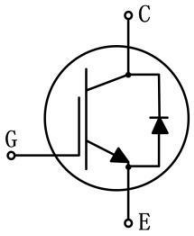
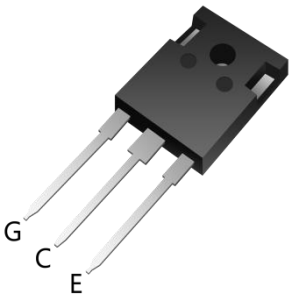
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
I_C	60	A
$V_{CE(sat)}$	1.8	V





TO-247-3L

Features

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

Applications

- Energy storage
- Solar string inverter
- Uninterruptible power supplies

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	120	A
Continuous collector current(T_C=100℃)		60	A
Pulsed collector current,tp limited by T_{vjmax}	I_{CM}	240	A
Diode continuous forward current(T_C=100℃)	I_F	60	A
Diode maximum current,tp limited by T_{vjmax}	I_{FM}	240	A
Power dissipation(T_C=25℃)	P_{tot}	312	W
Power dissipation(T_C=100℃)		156	W
Operating junction temperature range	T_{vj}	-40 to+175	℃
Storage temperature range	T_{stg}	-40 to+150	℃

Thermal Characteristics

Parameter	Symbol	Value		Unit
		Typ	Max.	
Thermal resistance,junction to case for IGBT	$R_{th(j-c)}$	-	0.48	℃/W
Thermal resistance,junction to case for Diode	$R_{th(j-c)}$	-	0.70	℃/W
Thermal resistance,junction to ambient	$R_{th(j-a)}$	-	40	℃/W

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

Static characteristics

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	B_{VCES}	V_{GE}=0V,I_C=250μA	650	-	-	V
Collector-emitter leakage current	I_{CES}	V_{CE}=650V,V_{GE}=0V	-	-	50	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	4.7	5	5.3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=60A	-	1.8	-	V
		V_{GE}=15V,I_C=60A	-	2.5	-	V

Dynamic Characteristics

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{ies}	V_{CE}=30V V_{GE}=0V f=1MHz	-	3860	-	pF
Output capacitance	C_{oes}		-	170	-	pF
Reverse transfer capacitance	C_{res}		-	30	-	pF
Total gate charge	Q_g	V_{CC}=520V V_{GE}=15V I_C=60A	-	120	-	nC

Switching Characteristics

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V V_{GE}=15V I_C=60A R_G=10Ω Inductive load	-	44	-	ns
Rise time	t_r		-	100	-	ns
Turn-off delay time	$t_{d(off)}$		-	166	-	ns
Fall time	t_f		-	75	-	ns
Turn-on energy	E_{on}		-	2.3	-	mJ
Turn-off energy	E_{off}		-	1.3	-	mJ
Total switching energy	E_{ts}		-	3.6	-	mJ
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V V_{GE}=15V I_C=60A R_G=10Ω Inductive load T_{vj}=175℃	-	45	-	ns
Rise time	t_r		-	105	-	ns
Turn-off delay time	$t_{d(off)}$		-	180	-	ns
Fall time	t_f		-	76	-	ns
Turn-on energy	E_{on}		-	3.6	-	mJ
Turn-off energy	E_{off}		-	1.6	-	mJ
Total switching energy	E_{ts}		-	5.2	-	mJ

Diode Characteristics

Parameter	Symbol	Test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	V_F	I_F=60A	-	1.7	-	V
		I_F=60A,T_{vj}=175℃	-	1.4	-	V
Diode reverse recovery time	t_{rr}	V_R=400V I_F=60A diF/dt=-450A/μs	-	78	-	ns
Diode peak reverse recovery current	I_{rrm}		-	14	-	A
Diode reverse recovery charge	Q_{rr}		-	600	-	nC
Diode reverse recovery time	t_{rr}	V_R=400V I_F=60A diF/dt=-450A/μs T_{vj}=175℃	-	155	-	ns
Diode peak reverse recovery current	I_{rrm}		-	25	-	A
Diode reverse recovery charge	Q_{rr}		-	2300	-	nC

