

**Key performance:**

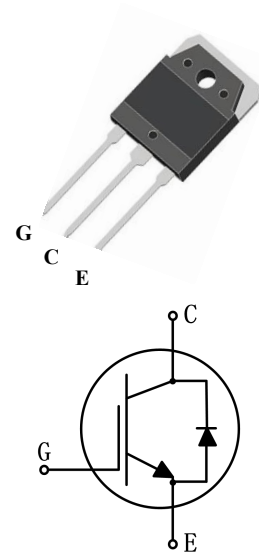
- $V_{CE}=1350V$
- $I_C=20A@T_C=100^{\circ}C$
- $V_{CE(sat)}=1.7V$

**Features:**

- Trench and field-stop technology
- Low collector to emitter saturation voltage
- Easy parallel switching capability
- High ruggedness performance
- RoHS compliant

**Applications:**

- Induction cooking
- Resonant converters

**TO-3P**

**Package parameters**

Type	Marking	Package	Packaging Method
JST20N135UH	ST20135UH	TO-3P	Tube

## Maximum ratings

Symbol	Parameter	Values	Unit
$V_{CES}$	Collector-emitter voltage	1350	V
$V_{GES}$	Gate-emitter voltage	±20	V
$I_C$	Continuous collector current ( $T_C=25^\circ\text{C}$ )	40	A
	Continuous collector current ( $T_C=100^\circ\text{C}$ )	20	A
$I_{CM}$	Pulsed collector current, $t_p$ limited by $T_{vjmax}$	80	A
$I_F$	Diode continuous forward current ( $T_C=100^\circ\text{C}$ )	20	A
$I_{FM}$	Diode maximum current, $t_p$ limited by $T_{vjmax}$	80	A
$P_{tot}$	Power dissipation ( $T_C=25^\circ\text{C}$ )	375	W
	Power dissipation ( $T_C=100^\circ\text{C}$ )	187	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	0.4	-	K/ W
$R_{th(j-c)}$	Thermal resistance, junction to case for Diode	1.2	-	K/ W
$R_{th(j-a)}$	Thermal resistance, junction to ambient	39	-	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	$V_{GE}=0\text{V}, I_C=250\mu\text{A}$	1350	-	-	V
$I_{CES}$	Collector-emitter leakage current	$V_{CE}=1350\text{V}, V_{GE}=0\text{V}$	-	-	100	$\mu\text{A}$
$I_{GES}$	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	$V_{GE}=V_{CE}, I_C=1\text{mA}$	5.4	5.9	6.4	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE}=15\text{V}, I_C=20\text{A}$	-	1.7	-	V
		$V_{GE}=15\text{V}, I_C=20\text{A}, T_{vj}=175^{\circ}\text{C}$	-	2.15	-	V

**Dynamic characteristics**

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$C_{ies}$	Input capacitance	$V_{CE}=30\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$	-	2940	-	pF
$C_{oes}$	Output capacitance		-	35	-	pF
$C_{res}$	Reverse transfer capacitance		-	7	-	pF
$Q_g$	Total gate charge	$V_{CC}=1080\text{V}$ $V_{GE}=15\text{V}$ $I_C=20\text{A}$	-	85	-	nC

**Switching characteristics**

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $V_{GE}=0/15V$ $I_C=20A$ $R_G=10\Omega$ Inductive load	-	32	-	ns
$t_r$	Rise time		-	38	-	ns
$t_{d(off)}$	Turn-off delay time		-	130	-	ns
$t_f$	Fall time		-	250	-	ns
$E_{on}$	Turn-on energy		-	1.5	-	mJ
$E_{off}$	Turn-off energy		-	1.4	-	mJ
$E_{ts}$	Total switching energy		-	2.9	-	mJ
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600V$ $V_{GE}=0/15V$ $I_C=20A$ $R_G=10\Omega, T_{vj}=175^\circ C$ Inductive load	-	29	-	ns
$t_r$	Rise time		-	36	-	ns
$t_{d(off)}$	Turn-off delay time		-	159	-	ns
$t_f$	Fall time		-	397	-	ns
$E_{on}$	Turn-on energy		-	1.6	-	mJ
$E_{off}$	Turn-off energy		-	2.0	-	mJ
$E_{ts}$	Total switching energy		-	3.6	-	mJ

