

IGBT Discrete with Anti-Parallel Diode

DESCRIPTION :

- 650V trench gate/field termination process
- Low Switching Losses
- Vcesat has a positive temperature coefficient

TYPICAL APPLICATIONS :

- Charging station
- Uninterruptible power supplies (UPS)
- Inverters



TO-247

IGBT

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Collector- Emitter Voltage	$T_{vj}=25^{\circ}\text{C}$	V_{CES}	650	V
Continuous DC collector current	$T_c=100^{\circ}\text{C}$, $T_{vj} \text{ max}=175^{\circ}\text{C}$	$I_{C \text{ nom}}$	75	A
Pulsed collector current	t_p limited by $T_{vj} \text{ max}$	$I_{C \text{ PULSE}}$	300	A
Gate emitter voltage		V_{GE}	± 20	V
Transient Gate-emitter voltage	$t_p \leq 10\mu\text{s}$, $D < 0.010$	V_{GE}	± 30	V
Total power dissipation	$T_c=25^{\circ}\text{C}$ $T_c=100^{\circ}\text{C}$	P_{tot}	440 220	W
Temperature under switching conditions		$T_{vj \text{ op}}$	$-40 \sim +175$	$^{\circ}\text{C}$
Storage temperature		T_{STG}	$-40 \sim +150$	$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
IGBT thermal resistance, junction - case		$R_{th(j-C)}$	0.34	K/W
Diode thermal resistance, junction - case		$R_{th(j-C)}$	0.49	K/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector-Emitter saturation voltage V _{GE} =15V, I _C =75A T _{vj} =25°C V _{GE} =15V, I _C =75A T _{vj} =125°C V _{GE} =15V, I _C =75A T _{vj} =150°C	V _{CE(SAT)}		1.63 2.03 2.13	2.10	V
Gate-Emitter threshold voltage I _C =0.75mA, V _{GE} = V _{CE} T _{vj} =25°C	V _{GE(th)}	4.2	5.1	6.0	V
Transconductance V _{GE} =20 V, I _C =75A	G _{fs}		91		S
Input capacitance f=100kHz, V _{CE} =25 V, V _{GE} =0 V T _{vj} =25°C	C _{ies}		7.44		nf
Output capacitance f=100kHz, V _{CE} =25 V, V _{GE} =0 V T _{vj} =25°C	C _{oes}		0.24		nf
Reverse transfer capacitance f=100kHz, V _{CE} =25 V, V _{GE} =0 V T _{vj} =25°C	C _{res}		0.13		nf
Gate charge I _C = 75A, V _{GE} = 15 V, V _{CE} =520V T _{vj} =25°C	Q _G		0.74		uC
Collector-emitter cut-off current V _{CE} =650V, V _{GE} =0V T _{vj} =25°C	I _{CES}			50	uA
Gate-emitter leakage current V _{CE} =0V, V _{GE} =20V T _{vj} =25°C	I _{GES}			100	nA
Turn-on delay time I _C =75A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =125°C (inductive load) T _{vj} =150°C	t _{d (ON)}		34 37 40		ns
Rise time I _C =75A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =125°C (inductive load) T _{vj} =150°C	t _r		153 157 163		ns
Turn-off delay time I _C =75A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =125°C (inductive load) T _{vj} =150°C	t _{d (OFF)}		183 198 208		ns
Fall time I _C =75A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =125°C (inductive load) T _{vj} =150°C	t _f		67 68 73		ns

Turn-on energy loss per pulse IC=75A, VCE=400 V Tvj=25°C VGE=±15 V, RG=8Ω Tvj=125°C (inductive load) Tvj=150°C	E _(ON)		4.28 4.35 4.57		mJ
Turn-off energy loss per pulse IC=75A, VCE=400 V Tvj=25°C VGE=±15 V, RG=8Ω Tvj=125°C (inductive load) Tvj=150°C	E _(OFF)		1.08 1.12 1.20		mJ

Diode

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25°C	V _{RRM}	650	V
Continuous DC forward current	Tc=100°C, Tvj max=175°C	I _F	75	A
Pulsed current	t _p limited by Tvj max	I _{F PULSE}	300	A

