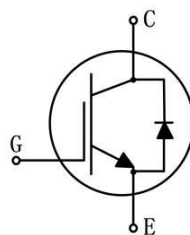


Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
I_C	75	A
$V_{CE(sat)}$	1.63	V



---Marking
---Tracking code
TO-247-3L

Features

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

Applications

- Charging station
- Uninterruptible power supplies
- Inverters

IGBT

Maximum Ratings

Parameter	Symbol	Test condition	Value	Unit
Collector-Emitter Voltage	V_{CES}	$T_{vj}=25^{\circ}\text{C}$	650	V
Continuous DC collector current	I_C	$T_C=25^{\circ}\text{C}, T_{vjmax}=175^{\circ}\text{C}$ $T_C=100^{\circ}\text{C}, T_{vjmax}=175^{\circ}\text{C}$	80 75	A
Pulsed collector current, tp limited by T_{vjmax}	I_{Cpuls}		300	A
Total power dissipation	P_{tot}	$T_C=25^{\circ}\text{C}, T_{vjmax}=175^{\circ}\text{C}$ $T_C=100^{\circ}\text{C}, T_{vjmax}=175^{\circ}\text{C}$	440 220	W
Gate emitter Voltage	V_{GE}	$t_p \leq 10\mu\text{s}, D < 0.010$	± 20 ± 30	V
Temperature under switching conditions	$T_{vj op}$		-40...+175	$^{\circ}\text{C}$
Storage temperature	T_{stg}		-40...+150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction-ambient	$R_{th(j-a)}$				65	$^{\circ}\text{C/W}$
IGBT thermal resistance, junction - case	$R_{th(j-C)}$			0.34		$^{\circ}\text{C/W}$
Diode thermal resistance, junction - case	$R_{th(j-C)}$			0.49		$^{\circ}\text{C/W}$

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			V
Collector-Emitter saturation Voltage	V_{CEsat}	$V_{GE}=15V, I_C=75A$ $T_{vj}=25^{\circ}C$ $V_{GE}=15V, I_C=75A$ $T_{vj}=125^{\circ}C$ $V_{GE}=15V, I_C=75A$ $T_{vj}=150^{\circ}C$		1.63 2.03 2.13	2.10	
Gate-Emitter threshold Voltage	$V_{GE(th)}$	$I_C=0.75mA, V_{GE}=V_{CE}$ $T_{vj}=25^{\circ}C$	4.2	5.1	6.0	
Transconductance	G_{fs}	$V_{CE}=20V, I_C=75A$		91		S
Input capacitance	C_{ies}	$f=1MHz, V_{CE}=25V$ $T_{vj}=25^{\circ}C$ $V_{GE}=0V$		7.44		nF
Output capacitance	C_{oes}			0.24		
Reverse transfer capacitance	C_{res}			0.13		
Gate charge	Q_G	$I_C=75A, V_{GE}=15V$ $T_{vj}=25^{\circ}C$ $V_{CE}=520V$		0.74		μC
Collector-emitter cut-off current	I_{CES}	$V_{CE}=650V$ $T_{vj}=25^{\circ}C$ $V_{CE}=0V$ $T_{vj}=175^{\circ}C$		2400	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	$t_{d on}$	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		34 37 40		ns
Rise time	t_r	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		153 157 163		
Turn-off delay time	$t_{d off}$	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		183 198 208		
Fall time	t_f	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		67 68 73		
Turn-on energy loss per pulse	E_{on}	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		4.28 4.35 4.57		mJ
Turn-off energy loss per pulse	E_{off}	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		1.08 1.12 1.20		
Total switching energy	E_{ts}	$I_C=75A, V_{CE}=400V$ $T_{vj}=25^{\circ}C$ $V_{GE}=\pm 15V, R_G=8\Omega$ $T_{vj}=125^{\circ}C$ (inductive load) $T_{vj}=150^{\circ}C$		5.36 5.47 5.77		

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	$T_C=25^{\circ}C, T_{vj max}=175^{\circ}C$ $T_C=100^{\circ}C, T_{vj max}=175^{\circ}C$	80 75	A
Diode pulsed current, tp limited by $T_{vj max}$	I_{Fpuls}		300	A

