30-E312NIC560H7-PU10F57Z
datasheet

_flow_NPC E3BP **1200 V / 560 A**

Topology features

- Low side Kelvin Emitter for improved switching performance
- Neutral Point Clamped Topology (I-Type)
- Split topology
- 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
- Cu baseplate
- Convex shaped baseplate for superior thermal contact
- CTI600 housing material
- Baseplate with rough surface
- Thermo-mechanical push-and-pull force relief
- Solder pin

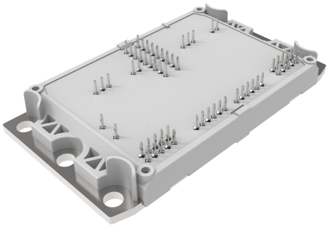
Target applications

- Energy Storage Systems
- Solar Inverters

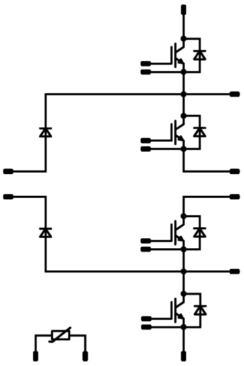
Types

- 30-E312NIC560H7-PU10F57Z

flow E3BP 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ T_s = 80 °C	290	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	1680	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V	1680	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	495	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C
Buck Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ T_s = 80 °C	176	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	480	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms T_j = 25 °C	1920	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	316	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ T_s = 80 °C	290	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	1680	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V	1680	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	495	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	176	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		480	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 25 °C	1920	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	316	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Inv. Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	187	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	287	W
Maximum junction temperature	T_{jmax}			175	°C

Module Properties

Parameter	Symbol	Conditions		Value	Unit
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 s	6800	V
Creepage distance				>12,7	mm
Clearance				11,76	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

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**	
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0048	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		560	25 125 150		1,79 2,03 2,08	2,15⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			16	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		74000		pF
Output capacitance	C_{oes}							1268		pF
Reverse transfer capacitance	C_{res}							376		pF
Gate charge	Q_g	V_{CC} = 960 V	0/15		560	25		4128		nC
Thermal										
Thermal resistance junction to sink⁽²⁾	$R_{th(j\text{-}s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,19		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-10/15	600	133	25 125 150		317,67 316,09 315,63		ns
Rise time	t_r					25 125 150		16,83 18,85 19,22		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		487,33 562,01 579,28		ns
Fall time	t_f					25 125 150		13,52 17,44 19,49		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,53 µC Q_{rFWD}=1,55 µC Q_{rFWD}=1,56 µC				25 125 150		2,79 3,31 3,47		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		4,13 6,85 7,59		mWs

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**	
Buck Diode										
Static										
Forward voltage	V_F				240	25 125 150		1,53 1,89 2,03	1,65(1) 2,3(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25		12	1200	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,3		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=8445 A/µs d*i*/d*t*=9466 A/µs d*i*/d*t*=8906 A/µs	-10/15	600	133	25 125 150		94,42 92,76 93,35		A
Reverse recovery time	t_{rr}					25 125 150		26,62 27,57 27,77		ns
Recovered charge	Q_r					25 125 150		1,53 1,55 1,56		µC
Reverse recovered energy	E_{rec}					25 125 150		0,365 0,366 0,366		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8661,57 9423,94 8569,5		A/µs

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	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0048	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		560	25 125 150		1,79 2,03 2,08	2,15[1]	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			16	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		74000		pF
Output capacitance	C_{oes}							1268		pF
Reverse transfer capacitance	C_{res}							376		pF
Gate charge	Q_g	V_{CC} = 960 V	0/15		560	25		4128		nC
Thermal										
Thermal resistance junction to sink[2]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,19		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-10/15	600	80	25 125 150		320,13 318,76 318,36		ns
Rise time	t_r					25 125 150		12,86 14,67 15,39		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		520,96 612,45 643		ns
Fall time	t_f					25 125 150		17,33 19,15 19,42		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,39 µC Q_{rFWD}=1,4 µC Q_{rFWD}=1,44 µC				25 125 150		1,7 1,92 1,98		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,55 4,05 4,61		mWs

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	
Boost Diode										
Static										
Forward voltage	V_F				240	25 125 150		1,53 1,89 2,03	1,65(1) 2,3(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25		12	1200	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,3		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=6854 A/µs di/dt=7042 A/µs di/dt=7118 A/µs	-10/15	600	80	25 125 150		90,72 87,79 88,75		A
Reverse recovery time	t_{rr}					25 125 150		25,77 27,32 28,19		ns
Recovered charge	Q_r					25 125 150		1,39 1,4 1,44		µC
Reverse recovered energy	E_{rec}					25 125 150		0,288 0,283 0,29		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8902,55 8420,65 8139,24		A/µs

