

HCH50FB120F0H1

1200V Dual Boost Hybrid Power Module

Description

The HCH50FB120F0H1 is a Dual Boost Power Module. It integrates high performance IGBT chips and SiC Diodes designed for the applications such as Solar Inverter, UPS, Fuel cell-DC/DC converter, Energy storage Systems.



Features

- Blocking voltage :1200V
- low saturation voltage $V_{CE(sat)}$
- SiC Diode
- 1600V Bypass and Anti-parallel Diodes
- Low Inductive Design
- Low thermal resistance
- Thermistor inside

Applications

- Solar Inverter
- Fuel cell-DC/DC converter
- Uninterruptible Power Supplier
- Energy Storage Systems

Circuit diagram

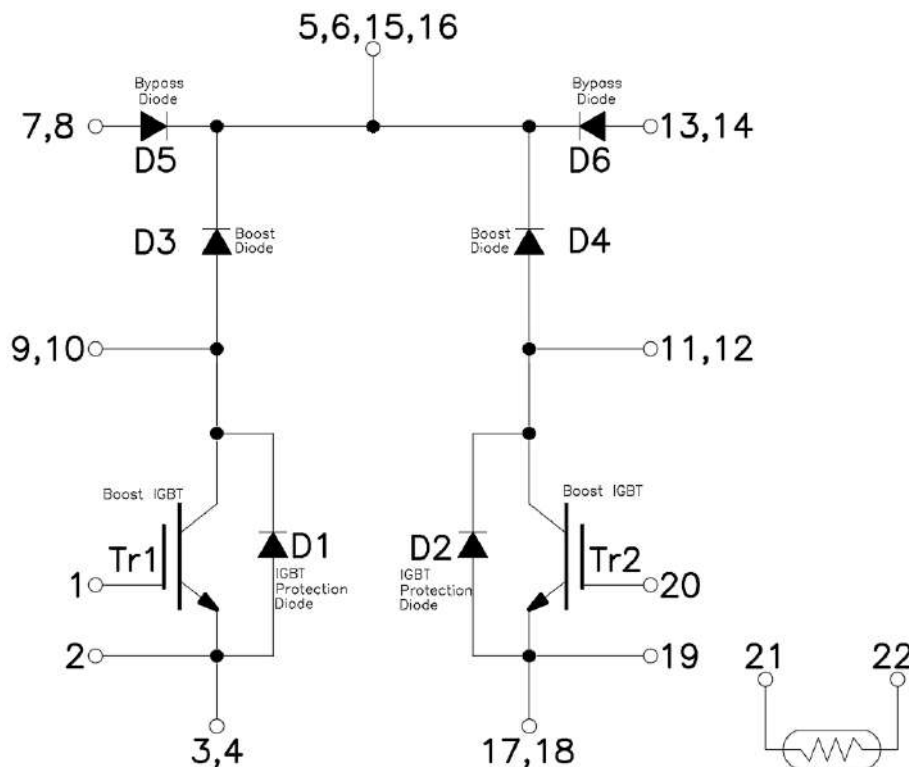


Figure 1. Out drawing & circuit diagram for HCF50FB120F0H1

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Pin Configuration and Marking Information

