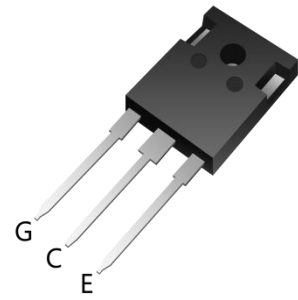
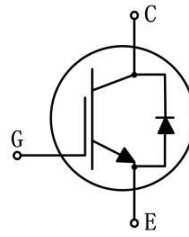


Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
I_C	50	A
$V_{CE(sat)}$	1.58	V



TO-247-3L

Features

- 650V trench gate/field termination process
- Low switching losses
- V_{cesat} has a positive temperature coefficient

Applications

- Charging station
- On board charger
- Uninterruptible power supplies
- Inverters

IGBT

Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Collector-Emitter Voltage	V_{CES}	$T_{vj}=25^{\circ}C$	650	V
Continuous DC collector current	I_C	$T_C=25^{\circ}C, T_{vj,max}=175^{\circ}C$ $T_C=100^{\circ}C, T_{vj,max}=175^{\circ}C$	80 50	A
Pulsed collector current, tp limited by $T_{vj,max}$	I_{Cpuls}		200	A
Total power dissipation	P_{tot}	$T_C=25^{\circ}C, T_{vj,max}=175^{\circ}C$ $T_C=100^{\circ}C, T_{vj,max}=175^{\circ}C$	295 150	W
Gate emitter Voltage	V_{GE}	$t_p \leq 10\mu s, D < 0.010$	± 20 ± 30	V
Temperature under switching conditions	$T_{vj,op}$		-40...+175	$^{\circ}C$
Storage temperature	T_{stg}		-40...+150	$^{\circ}C$

Thermal Characteristics

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	$^{\circ}C/W$
IGBT thermal resistance, junction - case	$R_{th(j-c)}$			0.51		$^{\circ}C/W$
Diode thermal resistance, junction - case	$R_{th(j-c)}$			0.43		$^{\circ}C/W$

Characteristic Values

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	650			
Collector-Emitter saturation Voltage	V_{CESat}	$V_{GE}=15V, I_C=50A$ $V_{GE}=15V, I_C=50A$ $V_{GE}=15V, I_C=50A$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	1.58 1.87 1.95	2.10	V
Gate-Emitter threshold Voltage	$V_{GE(th)}$	$I_C=0.5mA, V_{GE}=V_{CE}$	$T_{vj}=25^{\circ}C$	4.2	5.0	5.8
Transconductance	G_{fs}	$V_{CE}=20V, I_C=50A$		77		S
Input capacitance	C_{ies}	$f=100kHz, V_{CE}=25V$ $V_{GE}=0V$	$T_{vj}=25^{\circ}C$	5.46		nF
Output capacitance	C_{oes}			0.20		
Reverse transfer capacitance	C_{res}			0.10		
Gate charge	Q_G	$I_C=50A, V_{GE}=15V$ $V_{CE}=520V$	$T_{vj}=25^{\circ}C$	0.53		μC
Collector-emitter cut-off current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$	$T_{vj}=25^{\circ}C$ $T_{vj}=175^{\circ}C$	2000	50	μA
Gate-emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	$T_{vj}=25^{\circ}C$		100	nA
Turn-on delay time	$t_{d on}$	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	33 21 19		ns
Rise time	t_r	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	75 67 65		
Turn-off delay time	$t_{d off}$	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	21 32 38		
Fall time	t_f	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	41 62 62		
Turn-on energy loss per pulse	E_{on}	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	2.37 2.88 3.10		
Turn-off energy loss per pulse	E_{off}	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	0.60 0.73 0.76		mJ
Total switching energy	E_{ts}	$I_C=50A, V_{CE}=400V$ $V_{GE}=\pm 15V, R_G=8\Omega$ (inductive load)	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	2.97 3.61 3.86		

Diode
Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Repetitive peak reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	650	V
Continuous DC forward current	I_F	$T_C=25^{\circ}C, T_{vj max}=175^{\circ}C$ $T_C=100^{\circ}C, T_{vj max}=175^{\circ}C$	100 50	A
Diode pulsed current, tp limited by $T_{vj max}$	I_{Fpuls}		150	A