Characteristic Values

Parameter	Symbol	Test condition	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=75A, V_{GE}=0V$ $T_{vj}=25^{\circ}C$ $I_F=75A, V_{GE}=0V$ $T_{vj}=125^{\circ}C$ $I_F=75A, V_{GE}=0V$ $T_{vj}=150^{\circ}C$		1.48 1.61 1.62	2.0	V
Peak reverse recovery current	I_{RM}	$I_F=75A,$ $-di_F/dt=460A/\mu s$ $(T_{vj}=150^{\circ}C)$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		17 23 25		A
Reverse Recovered charge	Q_{rr}	$I_F=75A,$ $-di_F/dt=460A/\mu s$ $(T_{vj}=150^{\circ}C)$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		2.43 3.37 3.72		μC
Reverse Recovery Time	t_{rr}	$I_F=75A,$ $-di_F/dt=460A/\mu s$ $(T_{vj}=150^{\circ}C)$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		200 211 227		ns
Reverse recovered energy	E_{rec}	$I_F=75A,$ $-di_F/dt=460A/\mu s$ $(T_{vj}=150^{\circ}C)$ $V_R=400V, V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		0.68 0.91 0.99		mJ

Typical Characteristics

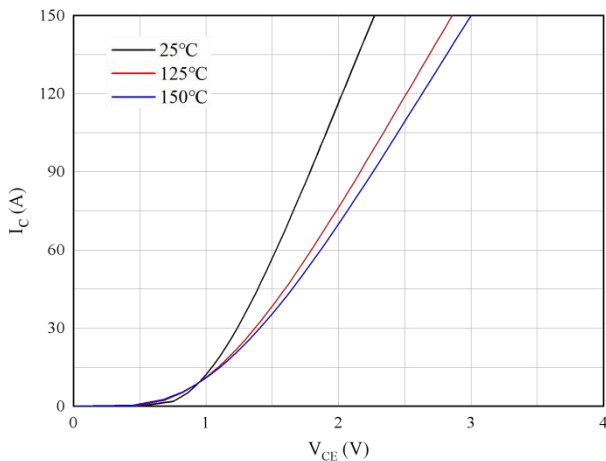


Fig 1. Typical output characteristics ($V_{GE}=15V$)

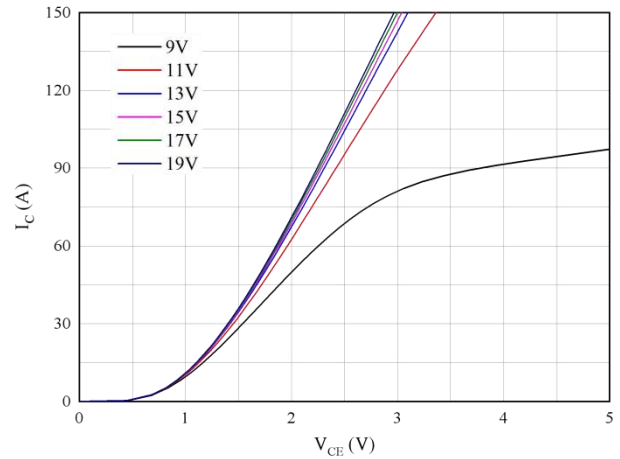


Fig 2. Typical output characteristics ($T_{vj}=150^{\circ}C$)

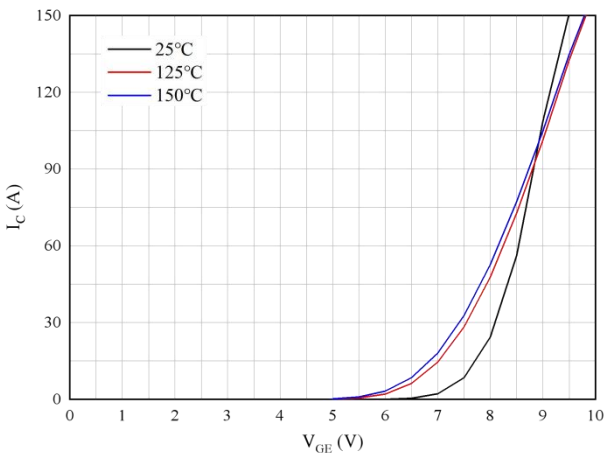


Fig 3. Typical transfer characteristic ($V_{CE}=20V$)