Typical Characteristics

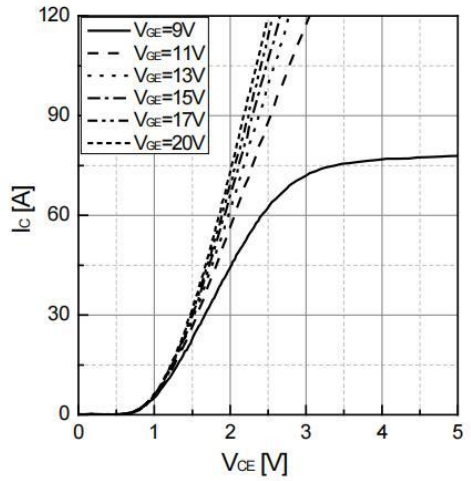


Fig 1. Typical output characteristic (T_{vj}=25℃)

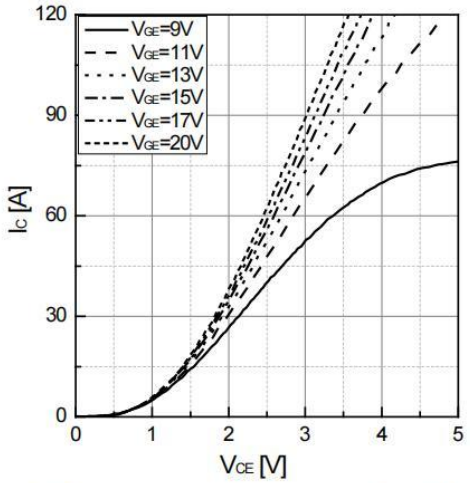


Fig 2. Typical output characteristic(T_{vj}=175℃)

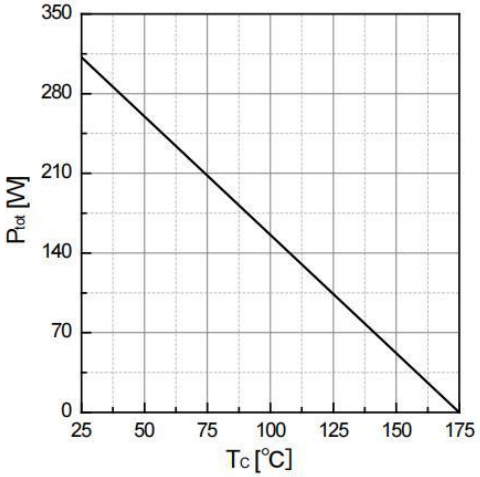


Fig 3. Power dissipation as a function of T_C

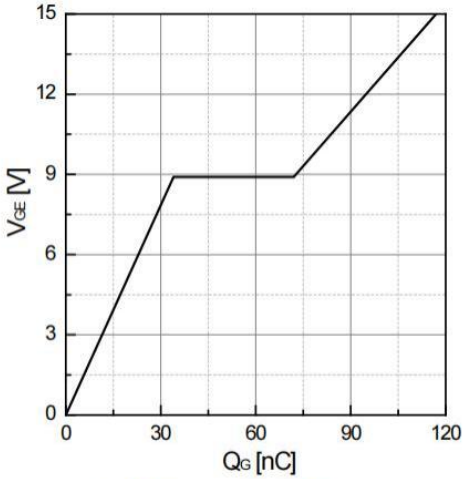


Fig 4. Typical Gate charge

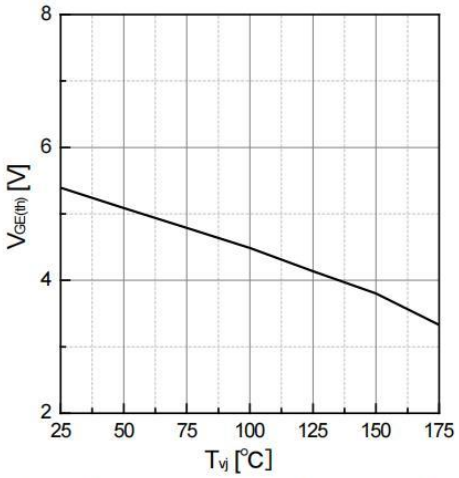


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} (I_C=1mA)