Characteristic Values

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=50A, V_{GE}=0V$ $T_{vj}=25^\circ C$ $I_F=50A, V_{GE}=0V$ $T_{vj}=125^\circ C$ $I_F=50A, V_{GE}=0V$ $T_{vj}=150^\circ C$		1.63 1.42 1.37	2.1	V
Peak reverse recovery current	I_{RM}	$I_F=50A,$ $-di_F/dt=400A/\mu s$ $T_{vj}=25^\circ C$ $(T_{vj}=150^\circ C)$ $T_{vj}=125^\circ C$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=150^\circ C$		21 29 32		A
Reverse Recovered charge	Q_{rr}	$I_F=50A,$ $-di_F/dt=400A/\mu s$ $T_{vj}=25^\circ C$ $(T_{vj}=150^\circ C)$ $T_{vj}=125^\circ C$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=150^\circ C$		1.48 3.26 3.95		μC
Reverse Recovery Time	t_{rr}	$I_F=50A,$ $-di_F/dt=400A/\mu s$ $T_{vj}=25^\circ C$ $(T_{vj}=150^\circ C)$ $T_{vj}=125^\circ C$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=150^\circ C$		133 199 218		ns
Reverse recovered energy	E_{rec}	$I_F=50A,$ $-di_F/dt=400A/\mu s$ $T_{vj}=25^\circ C$ $(T_{vj}=150^\circ C)$ $T_{vj}=125^\circ C$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=150^\circ C$		0.34 0.66 0.78		mJ

Typical Characteristics

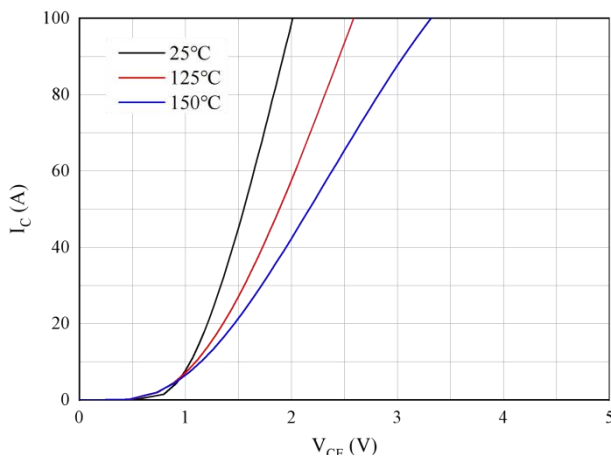


Fig 1. Typical output characteristics ($V_{GE} = 15V$)

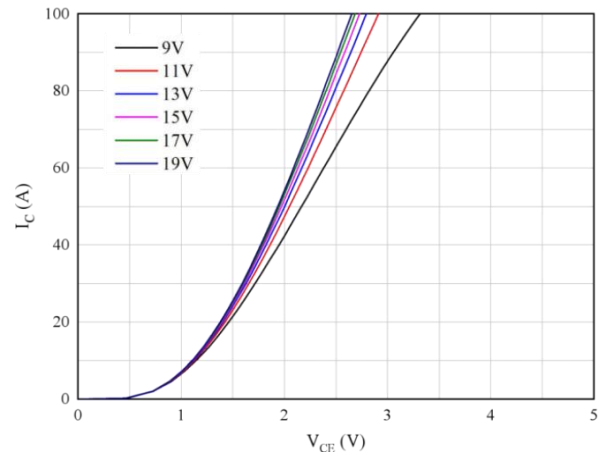


Fig 2. Typical output characteristics ($T_{vj} = 150^\circ C$)