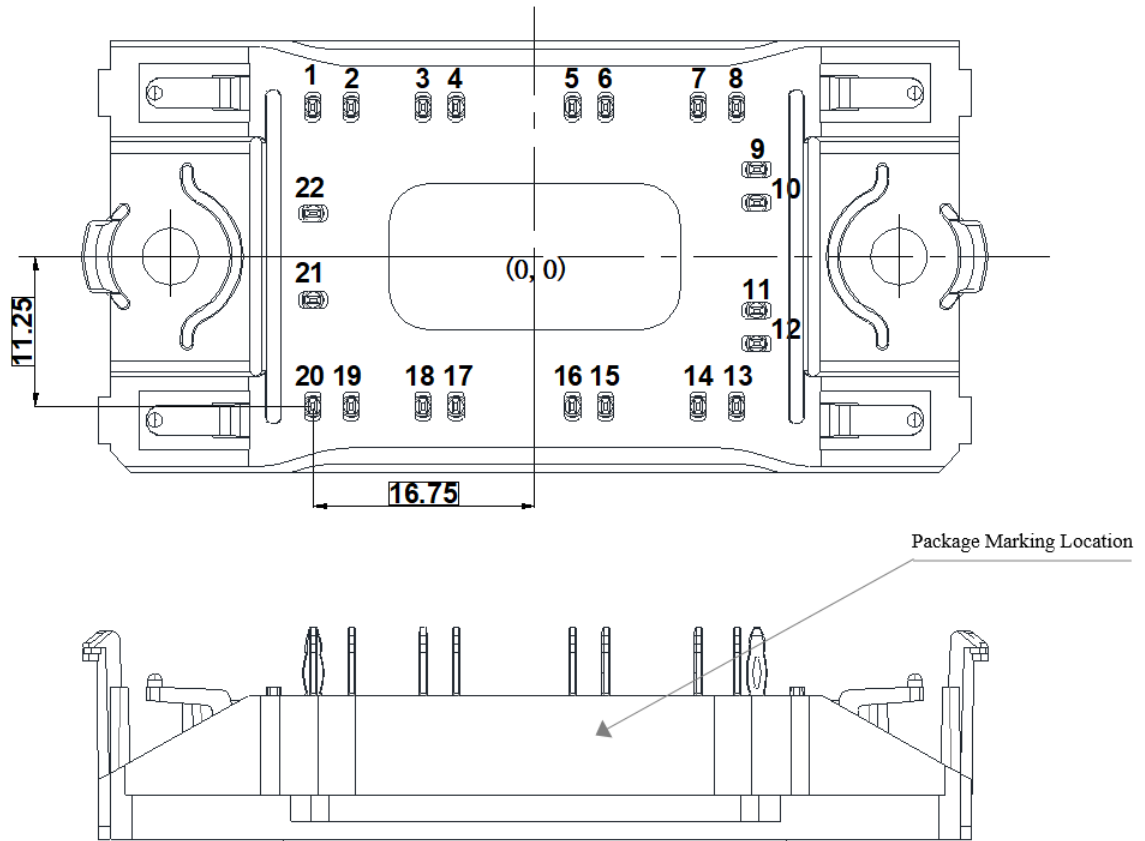


Figure 2. Pin configuration

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Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, $f=50\text{Hz}$, $t=1\text{min}$	2.5	kV
Creepage distance	-	12.7	mm
Clearance	Press-fit pin	9.15	mm
Comparative Tracking Index	-	>200	-
Module lead resistance, terminals–chip	$T_C = 25^\circ\text{C}$	0.8	m Ω
Weight	-	26.5	g

Thermistor Electrical characteristics

Symbol	Item	Condition	Value			Unit
			Min.	Typ.	Max	
R25	Nominal resistance	-	-	22	-	k Ω
R100	Nominal resistance	$T = 100^\circ\text{C}$	-	-	-	Ω
$\Delta R/R$	Deviation of R25	-	-5	-	5	%
-	B-value	$B(25/50)$, tolerance $\pm 3\%$	-	3950	-	K
-	B-value	$B(25/100)$, tolerance $\pm 3\%$	-	3998	-	K
P_D	Power Dissipation	-	-	200	-	mW

Maximum Ratings ($T_J = 25^\circ\text{C}$ unless otherwise specified) Boost IGBT

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	± 20	V
I_C	DC Continuous Collector Current	$T_S = 80^\circ\text{C}$	60	A
		$T_C = 80^\circ\text{C}$	75	A
I_{CM}	Pulse Collector Current	$T_C = 80^\circ\text{C}$, Note1	150	A
P_{tot}	Maximum Power Dissipation	$T_S = 80^\circ\text{C}$, $T_J = 175^\circ\text{C}$	190	W
		$T_C = 80^\circ\text{C}$, $T_J = 175^\circ\text{C}$	271	W
T_J	Junction temperature	-	-40 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature	-	-40 to 125	$^\circ\text{C}$

Note1: Pulse width limited by maximum junction temperature

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Boost Diode

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1200	V
I_F	Continuous Forward Current	$T_j = T_{jmax}$, $T_s < 80^{\circ}C$	33	A
		$T_j = T_{jmax}$, $T_c < 80^{\circ}C$	37	A
I_{FSM}	Surge Forward Current	$T_s = 25^{\circ}C$	185	A
I^2t	Surge Current Capability	(60Hz single half-sine wave)	142	A ² s
P_{tot}	Total Power Dissipation	$T_j = T_{jmax}$, $T_s < 80^{\circ}C$	100	W
		$T_j = T_{jmax}$, $T_c < 80^{\circ}C$	118	W
T_{jmax}	Maximum Junction temperature	-	175	$^{\circ}C$