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=75A, VGE=0 V Tvj=25°C IF=75A, VGE=0 V Tvj=125°C IF=75A, VGE=0 V Tvj=150°C	V _F		1.48 1.61 1.62	2.00	V
Peak reverse recovery current IF=75 A, Tvj=25°C -diF/dt =460A/μs(Tvj=150°C) Tvj=125°C VR=400 V, VGE= -15 V Tvj=150°C	I _{RM}		17 23 25		A
Reverse Recovered charge IF=75 A, Tvj=25°C -diF/dt =460A/μs(Tvj=150°C) Tvj=125°C VR=400 V, VGE= -15 V Tvj=150°C	Q _{rr}		2.43 3.37 3.72		uC
Reverse Recovered Time IF=75 A, Tvj=25°C -diF/dt =460A/μs(Tvj=150°C) Tvj=125°C VR=400 V, VGE= -15 V Tvj=150°C	T _{rr}		200 211 227		ns
Reverse recovered energy IF=75 A, Tvj=25°C -diF/dt =460A/μs(Tvj=150°C) Tvj=125°C VR=400 V, VGE= -15 V Tvj=150°C	E _{rec}		0.68 0.91 0.99		mJ

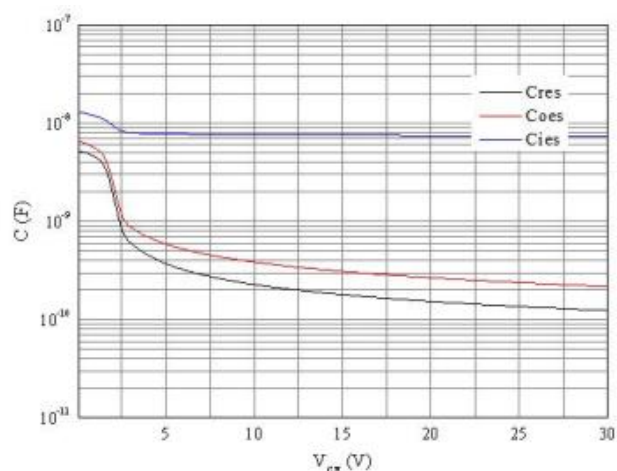


Figure 1. Capacitance characteristic

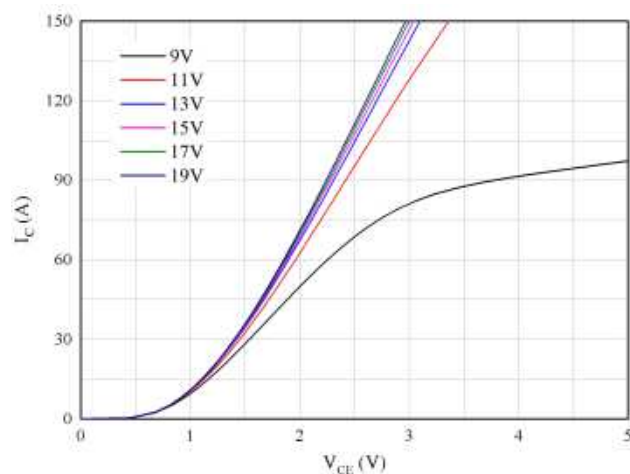


Figure 2. Typical output characteristics (Tvj=150°C)

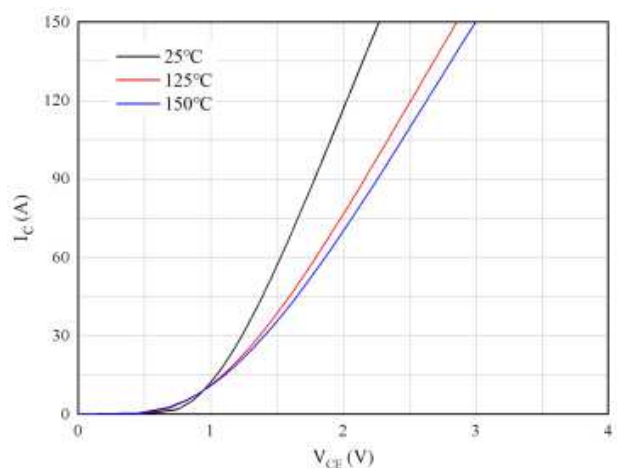


Figure 3. Typical output characteristics (V_GE=15V)

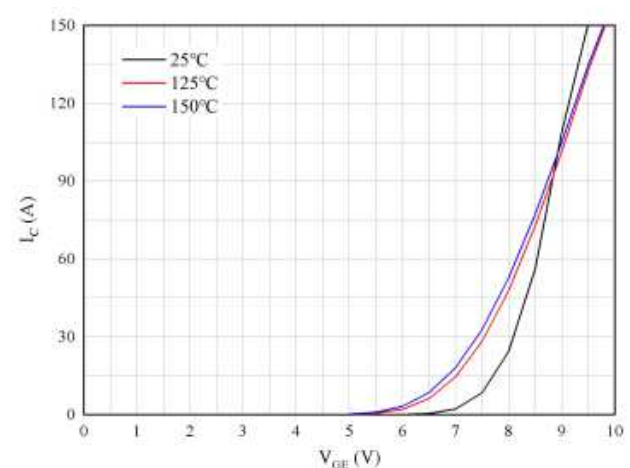


Figure 4. Typical transfer characteristic (V_CE=20V)

