General Description

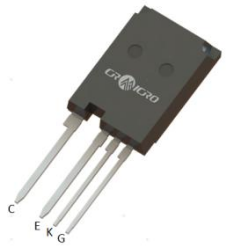
Using micro trench design and advanced.

Field Stop (FS) technology, offering superior conduction

and switching performances, RoHS Compliant.

V_{CE}	650	V
I_C	120	A
P_{tot} (T_C = 25℃)	519	W
$V_{CE(sat)}$	1.33	V

Outline: TO-247PLUS-4A



Features

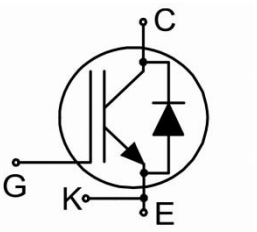
- FS Trench Technology, positive temperature coefficient
- Low saturation voltage:

  $V_{CE(sat)}$, TYP = 1.33V@I_C = 120A, V_{GE} = 15V
- Low switching loss
- Qualified according to JEDEC criteria

Applications

- UPS
- Solar converts
- Charger

Inner circuit:



Package Parameters

Type	Marking	Package	Packing	Qty
CRG120T65AXA7HDZ	G120T65AXA7HDZ	TO-247PLUS-4A	Tube	25

Absolute Maximum Ratings (T_C = 25℃ unless otherwise specified)

Symbol	Parameter	Rating	Unit
V_{CE}	Collector-Emitter Voltage	650	V
V_{GE}	Gate-Emitter Voltage	±20	V
V_{GE}	Gate-Emitter Voltage（t_p≤10us,D<0.01）	±30	V
I_C[a1]	Collector Current @T_C = 25℃	180	A
	Collector Current @T_C = 100℃	147	
I_{CM}	Pulsed Collector Current, t_p limited by T_{jmax}	480	A
I_F[a2]	Diode Continuous Forward Current@T_C = 25℃	180	A
	Diode Continuous Forward Current@T_C = 100℃	120	
I_{FM}	Diode Maximum Forward Current, t_p limited by T_{jmax}	480	A
P_D	Power Dissipation @T_C = 25℃	519	W
	Power Dissipation @T_C = 100℃	259	W
T_j[a3]	Operating Junction temperature range	-40～175	℃
T_{stg}	Storage Temperature Range	-55～150	℃
T_L	Maximum Temperature for Soldering	270	℃

Thermal Characteristics

Symbol	Parameter	Typ	Max	Unit
$R_{th(j-c)}$	Thermal Resistance, Junction to case for IGBT	--	0.29	℃/W
$R_{th(j-c)}$	Thermal Resistance, Junction to case for Diode	--	0.37	℃/W
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient	--	40	℃/W

Electrical Characteristics of the IGBT (T_j = 25℃ unless otherwise specified)

Symbol	Parameter	Conditions	Value			Unit
			Min	Typ	Max	
OFF Characteristics						
V_{CE}	Collector-Emitter Breakdown Voltage	V_{GE} = 0V, I_{CE} = 250uA	650	--	--	V
I_{CES}	Collector Cut-off Current	V_{GE} = 0V, V_{CE} = 650V	--	--	100	uA
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	V_{GE} = +20V	--	--	+250	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	V_{GE} = -20V	--	--	-250	nA
ON Characteristics						
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 120A, V_{GE} = 15V @T_j = 25℃	--	1.33	1.65	V
		I_C = 120A, V_{GE} = 15V @T_j = 175℃	--	1.6	--	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 1mA, V_{CE} = V_{GE}	3	4	5	V
Pulse width t_p≤300μs, δ ≤2%						

