

**Key performance:**

- $V_{CE}=650V$
- $I_C=40A@T_C=100^{\circ}C$
- $V_{CE(sat)}=1.7V$

**Features:**

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

**Benefits:**

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

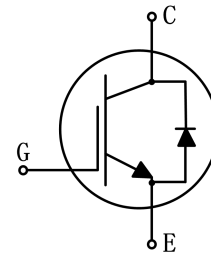
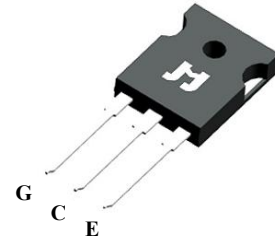
**Applications:**

- PFC applications
- Uninterruptible power supplies
- Solar inverters

**Package parameters**

Type	Marking	Package	Packaging Method
JJT40N65HK	T4065HK	TO-247i	Tube

TO-247i



## 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 ( $T_C=25^\circ\text{C}$ )	80	A
	Continuous collector current ( $T_C=100^\circ\text{C}$ )	40	A
$I_{CM}$	Pulsed collector current, $t_p$ limited by $T_{vjmax}$	160	A
$I_F$	Diode continuous forward current ( $T_C=100^\circ\text{C}$ )	40	A
$I_{FM}$	Diode maximum current, $t_p$ limited by $T_{vjmax}$	160	A
$P_{tot}$	Power dissipation ( $T_C=25^\circ\text{C}$ )	125	W
	Power dissipation ( $T_C=100^\circ\text{C}$ )	63	W
$T_{vj}$	Operating junction temperature range	-40 to +175	°C
$T_{stg}$	Storage temperature range	-55 to +150	°C

## Thermal characteristics

Symbol	Parameter	Values		Unit
		Typ.	Max.	
$R_{th(j-c)}$	Thermal resistance, junction to case for IGBT	-	1.2	K/ W
$R_{th(j-c)}$	Thermal resistance, junction to case for Diode	-	0.9	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	$V_{GE}=V_{CE}, I_C=1\text{mA}$	4.0	5.0	6.0	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE}=15\text{V}, I_C=40\text{A}$	-	1.7	-	V
		$V_{GE}=15\text{V}, I_C=40\text{A}, T_{vj}=175^{\circ}\text{C}$	-	2.3	-	V

**Dynamic characteristics**

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$C_{ies}$	Input capacitance	$V_{CE}=30\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$	-	2500	-	pF
$C_{oes}$	Output capacitance		-	101	-	pF
$C_{res}$	Reverse transfer capacitance		-	21	-	pF
$Q_g$	Total gate charge	$V_{CC}=520\text{V}$ $V_{GE}=15\text{V}$ $I_C=40\text{A}$	-	80	-	nC

### Switching characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=40A$ $R_G=10\Omega$ Inductive load	-	32	-	ns
$t_r$	Rise time		-	59	-	ns
$t_{d(off)}$	Turn-off delay time		-	110	-	ns
$t_f$	Fall time		-	52	-	ns
$E_{on}$	Turn-on energy		-	1.2	-	mJ
$E_{off}$	Turn-off energy		-	0.6	-	mJ
$E_{ts}$	Total switching energy		-	1.8	-	mJ
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=40A$ $R_G=10\Omega$ Inductive load $T_{vj}=175^\circ C$	-	28	-	ns
$t_r$	Rise time		-	51	-	ns
$t_{d(off)}$	Turn-off delay time		-	131	-	ns
$t_f$	Fall time		-	78	-	ns
$E_{on}$	Turn-on energy		-	1.6	-	mJ
$E_{off}$	Turn-off energy		-	1.0	-	mJ
$E_{ts}$	Total switching energy		-	2.6	-	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	$I_F=40\text{A}$	-	1.5	-	V
		$I_F=40\text{A}, T_{vj}=175^{\circ}\text{C}$	-	1.3	-	V
$t_{rr}$	Diode reverse recovery time	$V_R=400\text{V}$ $I_F=40\text{A}$ $di_F/dt=-1200\text{A}/\mu\text{s}$	-	82	-	ns
$I_{rrm}$	Diode peak reverse recovery current		-	15	-	A
$Q_{rr}$	Diode reverse recovery charge		-	1620	-	nC
$t_{rr}$	Diode reverse recovery time	$V_R=400\text{V}$ $I_F=40\text{A}$ $di_F/dt=-1200\text{A}/\mu\text{s}$ $T_{vj}=175^{\circ}\text{C}$	-	132	-	ns
$I_{rrm}$	Diode peak reverse recovery current		-	43	-	A
$Q_{rr}$	Diode reverse recovery charge		-	3580	-	nC

