



Vincotech

30-FT12B2A200H702-PK49L03

datasheet

flowBOOST 2 dual

1200 V / 200 A

Topology features

- Auxiliary diodes for FC pre-charge (patent pending)
- Dual Flying Cap Booster
- Kelvin Emitter for improved switching performance
- Temperature sensor

Component features

- High speed switching
- Low collector emitter saturation voltage
- Low turn-off losses
- Optimized for hard switching topologies
- Positive temperature coefficient

Housing features

- Base isolation: Al_2O_3
- Convex shaped baseplate for superior thermal contact
- Cu baseplate
- Thermo-mechanical push-and-pull force relief
- Solder pin

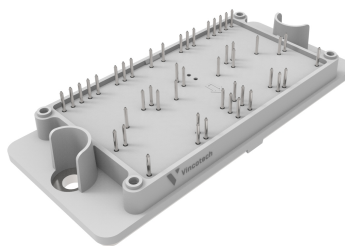
Target applications

- Solar Inverters

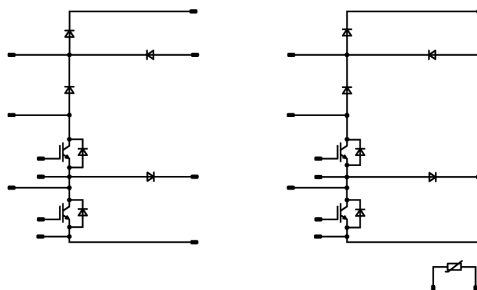
Types

- 30-FT12B2A200H702-PK49L03

flow 2 13 mm housing



Schematic





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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Inner Boost Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	156	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	600	A
Turn off safe operating area		$T_j = 150\text{ °C}$, $V_{CE} = 1200\text{ V}$	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	287	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C

Inner Boost Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	114	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	200	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	234	W
Maximum junction temperature	T_{jmax}		175	°C

Inner Boost Sw. Protection Diode

Peak repetitive reverse voltage	V_{RRM}		1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	98	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	480	A
Surge current capability	I^2t		1152	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	124	W
Maximum junction temperature	T_{jmax}		175	°C



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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Outer Boost Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	156	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	600	A
Turn off safe operating area		$T_j = 150\text{ °C}$, $V_{CE} = 1200\text{ V}$	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	287	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C

Outer Boost Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	114	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	200	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	234	W
Maximum junction temperature	T_{jmax}		175	°C

Outer Boost Sw. Protection Diode

Peak repetitive reverse voltage	V_{RRM}		1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	98	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	480	A
Surge current capability	I^2t		1152	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	124	W
Maximum junction temperature	T_{jmax}		175	°C



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Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Aux Diode H				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	74	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	150	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	145	W
Maximum junction temperature	T_{jmax}		175	°C

Aux Diode L

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	51	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	80	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	320	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_a = 80\text{ °C}$	123	W
Maximum junction temperature	T_{jmax}		175	°C

Module Properties

Thermal Properties

Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{jop}		-40...+($T_{jmax} - 25$)	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	6800	V
Creepage distance			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Inner Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0032	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		200	25 125 150		1,78 1,94 1,98	2,15 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			8	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$	0	25		25		26000		pF
Output capacitance	C_{oes}							480		pF
Reverse transfer capacitance	C_{res}							144		pF
Gate charge	Q_g	$V_{CC} = 960 \text{ V}$	0/15		200	25		1428		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,33		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \text{ } \Omega$ $R_{goff} = 16 \text{ } \Omega$	± 15	700	200	25 125 150		1140,88 1126,71 1123,3		ns
Rise time	t_r					25 125 150		73,55 68,72 68,04		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		864,57 912,32 925,27		ns
Fall time	t_f					25 125 150		19,32 53,25 63,69		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD}=0,268 \text{ } \mu\text{C}$ $Q_{tFWD}=0,301 \text{ } \mu\text{C}$ $Q_{tFWD}=0,276 \text{ } \mu\text{C}$				25 125 150		17,67 14,88 14,05		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		6,03 9,8 10,79		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Inner Boost Diode

Static

Forward voltage	V_F				100	25 125 150		1,42 1,73 1,84	1,65 ⁽¹⁾ 2,3 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25		5	500	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,41		K/W
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Dynamic

Peak recovery current	I_{RM}	$di/dt=4136$ A/µs $di/dt=10770$ A/µs $di/dt=2111$ A/µs	± 15	700	200	25 125 150		25,45 27,92 28,74		A
Reverse recovery time	t_{rr}					25 125 150		18,58 19,16 18,65		ns
Recovered charge	Q_r					25 125 150		0,268 0,301 0,276		µC
Reverse recovered energy	E_{rec}					25 125 150		0,014 0,017 0,016		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		1548,45 2937,25 4552,73		A/µs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Inner Boost Sw. Protection Diode

Static

Forward voltage	V_F				40	25 125 150		1,06 0,987 0,974	1,5 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1600$ V				25 150			50 1000	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,76		K/W
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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Outer Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0032	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		200	25 125 150		1,78 1,94 1,98	2,15 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			8	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$	0	25		25		26000		pF
Output capacitance	C_{oes}							480		pF
Reverse transfer capacitance	C_{res}							144		pF
Gate charge	Q_g	$V_{CC} = 960 \text{ V}$	0/15		200	25		1428		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,33		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \text{ } \Omega$ $R_{goff} = 16 \text{ } \Omega$	± 15	700	200	25 125 150		1131,73 1119,22 1115,5		ns
Rise time	t_r					25 125 150		61,42 57,9 57,91		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		862,07 910,63 923,92		ns
Fall time	t_f					25 125 150		15,96 68,37 81,24		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 0,378 \text{ } \mu\text{C}$ $Q_{tFWD} = 0,43 \text{ } \mu\text{C}$ $Q_{tFWD} = 0,428 \text{ } \mu\text{C}$				25 125 150		14,55 12,57 11,71		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,8 9,99 11,2		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Outer Boost Diode

Static

Forward voltage	V_F				100	25 125 150		1,42 1,73 1,84	1,65 ⁽¹⁾ 2,3 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25		5	500	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,41		K/W
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Dynamic

Peak recovery current	I_{RM}	$di/dt=3352$ A/µs $di/dt=2745$ A/µs $di/dt=2613$ A/µs	± 15	700	200	25 125 150		35,14 39,79 41,81		A
Reverse recovery time	t_{rr}					25 125 150		19,7 18,78 18,86		ns
Recovered charge	Q_r					25 125 150		0,378 0,43 0,428		µC
Reverse recovered energy	E_{rec}					25 125 150		0,031 0,043 0,046		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		4614,39 6679,98 6294,98		A/µs



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Characteristic Values

Parameter	Symbol	Conditions						Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]		Min	Typ	Max	

Outer Boost Sw. Protection Diode

Static

Forward voltage	V_F				40	25 125 150		1,06 0,987 0,974	1,5 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1600$ V				25 150			50 1000	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,76		K/W
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Aux Diode H

Static

Forward voltage	V_F				75	25 125 150		2,59 2,16 2,07	3,3 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25 150			250 2000	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,66		K/W
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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Aux Diode L

Static

Forward voltage	V_F				40	25 125 150		1,49 1,84 1,98	1,65 ⁽¹⁾ 2,3 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25		2	200	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,77		K/W
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Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	$R_{100} = 1484$ Ω				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ± 1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ± 1 %						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.



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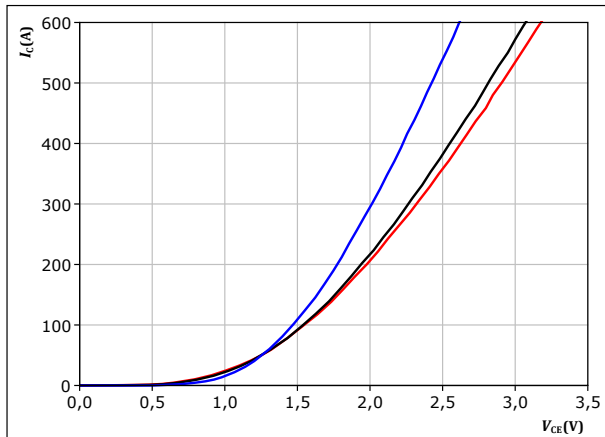
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Inner Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