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	
Boost Sw. Inv. Diode										
Static										
Forward voltage	V_F				300	25 125 150	1,45	1,91 1,93 1,91	1,95(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			3	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,33		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

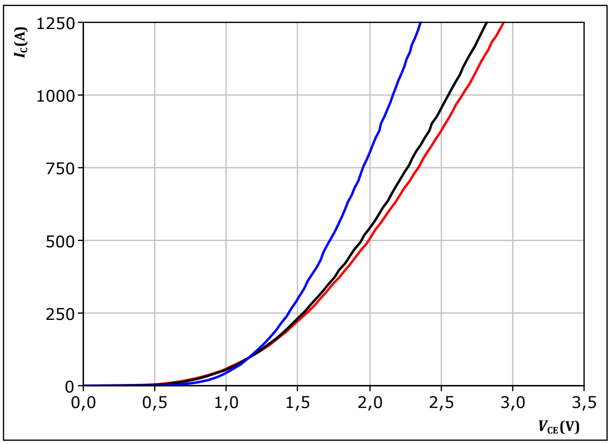
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



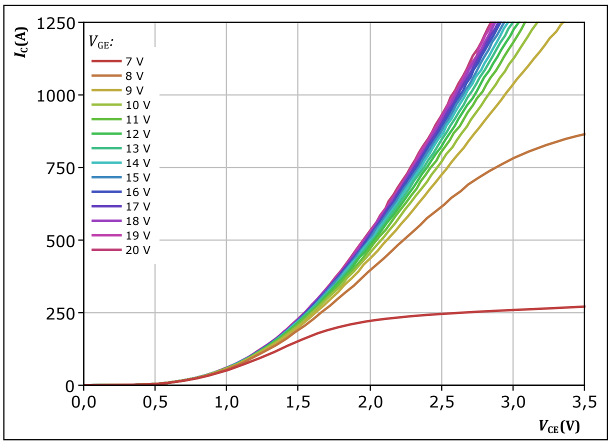
t_p = 250 µs
V_{GE} = 15 V

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

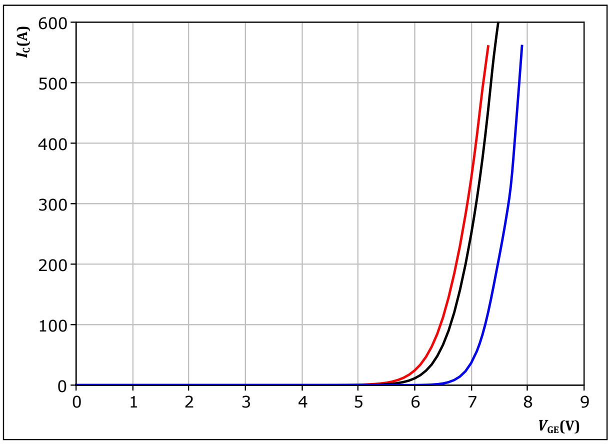


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 20 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})



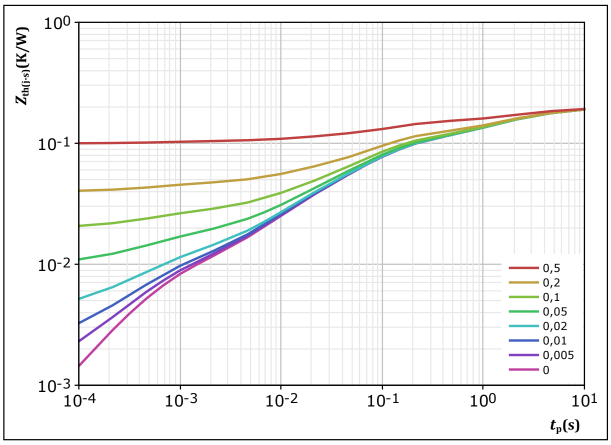
t_p = 250 µs
V_{CE} = 30 V

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
$R_{th(j-s)}$ = 0,192 K/W

IGBT thermal model values

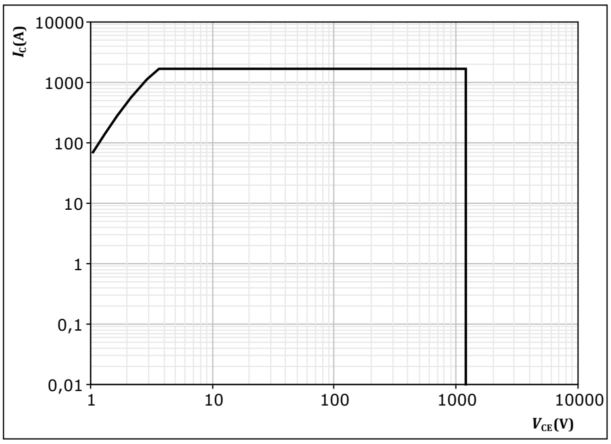
R (K/W)	τ (s)
3,88E-02	6,87E+00
6,56E-02	1,33E+00
7,12E-02	8,85E-02
1,67E-02	1,12E-02
7,15E-03	5,40E-04