Dynamic Characteristics							
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		--	8726	--	pF
C_{oes}	Output Capacitance			--	267	--	
C_{res}	Reverse Transfer Capacitance			--	43	--	
Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time	V_{CE} = 400V, I_C = 120A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_j = 25℃		--	32	--	ns
t_r	Rise Time			--	32	--	
$t_{d(off)}$	Turn-Off Delay Time			--	518	--	
t_f	Fall Time			--	36	--	
E_{on} [a4]	Turn-On Switching Loss			--	1.8	--	mJ
E_{off}	Turn-Off Switching Loss			--	2.6	--	
E_{ts}	Total Switching Loss			--	4.4	--	
$t_{d(on)}$	Turn-on Delay Time	V_{CE} = 400V, I_C = 120A, R_G = 10Ω, V_{GE} = 15V, Inductive Load, T_j = 175℃		--	25	--	ns
t_r	Rise Time			--	41	--	
$t_{d(off)}$	Turn-Off Delay Time			--	588	--	
t_f	Fall Time			--	52	--	
E_{on} [a4]	Turn-On Switching Loss			--	3.1	--	mJ
E_{off}	Turn-Off Switching Loss			--	3.4	--	
E_{ts}	Total Switching Loss			--	6.5	--	
Q_g	Total Gate Charge	V_{CE} = 520V, I_C = 120A, V_{GE} = 15V		--	421	--	nC
Q_{ge}	Gate to Emitter Charge			--	48	--	
Q_{gc}	Gate to Collector Charge			--	158	--	
Electrical Characteristics of the DIODE							
V_F	Diode Forward Voltage	I_F = 120A	T_j = 25℃	--	1.95	2.5	V
			T_j = 175℃	--	1.82	--	V
t_{rr}	Reverse Recovery Time	V_R = 400V, R_G = 10Ω, I_F = 120A	T_j = 25℃	--	110	--	ns
			T_j = 175℃	--	192	--	
Q_{rr}	Reverse Recovery Charge		T_j = 25℃	--	3	--	nC
			T_j = 175℃	--	11.3	--	
I_{rrm}	Reverse Recovery Current		T_j = 25℃	--	76.3	--	A
			T_j = 175℃	--	126.7	--	
dI_F/dt	Diode Current Slope		T_j = 25℃	--	3670	--	A/us
			T_j = 175℃	--	3380	--	
E_{rec}	Reverse Recovery Energy		T_j = 25℃	--	823	--	uJ
			T_j = 175℃	--	3400	--	

Notes:

a1: The collector DC current is limited by the maximum junction temperature, limited by the bond wire current capacity at 25℃
a2: FRD DC forward current is limited by the maximum junction temperature, limited by the bond wire current capacity at 25℃
a3: Repetitive rating; pulse width limited by maximum junction temperature; Under overloading conditions, it is allowed to operate under the maximum junction temperature T_j = 175℃, and the maximum duty cycle is less than 20% (maximum lasting 60s)
a4: Turn-on losses include diode losses