**Electrical characteristics of Diode** ( $T_{vj}=25^\circ C$  unless otherwise specified)

Symbol	Parameter	Test condition	Values			Unit
			Min.	Typ.	Max.	
$V_F$	Diode forward voltage	$I_F=20A$	-	1.65	-	V
		$I_F=20A, T_{vj}=175^\circ C$	-	1.55	-	V

## Typical performance characteristics

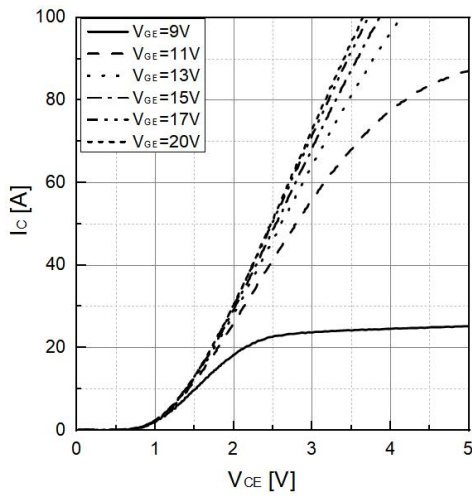


Fig 1. Typical output characteristic ( $T_{vj}=25^{\circ}\text{C}$ )

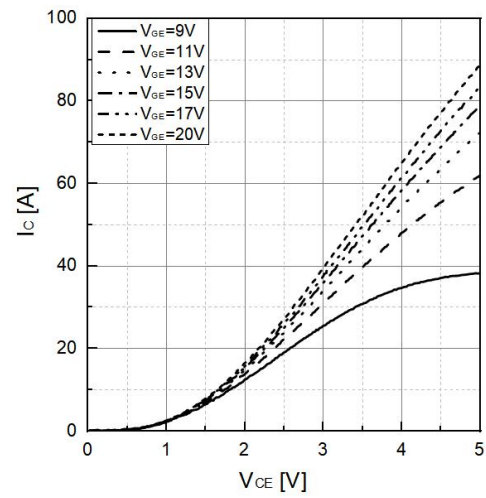


Fig 2. Typical output characteristic ( $T_{vj}=175^{\circ}\text{C}$ )