Bypass Diode/Boost IGBT Protection Diode

Symbol	Parameter	Conditions	Ratings	Unit
V_{RRM}	Peak Repetitive Revers Voltage	-	1600	V
I_F	Continuous Forward Current	$T_j = T_{jmax}$, $T_s < 80^{\circ}C$	43	A
		$T_j = T_{jmax}$, $T_c < 80^{\circ}C$	50	A
I_{FRM}	Repetitive Peak Forward Current	$T_j = T_{jmax}$	200	A
P_{tot}	Total Power Dissipation	$T_j = T_{jmax}$, $T_s < 80^{\circ}C$	82	W
		$T_j = T_{jmax}$, $T_c < 80^{\circ}C$	100	W
T_{jmax}	Maximum Junction temperature	-	150	$^{\circ}C$

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IGBT Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit	
				Min.	Typ.	Max		
V _{CE(sat)} (Chip)	Collector-Emitter Saturation Voltage	I _C =50A	T _J =25°C	-	1.88	2.25	V	
		V _{GE} =15V	T _J =150°C	-	2.45	-	V	
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =18mA, V _{CE} =V _{GE}		5.0	5.8	6.8	V	
C _{ies}	Input capacitance	V _{CE} =25V, V _{GE} =0V f =1MHz	T _J =25°C	-	5.3	-	nF	
C _{res}	Reverse transfer Capacitance		T _J =25°C	-	0.12	-	nF	
I _{CES}	Collector- Emitter Cut off Current	V _{CE} =1200V, V _{GE} =0V	T _J =25°C	-	-	0.2	mA	
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =20V, V _{CE} =0V	T _J =25°C	-	-	0.8	uA	
t _{d(on)}	Turn-on delay time	V _{CC} =700V I _C =50A V _{GE} =+15V/-8V R _G =5.0Ω Inductive load	T _J =25°C	-	50	-	ns	
			T _J =125°C	-	44	-		
t _r	Rise time		T _J =25°C	-	12	-	ns	
			T _J =125°C	-	15	-		
t _{d(off)}	Turn-off delay time		T _J =25°C	-	148	-	ns	
			T _J =125°C	-	173	-		
t _f	Fall time		T _J =25°C	-	170	-	ns	
			T _J =125°C	-	217	-		
E _{on}	Turn-on power dissipation		T _J =25°C	-	0.54	-	mJ	
			T _J =125°C	-	0.76	-		
E _{off}	Turn-off power dissipation		T _J =25°C	-	3.09	-	mJ	
			T _J =125°C	-	4.32	-		
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)			-	0.35	-	°C/W	
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W	

Assumes Thermal Conductivity of grease is 2.8 W/m·K and thickness is 50um.

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Boost Diode Electrical characteristics ($T_j=25^{\circ}\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V _R	Breakdown Voltage	I _R =1mA		1200	-	-	V
I _R	Reverse Leakage Current	V _R =1200V	T _j =25°C	-	3	40	uA
			T _j =150°C	-	93	-	uA
V _F	Diode Forward Voltage	I _F =20A V _{GE} =0V	T _j =25°C	-	1.46	1.6	V
			T _j =150°C	-	2.03	2.65	
t _{rr}	Reverse recovery time	V _{CC} =700V	T _j =25°C	-	0.012	-	us
			T _j =125°C	-	0.016	-	
I _{RM}	Peak reverse recovery Current	I _C =50A V _{GE} =+15V/-8V	T _j =25°C	-	6.0	-	A
			T _j =125°C	-	12.0	-	
Q _{rr}	Recovered charge	R _G =5.0Ω	T _j =25°C	-	0.048	-	uC
			T _j =125°C	-	0.118	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)			-	0.8	-	°C/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is $2.8\text{ W/m}\cdot\text{K}$ and thickness is $50\mu\text{m}$.

Bypass/Protection Diode Electrical characteristics ($T_j=25^{\circ}\text{C}$ unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max	
V _R	Breakdown Voltage	I _R =5uA		1600	-	-	V
I _R	Reverse Leakage Current	V _R =1600V	T _j =25°C	-	-	5	uA
			T _j =150°C	-	-	1	mA
V _F	Diode Forward Voltage	I _F =16A V _{GE} =0V	T _j =25°C	-	1.0	1.4	V
			T _j =150°C	-	0.9	-	
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)			-	0.7	-	°C/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied)			-	0.15	-	°C/W

Assumes Thermal Conductivity of grease is $2.8\text{ W/m}\cdot\text{K}$ and thickness is $50\mu\text{m}$.

