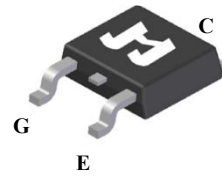


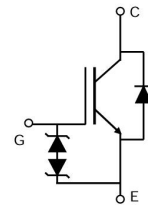
**Key performance:**

- $V_{CE}=650V$
- $I_C=6A@T_C=100^{\circ}C$
- $V_{CE(sat)}=1.7V$

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
- HBM  $\geq \pm 2000V$
- CDM  $\geq \pm 500V$


**Applications:**

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

**Package parameters**

Type	Marking	Package	Packaging method
JJT6N65TD	T0665STD	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 ( $T_C=25^\circ\text{C}$ )	12	A
	Continuous collector current ( $T_C=100^\circ\text{C}$ )	6	A
$I_{CM}$	Pulsed collector current, $t_p$ limited by $T_{vjmax}$	24	A
$I_F$	Diode continuous forward current ( $T_C=100^\circ\text{C}$ )	6	A
$I_{FM}$	Diode maximum current, $t_p$ limited by $T_{vjmax}$	24	A
$t_{sc}$	Short circuit withstand time	8	µs
$P_{tot}$	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	-	3.0	K/ W
$R_{th(j-a)}$	Thermal resistance, junction to ambient	-	90	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	$V_{CE}=650\text{V}, V_{GE}=0\text{V}$	-	-	10	$\mu\text{A}$
$I_{GES}$	Gate leakage current, forward	$V_{GE}=20\text{V}, V_{CE}=0\text{V}$	-	-	100	$\mu\text{A}$
	Gate leakage current, reverse	$V_{GE}=-20\text{V}, V_{CE}=0\text{V}$	-	-	-100	$\mu\text{A}$
$V_{GE(th)}$	Gate-emitter threshold voltage	$V_{GE}=V_{CE}, I_C=1\text{mA}$	5.3	6.3	7.3	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE}=15\text{V}, I_C=6\text{A}$	-	1.7	-	V
		$V_{GE}=15\text{V}, I_C=6\text{A}, T_{vj}=175^{\circ}\text{C}$	-	2.2	-	V

**Dynamic characteristics**

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$C_{ies}$	Input capacitance	$V_{CE}=30\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$	-	355	-	pF
$C_{oes}$	Output capacitance		-	25	-	pF
$C_{res}$	Reverse transfer capacitance		-	8	-	pF
$Q_g$	Total gate charge	$V_{CC}=520\text{V}$ $V_{GE}=15\text{V}$ $I_C=6\text{A}$	-	19	-	nC

### Switching characteristics

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=6A$ $R_G=10\Omega$ Inductive load	-	9	-	ns
$t_r$	Rise time		-	18	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
$t_f$	Fall time		-	91	-	ns
$E_{on}$	Turn-on energy		-	0.18	-	mJ
$E_{off}$	Turn-off energy		-	0.09	-	mJ
$E_{ts}$	Total switching energy		-	0.27	-	mJ
$t_{d(on)}$	Turn-on delay time	$V_{CC}=400V$ $V_{GE}=0/15V$ $I_C=6A$ $R_G=10\Omega$ Inductive Load $T_{vj}=175^\circ C$	-	8	-	ns
$t_r$	Rise time		-	20	-	ns
$t_{d(off)}$	Turn-off delay time		-	33	-	ns
$t_f$	Fall time		-	118	-	ns
$E_{on}$	Turn-on energy		-	0.23	-	mJ
$E_{off}$	Turn-off energy		-	0.15	-	mJ
$E_{ts}$	Total switching energy		-	0.38	-	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	$I_F=6\text{A}$	-	1.4	-	V
		$I_F=6\text{A}, T_{vj}=175^{\circ}\text{C}$	-	1.2	-	V
$t_{rr}$	Diode reverse recovery time	$V_R=400\text{V}$ $I_F=6\text{A}$ $di_F/dt=-500\text{A}/\mu\text{s}$	-	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	$V_R=400\text{V}$ $I_F=6\text{A}$ $di_F/dt=-500\text{A}/\mu\text{s}$ $T_{vj}=175^{\circ}\text{C}$	-	98	-	ns
$I_{rrm}$	Diode peak reverse recovery current		-	12	-	A
$Q_{rr}$	Diode reverse recovery charge		-	529	-	nC