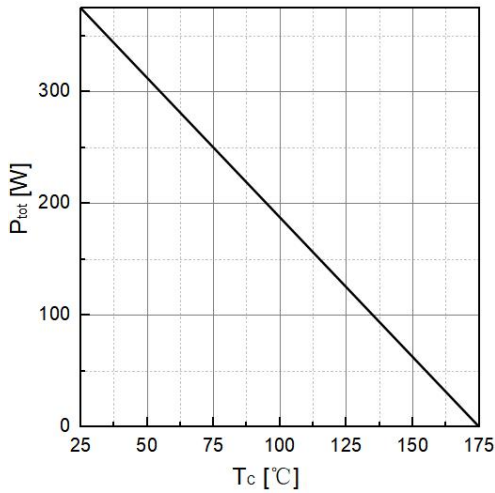


Fig 3. Power dissipation as a function of  $T_c$

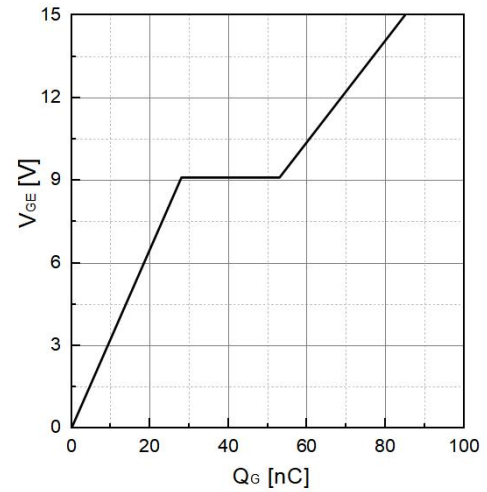


Fig 4. Typical Gate charge

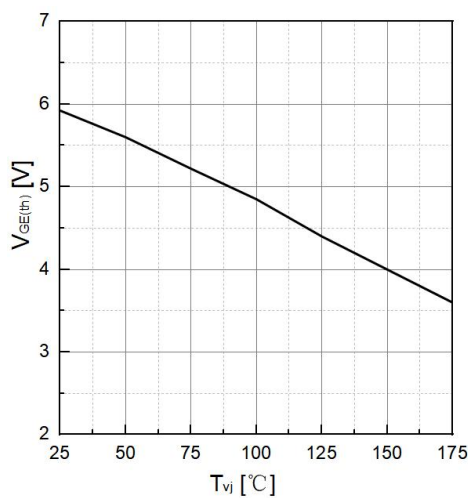


Fig 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}$   
( $I_C=1\text{mA}$ )