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Test Conditions

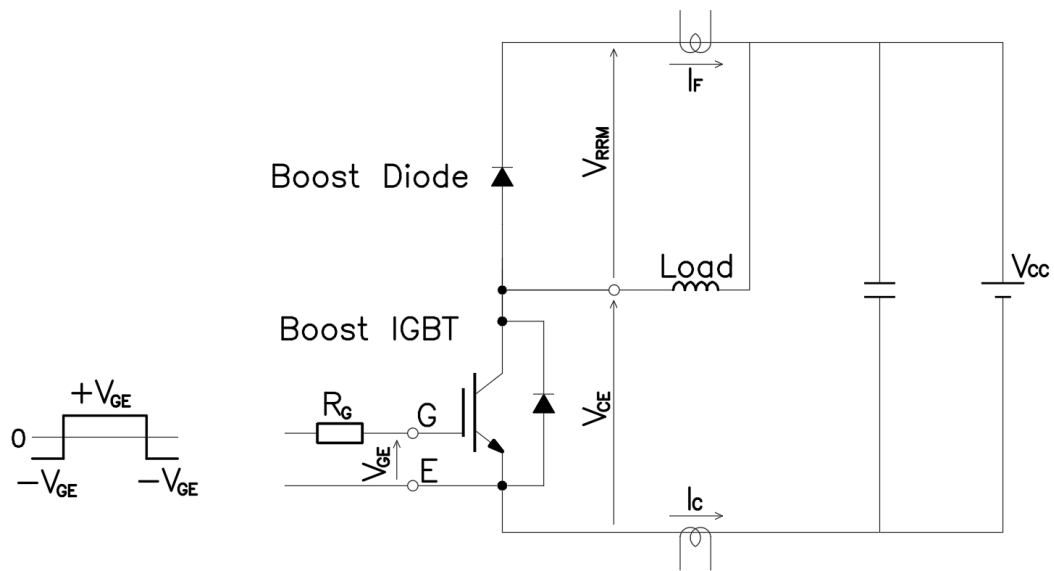


Figure 3. Switching time measure circuit

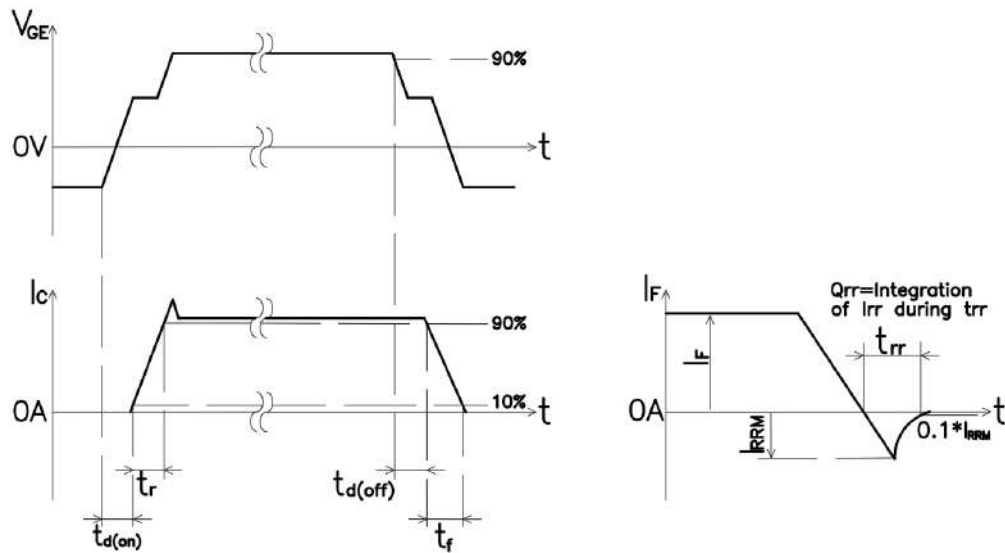


Figure 4. Switching time definition

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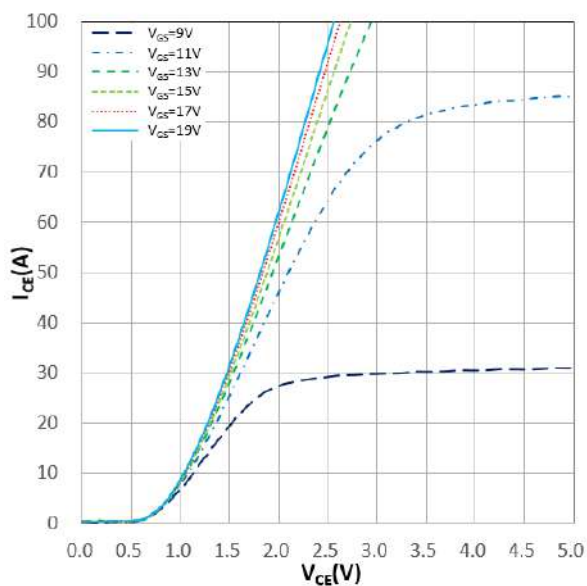


