

IGBT Discrete with Anti-Parallel Diode

DESCRIPTION :

- 700V trench gate/field termination process
- Low Switching Losses
- Vcesat has a positive temperature coefficient

TYPICAL APPLICATIONS :

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



$V_{CES} = 700V$, $I_{C\ nom} = 60A$ / $I_{CRM} = 180A$

IGBT

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Collector- Emitter Voltage	$T_{vj}=25^{\circ}C$	V_{CES}	700	V
Continuous DC collector current	$T_c=100^{\circ}C$, $T_{vj\ max}=175^{\circ}C$	$I_{C\ nom}$	60	A
Repetitive peak collector current	$t_p=1ms$	I_{CRM}	180	A
Gate emitter voltage		V_{GE}	± 20	V
Transient Gate-emitter voltage	$t_p \leq 10\mu s$, $D < 0.010$	V_{GE}	± 25	V
Total power dissipation	$T_c=25^{\circ}C$ $T_c=100^{\circ}C$	P_{tot}	440 220	W
Temperature under switching conditions		$T_{vj\ op}$	-40~+175	$^{\circ}C$
Storage temperature		T_{STG}	-40~+150	$^{\circ}C$

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 =60A T _{vj} =25°C V _{GE} =15V, I _C =60A T _{vj} =150°C V _{GE} =15V, I _C =60A T _{vj} =175°C	V _{CE(SAT)}		1.47 1.81 1.86	1.90	V
Gate-Emitter threshold voltage I _C =0.6mA, V _{GE} = V _{CE} T _{vj} =25°C	V _{GE(th)}	4.4	5.0	5.6	V
Transconductance V _{GE} =20 V, I _C =60A	G _{fs}		96		S
Input capacitance f=100kHz, V _{CE} =25 V, V _{GE} =0 V T _{vj} =25°C	C _{ies}		8039		Pf
Output capacitance f=100kHz, V _{CE} =25 V, V _{GE} =0 V T _{vj} =25°C	C _{oes}		239		Pf
Reverse transfer capacitance f=100kHz, V _{CE} =25 V, V _{GE} =0 V T _{vj} =25°C	C _{res}		136		Pf
Gate charge I _C = 60A, V _{GE} = 15 V, V _{CE} =560V T _{vj} =25°C	Q _G		742		nC
Collector-emitter cut-off current V _{CE} =700V, V _{GE} =0V T _{vj} =25°C	I _{CES}			1	mA
Gate-emitter leakage current V _{CE} =0V, V _{GE} =20V T _{vj} =25°C	I _{GES}			200	nA
Turn-on delay time I _C =60A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =175°C (inductive load)	t _{d (ON)}		36 30		ns
Rise time I _C =60A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =175°C (inductive load)	t _r		112 97		ns
Turn-off delay time I _C =60A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =175°C (inductive load)	t _{d (OFF)}		182 212		ns
Fall time I _C =60A, V _{CE} =400 V T _{vj} =25°C V _{GE} =±15 V, R _G =8Ω T _{vj} =175°C (inductive load)	t _f		49 78		ns

Turn-on energy loss per pulse IC=60A, VCE=400 V, VGE=±15 V, RG=8Ω Tvj=25°C di/dt=600A/us(Tvj=175°C) Tvj=175°C (inductive load)	E _(ON)		2.76 3.53		mJ
Turn-off energy loss per pulse IC=60A, VCE=400 V, VGE=±15 V, RG=8Ω Tvj=25°C dv/dt=10000V/us(Tvj=175°C) Tvj=175°C (inductive load)	E _(OFF)		0.75 1.13		mJ

Diode

MAXIMUM RATINGS

Characteristic	Condition	Symbol	Value	Unit
Repetitive peak reverse voltage	Tvj=25°C	V _{RRM}	700	V
Continuous DC forward current	Tc=100°C, Tvj max=175°C	I _F	60	A
Repetitive peak forward current	t _P =1ms	I _{FRM}	180	A

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Forward voltage IF=60A, VGE=0 V Tvj=25°C IF=60A, VGE=0 V Tvj=150°C IF=60A, VGE=0 V Tvj=175°C	V _F		1.45 1.55 1.52	2.00	V
Peak reverse recovery current IF=60 A, Tvj=25°C -diF/dt =600A/μs(Tvj=175°C) Tvj=175°C VR=400 V ,VGE= -15 V	I _{RM}		18 30		A
Reverse Recovered charge IF=60 A, Tvj=25°C -diF/dt =600A/μs(Tvj=175°C) Tvj=175°C VR=400 V ,VGE= -15 V	Q _{rr}		1.55 3.99		uC
Reverse Recovered Time IF=60 A, Tvj=25°C -diF/dt =600A/μs(Tvj=175°C) Tvj=175°C VR=400 V ,VGE= -15 V	T _{rr}		142 210		ns
Reverse recovered energy IF=60 A, Tvj=25°C -diF/dt =600A/μs(Tvj=175°C) Tvj=175°C VR=400 V ,VGE= -15 V	E _{rec}		0.38 0.97		mJ