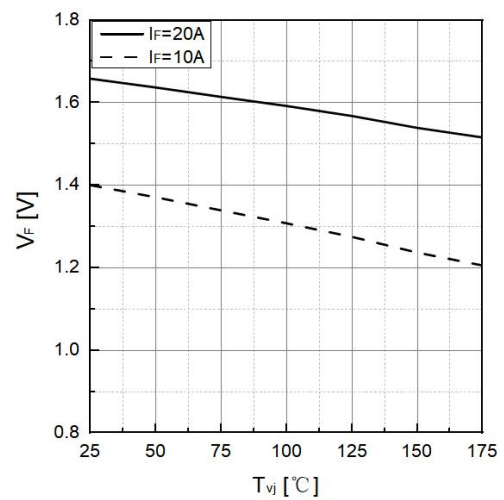


Fig 6. Typical  $V_F$  as a function of  $T_{vj}$

Typical performance characteristics

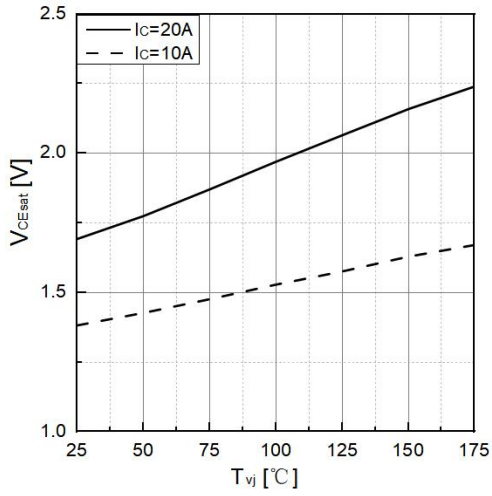


Fig 7. Typical  $V_{CEsat}$  as a function of  $T_{vj}$

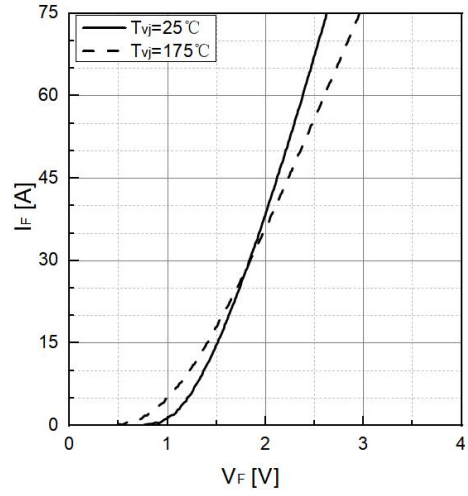


Fig 8. Typical  $I_F$  as a function of  $V_F$

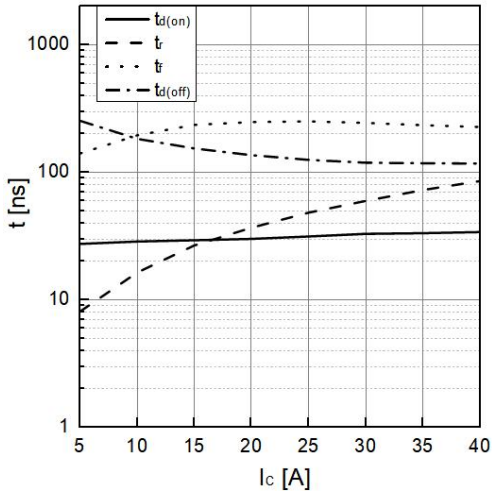


Fig 9. Typical switching time as a function of  $I_c$

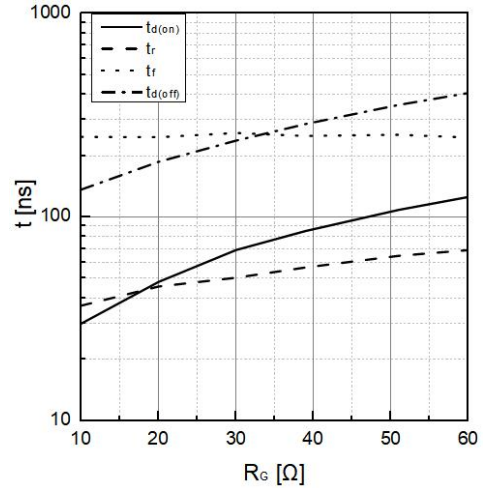


Fig 10. Typical switching times as a function of  $R_G$

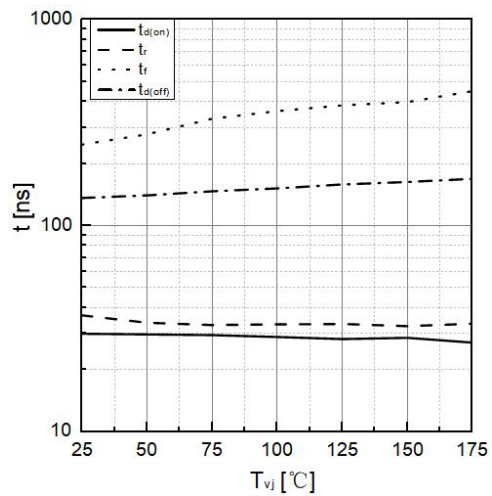


Fig 11. Typical switching time as a function of  $T_{vj}$

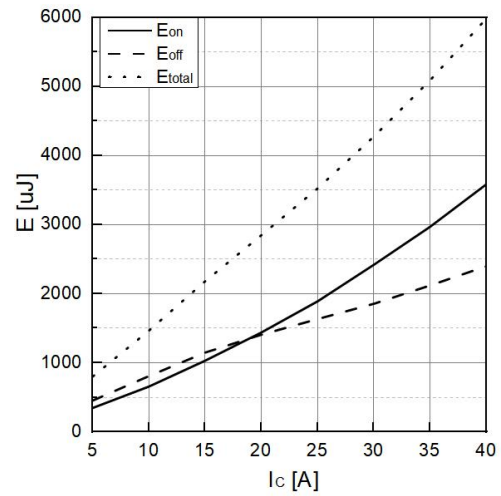


Fig 12. Typical switching energy losses as a function of  $I_c$