Typical Performance Characteristics

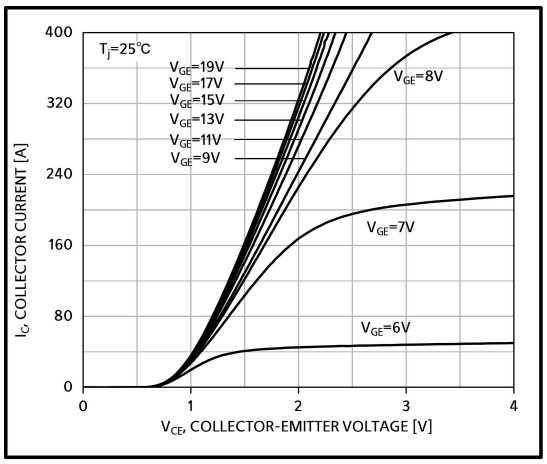


Figure 1. Output Characteristics

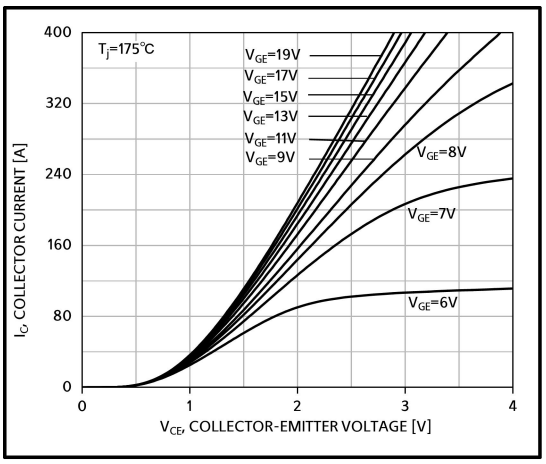


Figure 2. Output Characteristics

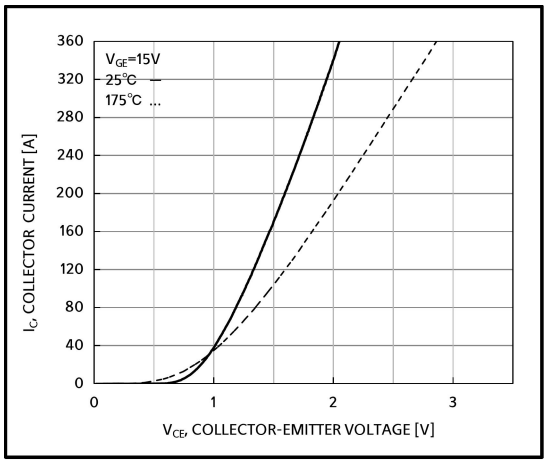


Figure 3. Saturation Voltage Characteristics

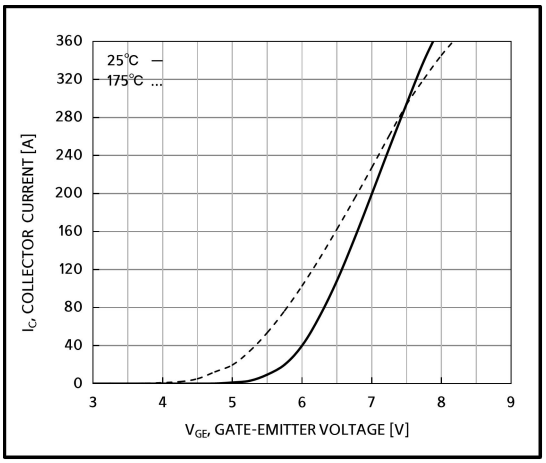


Figure 4. Transfer Characteristics

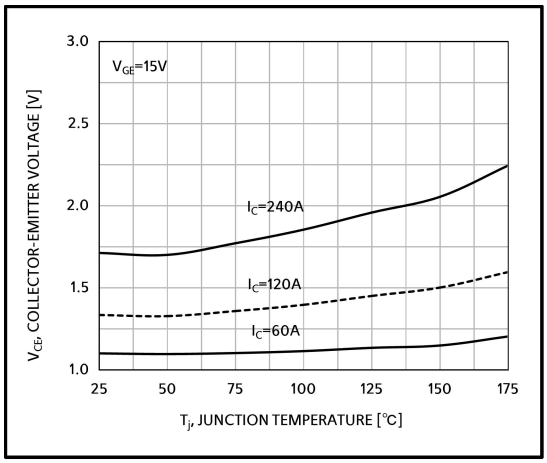


Figure 5. Saturation Voltage-T_j Characteristics

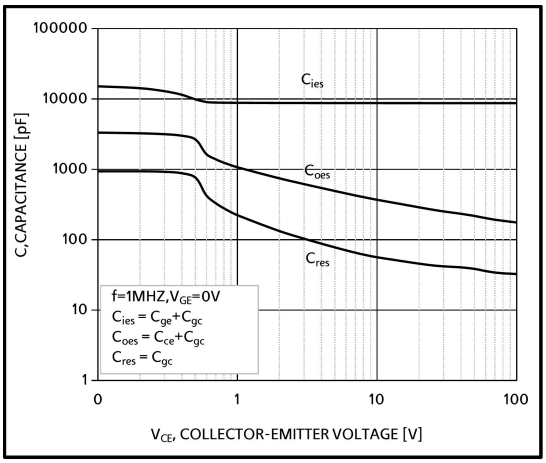