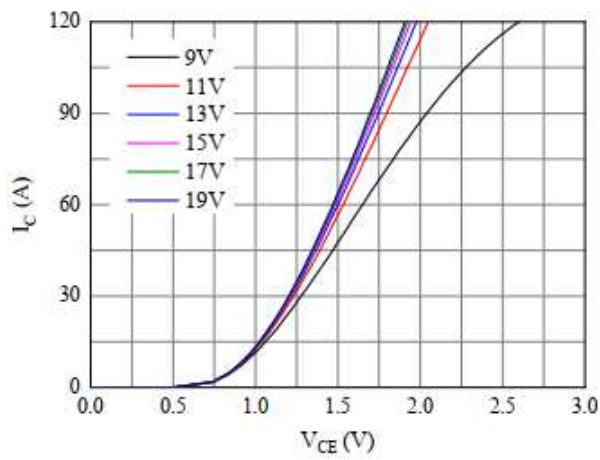


Figure 1. Typical output characteristics (Tvj=25°C)

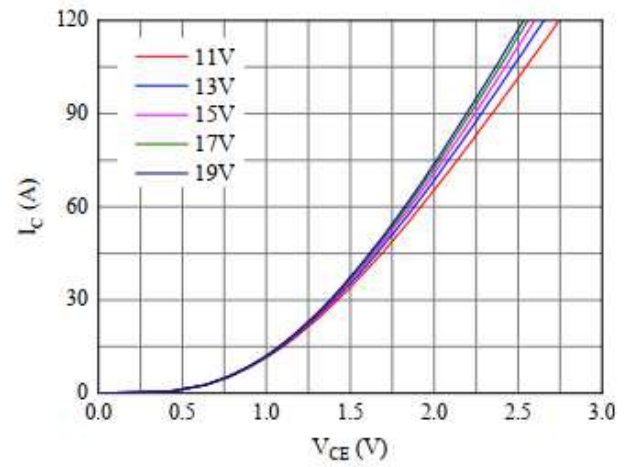


Figure 2. Typical output characteristics (Tvj=175°C)

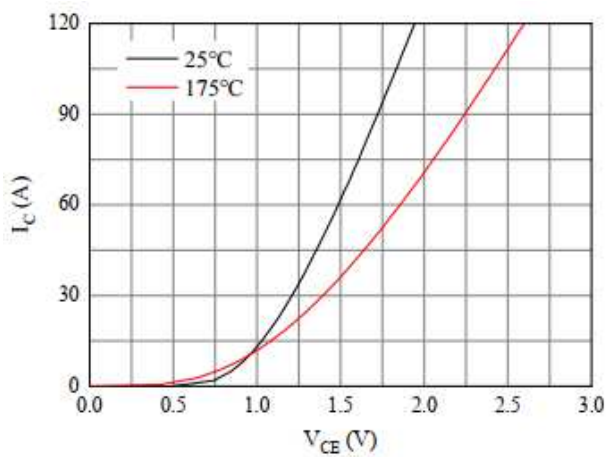


Figure 3. Typical output characteristics (V_{GS}=15V)

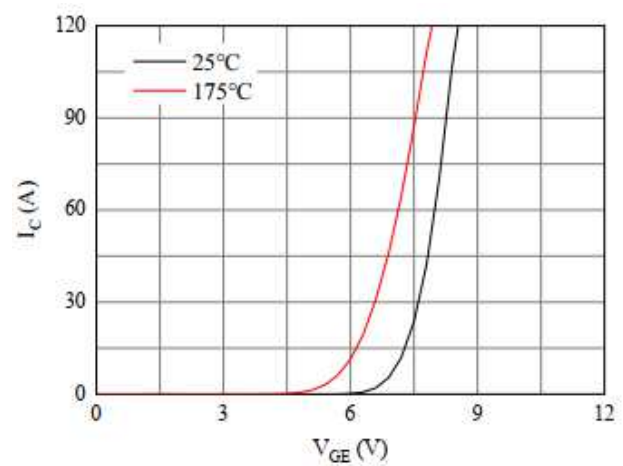


Figure 4. Typical transfer characteristic (V_{CE}=20V)