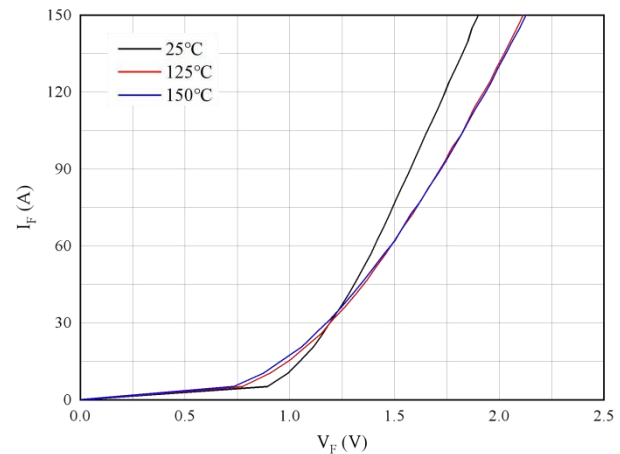


Fig 4. Forward characteristic of Diode

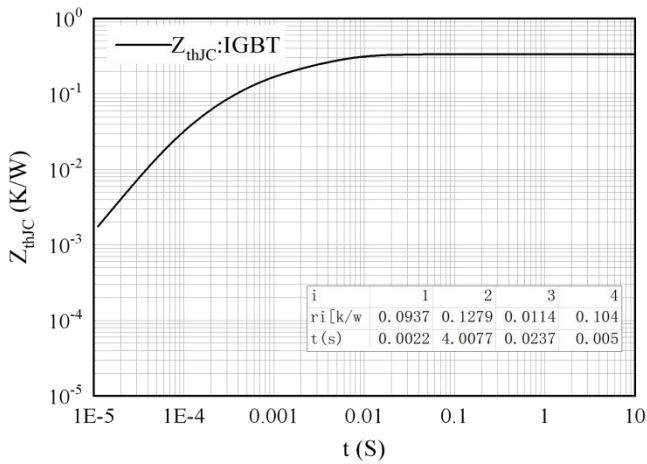


Fig 5. Transient thermal impedance IGBT,
 $Z_{thJC}=f(t)$

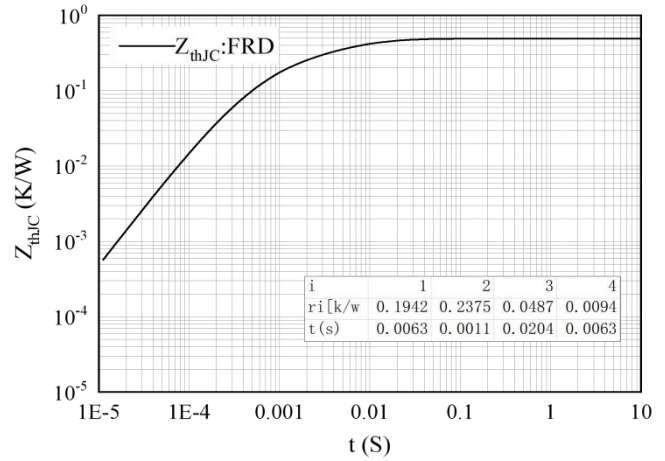


Fig 6. Transient thermal impedance FRD,
 $Z_{thJC}=f(t)$

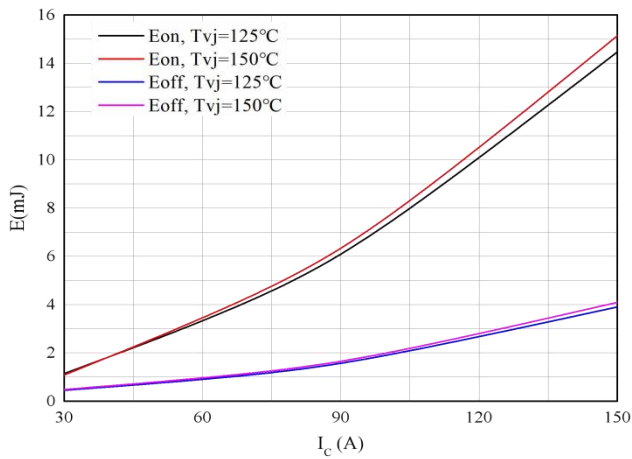


Fig 7. Switching losses of IGBT
 $V_{GE}=\pm 15V$, $R_{Gon}=8\Omega$, $R_{Goff}=8\Omega$, $V_{CE}=400V$