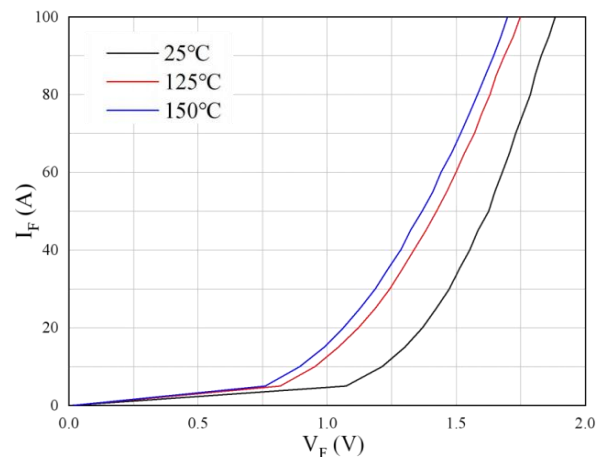
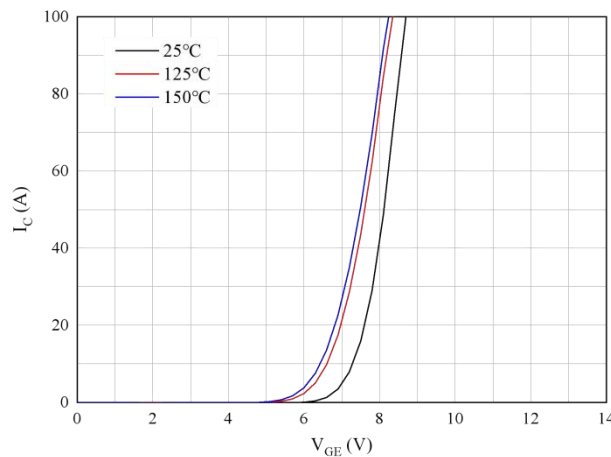


Fig 3. Typical transfer characteristic($V_{CE}=20V$)

Fig 4. Forward characteristic of Diode

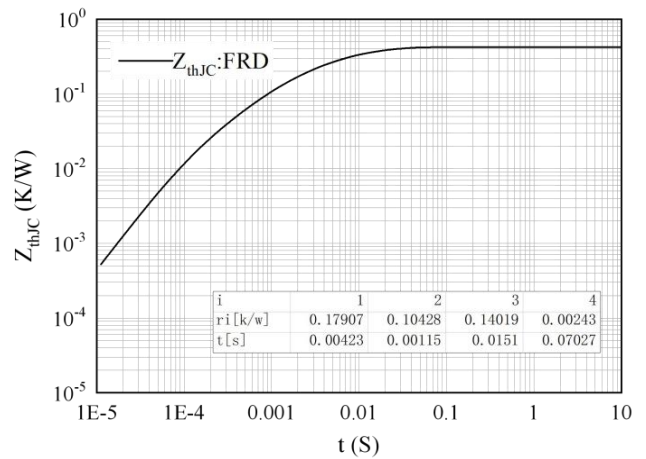
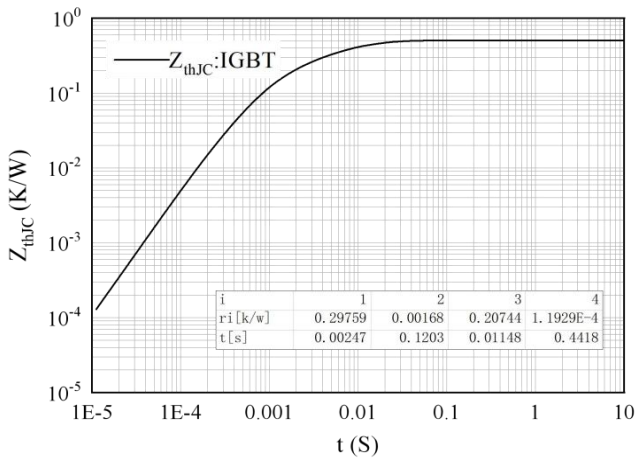