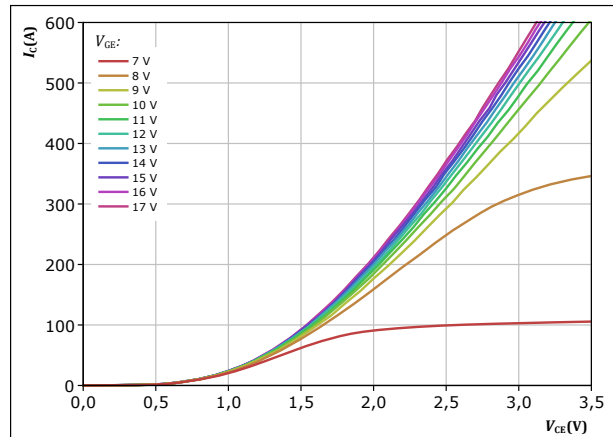


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

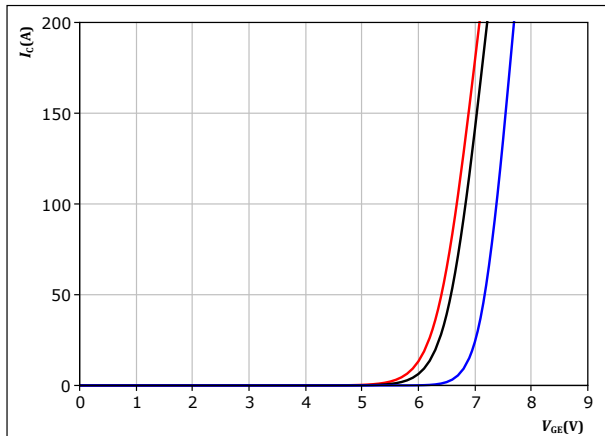


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

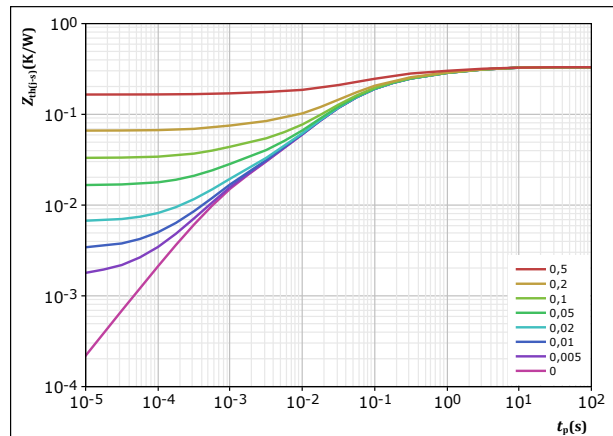


$t_p = 250 \mu s$
 $V_{CE} = 48 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T$
 $R_{th(j-s)} = 0,331 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
3,72E-02	4,28E+00
7,68E-02	6,09E-01
1,42E-01	7,68E-02
6,11E-02	1,66E-02
1,38E-02	8,44E-04



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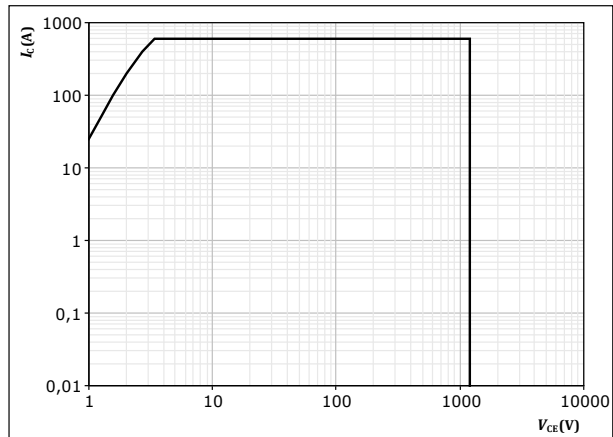
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Inner Boost Switch Characteristics

figure 5. IGBT

Safe operating area

$$I_C = f(V_{CE})$$

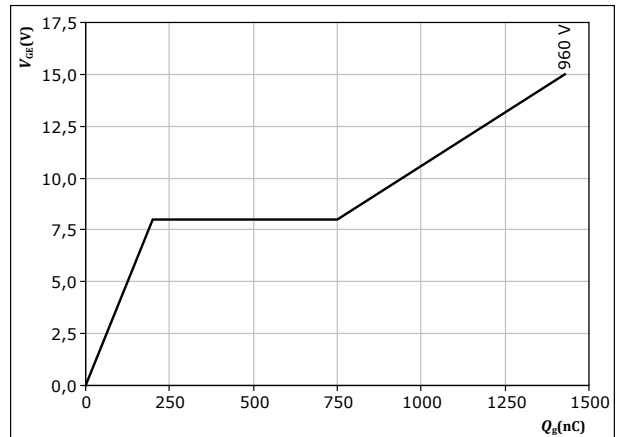


$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 6. IGBT

Gate voltage vs gate charge

$$V_{GE} = f(Q_g)$$



$I_C = 200$ A
 $T_j = 25$ °C



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Inner Boost Diode Characteristics

figure 7.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

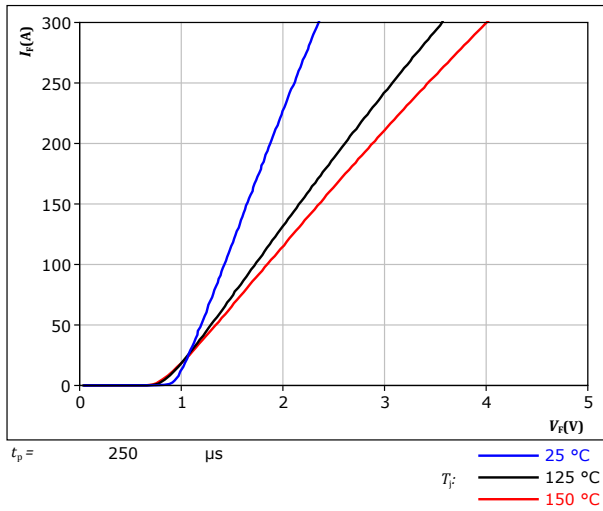
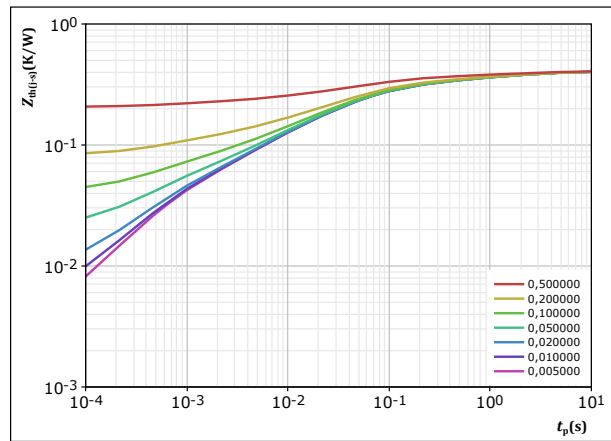


figure 8.

FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D =$	t_p / T
$R_{th(j-s)} =$	0,405 K/W
FWD thermal model values	
R (K/W)	τ (s)
1,72E-02	1,61E+01
5,46E-02	1,79E+00
5,92E-02	2,84E-01
1,42E-01	5,45E-02
7,40E-02	1,41E-02
3,56E-02	3,31E-03
2,91E-02	5,40E-04



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Inner Boost Sw. Protection Diode Characteristics

figure 9. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

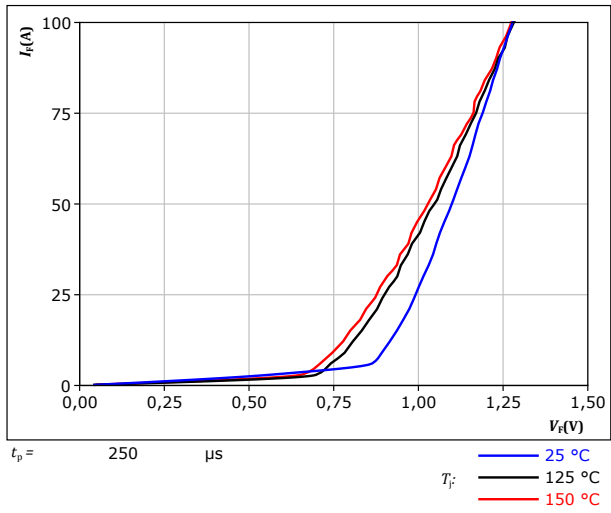
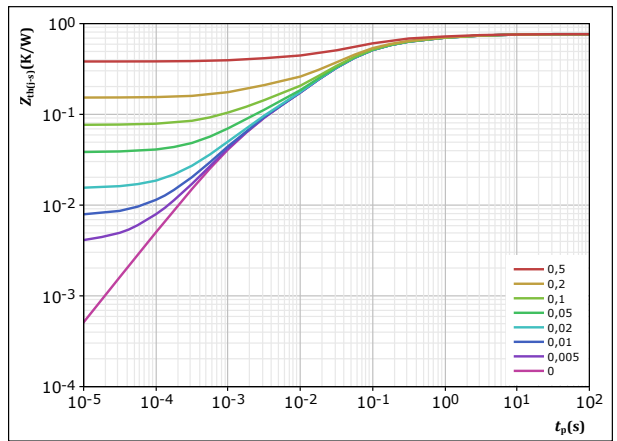


figure 10. Rectifier

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D =$	t_p / T
$R_{th(j-s)} =$	0,765 K/W
Rectifier thermal model values	
R (K/W)	τ (s)
4,68E-02	5,24E+00
1,43E-01	5,88E-01
3,57E-01	7,04E-02
1,61E-01	1,86E-02
5,74E-02	1,54E-03