Figure 6. Capacitance Characteristics

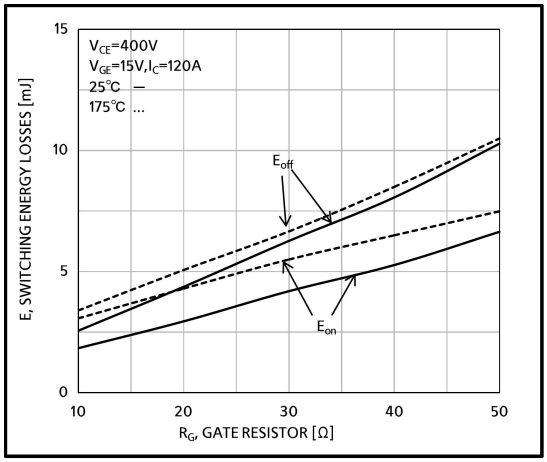


Figure 7. Switching Loss-R_G Characteristics

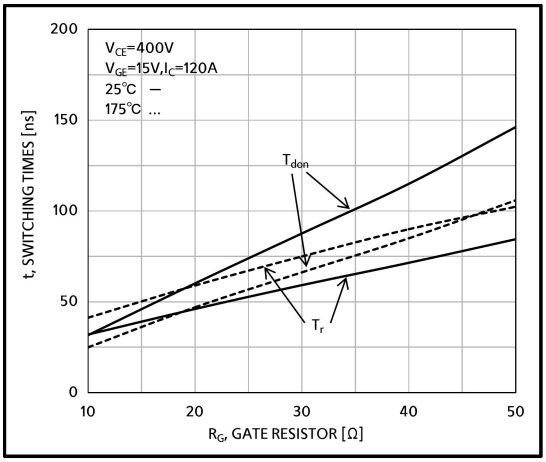


Figure 8. Switching Time-R_G Characteristics

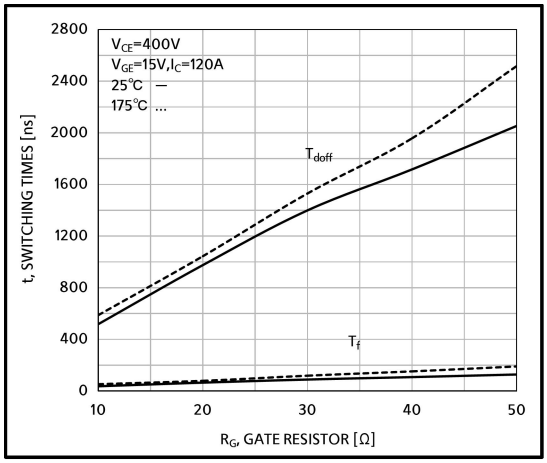


Figure 9. Switching Time-R_G Characteristics

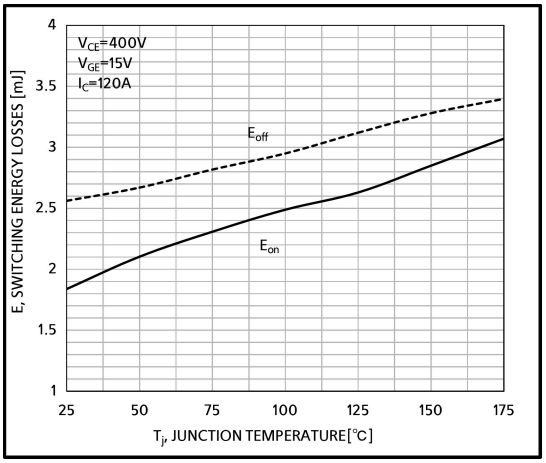


Figure 10. Switching Loss-T_j Characteristics

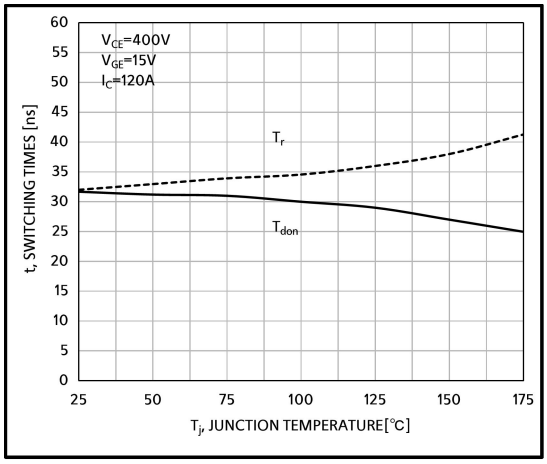


Figure 11. Switching Time-T_j Characteristics