## Typical performance characteristics

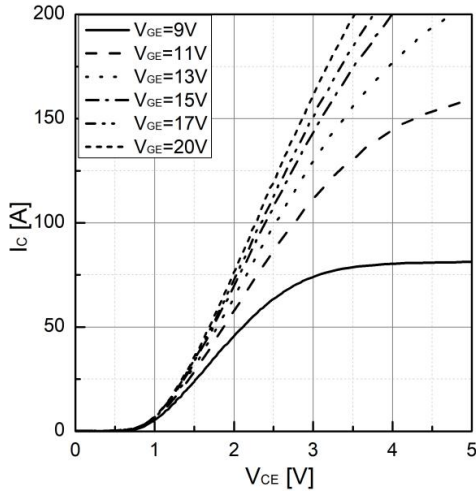


Fig 1. Typical output characteristic ( $T_{vj}=25^{\circ}\text{C}$ )

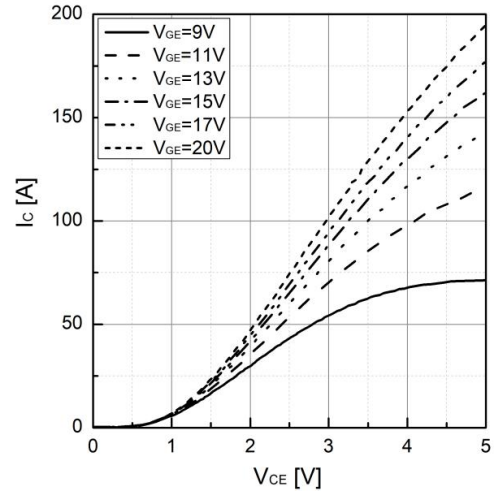


Fig 2. Typical output characteristic ( $T_{vj}=175^{\circ}\text{C}$ )

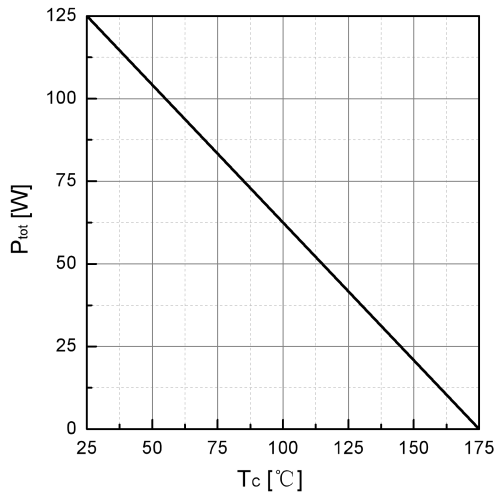


Fig 3. Power dissipation as a function of  $T_c$

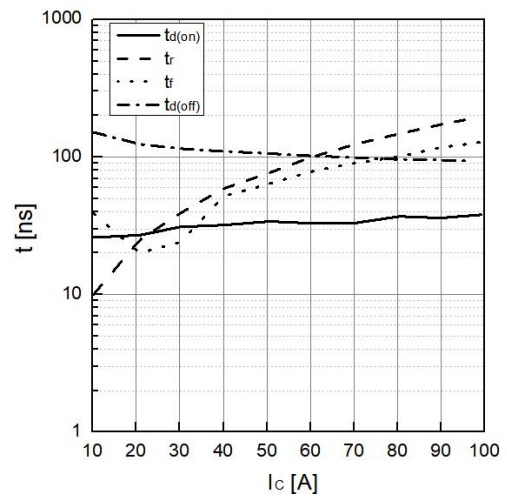


Fig 4. Typical switching time as a function of  $I_c$

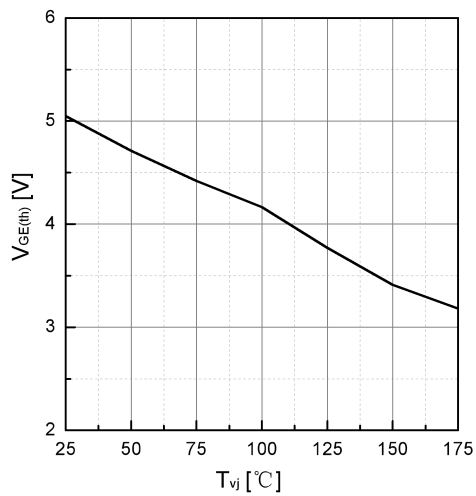


Fig 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}$   
( $I_c=1\text{mA}$ )