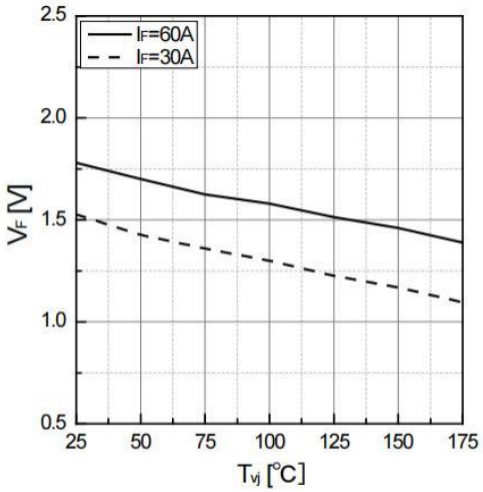


Fig 6. Typical V_F as a function of T_{vj}

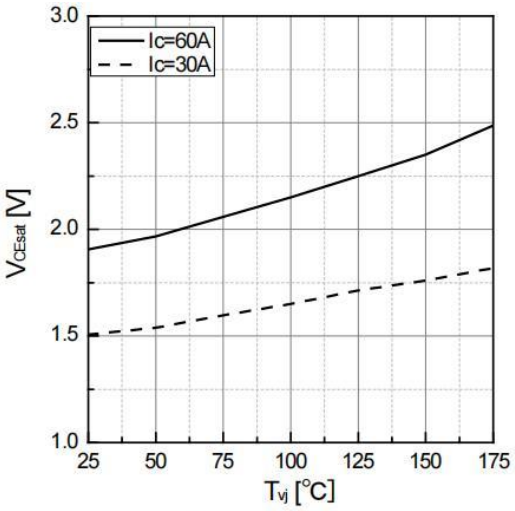


Fig 7. Typical V_{CEsat} as a function of T_{vj}

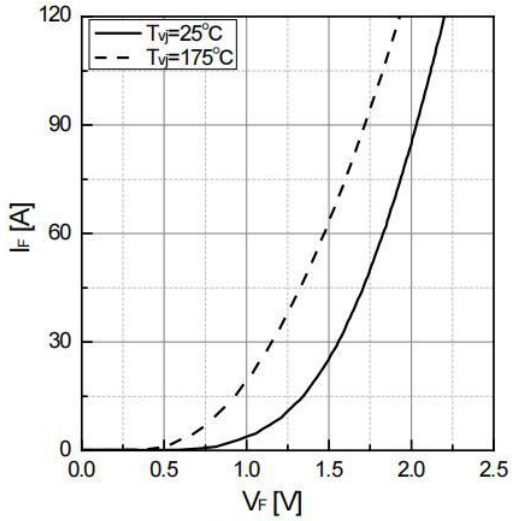


Fig 8. Typical I_F as a function of V_F

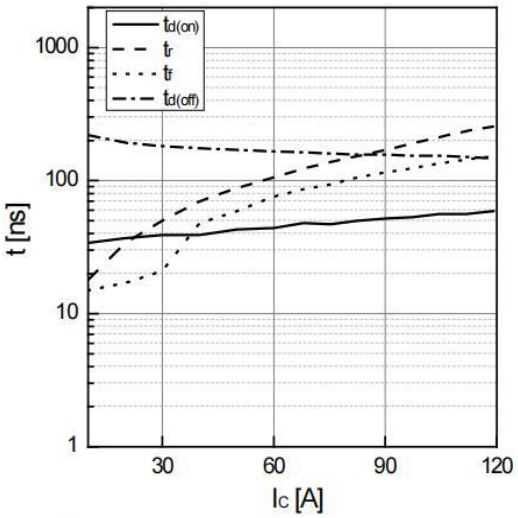


Fig 9. Typical switching time as a function of I_C

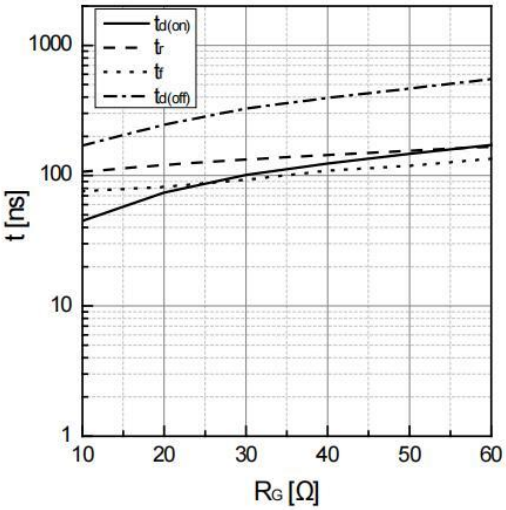