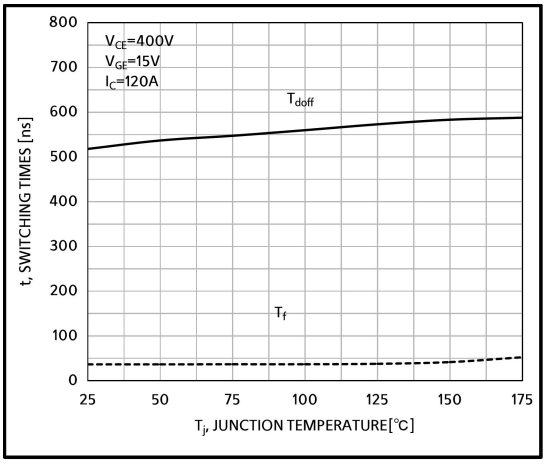


Figure 12. Switching Time-T_j Characteristics

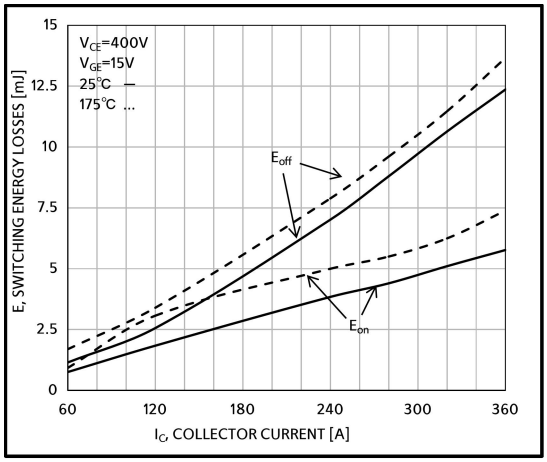


Figure 13. Switching Loss-I_C Characteristics

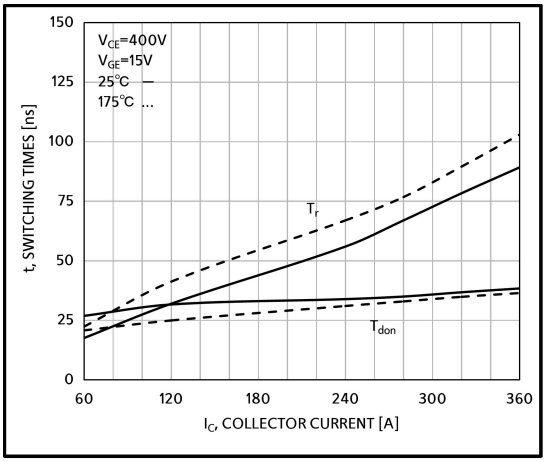


Figure 14. Switching Time-I_C Characteristics

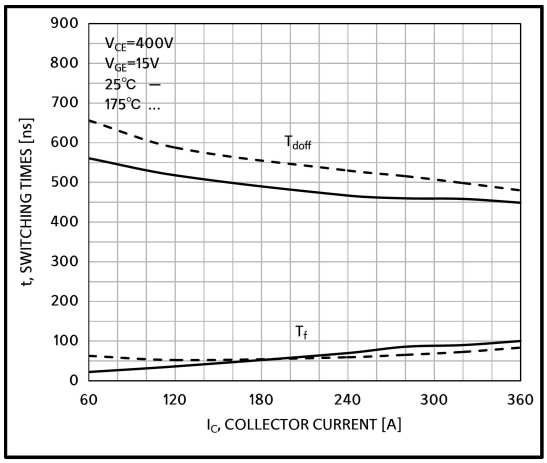


Figure 15. Switching Time-I_C Characteristics

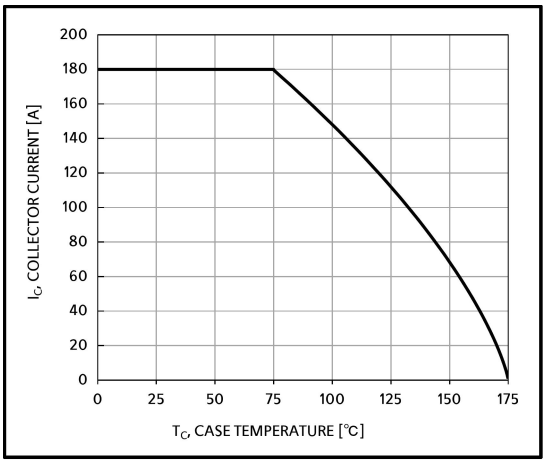


Figure 16. Collector Current-Tc Characteristics
(Tj ≤175℃)