## Typical performance characteristics

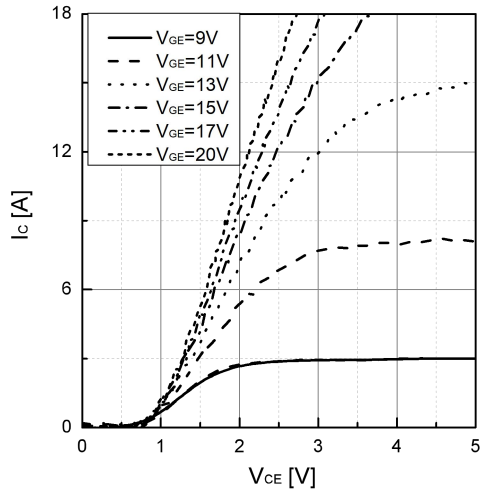


Fig 1. Typical output characteristic ( $T_{vj}=25^{\circ}\text{C}$ )

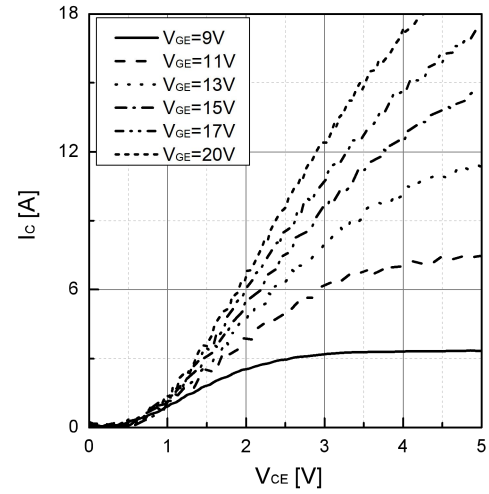


Fig 2. Typical output characteristic ( $T_{vj}=175^{\circ}\text{C}$ )

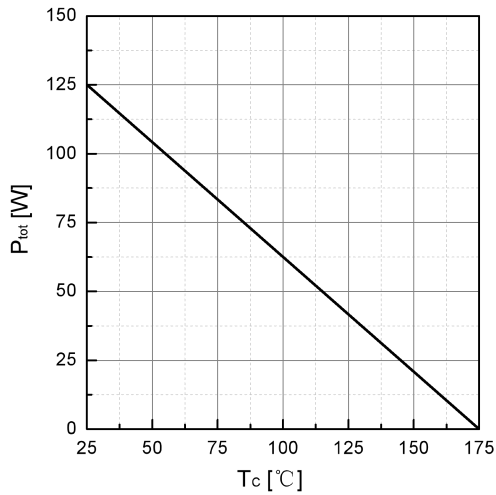


Fig 3. Power dissipation as a function of  $T_c$

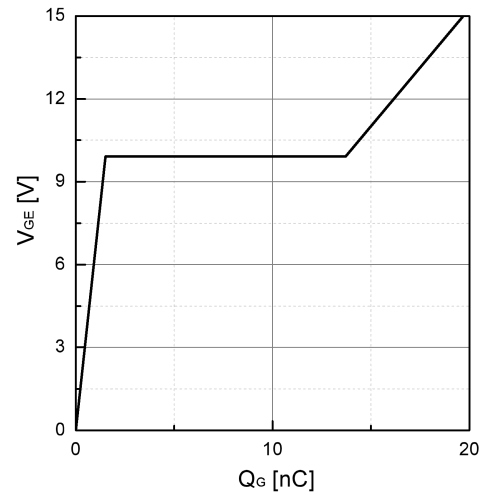


Fig 4. Typical Gate charge

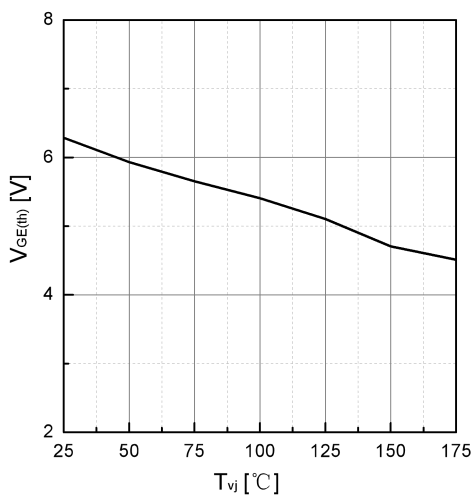


Fig 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}$   
( $I_C=1\text{mA}$ )

