



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: AlN
- Convex shaped baseplate for superior thermal contact
- Cu baseplate
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

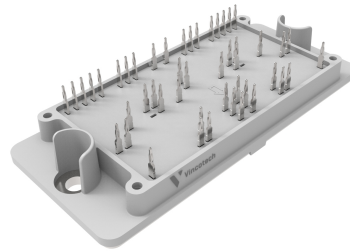
Target applications

- Solar Inverters

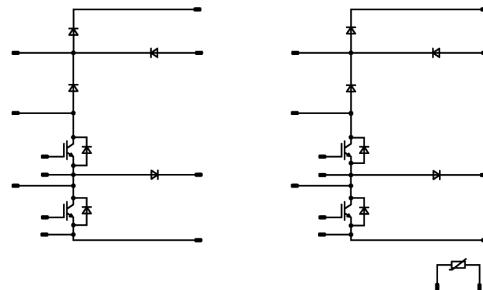
Types

- 30-PT12B2A200H713-PK89L18T

flow 2 13 mm housing



Schematic





Vincotech

30-PT12B2A200H713-PK89L18T
datasheet

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	202	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}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	408	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	151	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	305	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 110\text{ °C}$	550	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	389	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	108	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		1100	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	141	W
Maximum junction temperature	T_{jmax}		150	°C



Vincotech

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	202	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}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	408	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	151	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	305	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 110\text{ °C}$	550	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	389	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	108	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		1100	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	141	W
Maximum junction temperature	T_{jmax}		150	°C



Vincotech

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	102	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}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	232	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	102	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}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	232	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* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production



Vincotech

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	$V_{CE(sat)}$		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}							26000		pF
Output capacitance	C_{oes}	$f = 100$ kHz	0	25		25		480		pF
Reverse transfer capacitance	C_{res}							144		pF
Gate charge	Q_g	$V_{CC} = 960$ V	0/15		200	25		1428		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,23		K/W
--	---------------	---------------------------------------	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		156,31 159,08 160,58		ns
Rise time	t_r	$R_{gon} = 2$ Ω $R_{goff} = 2$ Ω				25 125 150		11,15 12,71 12,71		ns
Turn-off delay time	$t_{d(off)}$		±15	700	200	25 125 150		164,72 197,59 206,29		ns
Fall time	t_f					25 125 150		37,45 57,94 67,87		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 1,04$ μC $Q_{tFWD} = 1,01$ μC $Q_{tFWD} = 1,03$ μC				25 125 150		4,6 4,68 4,73		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,94 9,26 10,39		mWs



Vincotech

30-PT12B2A200H713-PK89L18T
datasheet

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		1,51 1,77 1,91	1,8 ⁽¹⁾		V
Reverse leakage current	I_R	$V_r = 1200$ V			25		175	1000		μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,24			K/W
Dynamic										
Peak recovery current	I_{RM}				25 125 150		88,14 92,24 94,94			A
Reverse recovery time	t_{rr}				25 125 150		22,5 21,49 21,48			ns
Recovered charge	Q_r	$di/dt=12104$ A/μs $di/dt=13603$ A/μs $di/dt=12954$ A/μs	±15	700	200	25 125 150	1,04 1,01 1,03			μC
Reverse recovered energy	E_{rec}				25 125 150		0,275 0,274 0,284			mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$				25 125 150		11648,81 13173,26 14229,42			A/μs



Vincotech

30-PT12B2A200H713-PK89L18T
datasheet

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			5	25 125 150		0,851 0,725 0,695	1,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1600$ V			25 150			100 2000	μ A

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,5		K/W
--	---------------	---------------------------------------	--	--	--	--	-----	--	-----



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [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}							26000		pF
Output capacitance	C_{oes}	$f = 100$ kHz	0	25		25		480		pF
Reverse transfer capacitance	C_{res}							144		pF
Gate charge	Q_g	$V_{CC} = 960$ V	0/15		200	25		1428		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,23		K/W
--	---------------	------------------------------------	--	--	--	--	--	------	--	-----

Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		158,02 160,48 161,44		ns
Rise time	t_r					25 125 150		13,28 15,05 15,61		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		166,26 200,21 209,22		ns
Fall time	t_f					25 125 150		31,83 60,63 76,05		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 0,939$ μC $Q_{tFWD} = 0,936$ μC $Q_{tFWD} = 0,952$ μC				25 125 150		3,6 4 3,99		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,42 9,47 10,64		mWs



Vincotech

30-PT12B2A200H713-PK89L18T
datasheet

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		1,51 1,77 1,91	1,8 ⁽¹⁾		V
Reverse leakage current	I_R	$V_r = 1200$ V			25		175	1000		μA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,24			K/W
Dynamic										
Peak recovery current	I_{RM}				25 125 150		102,11 100,51 101,42			A
Reverse recovery time	t_{rr}				25 125 150		15,36 15,74 15,88			ns
Recovered charge	Q_r	$di/dt=15421$ A/μs $di/dt=13171$ A/μs $di/dt=12257$ A/μs	±15	700	200	25 125 150	0,939 0,936 0,952			μC
Reverse recovered energy	E_{rec}				25 125 150		0,275 0,279 0,286			mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$				25 125 150		19321,83 19195,26 19542,99			A/μs



Vincotech

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			5	25 125 150		0,851 0,725 0,695	1,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1600$ V			25 150			100 2000	μ A

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					0,5		K/W
--	---------------	------------------------------------	--	--	--	--	-----	--	-----

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	μ A

Thermal

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



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				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)						0,41		K/W
--	---------------	---------------------------------------	--	--	--	--	--	------	--	-----

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.

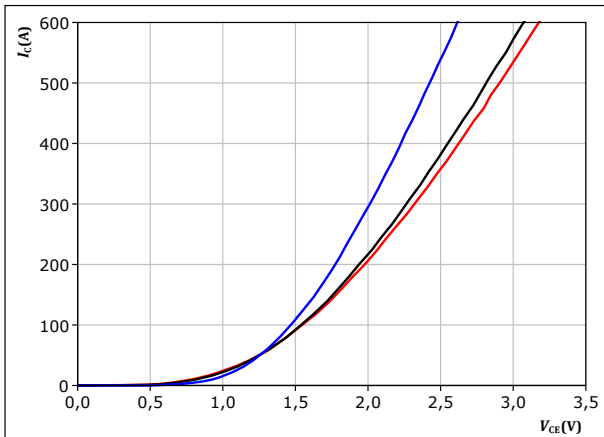


Inner Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

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



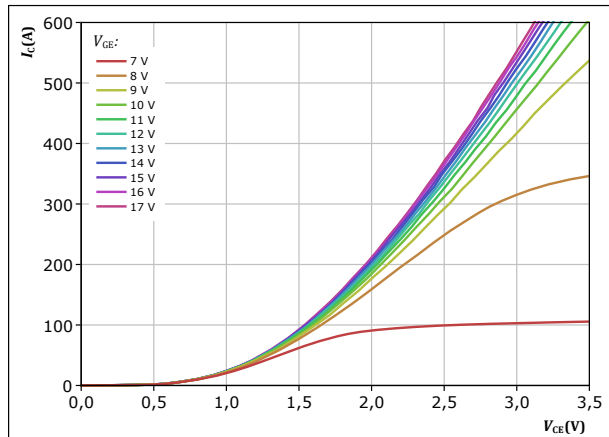
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

T_j : 25 °C
125 °C
150 °C

figure 2. IGBT

Typical output characteristics

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



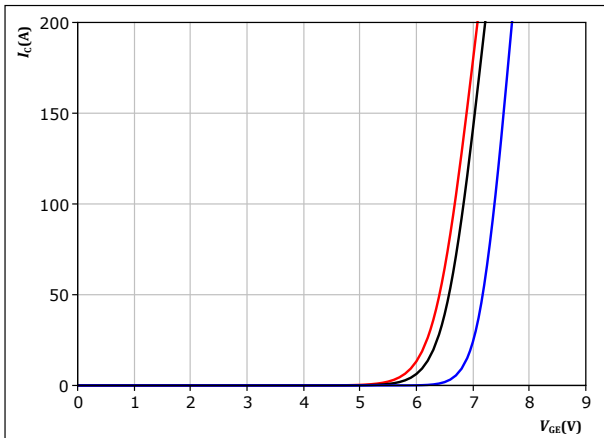
$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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



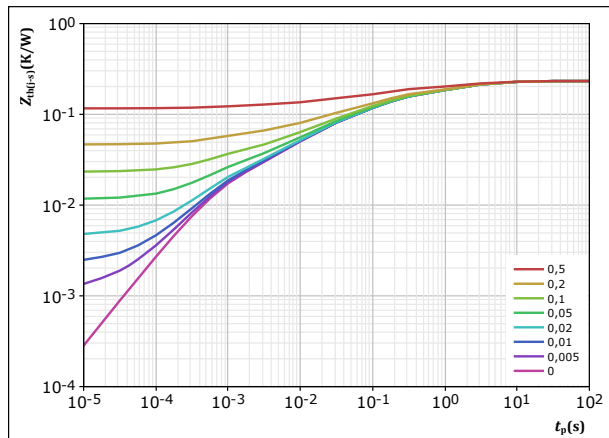
$t_p = 250 \mu s$
 $V_{CE} = 48 V$

T_j : 25 °C
125 °C
150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,233 K/W$