Figure 5. I_{CE} vs V_{CE}
 $T_j=25^{\circ}\text{C}$, V_{GE} parameter

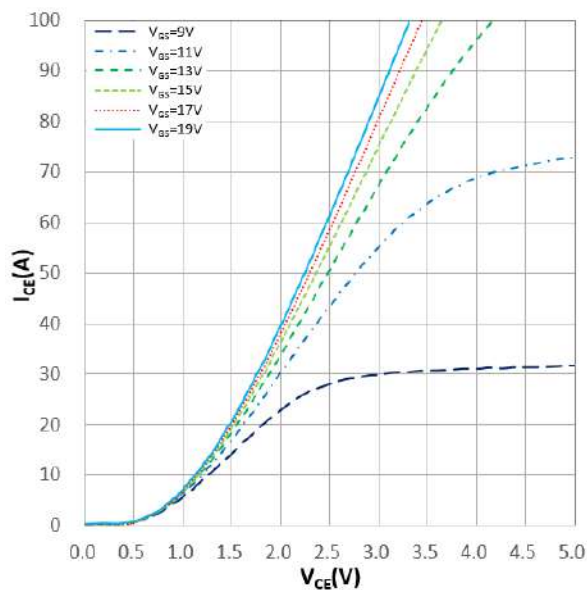


Figure 6. I_{CE} vs V_{CE}
 $T_j=125^{\circ}\text{C}$, V_{GE} parameter

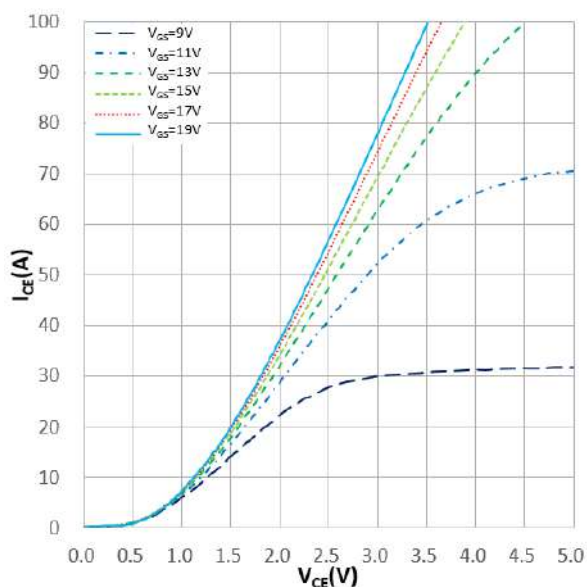


Figure 7. I_{CE} vs V_{CE}
 $T_j=150^{\circ}\text{C}$, V_{GE} parameter

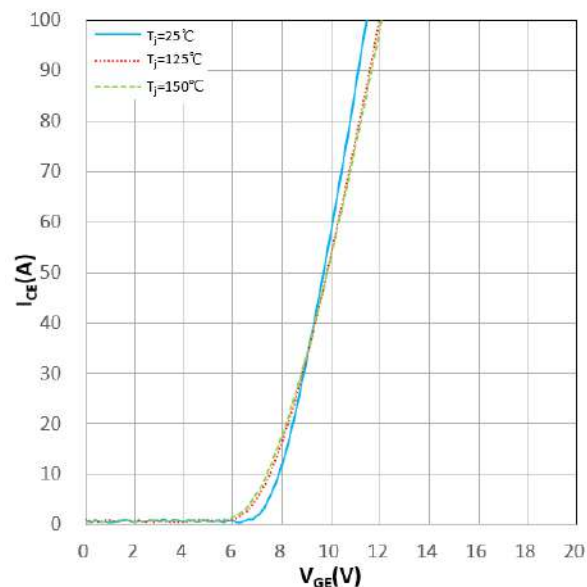


Figure 8. I_{CE} vs V_{GE}
 $V_{CE}=10\text{V}$, T_j parameter