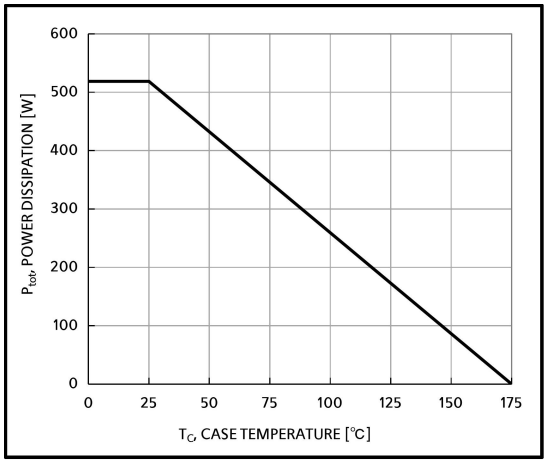


Figure 17. Power Dissipation-Tc Characteristics
(Tj ≤175℃)

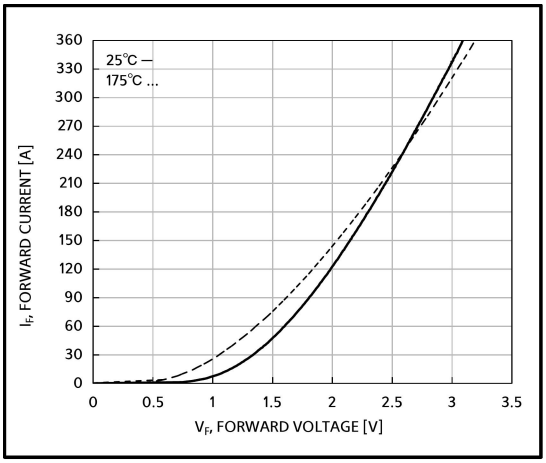


Figure 18. Diode Forward Characteristics

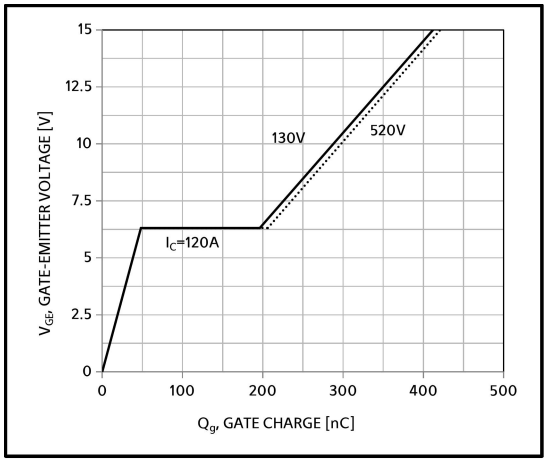


Figure 19. Gate Charge Characteristics

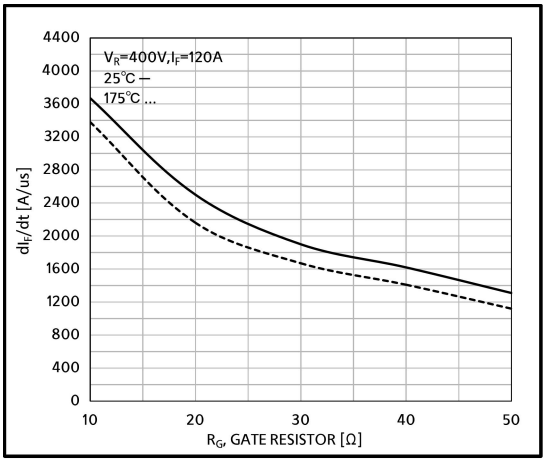


Figure 20. Typical diode current slope as a function of gate resistor

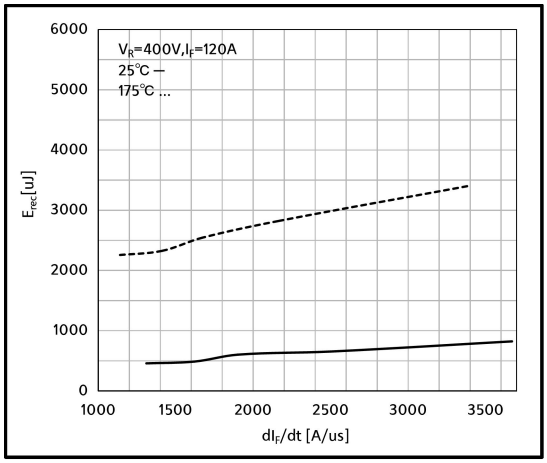


Figure 21. Typical reverse recovery Energy as a function of diode current slope

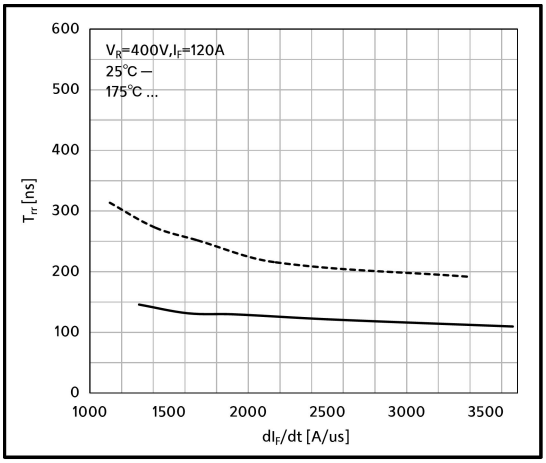


Figure 22. Typical reverse recovery time as a function of diode current slope

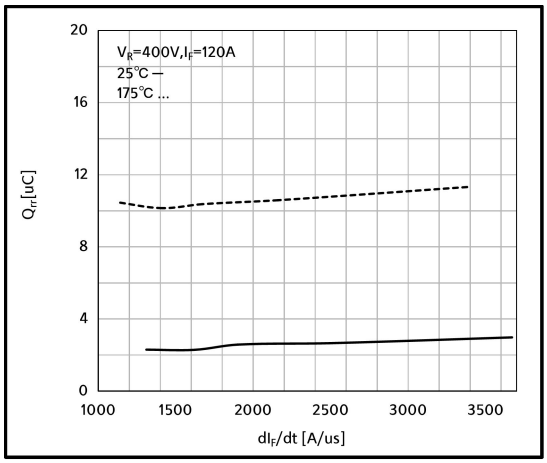


Figure 23. Typical reverse recovery charge as a function of diode current slope

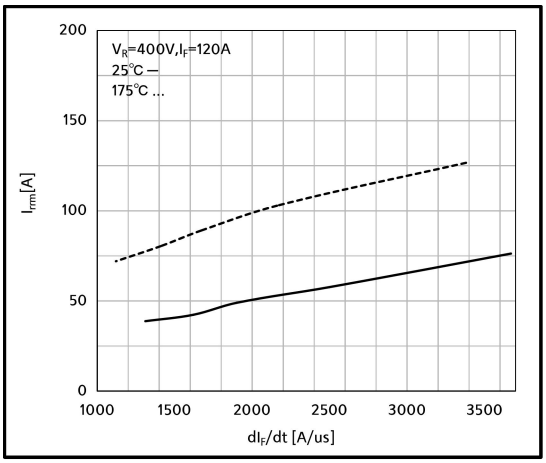


Figure 24. Typical reverse recovery charge as a function of diode current slope

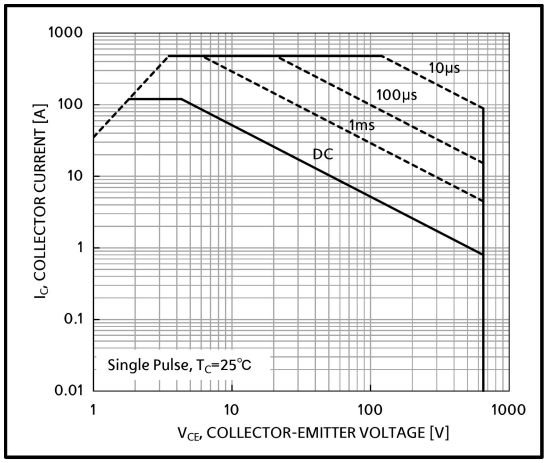