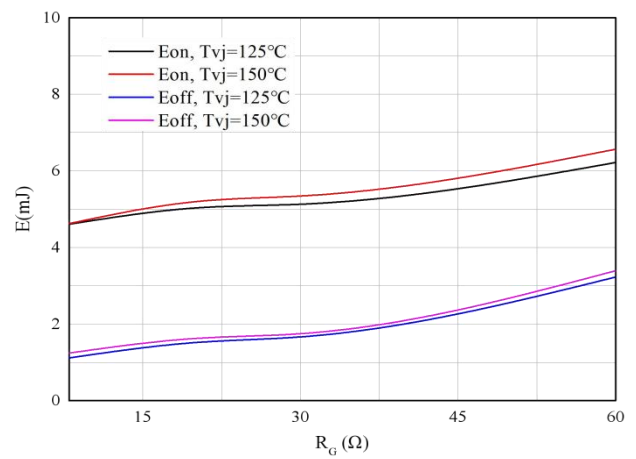


Fig 8. Switching losses of IGBT
 $V_{GE}=\pm 15V$, $I_C=75A$, $V_{CE}=400V$

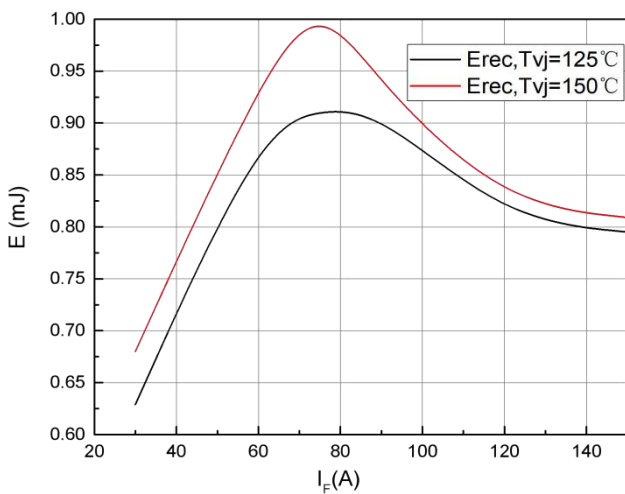


Fig 9. Switching losses of Diode
 $R_{gon}=8\Omega$, $V_{CE}=400V$

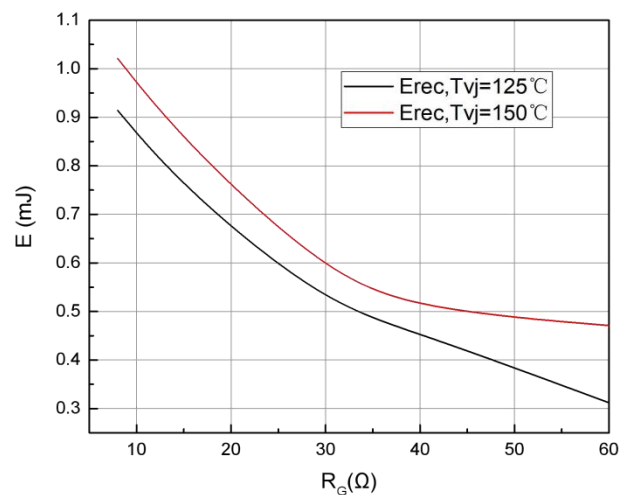