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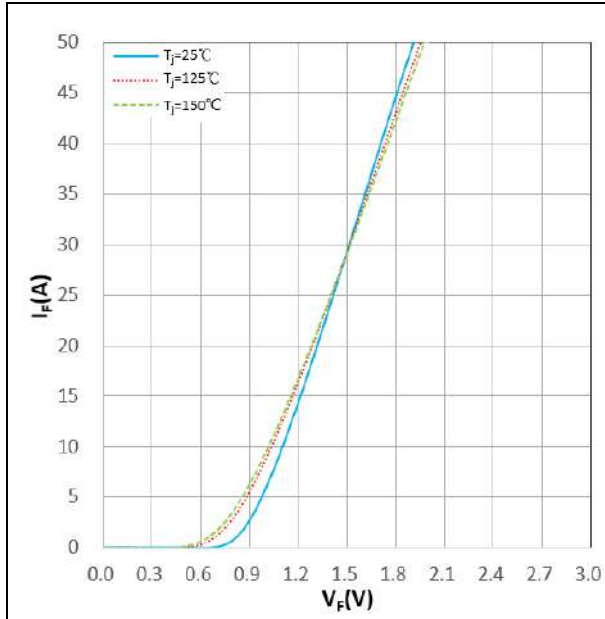
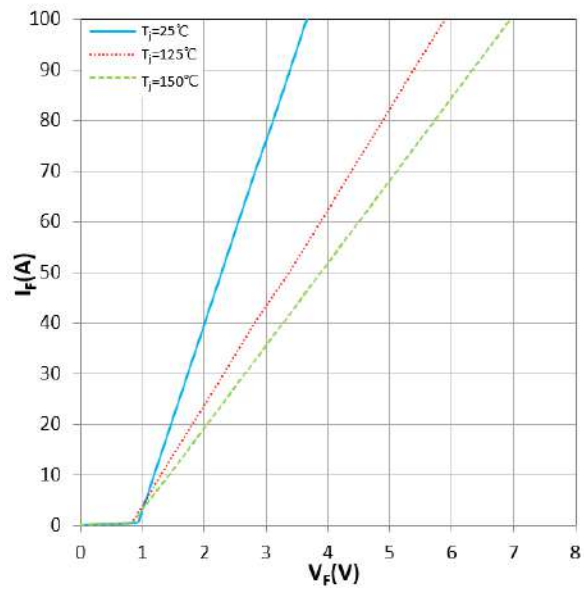
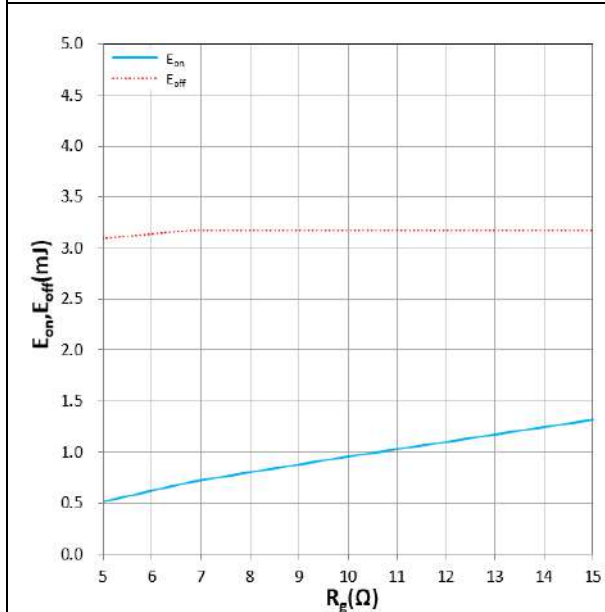

Figure9. I_F vs V_F for Bypass Diode

Figure10. I_F vs V_F for Boost Diode


Figure 11. E_{on} , E_{off} vs R_g (Typ)
 $V_{CC}=700V$, $I_C=50A$, $V_{GE}=+15V/-8V$, $T_j=25^{\circ}C$
Inductive Load