IGBT thermal model values

R (K/W)	τ (s)
2,70E-02	5,50E+00
5,89E-02	1,17E+00
8,62E-02	1,09E-01
4,32E-02	1,15E-02
1,73E-02	7,22E-04

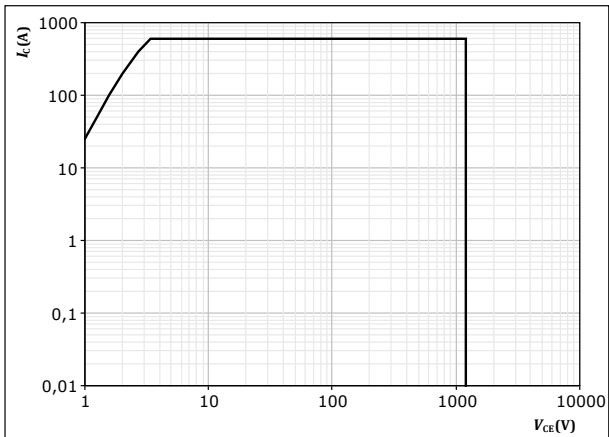


Inner Boost Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$

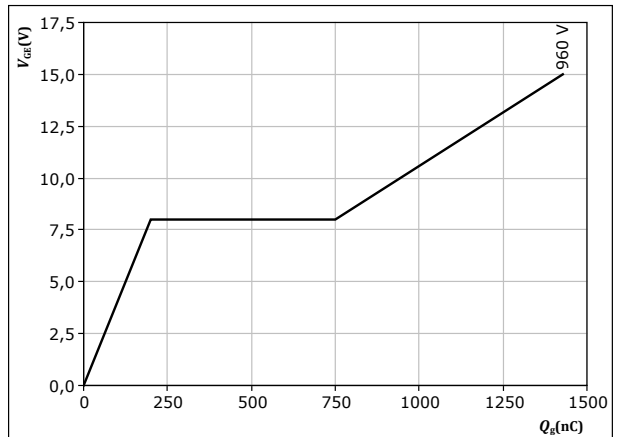


$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 6. IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$



$I_C = 100$ A
 $T_j = 25$ °C



Inner Boost Diode Characteristics

figure 7. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

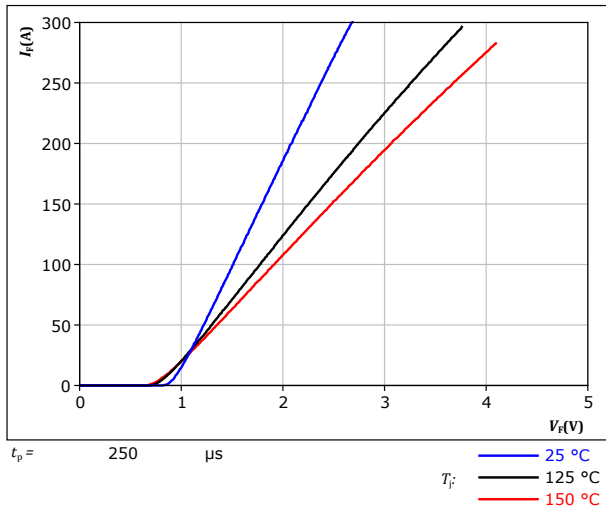
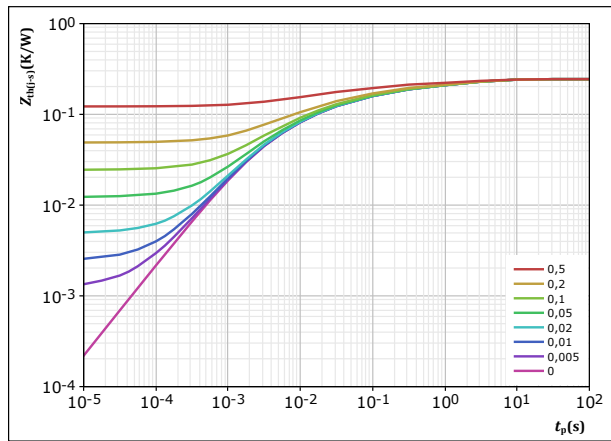


figure 8. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,244 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
2,94E-02	4,34E+00
3,97E-02	8,05E-01
7,19E-02	8,32E-02
6,98E-02	1,18E-02
3,36E-02	2,22E-03



Inner Boost Sw. Protection Diode Characteristics

figure 9. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

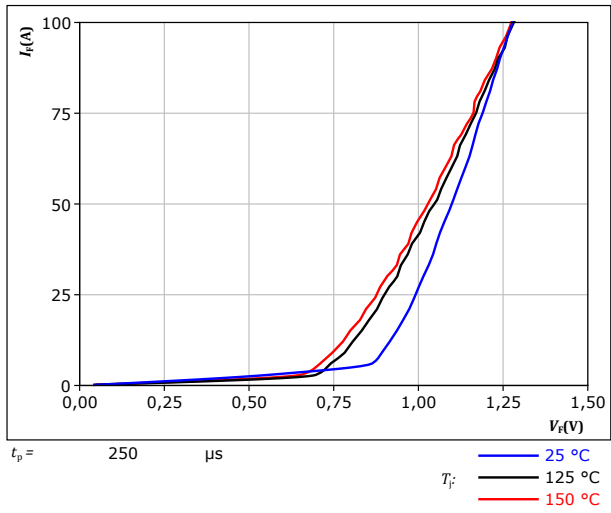
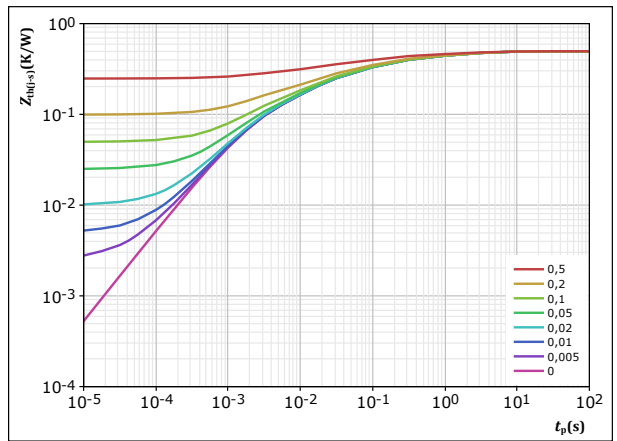


figure 10. Rectifier

Transient thermal impedance as a function of pulse width

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



$D = \frac{t_p}{T}$
 $R_{th(j-s)} = 0,496 \text{ K/W}$
 Rectifier thermal model values

R (K/W)	τ (s)
4,54E-02	3,97E+00
8,02E-02	6,56E-01
1,52E-01	9,26E-02
1,42E-01	1,44E-02
7,70E-02	1,87E-03

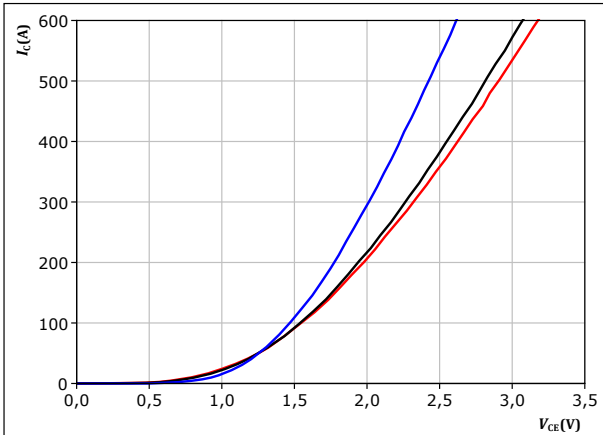


Outer Boost Switch Characteristics

figure 11. IGBT

Typical output characteristics

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

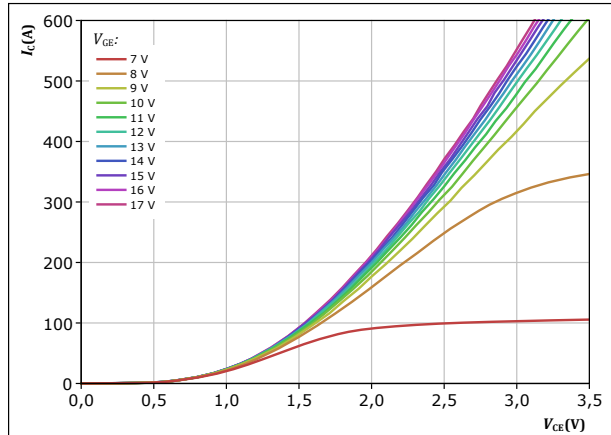


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C (blue), 125 °C (black), 150 °C (red)

