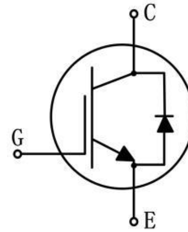
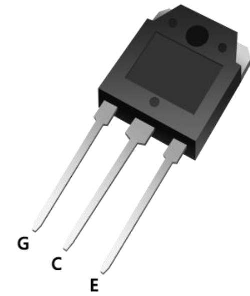
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
I_C	40	A
$V_{CE(sat)}$	1.9	V





TO-3PN

Features

- Trench and field-stop technology
- Low saturation voltage:$V_{CE(sat).typ}$=1.9V @I_C=40A and T_C=100℃
- Low switching loss:$E_{off.typ}$=0.95mJ @I_C=40A and T_C=100℃
- Easy parallel switching capability

Applications

- Energy storage
- Solar string inverter
- Uninterruptible Power Supply

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Gate-Emitter Voltage	V_{GES}	±20	V
Continuous collector current(T_C=25℃)	I_C	80	A
Continuous collector current(T_C=100℃)		40	A
Pulse collector current,t_p=1ms	I_{CM}	160	A
Diode continuous forward current(T_C=100℃)	I_F	40	A
Diode maximum current,t_p limited by T_{vjmax}	I_{FM}	160	A
Power dissipation(T_C=25℃)	P_{tot}	300	W
Maximum junction temperature	T_{vj}	-40 to+175	℃
Maximum storage temperature	T_{STG}	-55 to+150	℃

Thermal Characteristics

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Thermal resistance,junction to case for IGBT	$R_{th(j-C)}$	-	-	0.5	℃/W
Thermal resistance,junction to case for Diode	$R_{th(j-C)}$	-	-	1.1	℃/W
Thermal resistance,junction to ambient	$R_{th(j-a)}$	-	-	40	℃/W

Electrical Characteristics of IGBT (T_{vj}=25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V,I_C=250μA	650	-	-	V
Collector-emitter leakage current	I_{CES}	V_{CE}=650V,V_{GE}=0V	-	-	10	μA
Gate leakage current,forward	I_{GES}	V_{GE}=±20V,V_{CE}=0V	-	-	100	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE},I_C=1mA	4.0	5.0	6.0	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=40A	-	1.9	-	V
		V_{GE}=15V,I_C=40A,T_{vj}=150℃	-	2.3	-	V
Input capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	-	2480	-	pF
Output capacitance	C_{oes}		-	95	-	pF
Reverse transfer capacitance	C_{res}		-	21	-	pF
Gate charge	Q_G	V_{CC}=520V V_{GE}=15V I_C=40A	-	78	-	nC
Turn-on delay time	$t_{d(on)}$	VCC=400V VGE=15V I_C=40A R_G=10Ω Inductive load	-	32	-	ns
Rise time	t_r		-	55	-	ns
Turn-off delay time	$t_{d(off)}$		-	106	-	ns
Fall time	t_f		-	51	-	ns
Turn-on energy	E_{on}		-	0.9	-	mJ
Turn-off energy	E_{off}		-	0.5	-	mJ
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V V_{GE}=15V I_C=40A R_G=10Ω Inductive load T_{vj}=150℃	-	28	-	ns
Rise time	t_r		-	52	-	ns
Turn-off delay time	$t_{d(off)}$		-	128	-	ns
Fall time	t_f		-	75	-	ns
Turn-on energy	E_{on}		-	0.9	-	mJ
Turn-off energy	E_{off}		-	0.9	-	mJ

Diode Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Diode forward voltage	V_F	I_F=40A	-	2.4	-	V
		I_F=40A,T_{vj}=150℃	-	1.8	-	V
Diode reverse recovery time	t_{rr}	V_R=400V I_F=40A diF/dt=-950A/us	-	68	-	ns
Diode peak reverse recovery current	I_{rrm}		-	15	-	A
Diode reverse recovery charge	Q_{rr}		-	522	-	nC
Diode reverse recovery time	t_{rr}	V_R=400V I_F=40A diF/dt=-950A/μs T_{vj}=150℃	-	106	-	ns
Diode peak reverse recovery current	I_{rrm}		-	24	-	A
Diode reverse recovery charge	Q_{rr}		-	1423	-	nC