## Typical performance characteristics

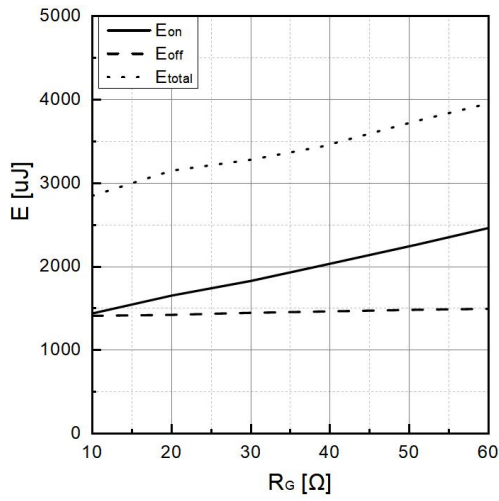


Fig 13. Typical switching energy losses as a function of  $R_G$

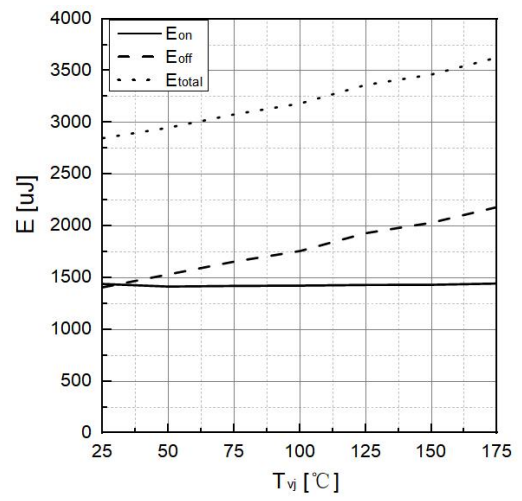


Fig 14. Typical switching energy losses as a function of  $T_{vj}$

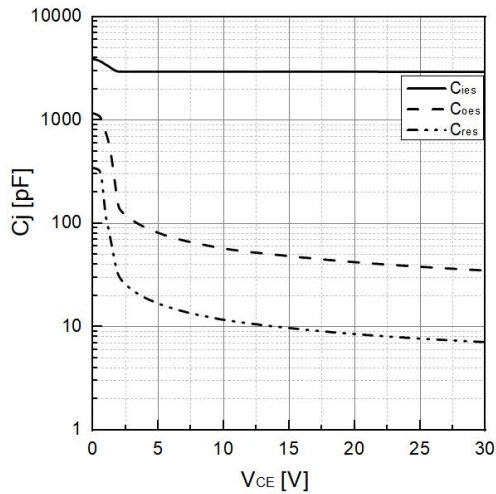


Fig 15. Typical capacitance as a function of  $V_{CE}$   
( $f=1\text{MHz}$ ,  $V_{GE}=0\text{V}$ )

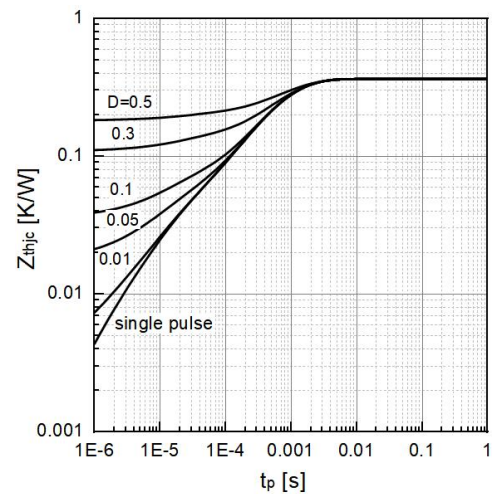
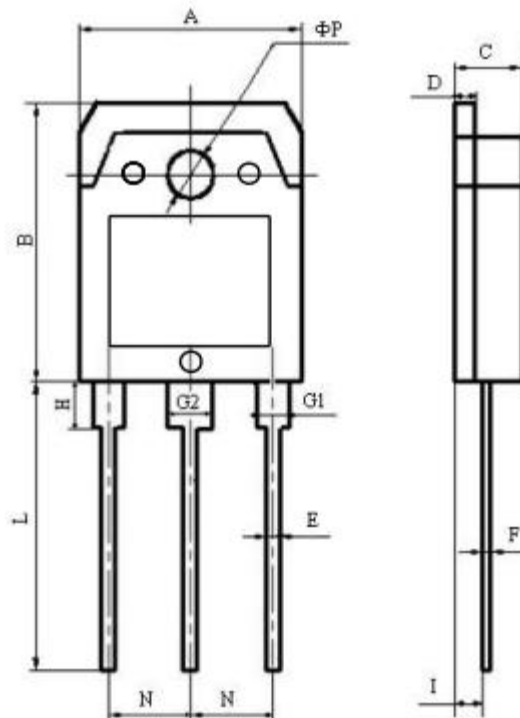


Fig 16. Transient thermal impedance of IGBT

**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
2026-01-24	Rev 1.0	Initial Release

## Disclaimer

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