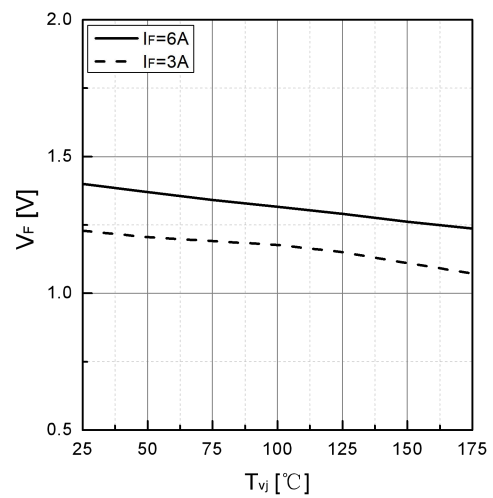


Fig 6. Typical  $V_F$  as a function of  $T_{vj}$

## Typical performance characteristics

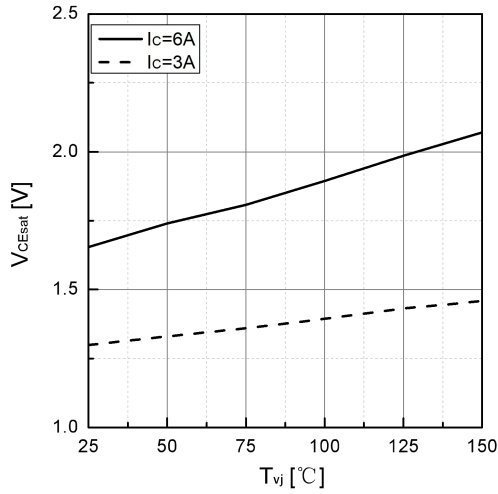


Fig 7. Typical  $V_{CEsat}$  as a function of  $T_{vj}$

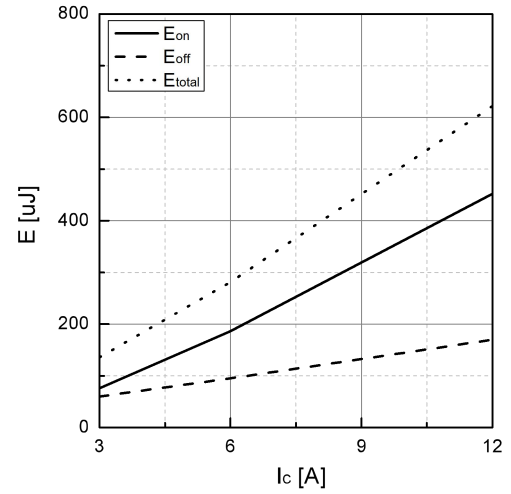


Fig 8. Typical switching time as a function of  $I_c$

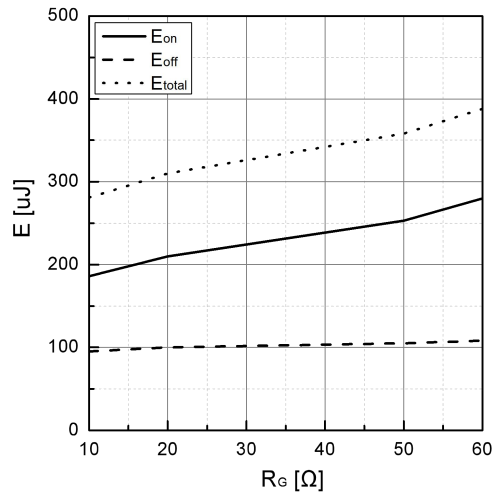


Fig 9. Typical switching times as a function of  $R_G$

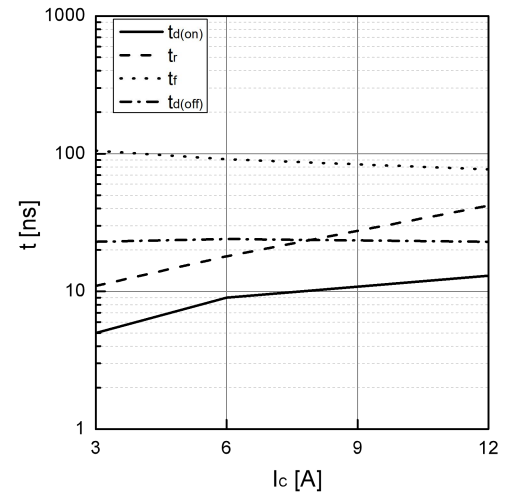


Fig 10. Typical switching energy losses as a function of  $I_c$

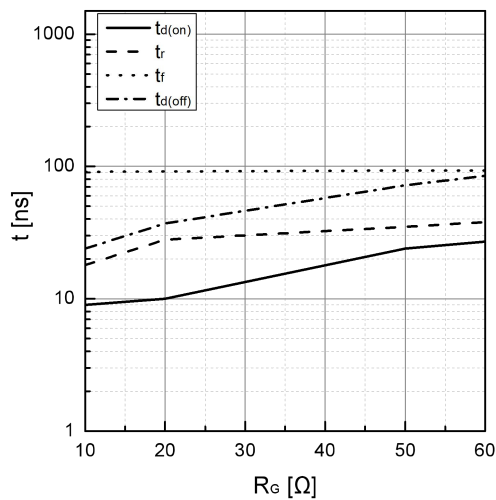


Fig 11. Typical switching energy losses as a function of  $R_G$