Typical Characteristics

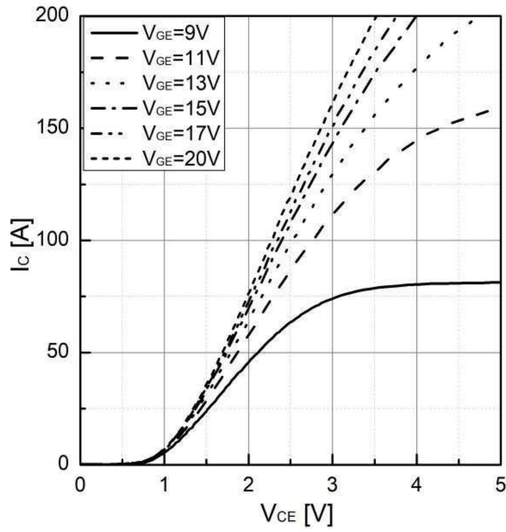


Fig 1. Typical output characteristics (T_{vj}=25℃)

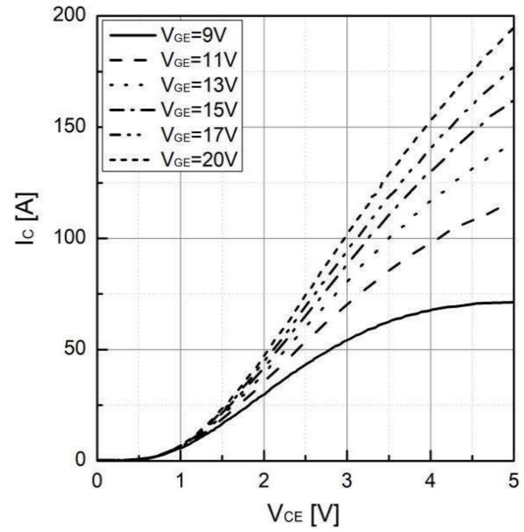


Fig 2. Typical output characteristics (T_{vj}= 150℃)