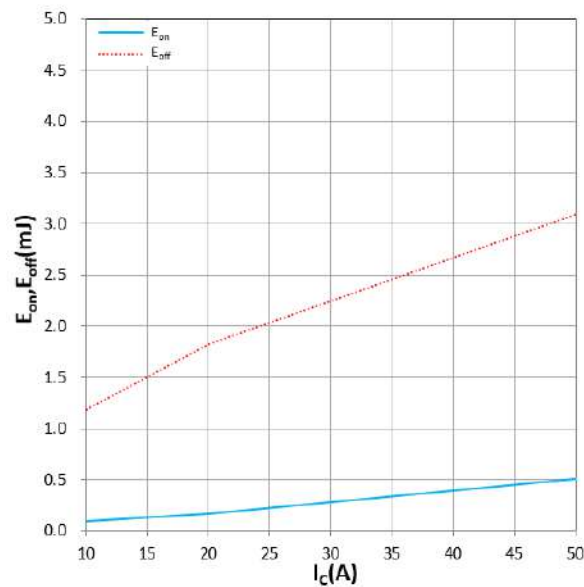


Figure 12. E_{on} , E_{off} vs I_c (Typ)
 $V_{CC}=700V$, $R_G=5\Omega$, $V_{GE}=+15V/-8V$, $T_j=25^{\circ}C$
Inductive Load

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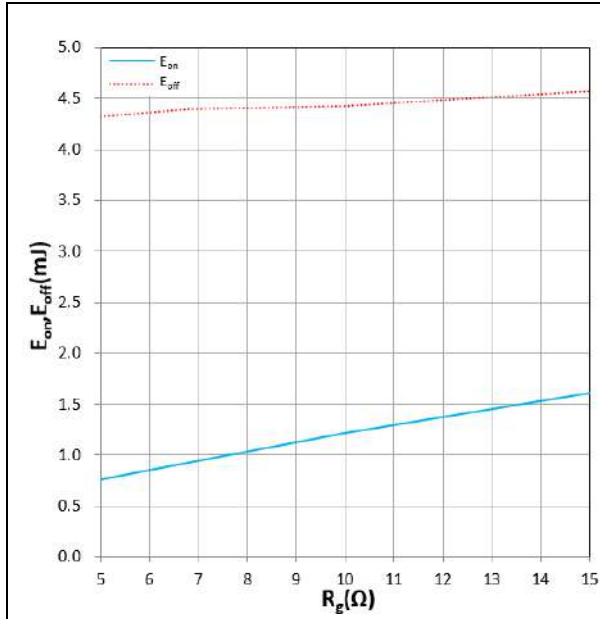


Figure 13. E_{on} , E_{off} vs R_g (Typ)
 $V_{CC}=700V$, $I_C=50A$, $V_{GE}=+15V/-8V$, $T_j=125^\circ C$
Inductive Load

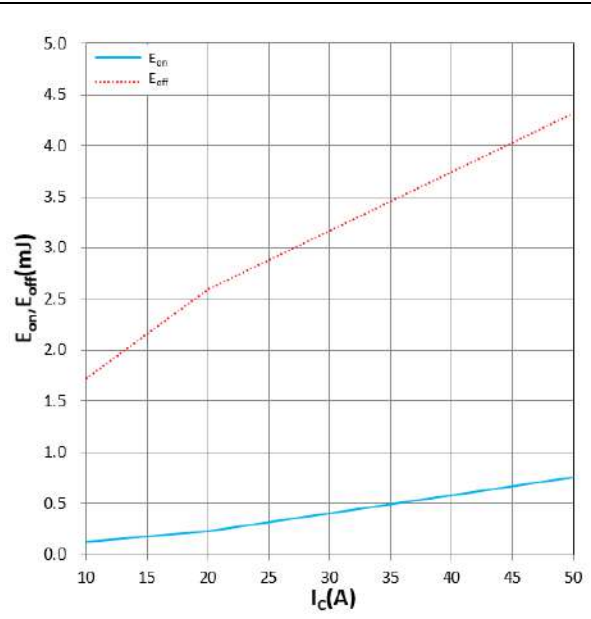


Figure 14. E_{on} , E_{off} vs I_C (Typ)
 $V_{CC}=700V$, $R_G=5\Omega$, $V_{GE}=+15V/-8V$, $T_j=125^\circ C$
Inductive Load