Fig 5. Transient thermal impedance IGBT, $Z_{thJC}=f(t)$

Fig 6. Transient thermal impedance FRD, $Z_{thJC}=f(t)$

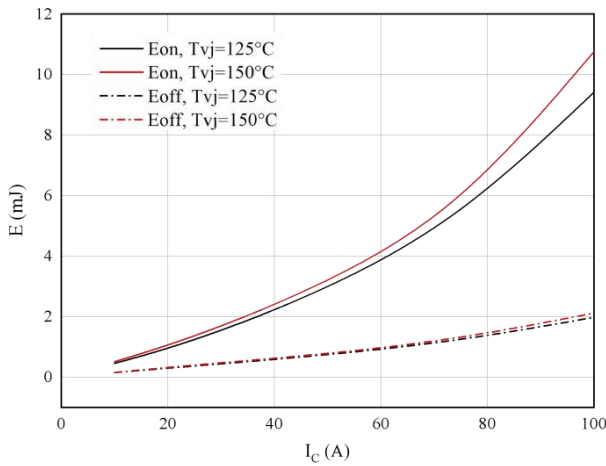


Fig 7. Switching losses of IGBT
 $V_{GE}=\pm 15V, R_{Gon}=8\Omega, R_{Goff}=8\Omega, V_{CE}=400V$