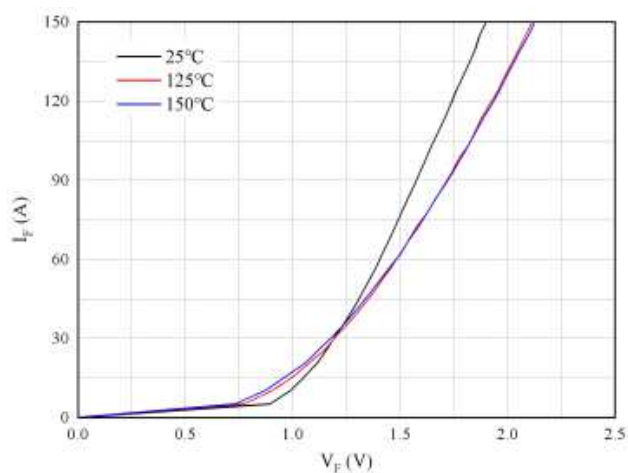


Figure 5. Forward characteristic of Diode

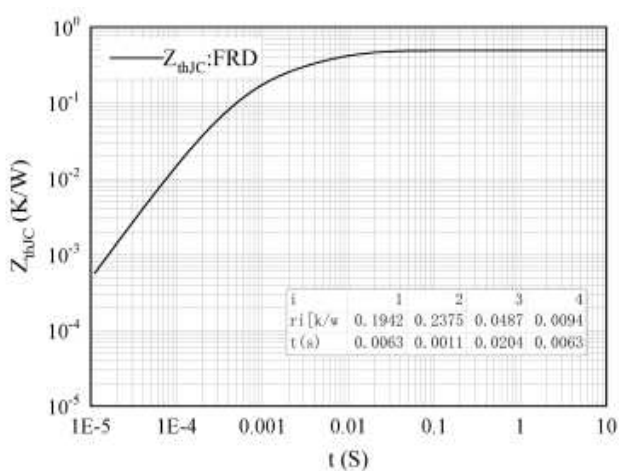


Figure 6. Transient thermal impedance FRD,
 $Z_{thJC}=f(t)$

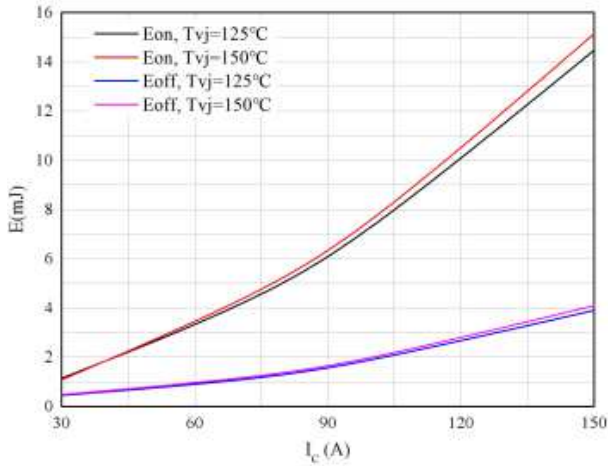


Figure 7. Switching losses of IGBT
VGE=±15V, Rgon=8Ω, Rgoff=8Ω, VCE=400V

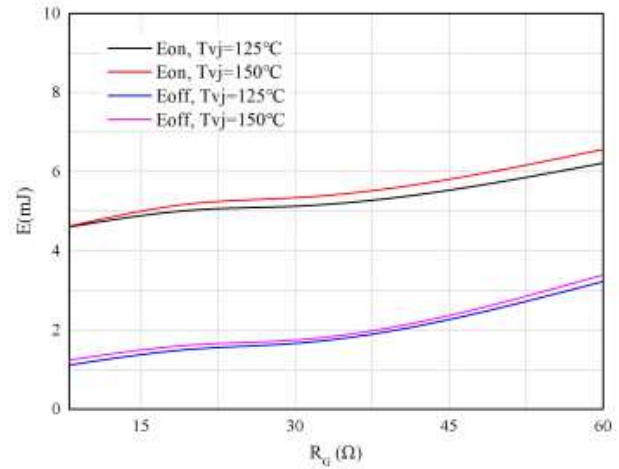


Figure 8. Switching losses of IGBT
VGE=±15V, IC=75A, VCE=400V

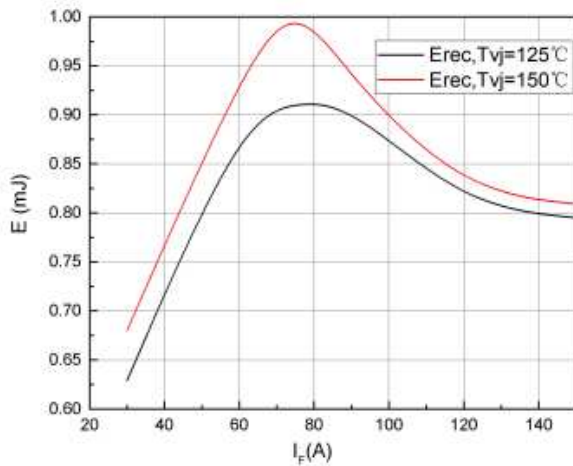


Figure 9. Switching losses of Diode
Rgon=8Ω, VCE=400V

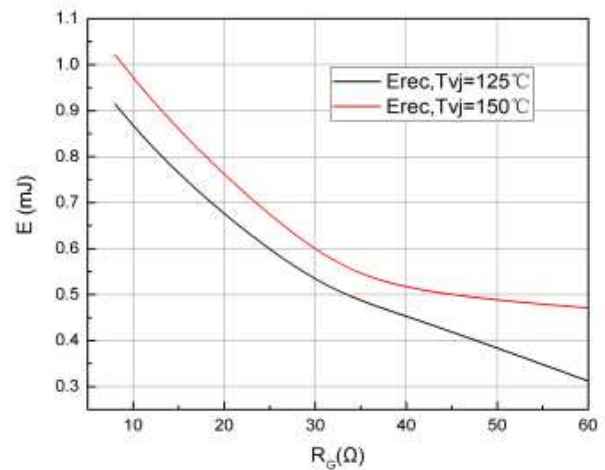