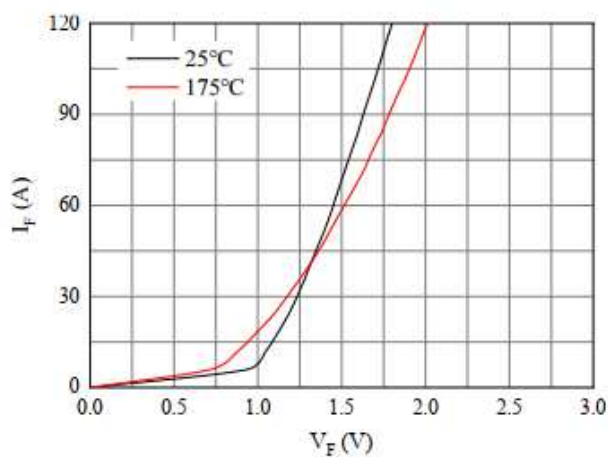


Figure 5. Forward characteristic of Diode

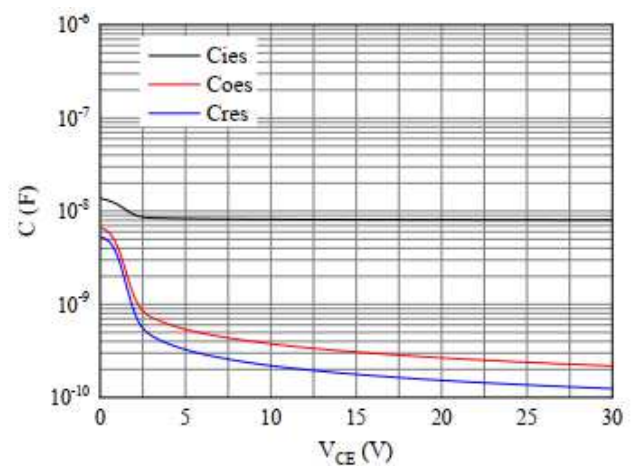


Figure 6. Capacitance characteristic

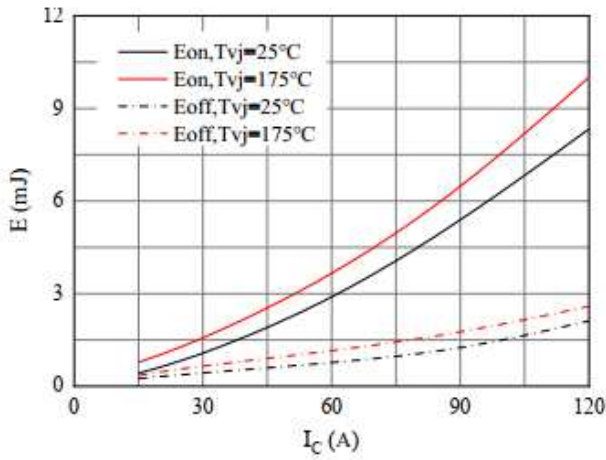


Figure 7. Switching losses of IGBT
VGE=±15V, Rgon=8Ω, Rgoff=8Ω, VCE=400V

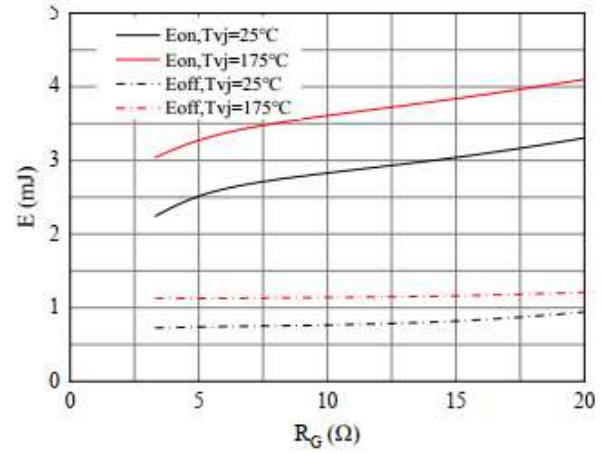


Figure 8. Switching losses of IGBT
VGE=±15V, IC=60A, VCE=400V

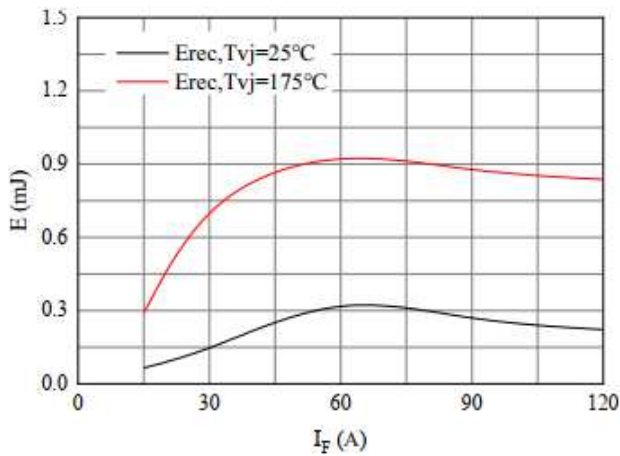


Figure 9. Switching losses of Diode
Rgon=8Ω, VCE=400V