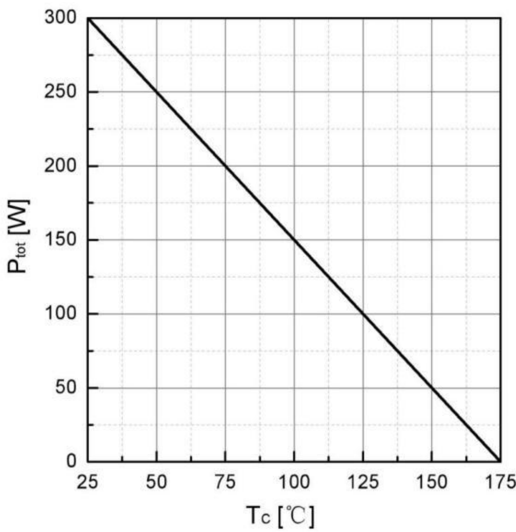


Fig 3. Power dissipation as a function of T_C

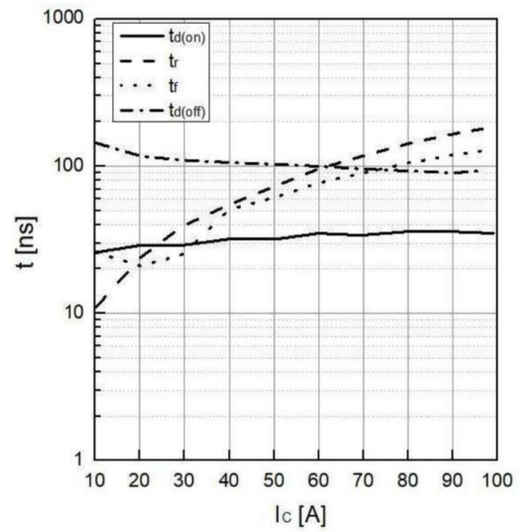


Fig 4. Typical switching time as a function of I_C

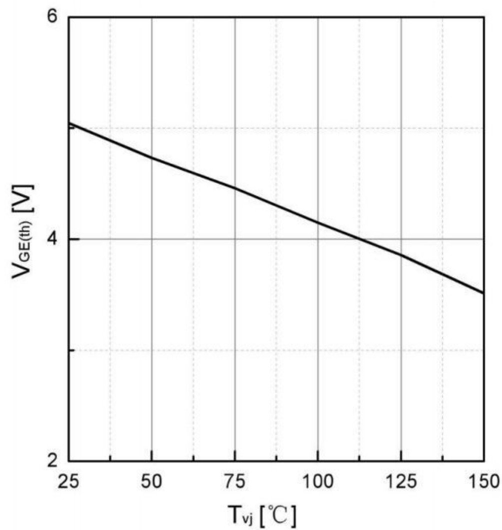


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj}

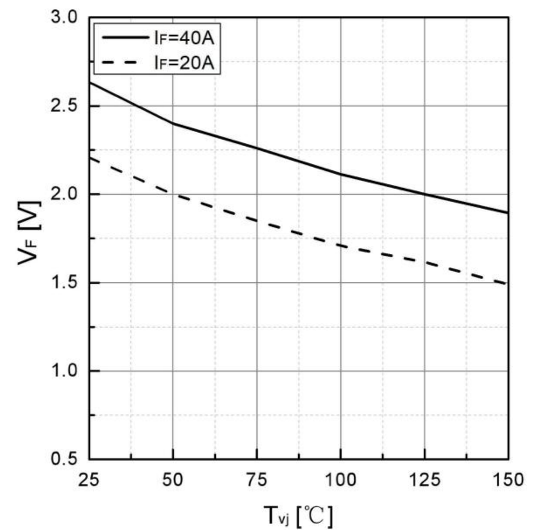


Fig 6. Typical V_F as a function of T_{vj}

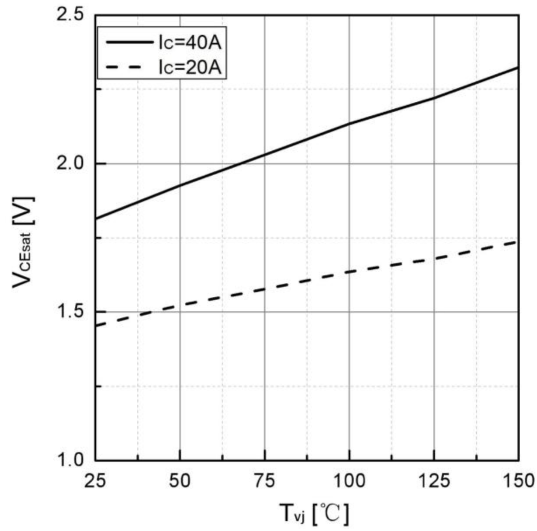


Fig 7.Typical V_{CEsat} as a function of T_{vj}

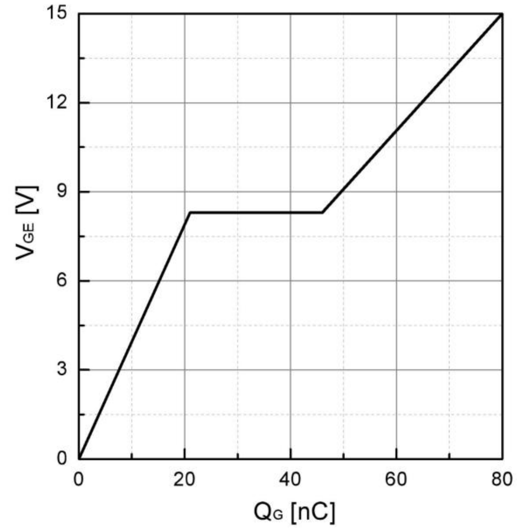


Fig 8.Typical Gate charge

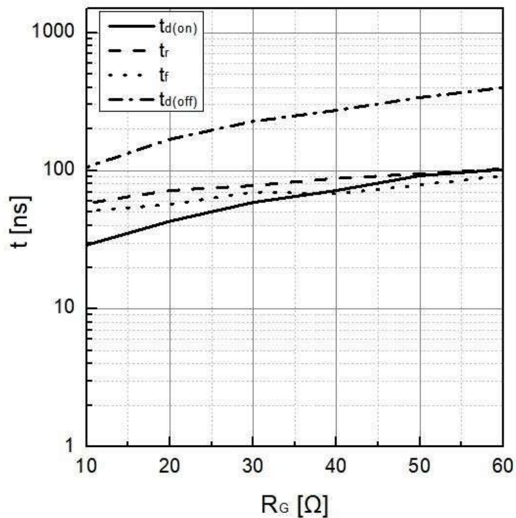


Fig 9.Typical switching times as a function of R_G

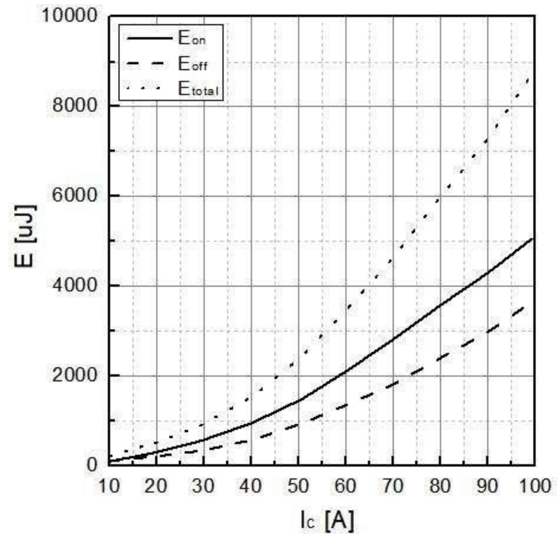


Fig 10.Typical switching energy losses as a function of I_C