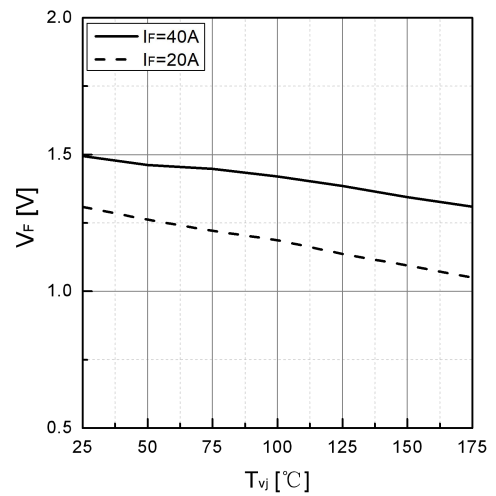


Fig 6. Typical  $V_F$  as a function of  $T_{vj}$

## Typical performance characteristics

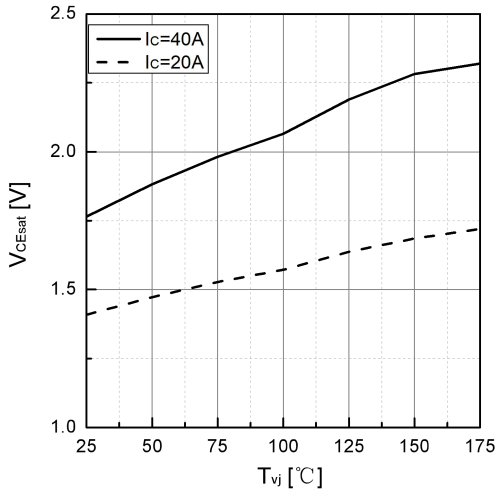


Fig 7. Typical  $V_{CEsat}$  as a function of  $T_{vj}$

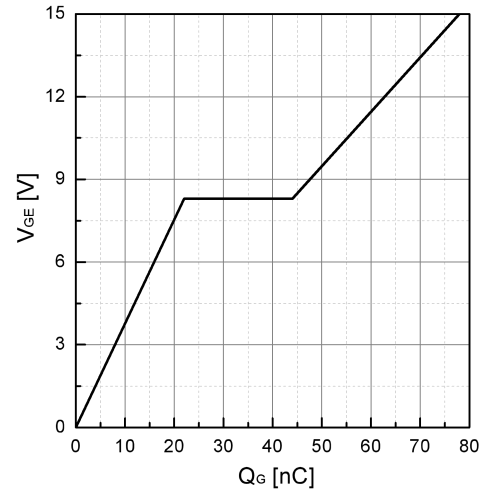


Fig 8. Typical Gate charge

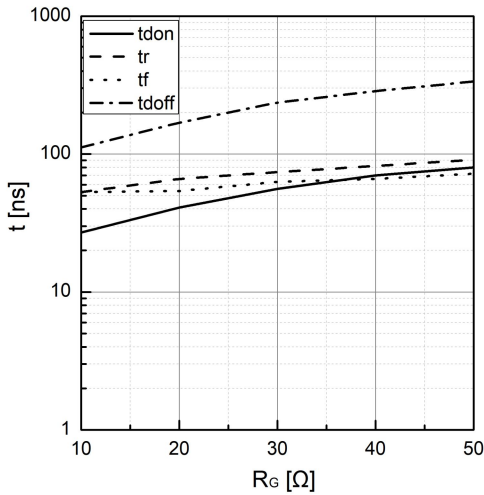


Fig 9. Typical switching times as a function of  $R_G$

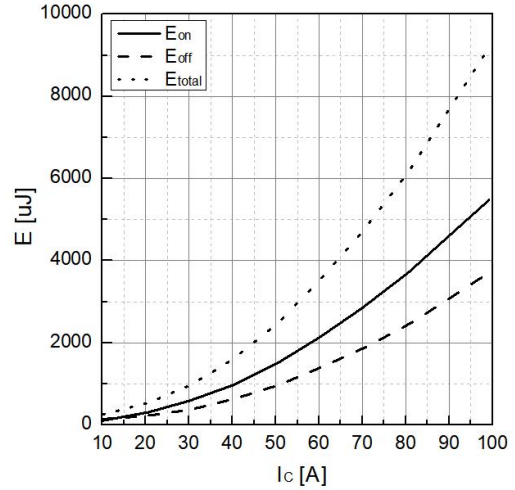


Fig 10. Typical switching energy losses as a function of  $I_c$

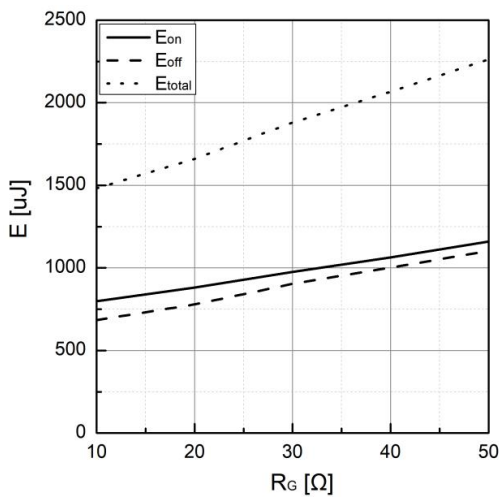


Fig 11. Typical switching energy losses as a function of  $R_G$