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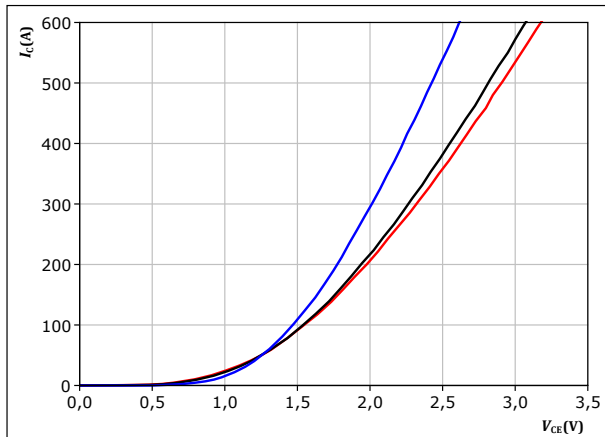
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Outer Boost Switch Characteristics

figure 11. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

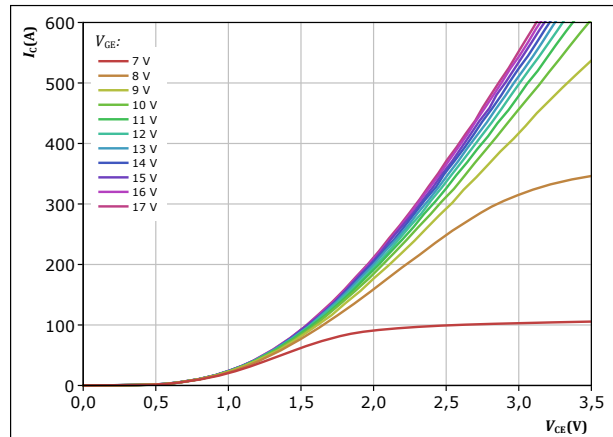


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25^\circ C, 125^\circ C, 150^\circ C$

figure 12. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

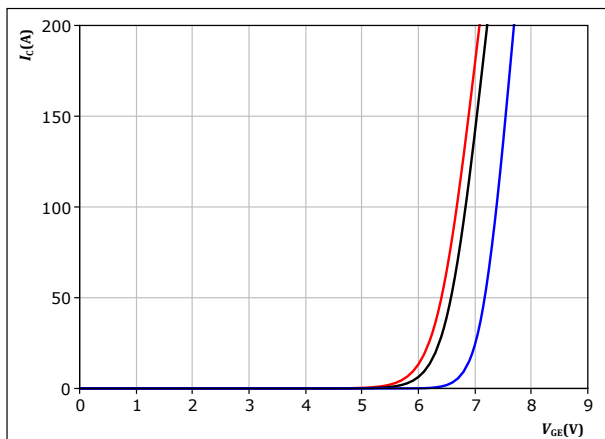


$t_p = 250 \mu s$
 $T_j = 150^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 13. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

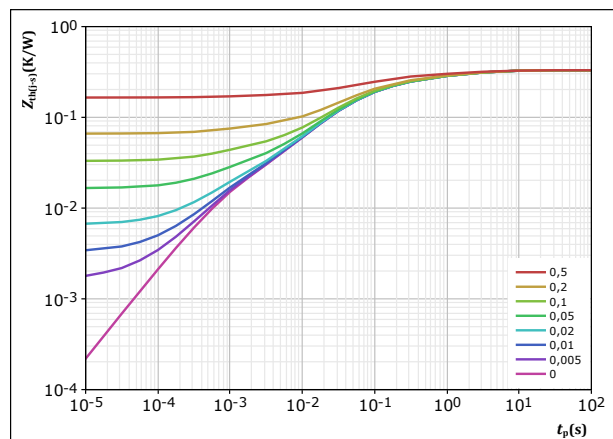


$t_p = 250 \mu s$
 $V_{CE} = 48 V$
 $T_j: 25^\circ C, 125^\circ C, 150^\circ C$

figure 14. IGBT

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T = 0.331 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
3,72E-02	4,28E+00
7,68E-02	6,09E-01
1,42E-01	7,68E-02
6,11E-02	1,66E-02
1,38E-02	8,44E-04



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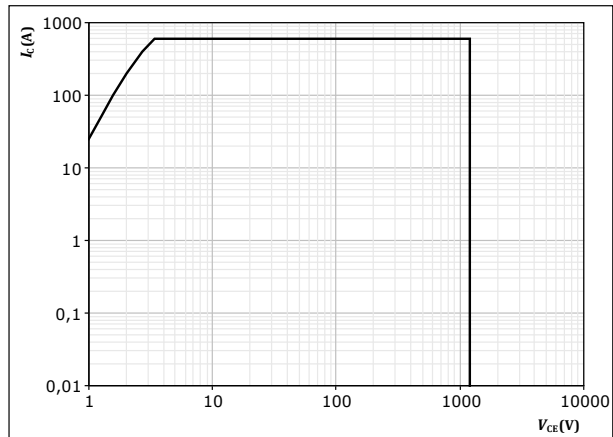
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Outer Boost Switch Characteristics

figure 15. IGBT

Safe operating area

$$I_C = f(V_{CE})$$

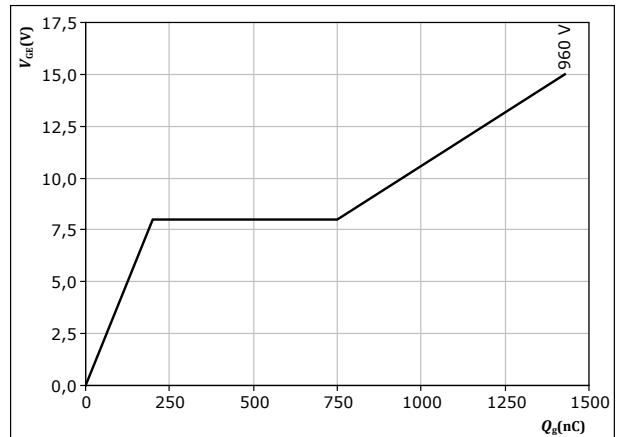


$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 16. IGBT

Gate voltage vs gate charge

$$V_{GE} = f(Q_g)$$



$I_C = 200$ A
 $T_j = 25$ °C



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Outer Boost Diode Characteristics

figure 17.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

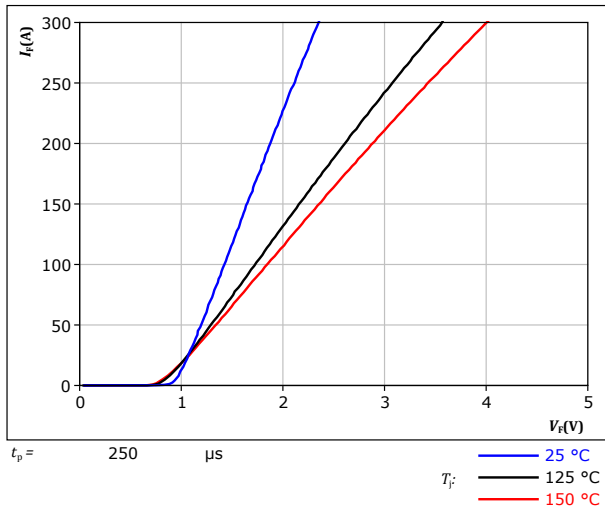
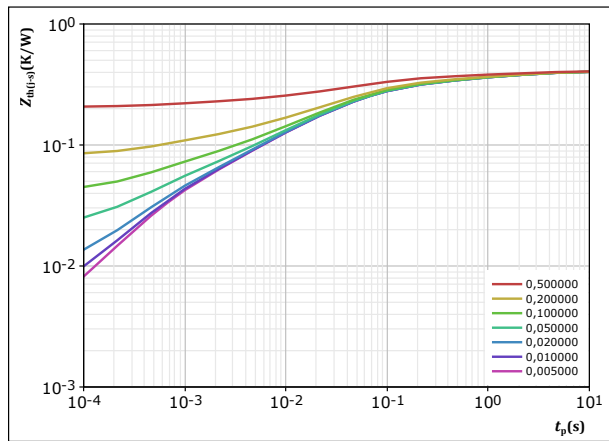


figure 18.

FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D =$	t_p / T
$R_{th(j-s)} =$	0,405 K/W
FWD thermal model values	
R (K/W)	τ (s)
1,72E-02	1,61E+01
5,46E-02	1,79E+00
5,92E-02	2,84E-01
1,42E-01	5,45E-02
7,40E-02	1,41E-02
3,56E-02	3,31E-03
2,91E-02	5,40E-04



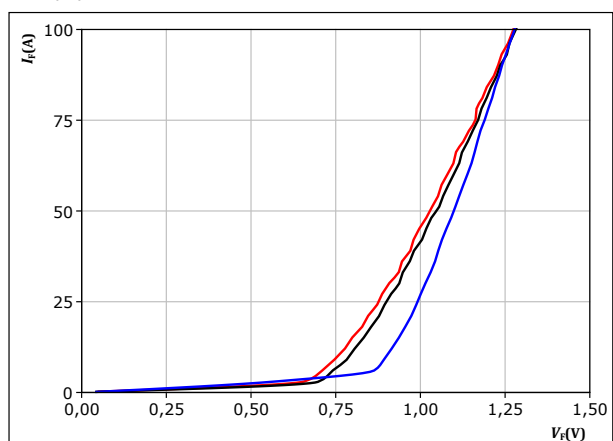
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Outer Boost Sw. Protection Diode Characteristics

figure 19. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

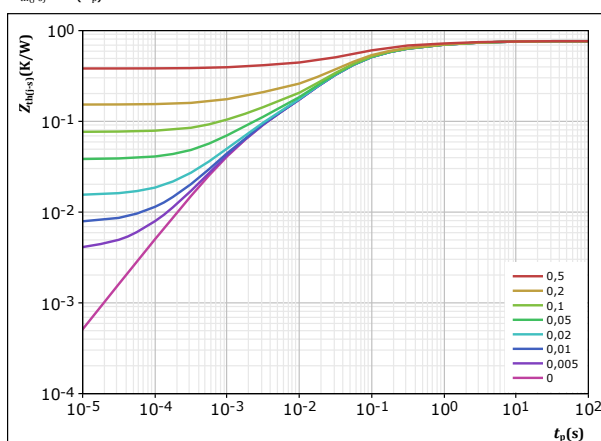
T_j :

