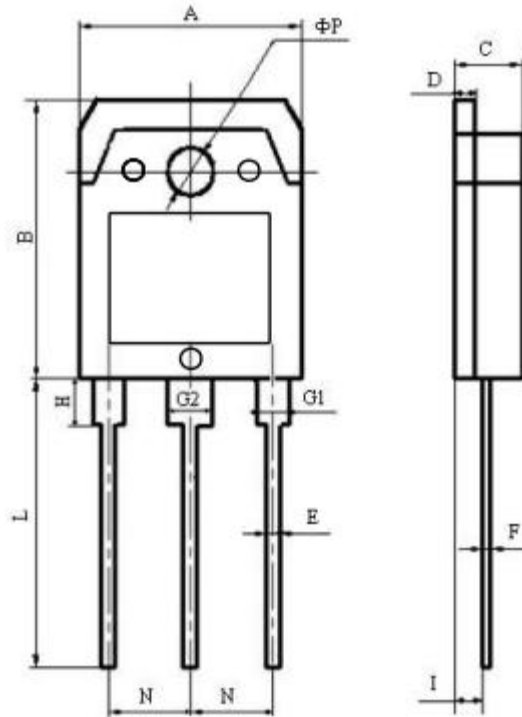


Fig 14. Transient thermal impedance of IGBT



**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
Φ P	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

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