figure 12. IGBT

Typical output characteristics

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

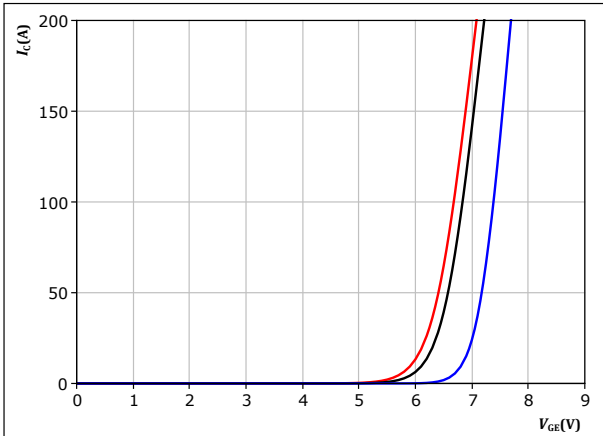


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 13. IGBT

Typical transfer characteristics

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

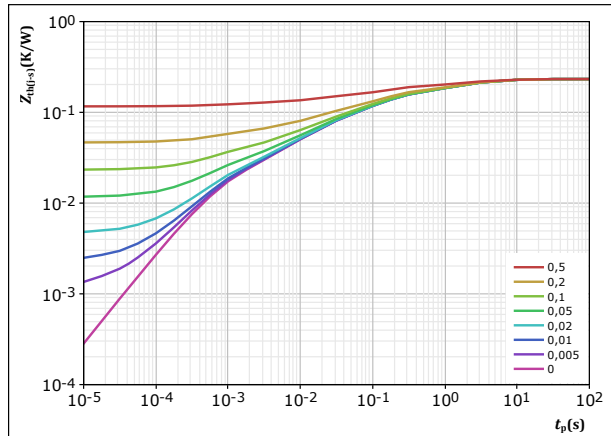


$t_p = 250 \mu s$
 $V_{CE} = 48 V$
 $T_j:$ 25 °C (blue), 125 °C (black), 150 °C (red)

figure 14. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,233 \text{ K/W}$
IGBT thermal model values

R (K/W)	τ (s)
2,70E-02	5,50E+00
5,89E-02	1,17E+00
8,62E-02	1,09E-01
4,32E-02	1,15E-02
1,73E-02	7,22E-04

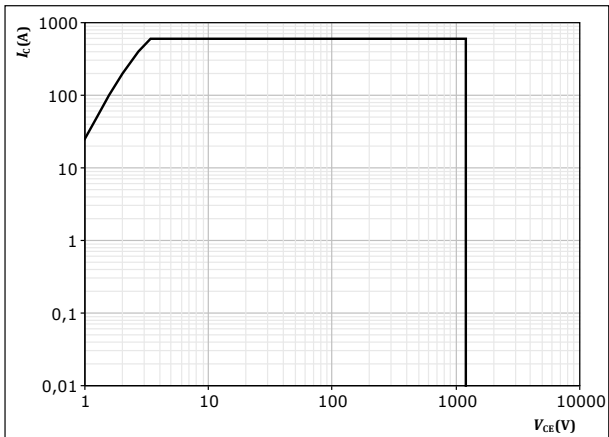


Outer Boost Switch Characteristics

figure 15. IGBT

Safe operating area

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

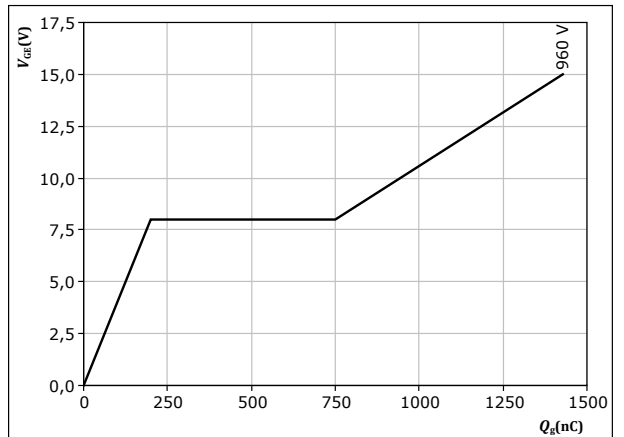


D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

figure 16. IGBT

Gate voltage vs gate charge

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



I_C = 100 A
T_j = 25 °C



Outer Boost Diode Characteristics

figure 17. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

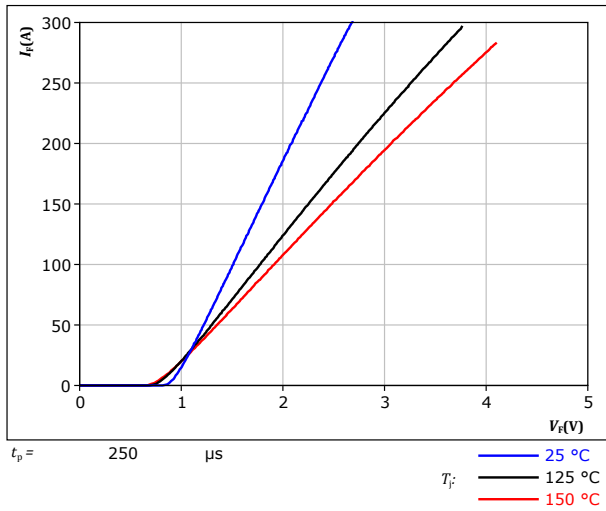
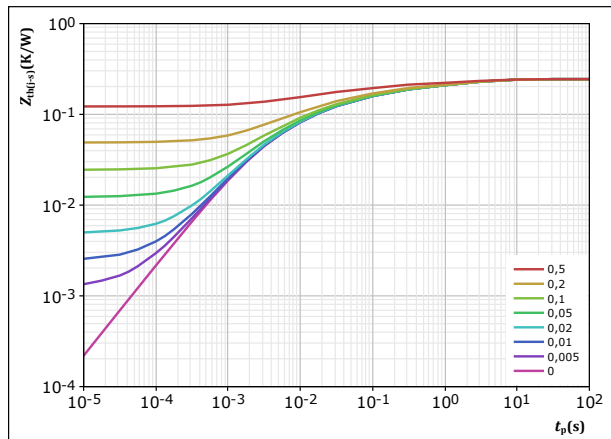


figure 18. FWD

Transient thermal impedance as a function of pulse width

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



$D = \frac{t_p}{T}$
 $R_{th(j-s)} = 0,244 \text{ K/W}$
 FWD thermal model values

R (K/W)	τ (s)
2,94E-02	4,34E+00
3,97E-02	8,05E-01
7,19E-02	8,32E-02
6,98E-02	1,18E-02
3,36E-02	2,22E-03



Outer Boost Sw. Protection Diode Characteristics

figure 19. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

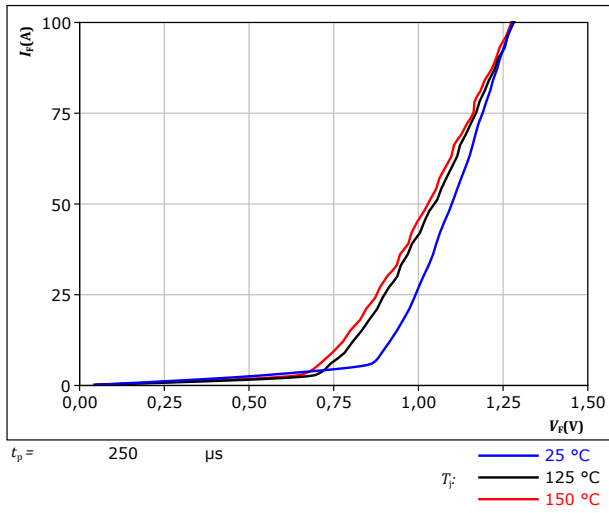
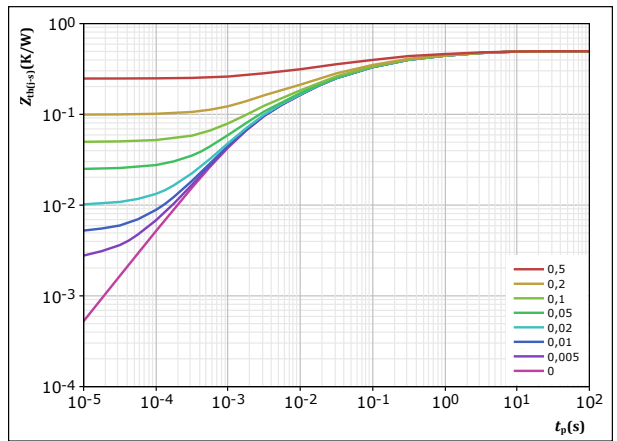


figure 20. Rectifier

Transient thermal impedance as a function of pulse width

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



$D = \frac{t_p}{T}$
 $R_{th(j-s)} = 0,496 \text{ K/W}$
 Rectifier thermal model values