- 25 °C
- 125 °C
- 150 °C

figure 20. Rectifier

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = t_p / T = 0.765$

$R_{th(j-s)} = 0.765 \text{ K/W}$

Rectifier thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
4.68E-02	5.24E+00
1.43E-01	5.88E-01
3.57E-01	7.04E-02
1.61E-01	1.86E-02
5.74E-02	1.54E-03



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Aux Diode H Characteristics

figure 21.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

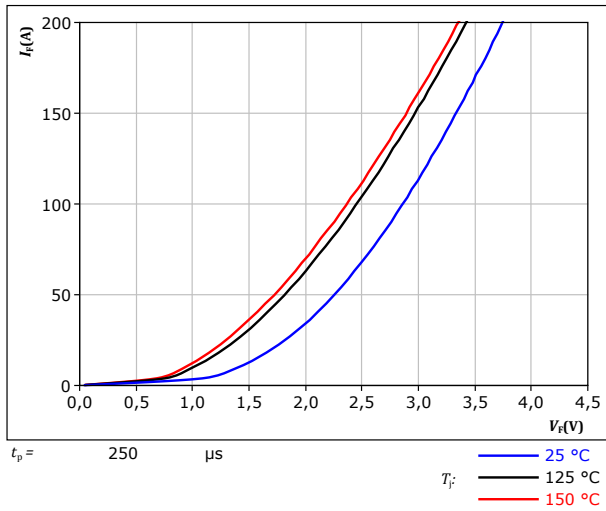
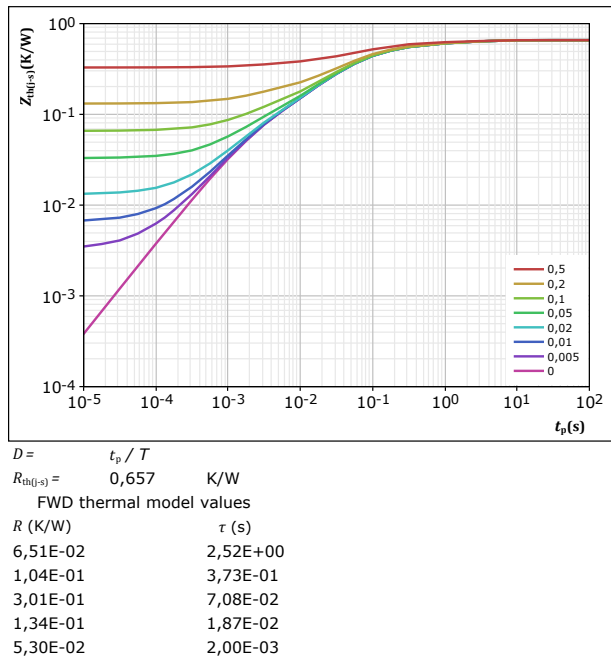


figure 22.

FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$





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Aux Diode L Characteristics

figure 23.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

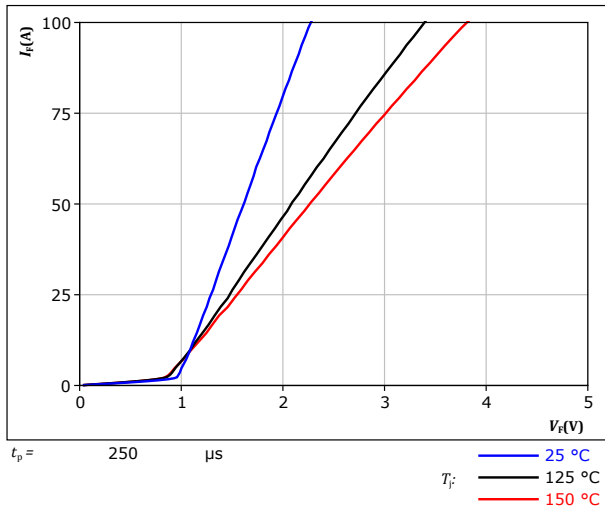
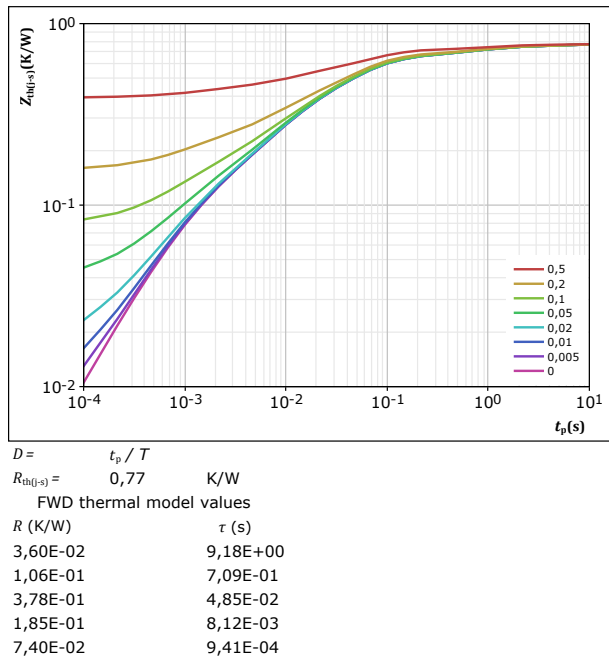


figure 24.

FWD

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$





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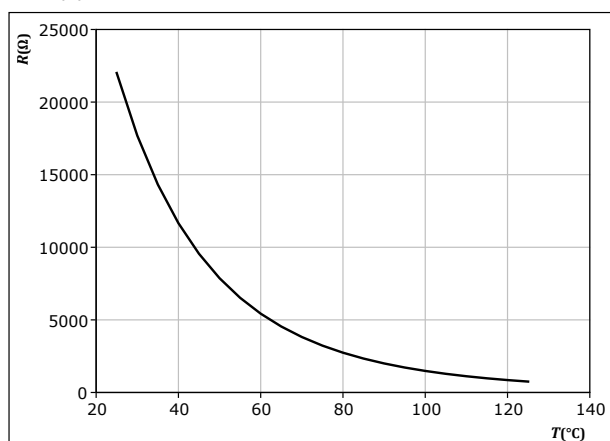
Thermistor Characteristics

figure 25.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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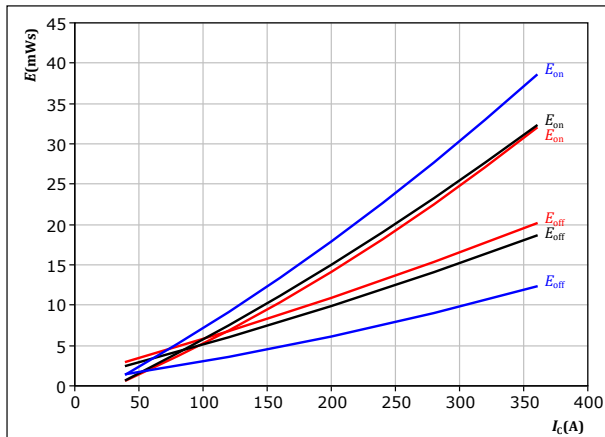
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Inner Boost Switching Characteristics

figure 26. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



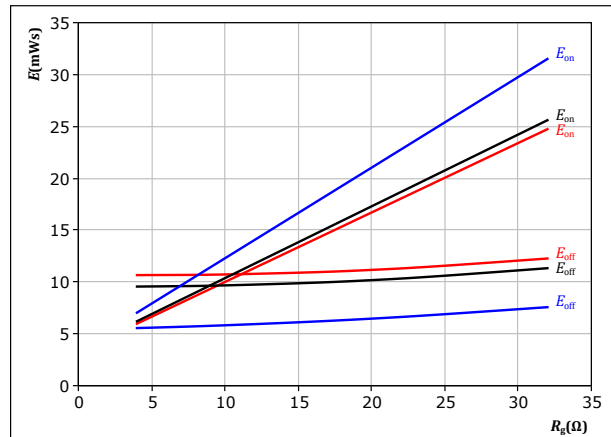
With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 27. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$$E = f(R_g)$$



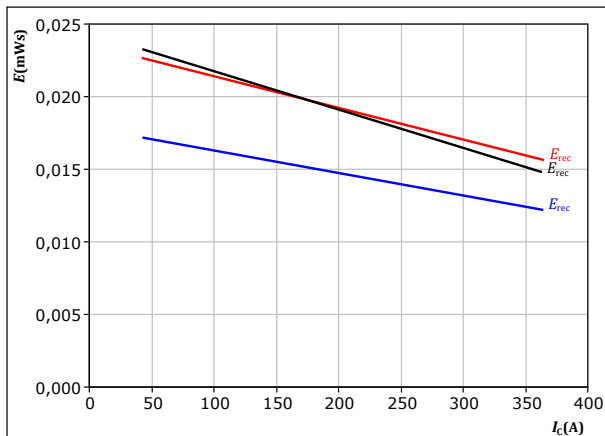
With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 28. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$