Figure 10. Switching losses of Diode
IF=75A, VCE=400V

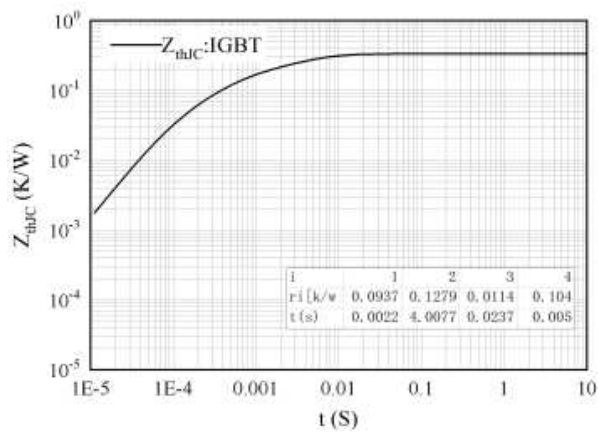
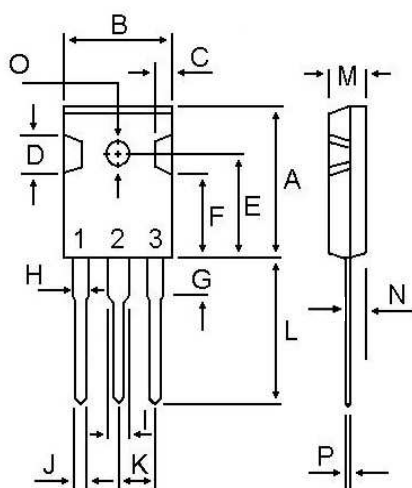


Figure 11. Transient thermal impedance IGBT,
 $Z_{thJC}=f(t)$

- Circuit diagram



- Package outlines : Dimensions in (mm)



DIM	MILLIMETERS	
	MIN	MAX
A	20.80	21.80
B	15.38	16.20
C	1.90	2.70
D	5.10	6.10
E	14.50	15.50
F	11.20	13.20
G	3.75	4.35
H	1.90	2.30
I	2.90	3.30
J	1.00	1.40
K	5.26	5.66
L	19.50	20.50
M	4.68	5.36
N	2.30	2.60
O	3.45	3.85
P	0.48	0.72

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