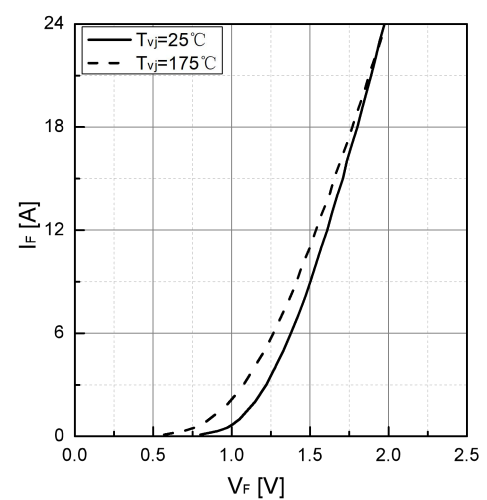


Fig 12. Typical  $I_F$  as a function of  $V_F$

### Typical performance characteristics

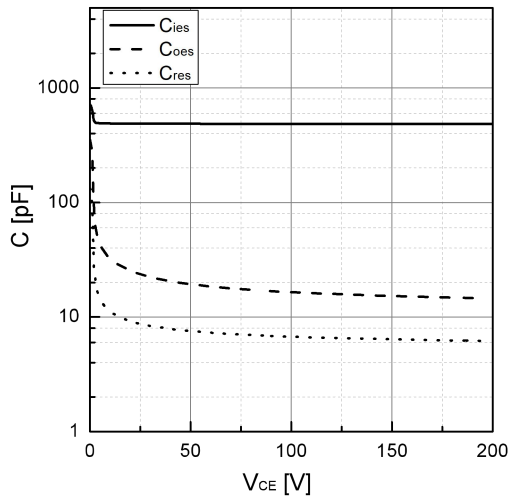


Fig 13. Typical capacitance as a function of  $V_{CE}$   
( $f=1\text{MHz}$ ,  $V_{GE}=0\text{V}$ )

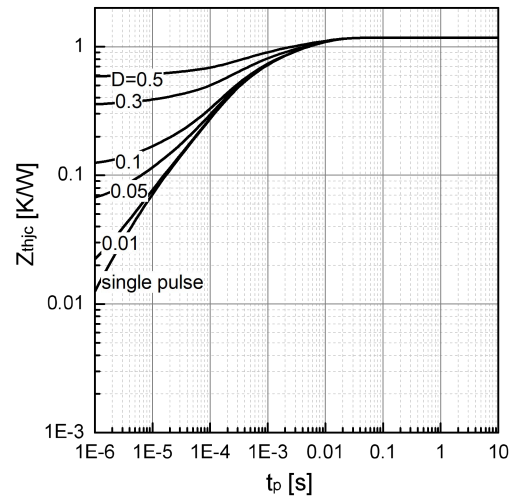
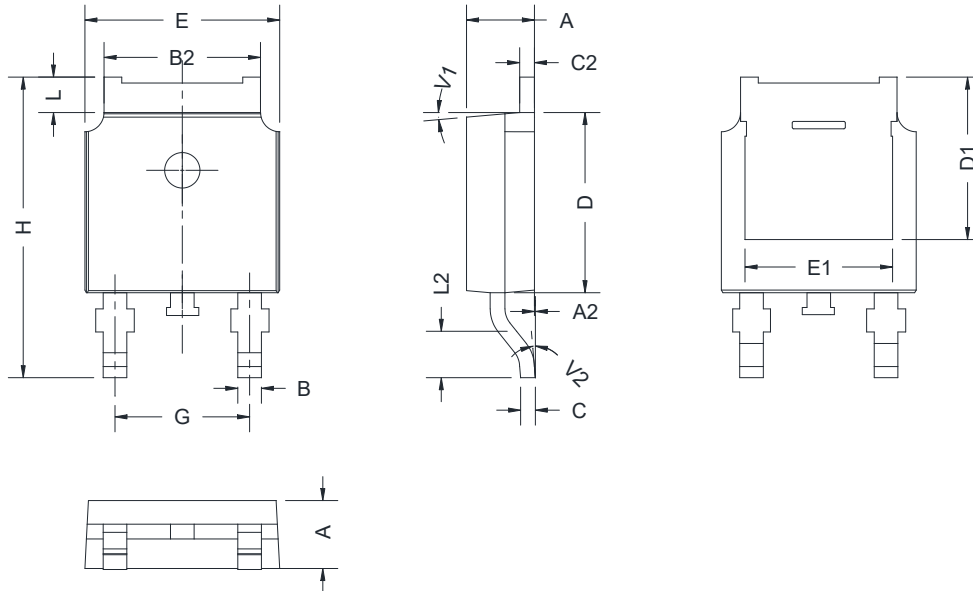


Fig 14. Transient thermal impedance of IGBT



**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
2024-09-06	Rev 1.0	Release of the datasheet
2024-10-22	Rev 1.1	Character Update
2025-02-06	Rev 1.2	Update Rth

## Disclaimer

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