R (K/W)	τ (s)
4,54E-02	3,97E+00
8,02E-02	6,56E-01
1,52E-01	9,26E-02
1,42E-01	1,44E-02
7,70E-02	1,87E-03



Aux Diode H Characteristics

figure 21. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

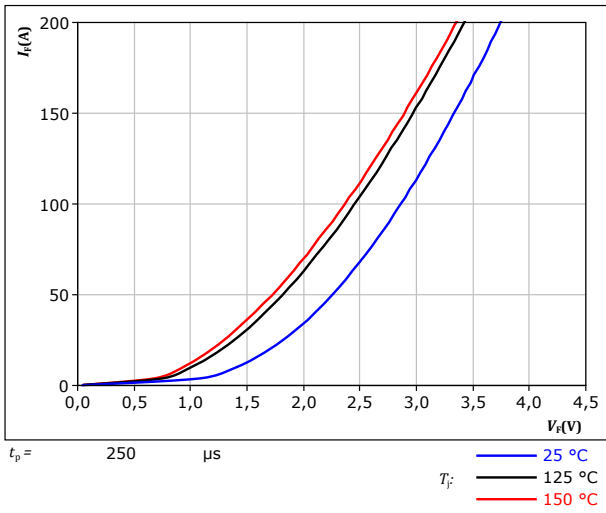
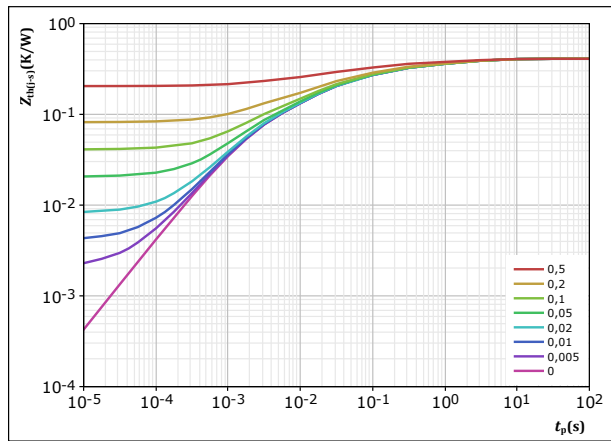


figure 22. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	0,41	K/W
FWD thermal model values		
R (K/W)	τ (s)	
4,02E-02	3,96E+00	
6,30E-02	7,85E-01	
1,22E-01	9,73E-02	
1,24E-01	1,55E-02	
6,11E-02	1,84E-03	



Aux Diode L Characteristics

figure 23. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

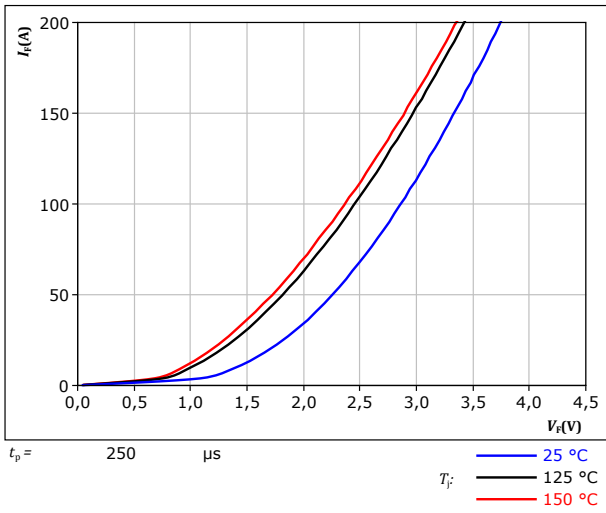
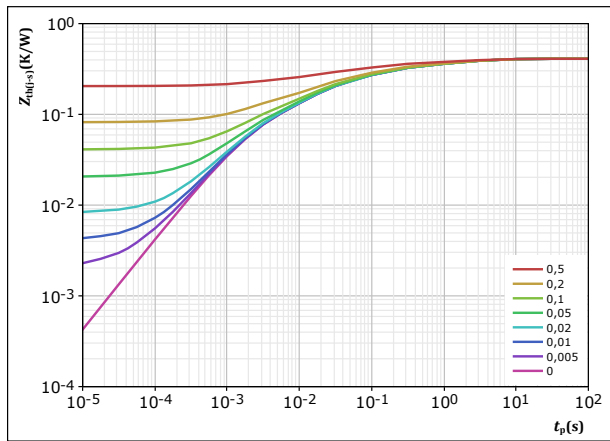


figure 24. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	0,41	K/W
FWD thermal model values		
R (K/W)	τ (s)	
4,02E-02	3,96E+00	
6,30E-02	7,85E-01	
1,22E-01	9,73E-02	
1,24E-01	1,55E-02	
6,11E-02	1,84E-03	

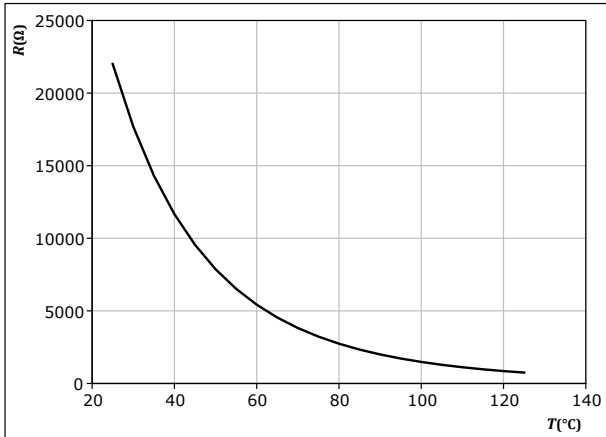


Thermistor Characteristics

figure 25. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$

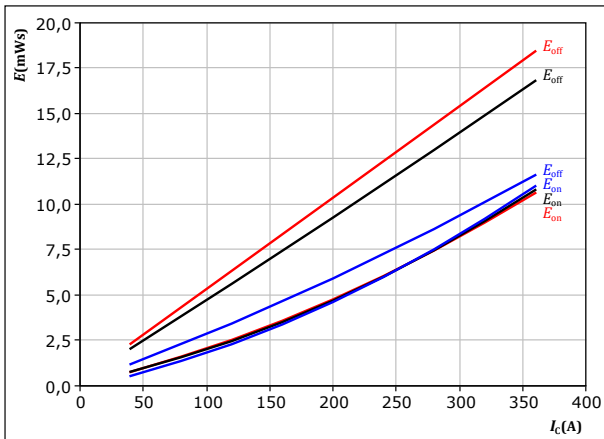




Inner Boost Switching Characteristics

figure 26. IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_c)$

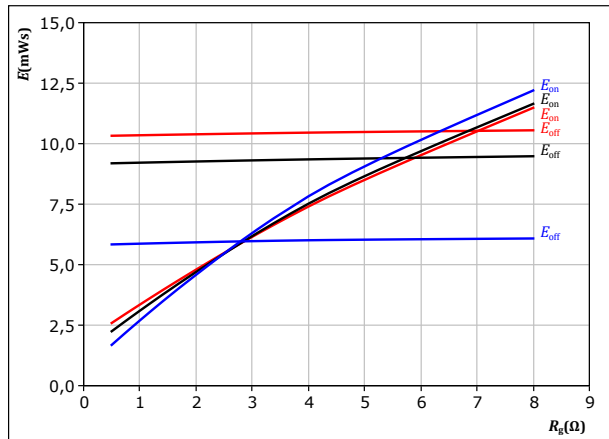


With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 27. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor
 $E = f(R_g)$

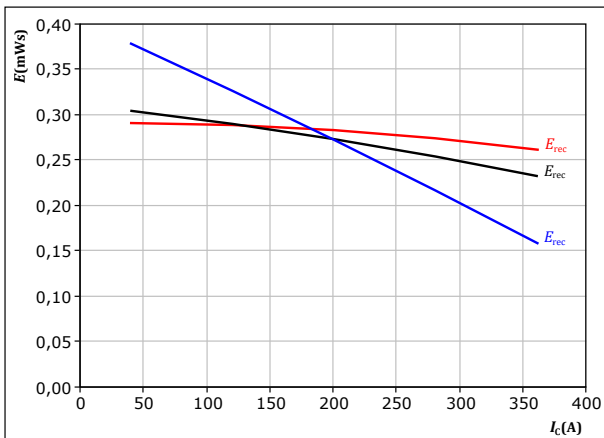


With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 28. FWD

Typical reverse recovered energy loss as a function of collector current
 $E_{rec} = f(I_c)$