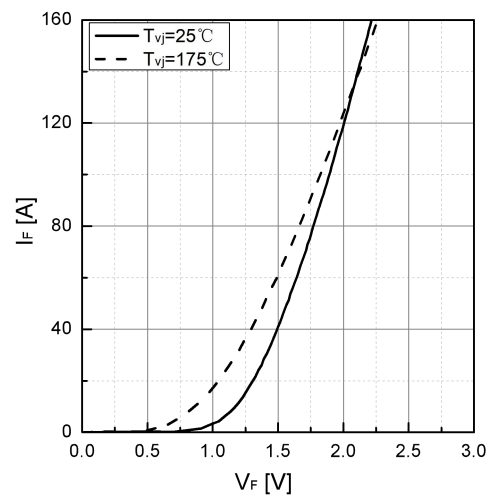


Fig 12. Typical  $I_F$  as a function of  $V_F$

### Typical performance characteristics

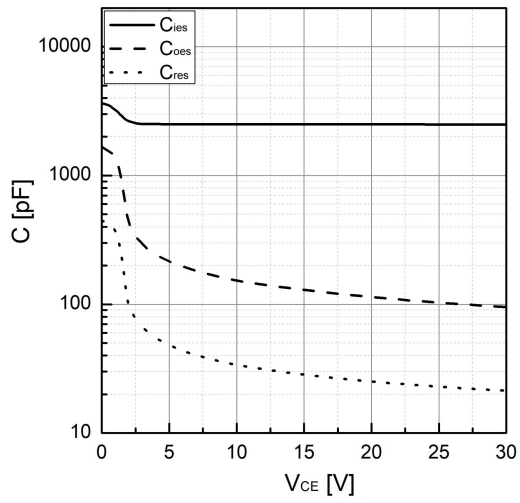


Fig 13. Typical capacitance as a function of  $V_{CE}$   
( $f=1\text{MHz}$ ,  $V_{GE}=0\text{V}$ )

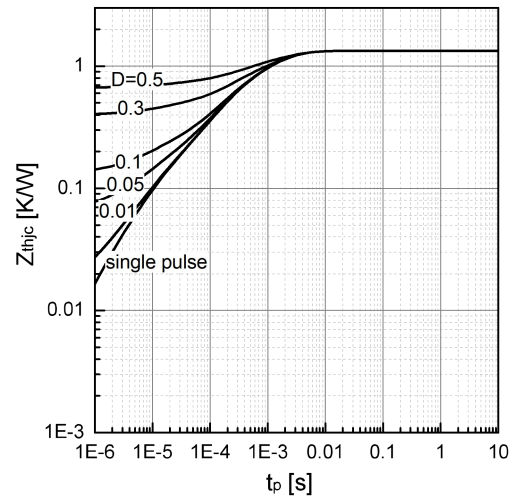
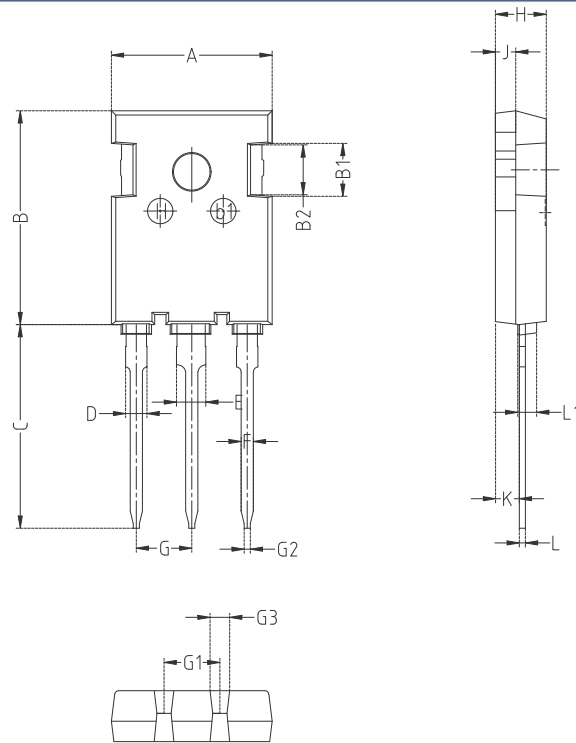


Fig 14. Transient thermal impedance of IGBT



**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
2024-10-22	Rev 1.0	Release of the datasheet

## Disclaimer

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