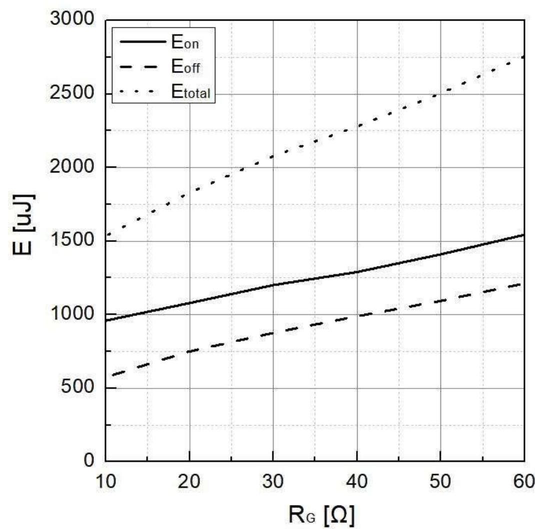


Fig 11.Typical switching energy losses as a function of R_G

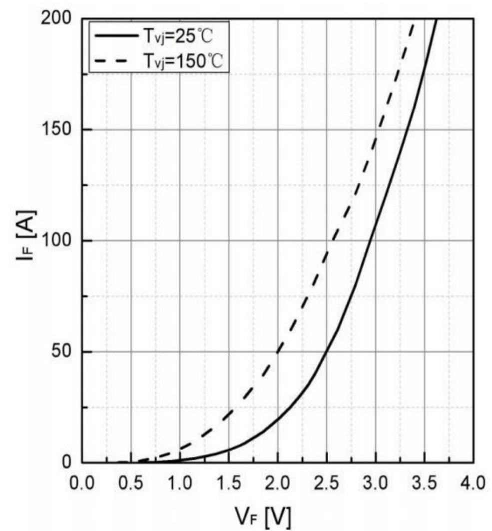


Fig 12.Typical I_F as a function of V_F

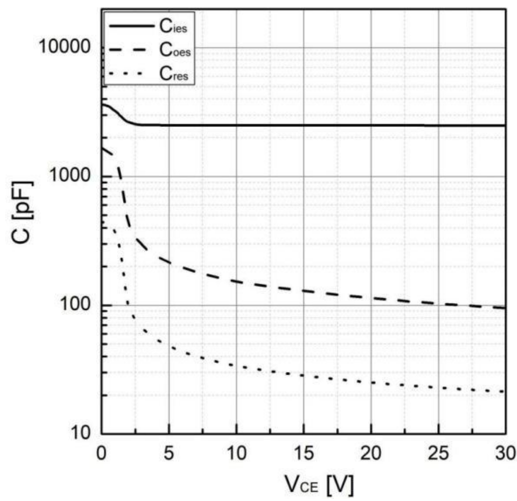


Fig 13.Typical capacitance as a function of V_{CE} (f=1Mhz,V_{GE}=0V)

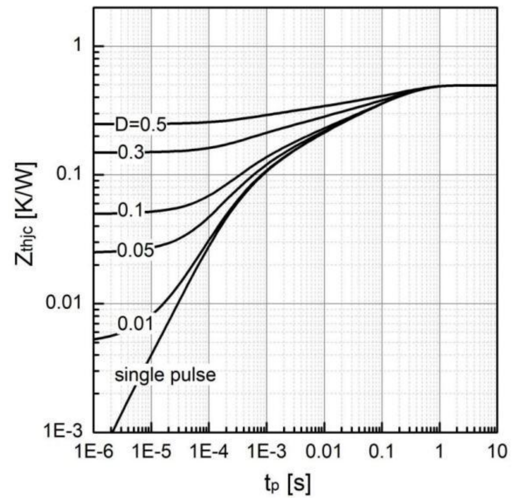


Fig 14.Transient thermal impedance of IGBT

Package Outlines (Unit：mm)

TO-3PN

15.60 ±0.20
13.60 ±0.20
9.60 ±0.20
ø3.20 ±0.10
3.80 ±0.20
12.76 ±0.20
19.90 ±0.20
23.40 ±0.20
13.90 ±0.20
2.00 ±0.20
3.00 ±0.20
1.00 ±0.20
3.50 ±0.20
16.50 ±0.30
5.45TYP [5.45 ±0.30]
5.45TYP [5.45 ±0.30]
4.80 ±0.20
1.50 $^{+0.15}_{-0.05}$
18.70 ±0.20
1.40 ±0.20
0.60 $^{+0.15}_{-0.05}$

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