Fig 10. Typical switching times as a function of R_G

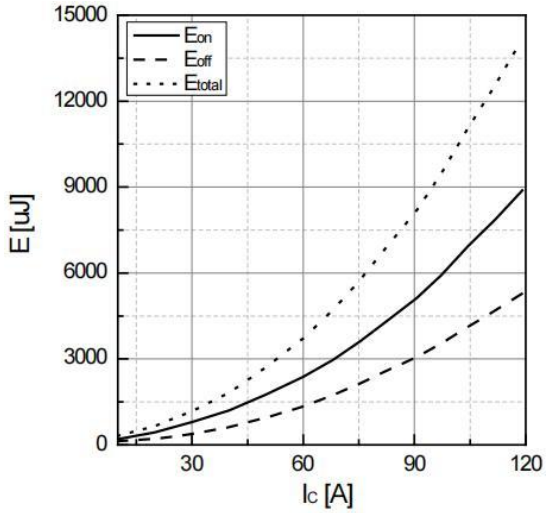


Fig 11. Typical switching energy losses as a function of I_C

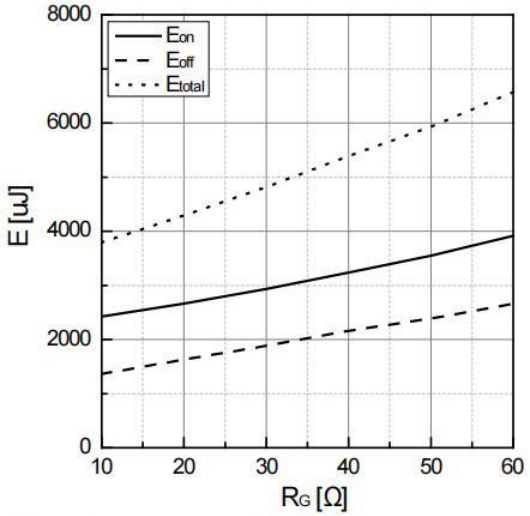


Fig 12. Typical switching energy losses as a function of R_G

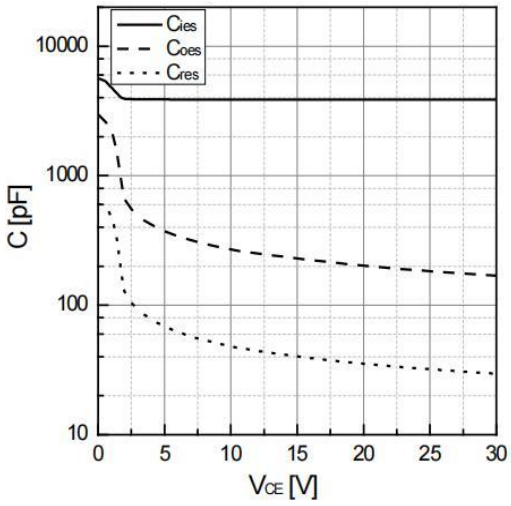


Fig 13. Typical capacitance as a function of V_{CE} (f=1Mhz, V_{GE}=0V)