Figure 25. Forward Bias Safe Operating Area

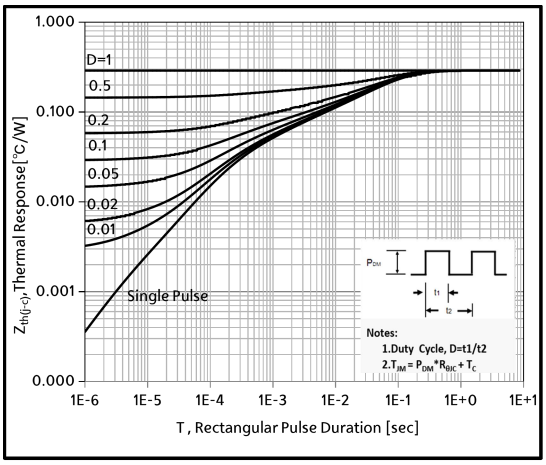


Figure 26 IGBT Transient Thermal Impedance

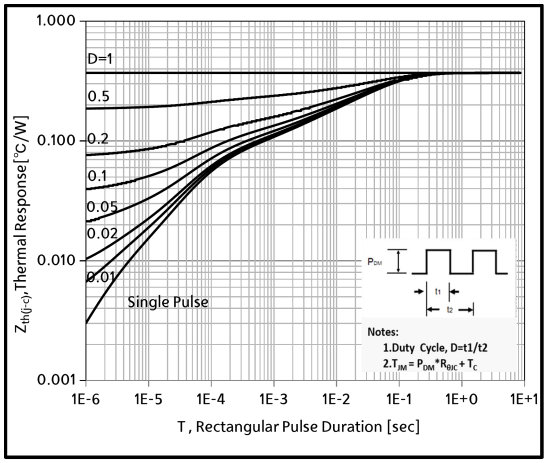
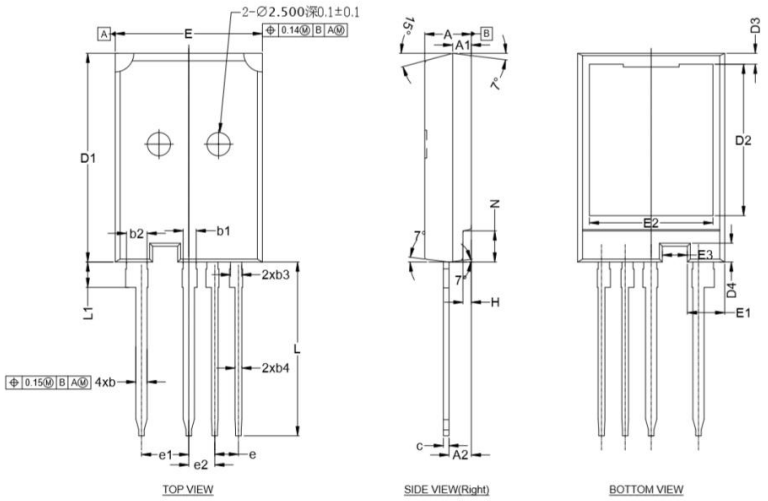


Figure 27. FRD Transient Thermal Impedance

Package Information



Items	Values(mm)	
	MIN	MAX
A	4.85	5.15
A1	1.90	2.20
A2	2.15	2.65
b	1.07	1.33
b1	1.30	1.55
b2	2.10	2.35
b3	1.10	1.45
b4	0.60	0.84
c	0.50	0.70
D1	22.20	22.60
D2	15.90	16.60
D3	0.97	1.37
D4	1.90	2.10
E	15.50	16.10
E1	3.85	4.15
E2	13.05	13.55
E3	2.53	2.83
e	2.54 BSC	
e1	5.08 BSC	
e2	2.79 BSC	
L	18.40	18.90
L1	2.50	2.90
H	0.80	1.00
N	3.24	3.44

TO-247PLUS-4A Package

The name and content of poisonous and harmful material in products

Part's Name Limit	Hazardous Substance									
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE	DIBP	DEHP	DBP	BBP
	⩽ 0.1%	⩽ 0.1%	⩽ 0.01 %	⩽ 0.1%	⩽ 0.1%	⩽ 0.1%	⩽ 0.1%	⩽ 0.1%	⩽ 0.1%	⩽ 0.1%
Lead Frame	○	○	○	○	○	○	○	○	○	○
Molding	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
Wire Bonding	○	○	○	○	○	○	○	○	○	○
Solder	×	○	○	○	○	○	○	○	○	○
Note	○：Means the hazardous material is under the criterion of 2011/65/EU. ×：Means the hazardous material exceeds the criterion of 2011/65/EU. The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS.									

Warnings

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. IGBTs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. This publication is made by Huajing Microelectronics and subject to regular change without notice.

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0510-85800360（Fax）

Application and Service：Post：214061 Tel / Fax：0510-85807228-3399 / 2227

Revison History		
Revision	Date	Major changes
1.0	2025/11/13	Initial release
2.0	2025/12/16	Update Ices maximum, adjust some images, revise some inaccurate descriptions