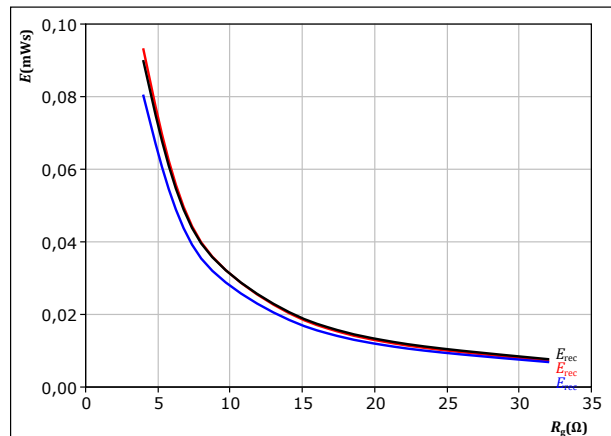
With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 29. FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$



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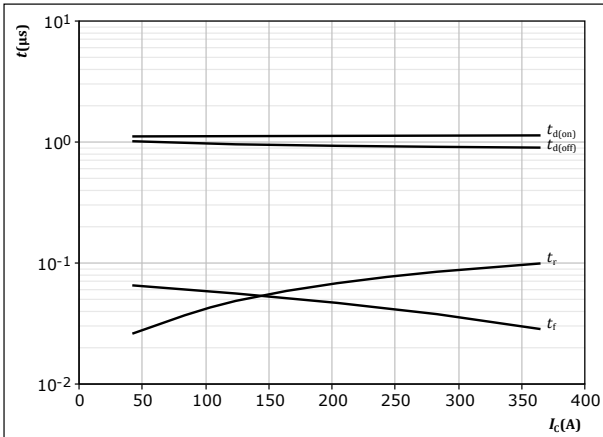
30-FT12B2A200H702-PK49L03 datasheet

Inner Boost Switching Characteristics

figure 30.

IGBT

Typical switching times as a function of collector current
 $t = f(I_c)$



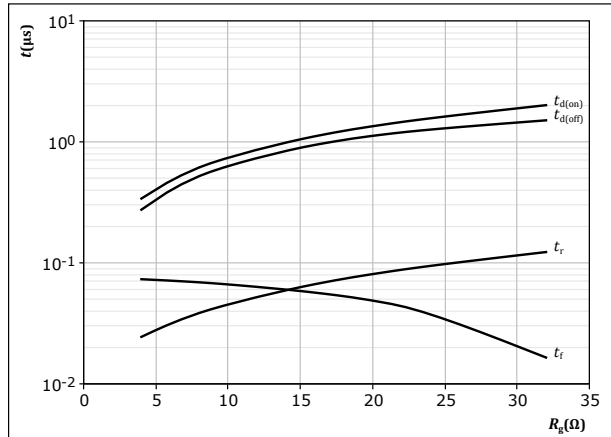
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

figure 31.

IGBT

Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



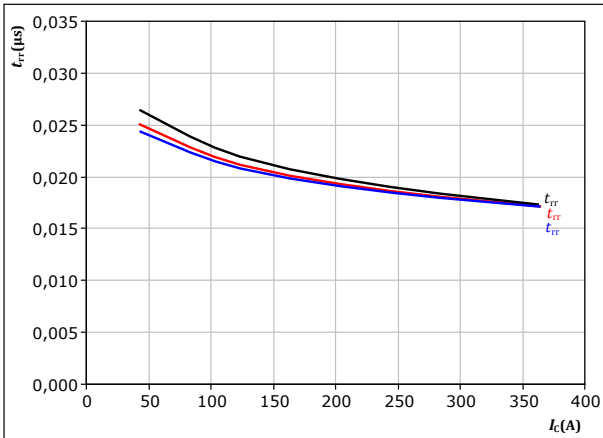
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A

figure 32.

FWD

Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



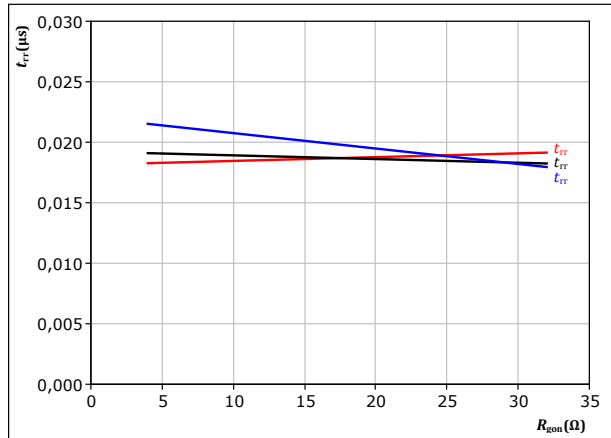
With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $T_j: 25$ °C (blue), 125 °C (black), 150 °C (red)

figure 33.

FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A
 $T_j: 25$ °C (blue), 125 °C (black), 150 °C (red)



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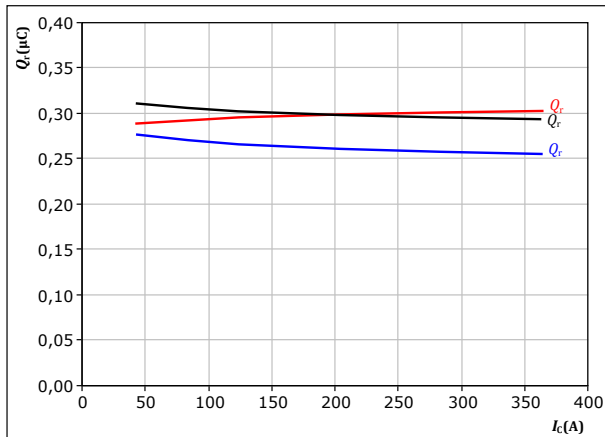
datasheet

Inner Boost Switching Characteristics

figure 34. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



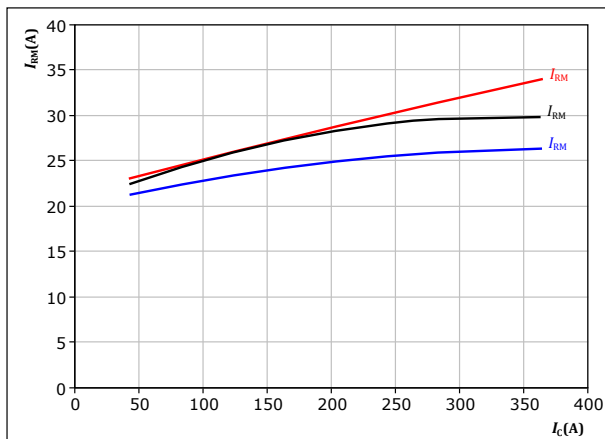
With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 36. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$



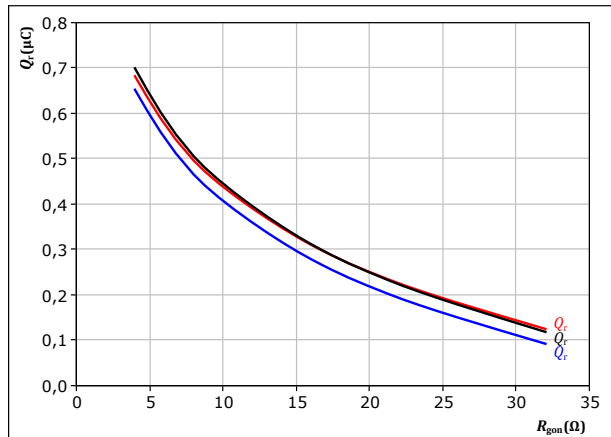
With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 35. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gon})$$



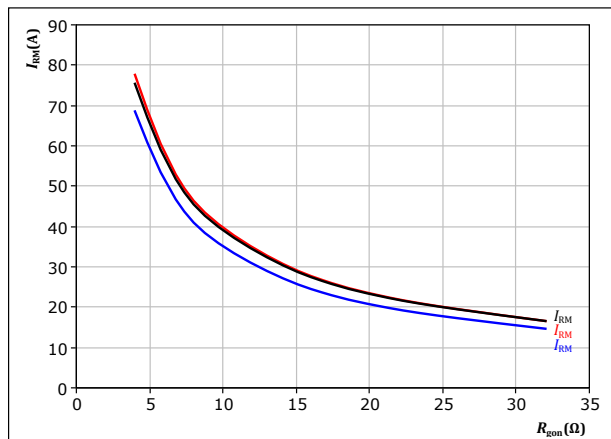
With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 37. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gon})$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



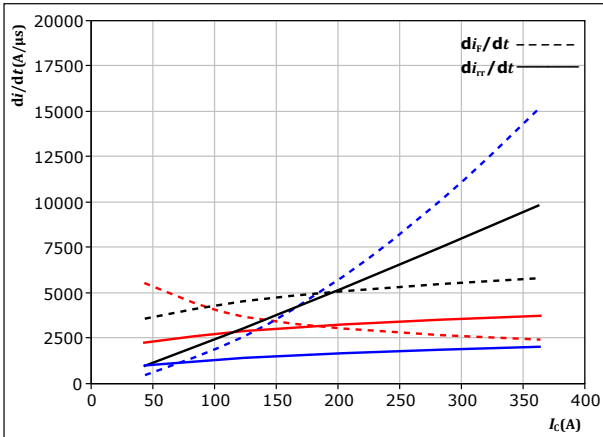
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datasheet