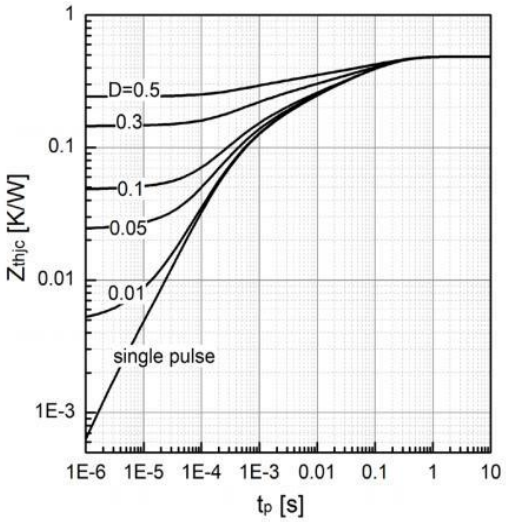
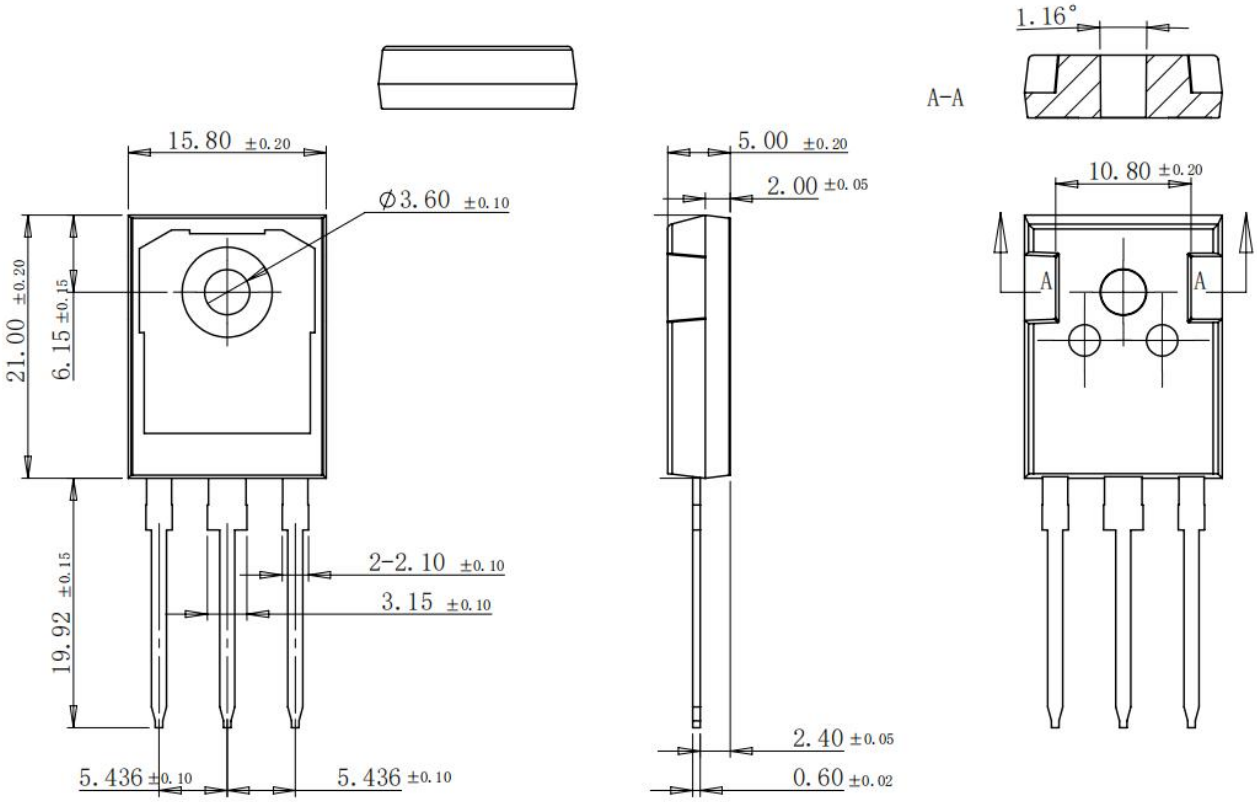


Fig 14. Transient thermal impedance of IGBT

Package Outlines (Unit：mm)

TO-247-3L



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