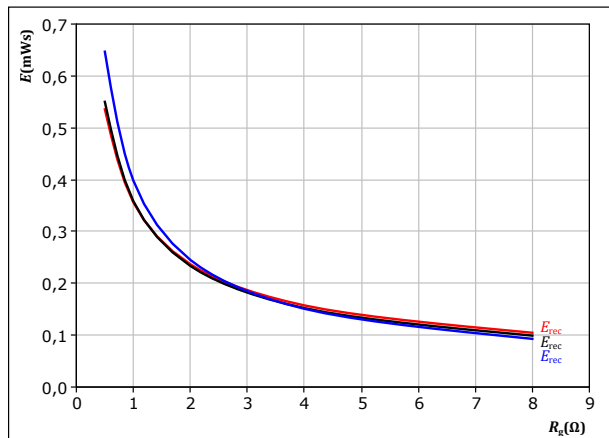


With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

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

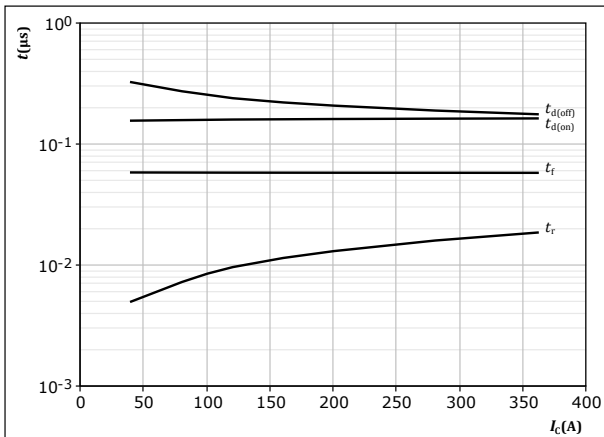
T_j :
— 25 °C
— 125 °C
— 150 °C



Inner Boost Switching Characteristics

figure 30. IGBT

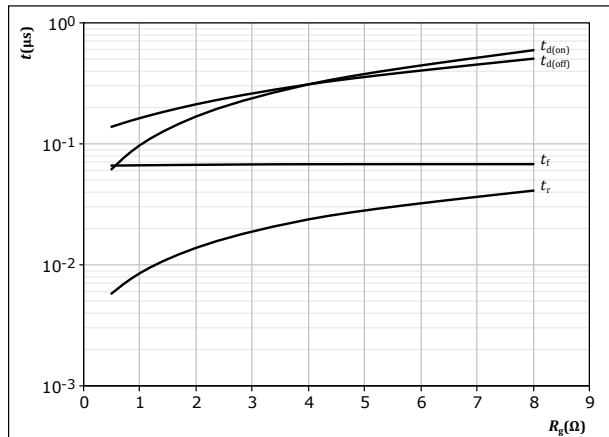
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 31. IGBT

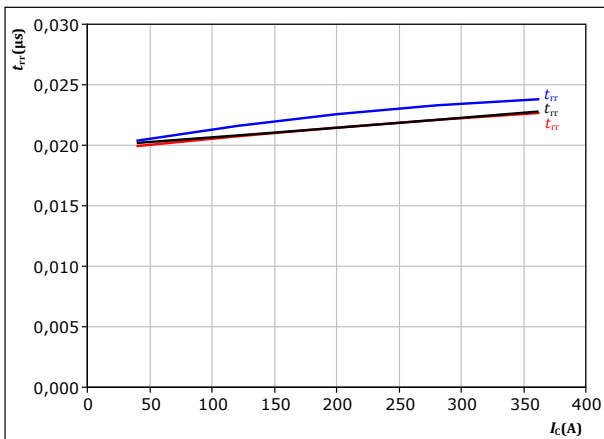
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



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

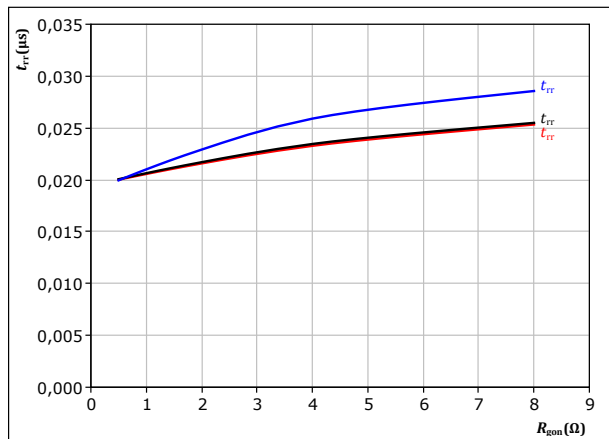
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 T_j : — 25 °C
— 125 °C
— 150 °C

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
— 125 °C
— 150 °C

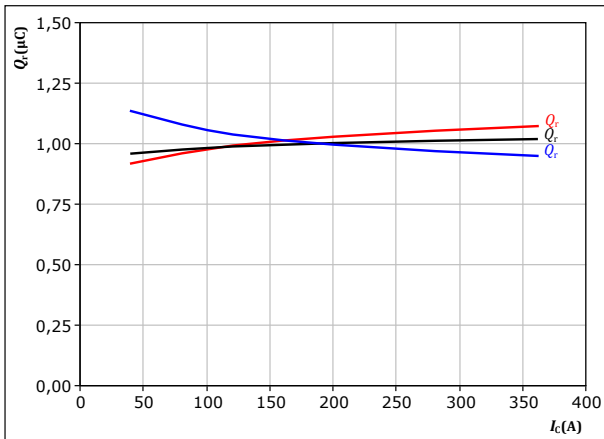


Inner Boost Switching Characteristics

figure 34. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

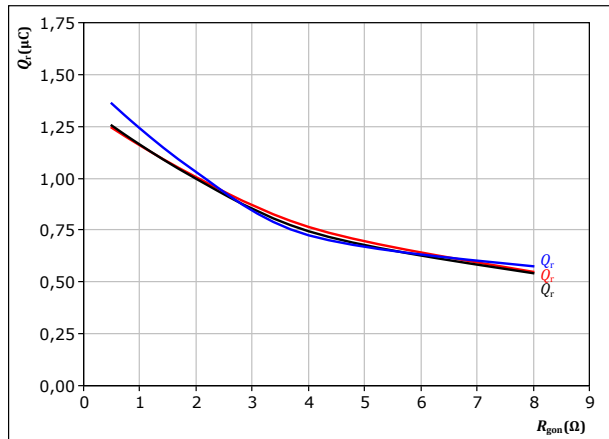
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

T_j : — 25 °C
— 125 °C
— 150 °C

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

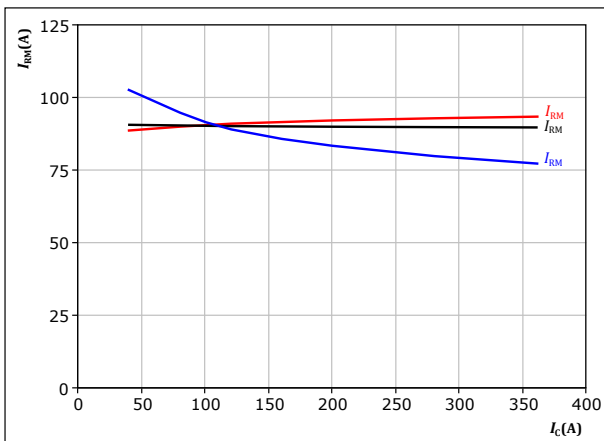
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$

T_j : — 25 °C
— 125 °C
— 150 °C

figure 36. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

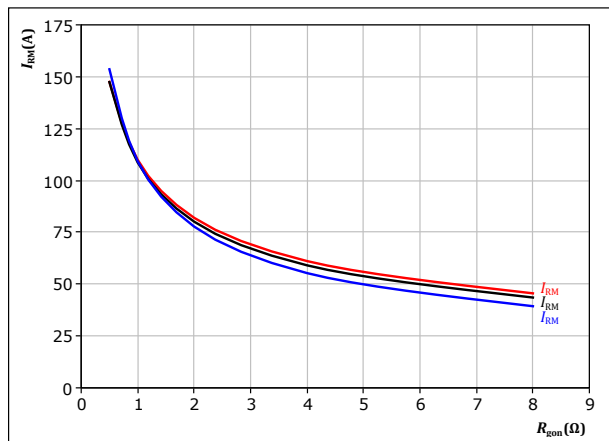
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