Fig 10. Switching losses of Diode
 $I_F=75A$, $V_{CE}=400V$

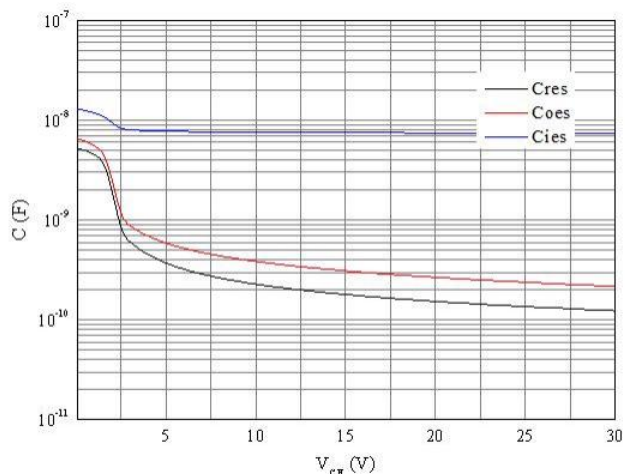
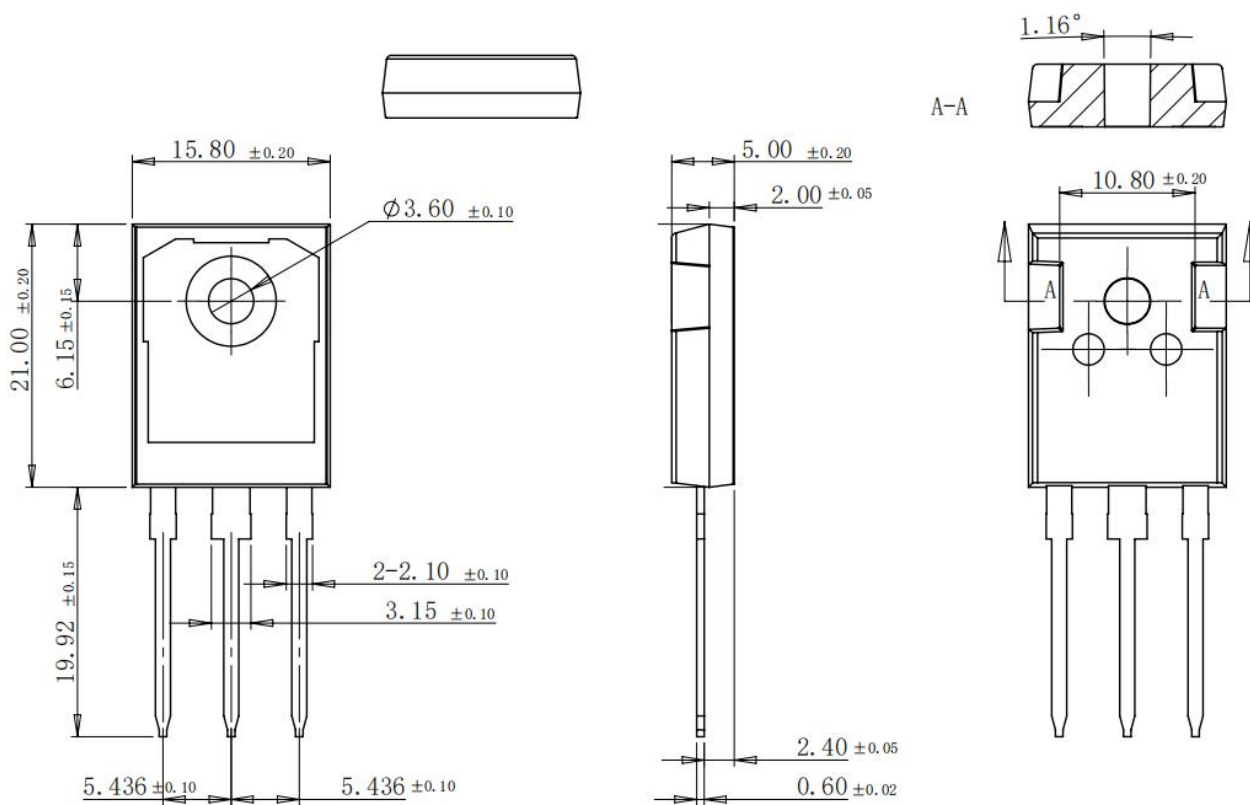


Fig 11. Capacitance characteristic

Package Outline (Unit: mm)

TO-247-3L



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