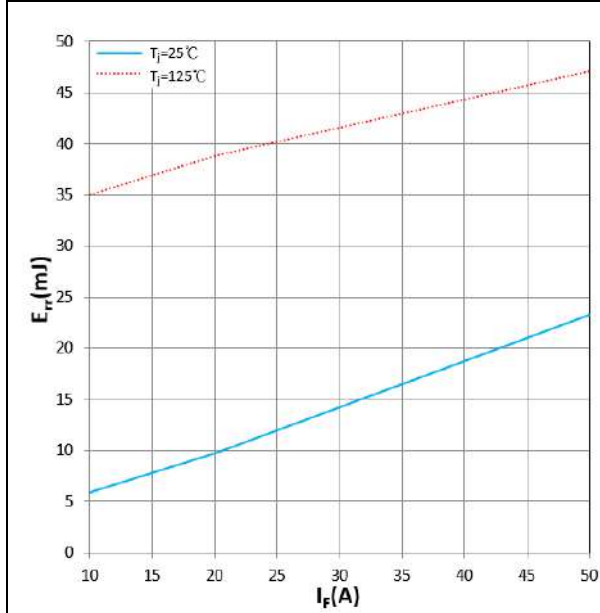


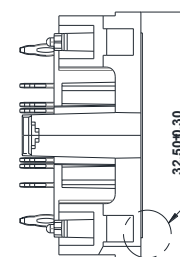
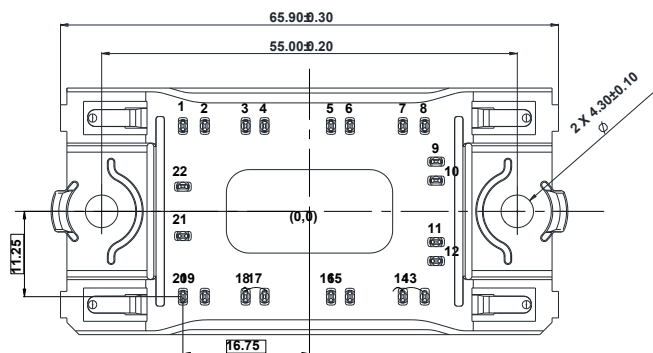
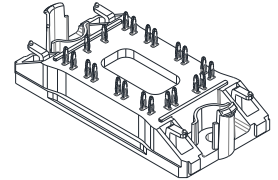
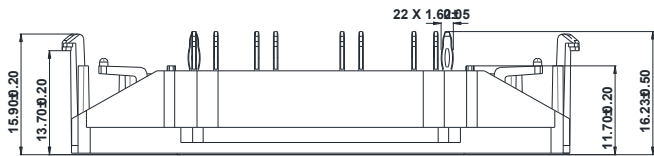
Figure 15. E_{rr} vs I_F
 $V_{RR}=700V$, $R_G=5\Omega$, $V_{GE}=+15V/-8V$
Inductive Load

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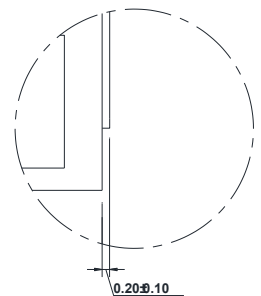
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Package Dimensions

Pin Table		
Pin	X	Y
1	-16.75	11.25
2	-13.85	11.25
3	-8.45	11.25
4	-5.95	11.25
5	2.85	11.25
6	5.35	11.25
7	12.35	11.25
8	15.25	11.25
9	16.75	6.55
10	16.75	4.05
11	16.75	-4.05
12	16.75	-6.55
13	15.25	-11.25
14	12.35	-11.25
15	5.35	-11.25
16	2.85	-11.25
17	-5.95	-11.25
18	-8.45	-11.25
19	-13.85	-11.25
20	-16.75	-11.25
21	-16.75	-3.25
22	-16.75	3.25



Detail



IMPORTANT NOTICE:

This product data sheet describes the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively under the terms and conditions of the supply agreement. There will be no guarantee or of any kind for the product and its characteristics.

The data contained in this document is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the product's suitability for the intended application and the completeness of the product data concerning such application.

Due to technical requirements, our product may contain dangerous substances. For information on the types in question, please contact the sales staff responsible for you.

Changes to this product data sheet are reserved.

Please contact the sales staff (sales@hiitio.com) for further information on the product, technology, delivery terms, conditions and prices.

Revision History

Document Version	Description of Changes
RevX.0.1	Released

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