Inner Boost Switching Characteristics

figure 38. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_C)$



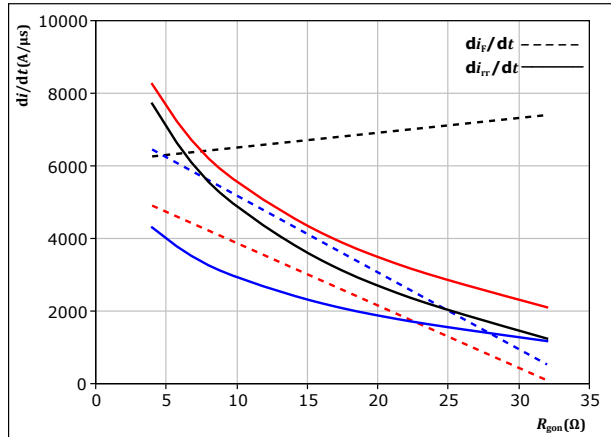
With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 39. FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{gon})$



With an inductive load at

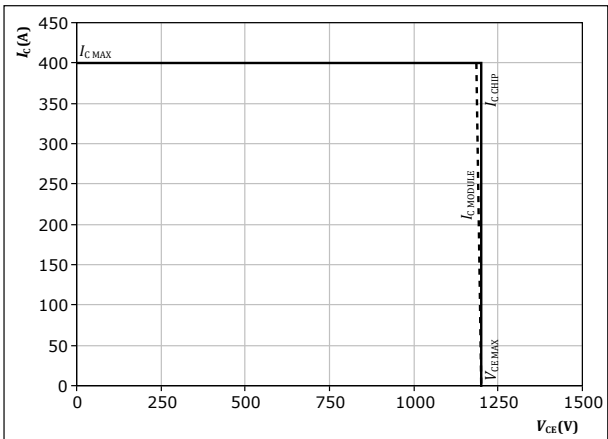
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 200 \text{ A}$

$T_j:$ — 25 °C
— 125 °C
— 150 °C

figure 40. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 16 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$



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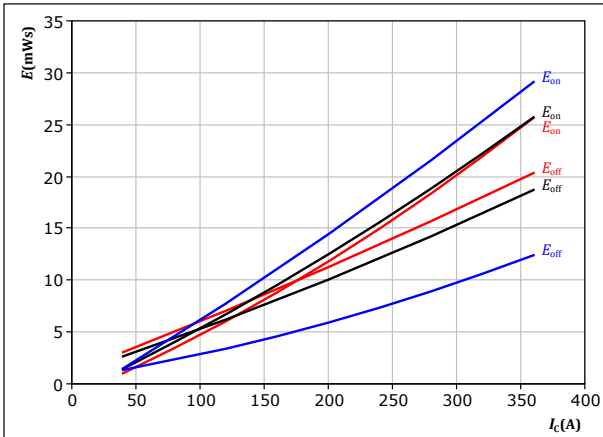
30-FT12B2A200H702-PK49L03 datasheet

Outer Boost Switching Characteristics

figure 41. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



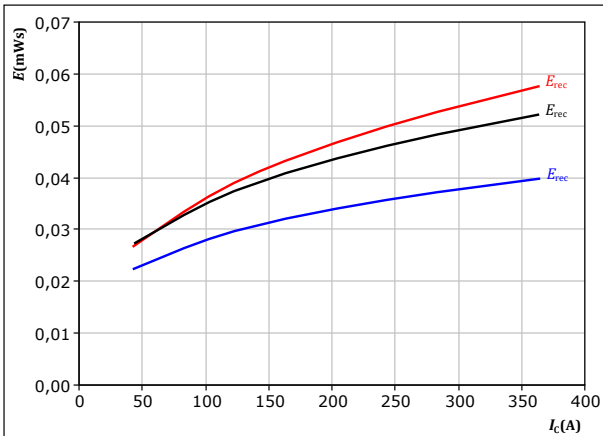
With an inductive load at

$V_{CE} =$	700	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	16	Ω		150 °C
$R_{goff} =$	16	Ω		

figure 43. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$



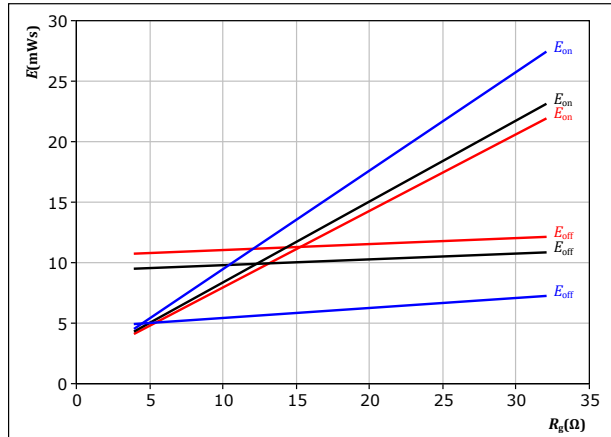
With an inductive load at

$V_{CE} =$	700	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	16	Ω		150 °C

figure 42. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$$E = f(R_g)$$



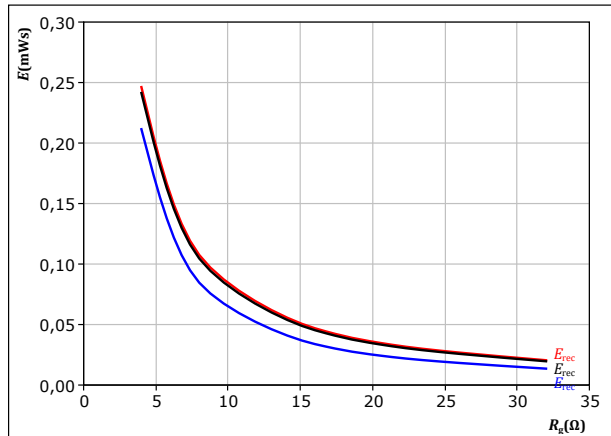
With an inductive load at

$V_{CE} =$	700	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	200	A		150 °C

figure 44. FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{CE} =$	700	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	200	A		150 °C



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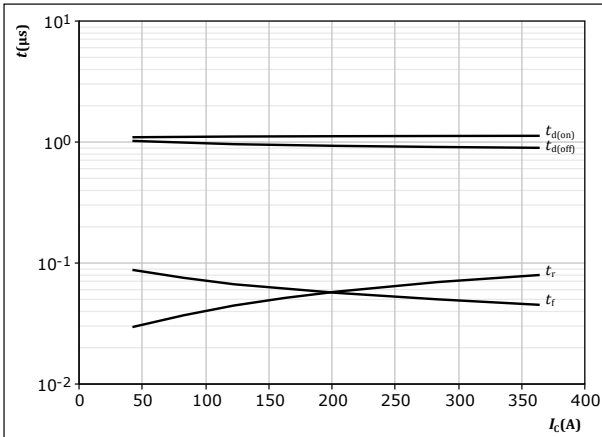
Outer Boost Switching Characteristics

figure 45.

IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



With an inductive load at

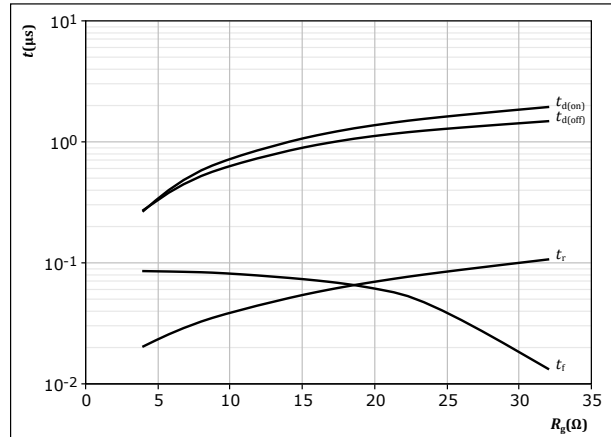
$T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

figure 46.

IGBT

Typical switching times as a function of IGBT turn on gate resistor

$$t = f(R_g)$$



With an inductive load at

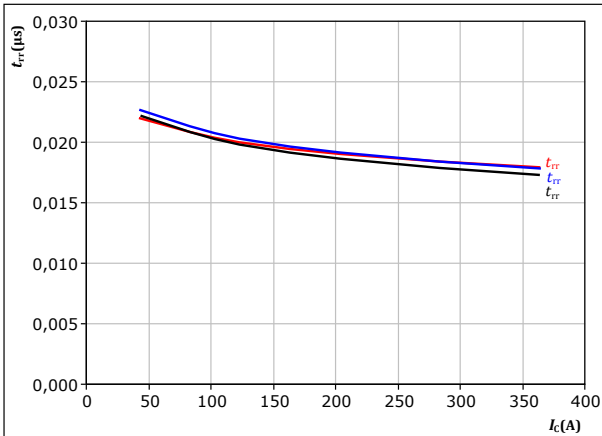
$T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_C = 200$ A

figure 47.

FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$



With an inductive load at

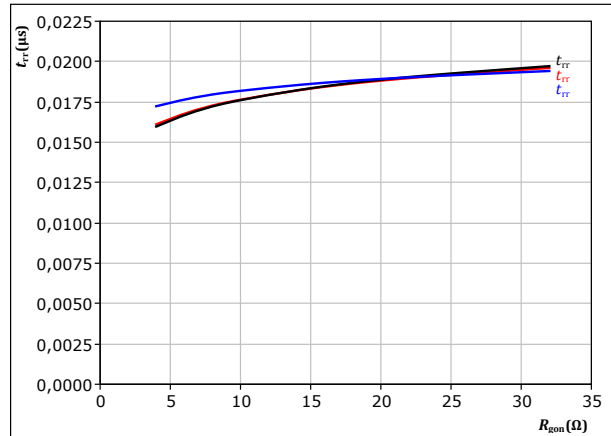
$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $T_j: 25$ °C (blue), 125 °C (black), 150 °C (red)

figure 48.

FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$$t_{rr} = f(R_{gon})$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_C = 200$ A
 $T_j: 25$ °C (blue), 125 °C (black), 150 °C (red)



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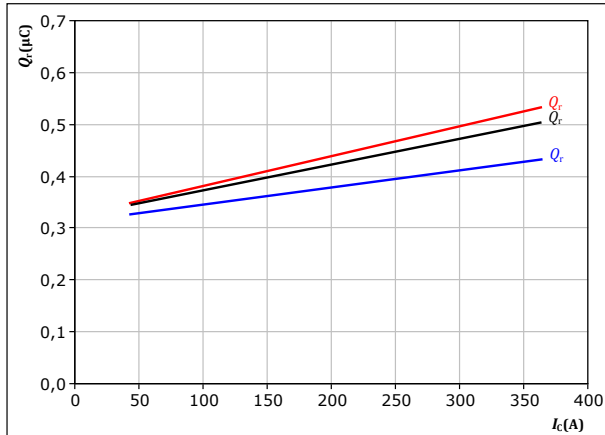
Outer Boost Switching Characteristics

figure 49.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

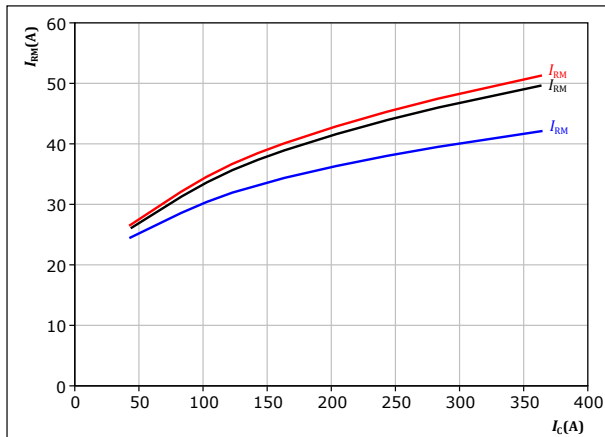
T_j : 25 °C
125 °C
150 °C

figure 51.

FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

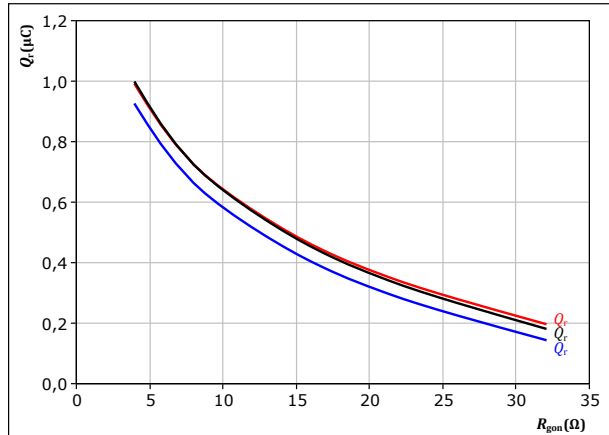
T_j : 25 °C
125 °C
150 °C

figure 50.

FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$$Q_r = f(R_{gon})$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A

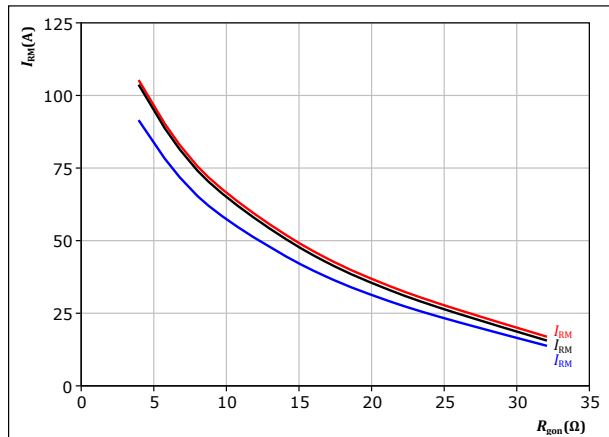
T_j : 25 °C
125 °C
150 °C

figure 52.

FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$$I_{RM} = f(R_{gon})$$



With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A

T_j : 25 °C
125 °C
150 °C



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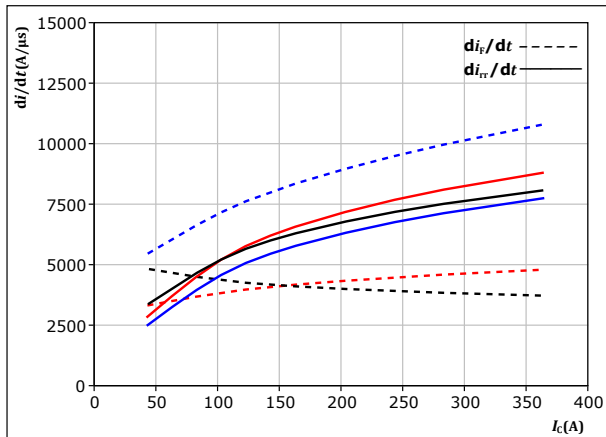
30-FT12B2A200H702-PK49L03

datasheet

Outer Boost Switching Characteristics

figure 53. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_C)$

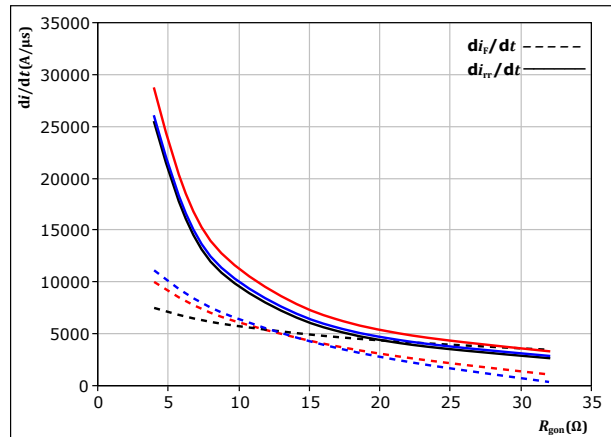


With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $T_j: 25^\circ\text{C}$ (blue), 125°C (black), 150°C (red)

figure 54. FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
 $di_f/dt, di_r/dt = f(R_{gon})$



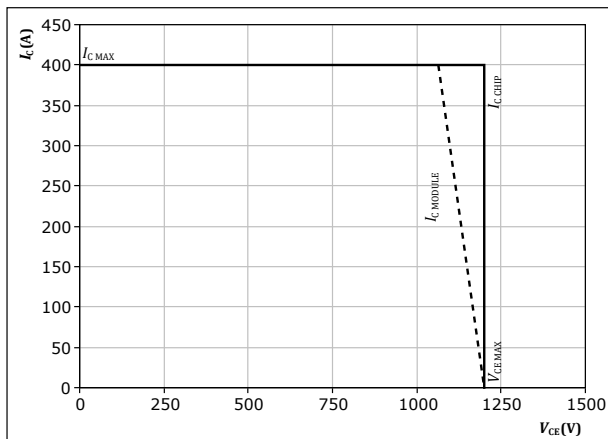
With an inductive load at

$V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_C = 200$ A
 $T_j: 25^\circ\text{C}$ (blue), 125°C (black), 150°C (red)

figure 55. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150^\circ\text{C}$
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω



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Switching Definitions

figure 56. IGBT

Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})

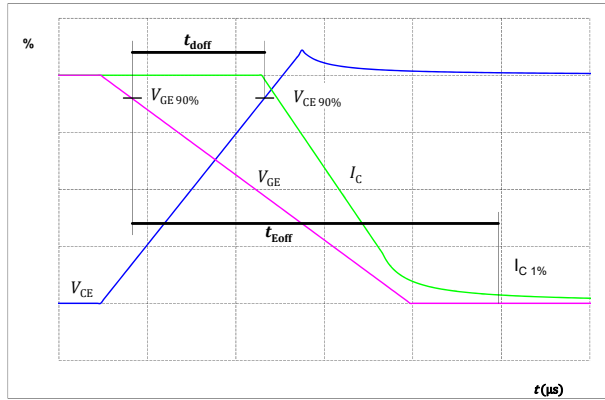


figure 57. IGBT

Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})