T_j : — 25 °C
— 125 °C
— 150 °C

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

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

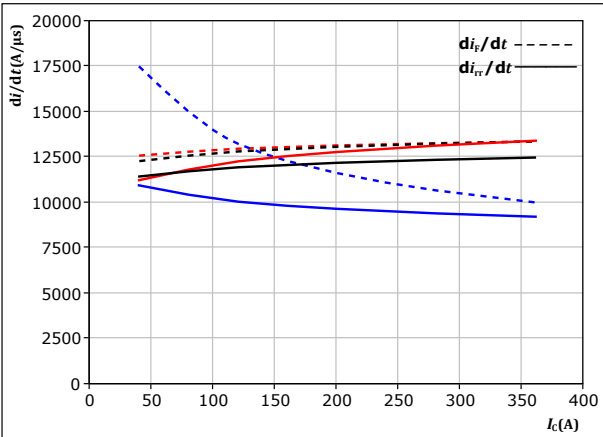
T_j : — 25 °C
— 125 °C
— 150 °C



Inner Boost Switching Characteristics

figure 38. FWD

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



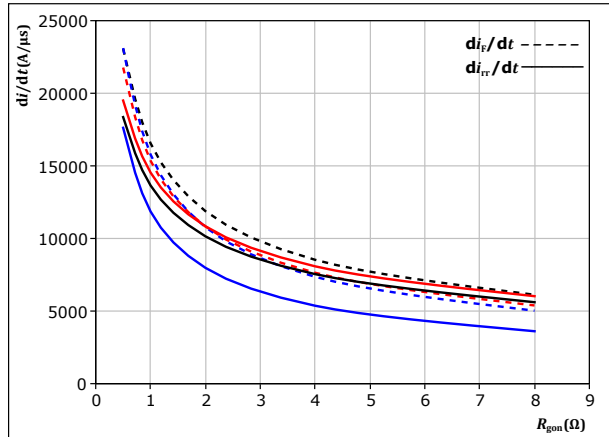
With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

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

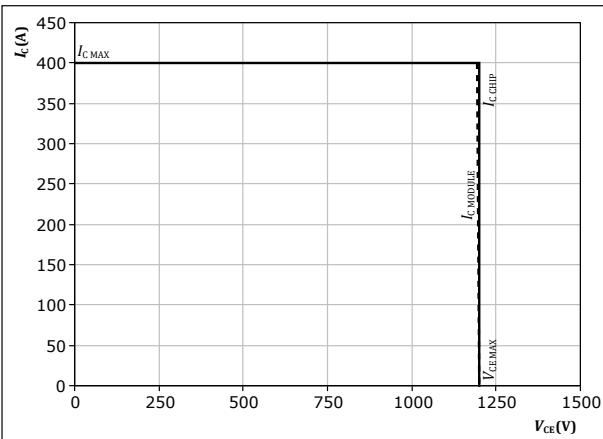
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 200 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 40. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



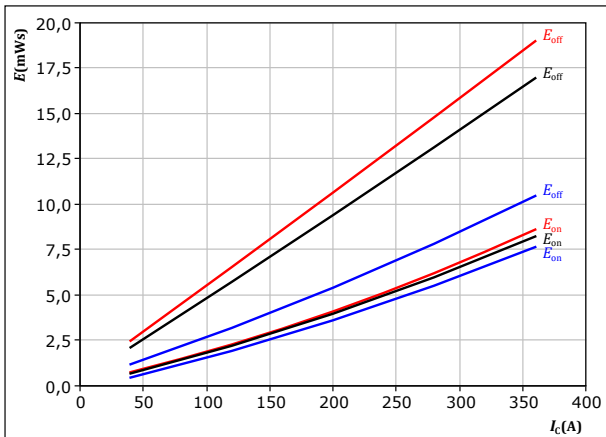
At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$



Outer Boost Switching Characteristics

figure 41. IGBT

Typical switching energy losses as a function of collector current
 $E = f(I_c)$

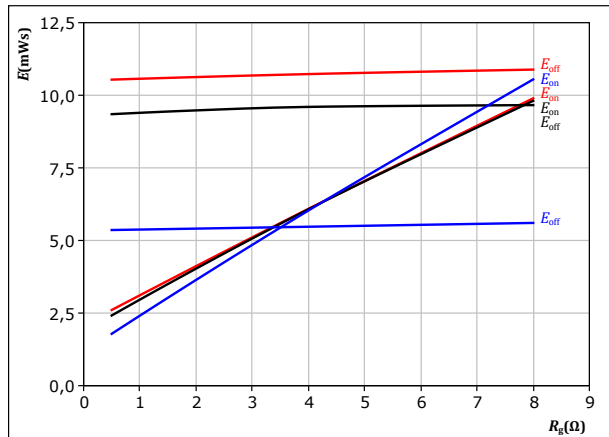


With an inductive load at

$V_{CE} = 700$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$R_{gon} = 2$ Ω	$T_j = 150$ °C
$R_{goff} = 2$ Ω	

figure 42. IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor
 $E = f(R_g)$

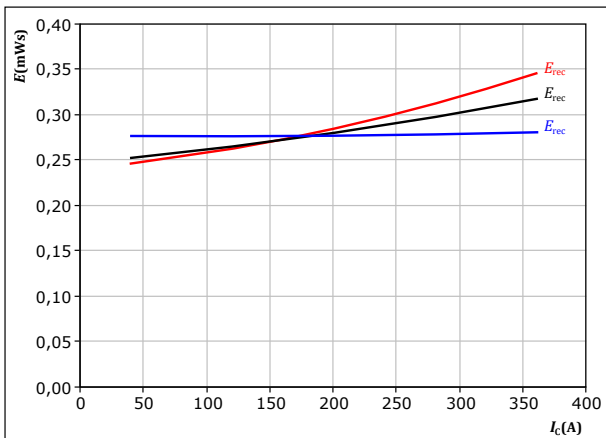


With an inductive load at

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

figure 43. FWD

Typical reverse recovered energy loss as a function of collector current
 $E_{rec} = f(I_c)$

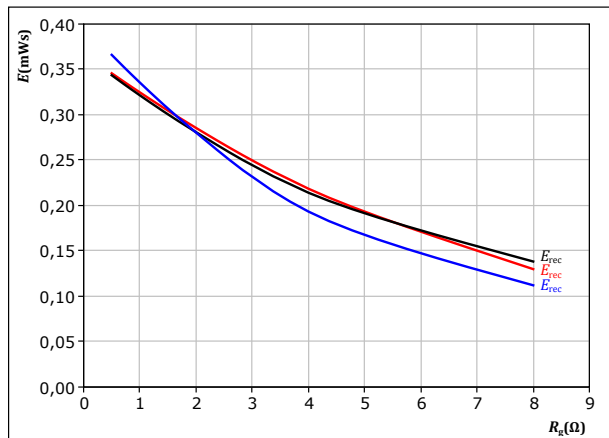


With an inductive load at

$V_{CE} = 700$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$R_{gon} = 2$ Ω	$T_j = 150$ °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

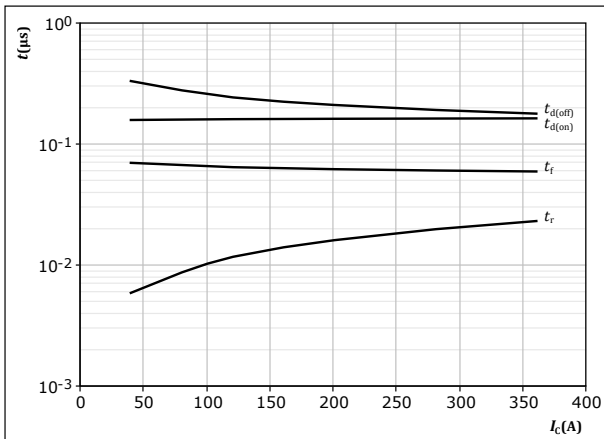
$V_{CE} = 700$ V	$T_j = 25$ °C
$V_{GE} = \pm 15$ V	$T_j = 125$ °C
$I_c = 200$ A	$T_j = 150$ °C



Outer Boost Switching Characteristics

figure 45. IGBT

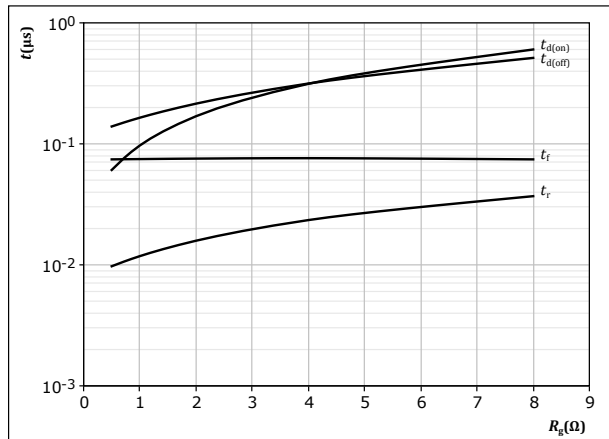
Typical switching times as a function of collector current
 $t = f(I_c)$