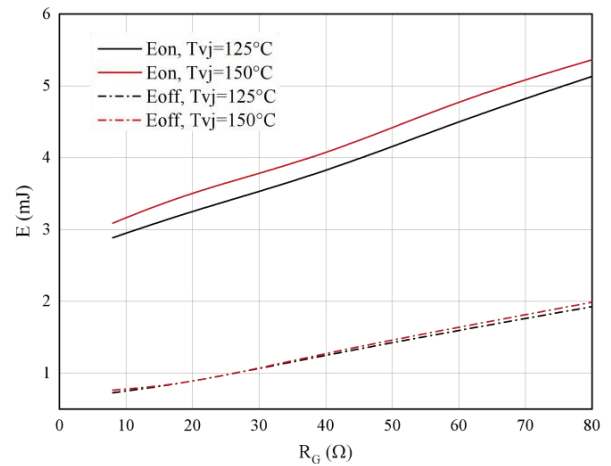


Fig 8. Switching losses of IGBT
 $V_{GE}=\pm 15V, I_C=50A, V_{CE}=400V$

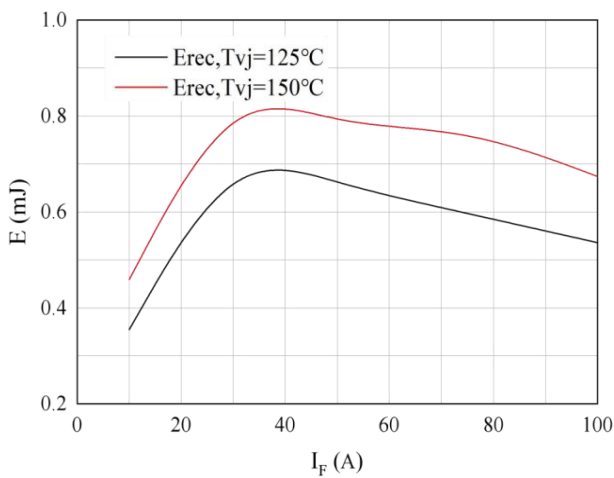


Fig 9. Switching losses of Diode
 $R_{gon}=8\Omega, V_{CE}=400V$

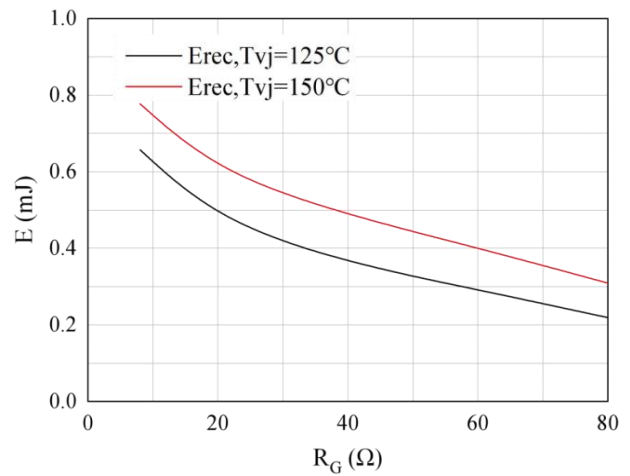


Fig 10. Switching losses of Diode
 $I_F=50A, V_{CE}=400V$

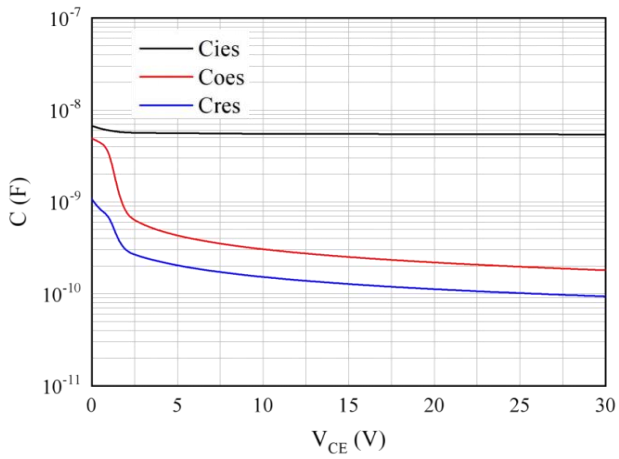
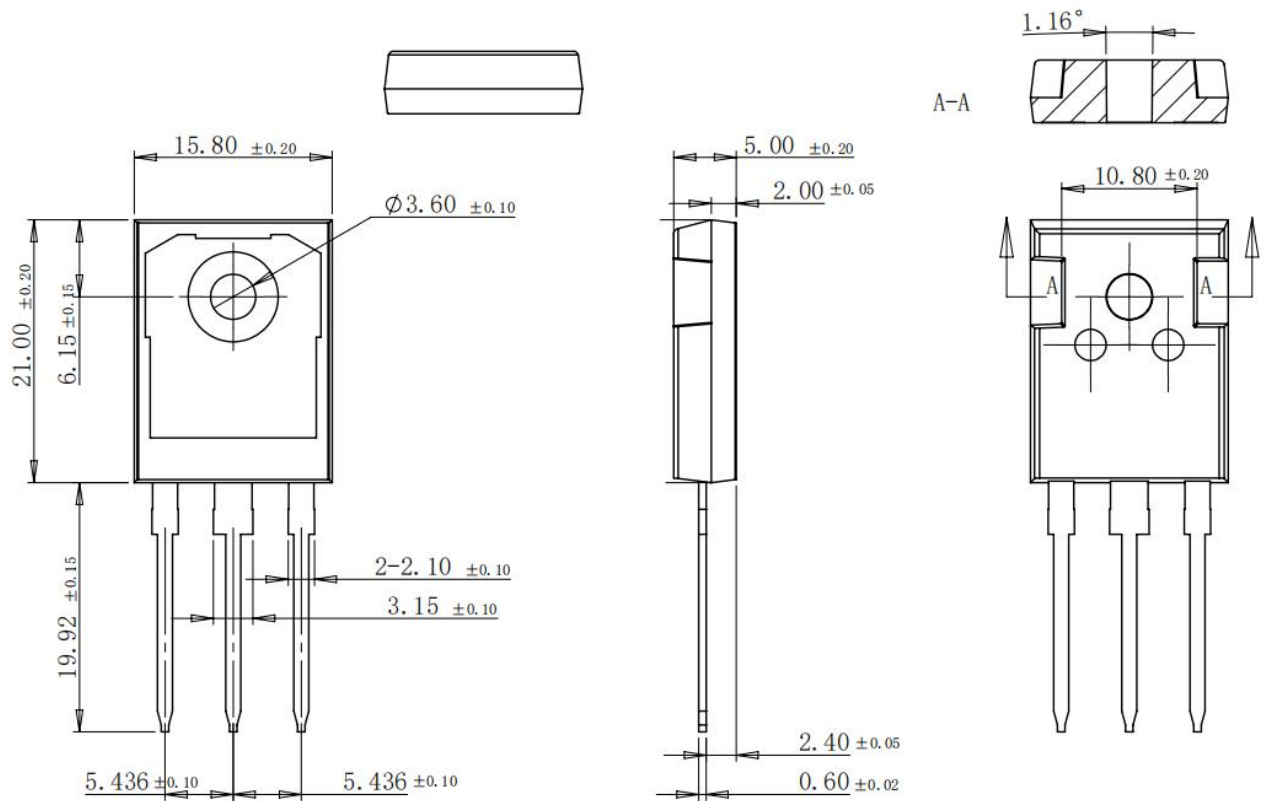


Fig 11. Capacitance characteristic

Package Outlines (Unit: mm)

TO-247-3L



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