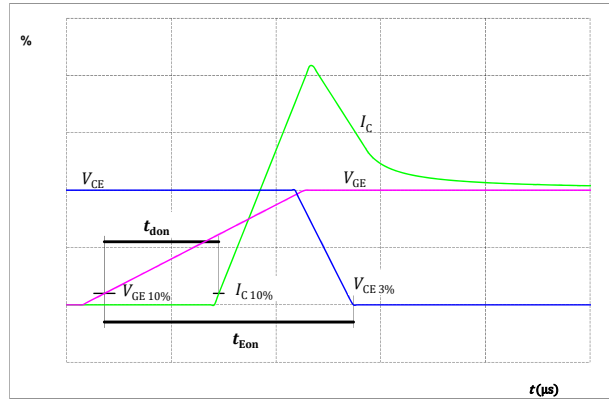


figure 58. IGBT

Turn-off Switching Waveforms & definition of t_f

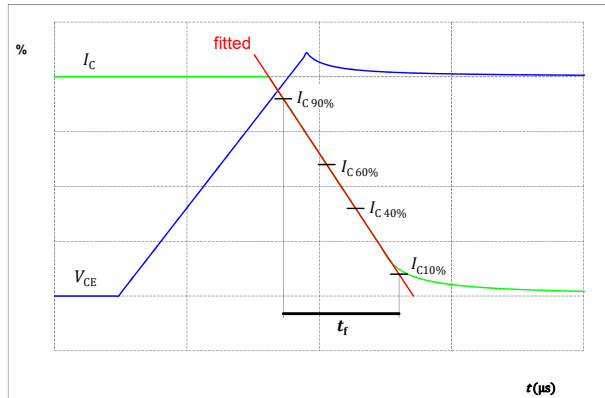
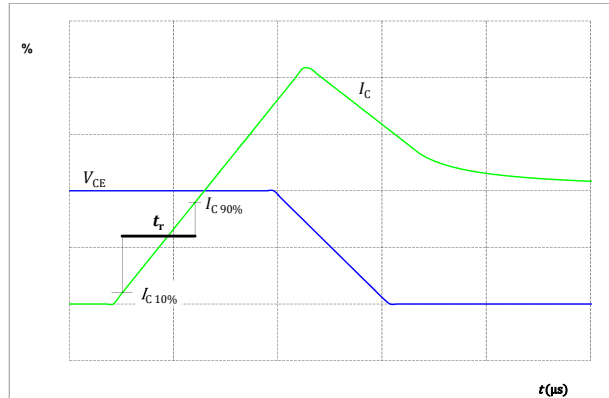


figure 59. IGBT

Turn-on Switching Waveforms & definition of t_r





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Switching Definitions

figure 60.

FWD

Turn-off Switching Waveforms & definition of t_{rr}

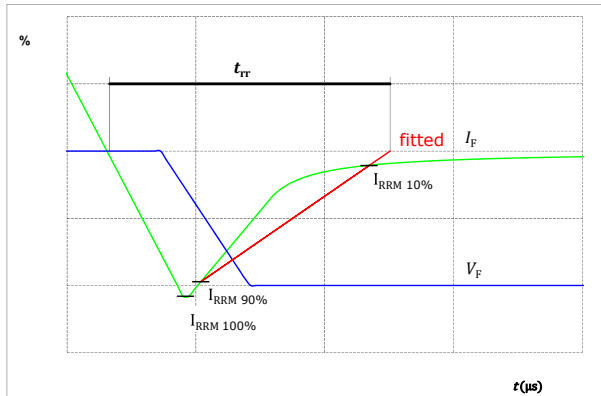
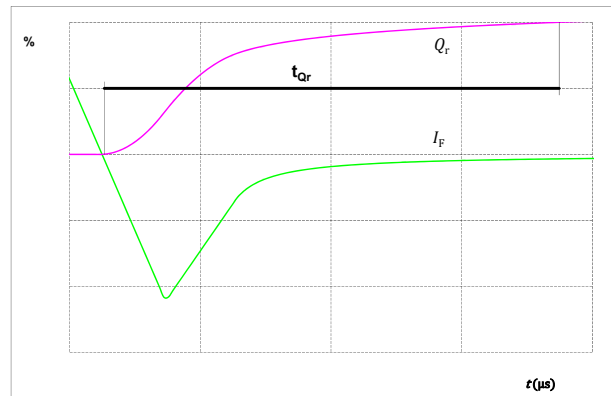


figure 61.

FWD

Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)





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Ordering Code	
Version	Ordering Code
Without thermal paste	30-FT12B2A200H702-PK49L03
With thermal paste (3,4 W/mK, PSX-P7)	30-FT12B2A200H702-PK49L03-/3/

Marking							
NN-NNNNNNNNNNNN TTTTTUVVWVY UL VIN LLLL SSSS 	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNN- TTTTTV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
		TTTTTTVV	LLLLL	SSSS	WWYY		

Outline							
Pin table [mm]							
Pin	X	Y	Function	26	70,9	0	C22
1	0	0	C12	27	53,9	0	DC-Boost2
2	17	0	DC-Boost1	28	50,9	0	DC-Boost2
3	20	0	DC-Boost1	29	50,9	3	DC-Boost2
4	20	3	DC-Boost1	30	38	0	DC+Boost2
5	32,9	0	DC+Boost1	31	38	3	DC+Boost2
6	32,9	3	DC+Boost1	32	38	6	DC+Boost2
7	32,9	6	DC+Boost1	33	67,9	13	G27
8	3	13	G17	34	70,9	13	S27
9	0	13	S17	35	62,9	18,5	FC22
10	8	18,5	FC12	36	54,4	21,5	Boost2
11	16,5	21,5	Boost1	37	51,4	18,5	Boost2
12	19,5	18,5	Boost1	38	51,4	21,5	Boost2
13	19,5	21,5	Boost1	39	44,4	18,5	FC21
14	26,5	18,5	FC11	40	not assembled		
15	32,9	25	Therm11	41	not assembled		
16	32,9	22	Therm12	42	70,9	36,9	G25
17	0	36,9	G15	43	67,9	36,9	S25
18	3	36,9	S15	44	64,9	36,9	FC22
19	6	36,9	FC12	45	61,9	36,9	FC22
20	9	36,9	FC12	46	58,9	36,9	FC22
21	12	36,9	FC12	47	51,9	36,9	FC21
22	19	36,9	FC11	48	48,9	36,9	FC21
23	22	36,9	FC11	49	45,9	36,9	FC21
24	25	36,9	FC11	50	38	36,9	C21
25	32,9	36,9	C11				

Technical drawing of the PCB showing top and bottom views with dimensions and pin locations.

Top view dimensions: 144 (width), 144 (height), 144 (width), 144 (height).

Bottom view dimensions: 144 (width), 144 (height).

Pin locations are marked with circles and numbers corresponding to the pin table.

Dimensions of positions: 144mm of the set of pins.

Dimension of positions: 144mm of the set of pins.



datasheet

Pinout

The pinout diagram illustrates the electrical connections for the 16-pin connector. It is divided into three main sections: Boost1, Boost2, and Thermistors.

- Boost1:** This section includes pins 1 through 10. It features a power MOSFET driver circuit with transistors T15 and T17, and diodes D15, D17, D18, D19, D45, and D47. The input is connected to pins 14, 22, and 24 (FC11). The output is connected to pins 5 and 7 (DC+Boost1). The gate is connected to pins 11 and 13 (Boost1). The source is connected to pins 10, 19, and 21 (FC12). The drain is connected to pins 1 and 9 (DC-Boost1).
- Boost2:** This section includes pins 26 through 34. It features a power MOSFET driver circuit with transistors T25 and T27, and diodes D25, D27, D28, D29, D55, and D57. The input is connected to pins 39, 47, and 49 (FC21). The output is connected to pins 30 and 32 (DC+Boost2). The gate is connected to pins 36 and 38 (Boost2). The source is connected to pins 35, 44, and 46 (FC22). The drain is connected to pins 26 and 34 (DC-Boost2).
- Thermistors:** This section includes pins 15 and 16. It shows a thermistor circuit with a resistor Rt connected between pins 15 (Therm11) and 16 (Therm12).

Identification					
ID	Component	Voltage	Current	Function	Comment
T15, T25	IGBT	1200 V	200 A	Inner Boost Switch	
D15, D25	FWD	1200 V	100 A	Inner Boost Diode	
D45, D55	Rectifier	1600 V	40 A	Inner Boost Sw. Protection Diode	
T17, T27	IGBT	1200 V	200 A	Outer Boost Switch	
D17, D27	FWD	1200 V	100 A	Outer Boost Diode	
D47, D57	Rectifier	1600 V	40 A	Outer Boost Sw. Protection Diode	
D19, D29	FWD	1200 V	75 A	Aux Diode H	
D18, D28	FWD	1200 V	40 A	Aux Diode L	
Rt	Thermistor			Thermistor	



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Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample
Handling instruction				
Handling instructions for <i>flow 2</i> packages see vincotech.com website.				
Package data				
Package data for <i>flow 2</i> packages see vincotech.com website.				
Vincotech thermistor reference				
See Vincotech thermistor reference table at vincotech.com website.				
UL recognition and file number				
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}\text{C}$ and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.				

Document No.:	Date:	Modification:	Pages
30-FT12B2A200H702-PK49L03-D2-14	7 May. 2026	Update Boost Sw. Protection Diode characteristics Change Aux Diode Low according to PCN-2026-008	

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