With an inductive load at
 $T_j = 150$ °C
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

figure 46. IGBT

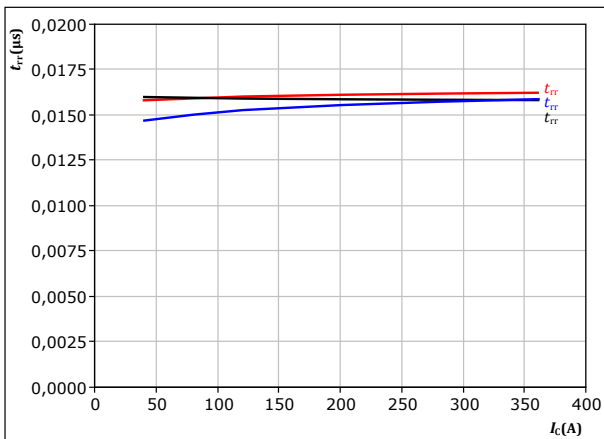
Typical switching times as a function of IGBT turn on gate resistor
 $t = f(R_g)$



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

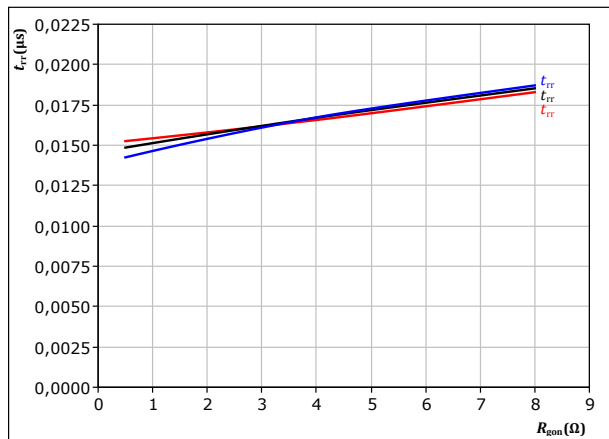
Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_c)$



With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 T_j : — 25 °C
— 125 °C
— 150 °C

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
— 125 °C
— 150 °C

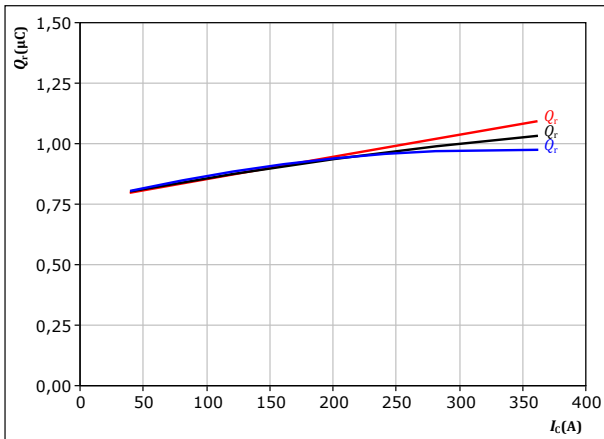


Outer Boost Switching Characteristics

figure 49. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

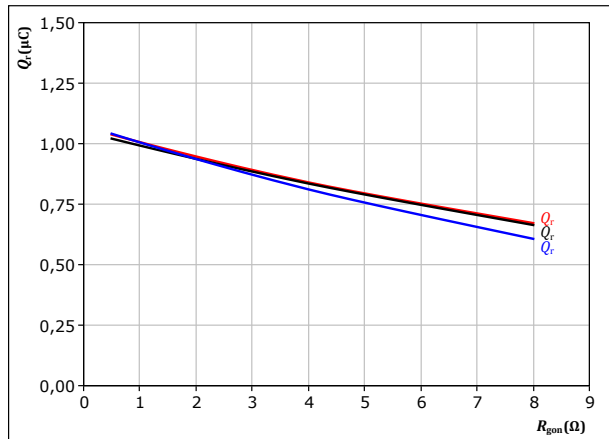
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

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

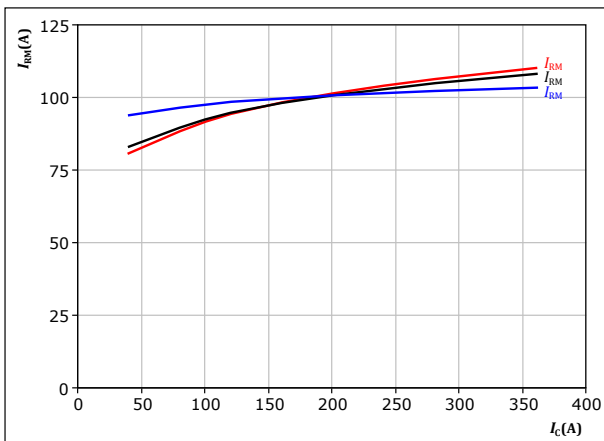
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 200 \text{ A}$

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

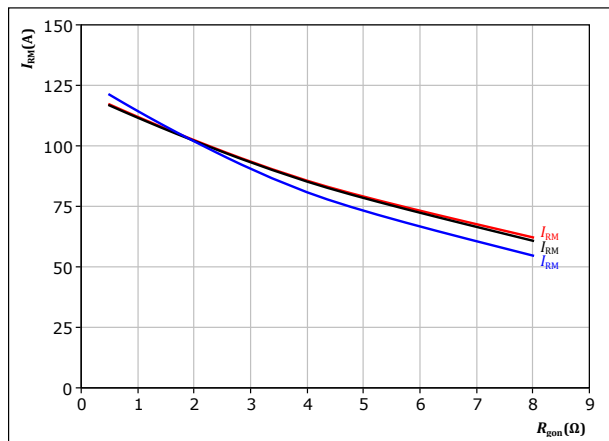
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

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

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

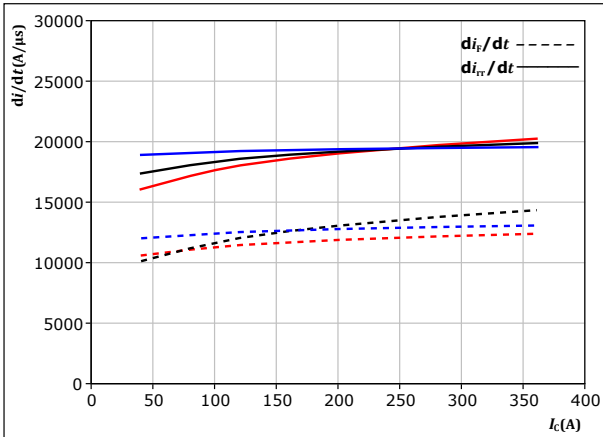
T_j : — 25 °C
— 125 °C
— 150 °C



Outer Boost Switching Characteristics

figure 53. FWD

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



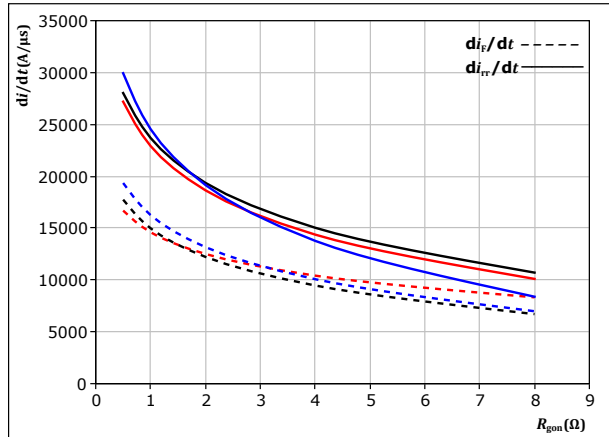
With an inductive load at

$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

$T_j:$ — 25 °C
 — 125 °C
 — 150 °C

figure 54. FWD

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



With an inductive load at

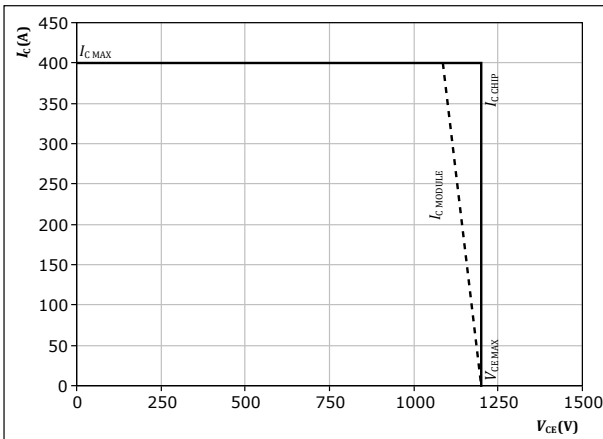
$V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 200 \text{ A}$