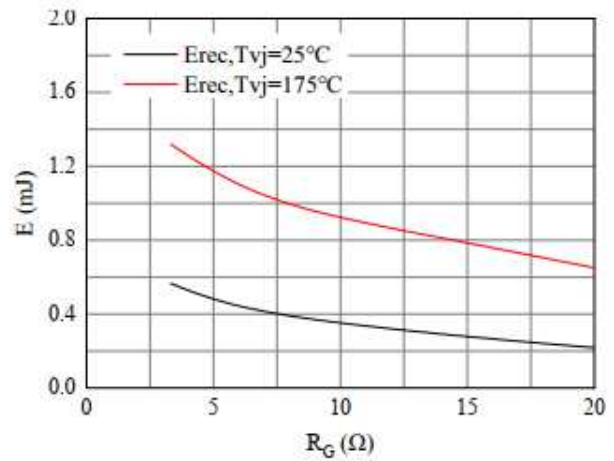


Figure 10. Switching losses of Diode
IF=60A, VCE=400V

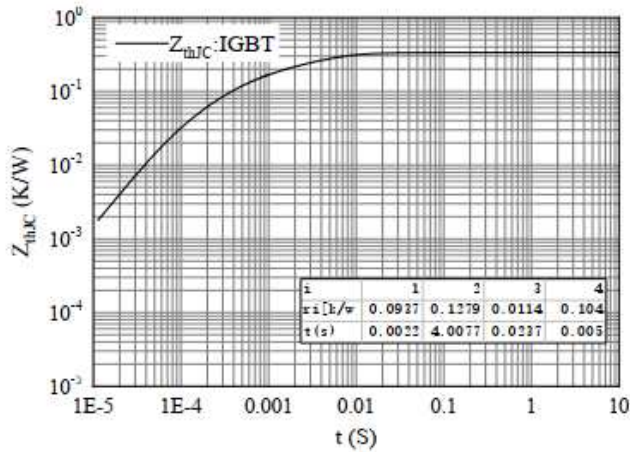


Figure 11. Transient thermal impedance IGBT,
 $Z_{thJC}=f(t)$

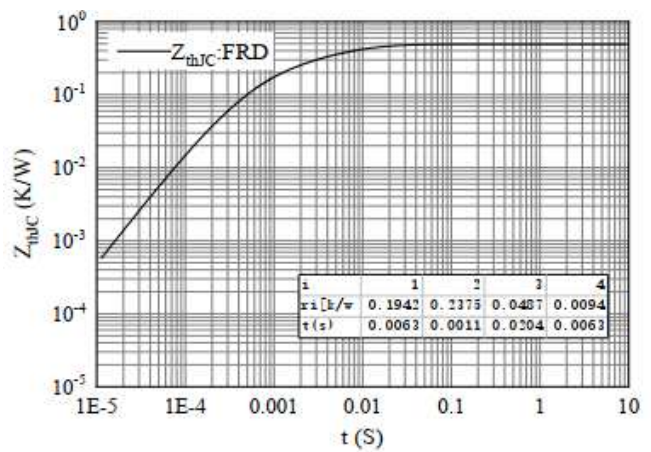
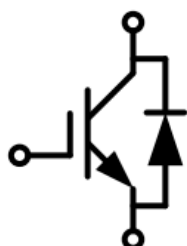
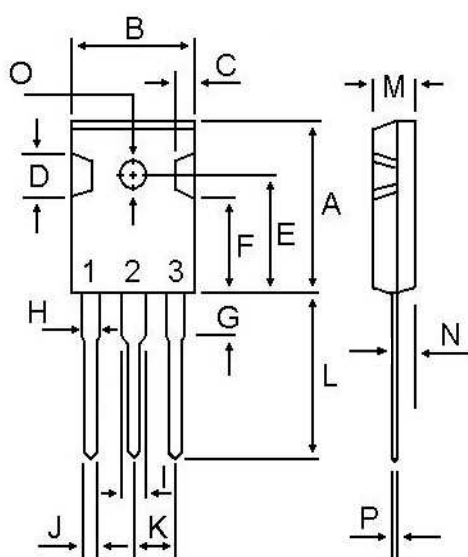


Figure 12. Transient thermal impedance FRD,
 $Z_{thJC}=f(t)$

- 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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