$T_j:$ — 25 °C
 — 125 °C
 — 150 °C

figure 55. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$



Switching Definitions

figure 56. IGBT

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

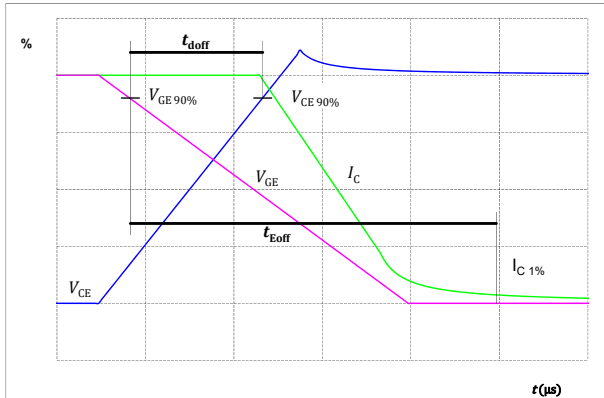


figure 57. IGBT

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

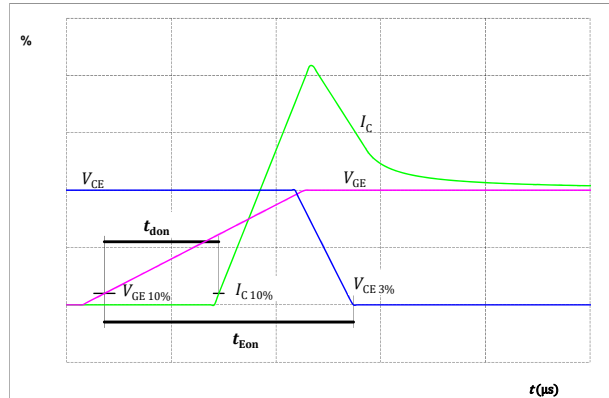


figure 58. IGBT

Turn-off Switching Waveforms & definition of t_f

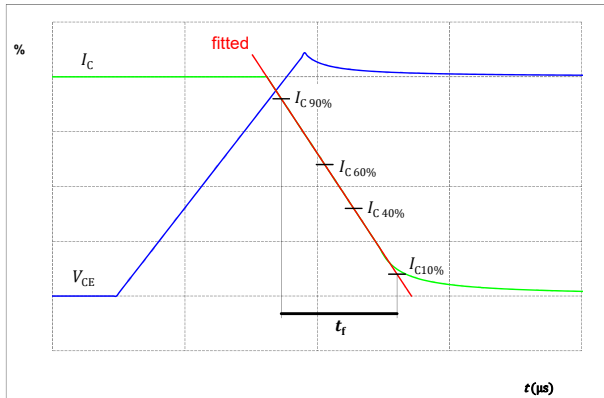
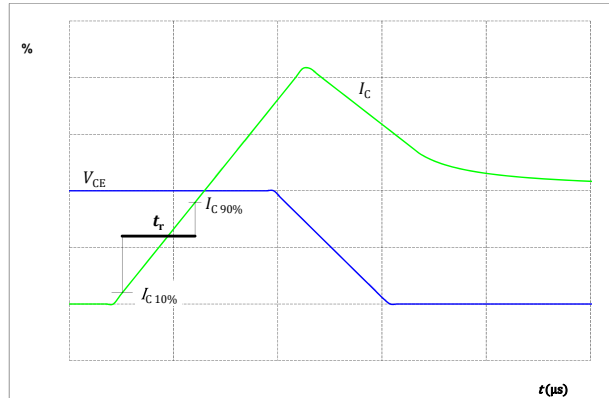


figure 59. IGBT

Turn-on Switching Waveforms & definition of t_r





Switching Definitions

figure 60. FWD

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

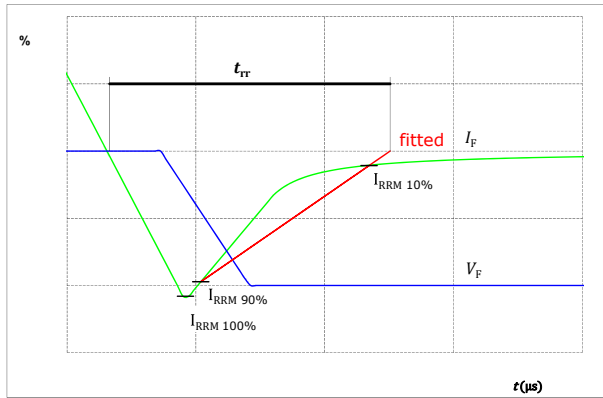
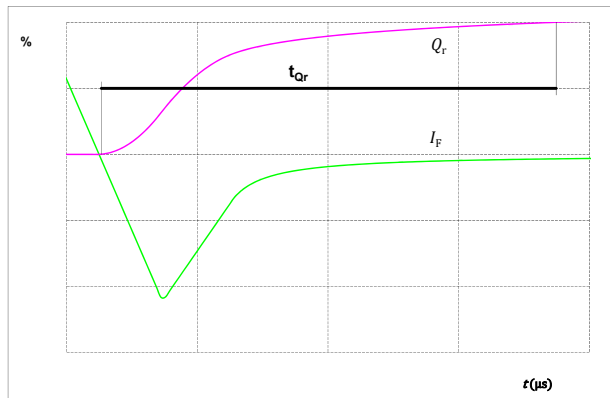
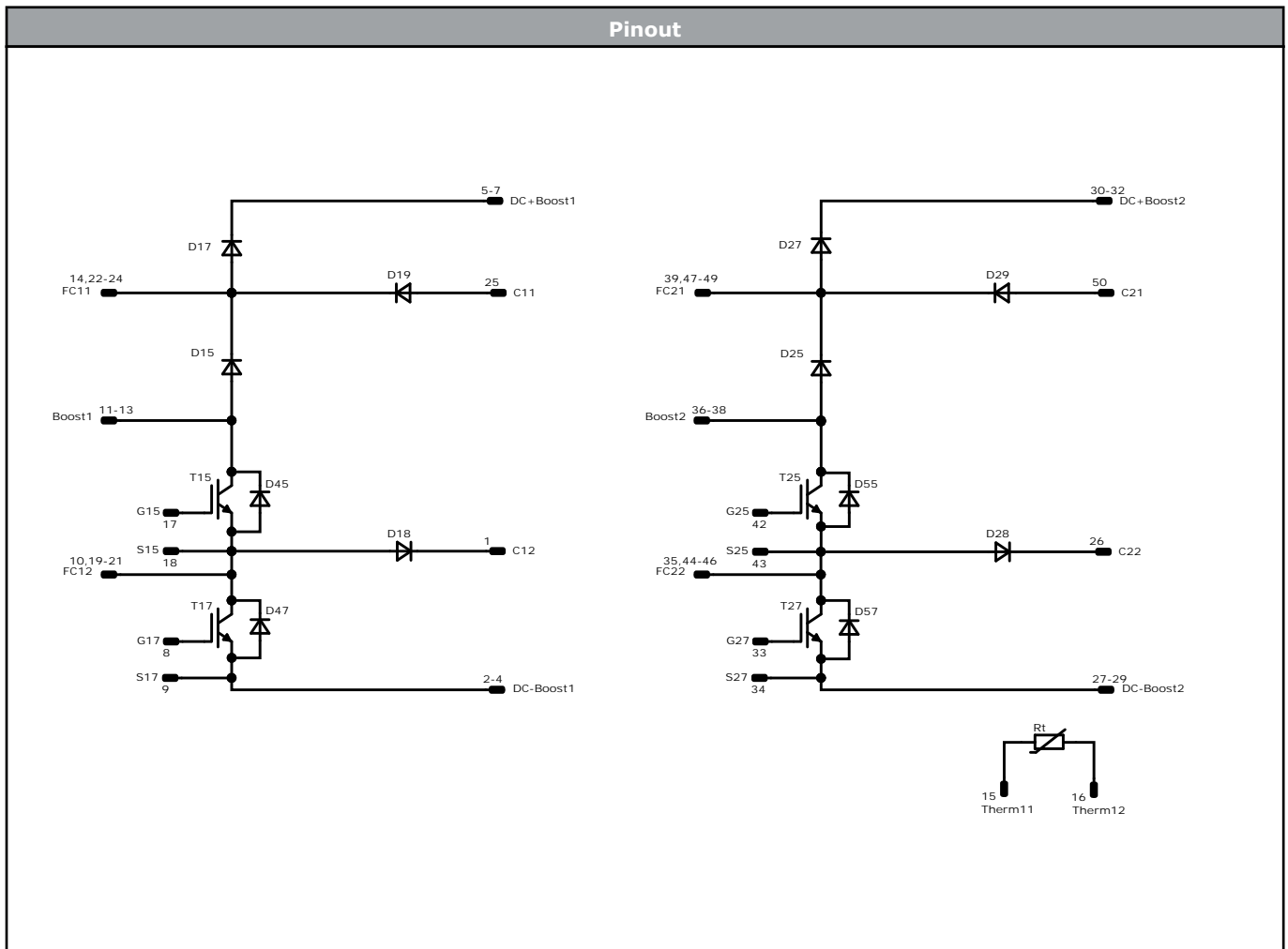


figure 61. FWD

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





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	75 A	Aux Diode L	
Rt	Thermistor			Thermistor	



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.

Application Note
For use of pre-charging auxiliary diodes see application note: "The Advantages and Operation of Flying-Capacitor Boosters" at vincotech.com

UL recognition and file number
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}C$ and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
30-PT12B2A200H713-PK89L18T-D1-14	11 Jun. 2024	Initial Release	

DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.