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})

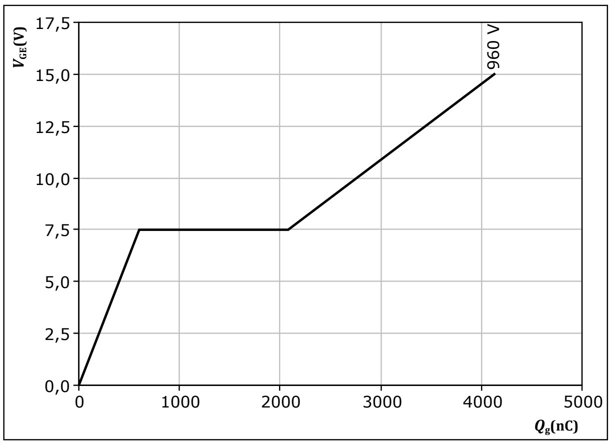


D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



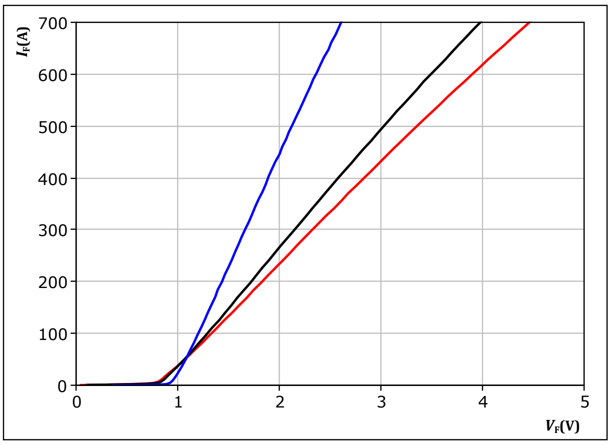
I_C = 560 A
T_j = 25 °C

Buck Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

I_F = f(V_F)



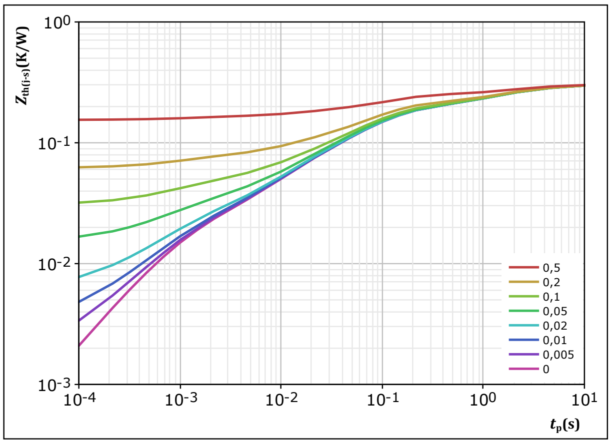
t_p = 250 µs

T_j:
- 25 °C
- 125 °C
- 150 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,3 K/W

FWD thermal model values

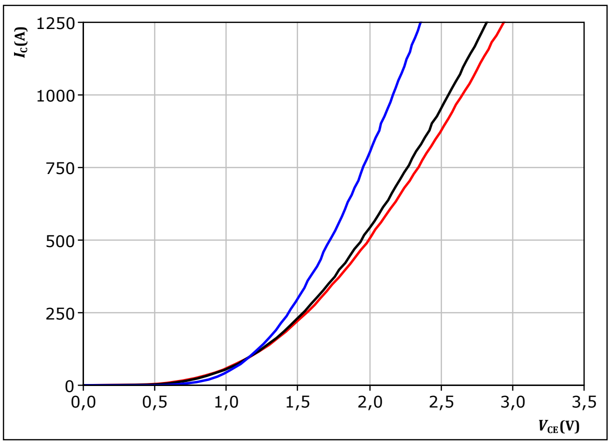
R (K/W)	τ (s)
3,83E-02	8,10E+00
8,96E-02	1,32E+00
1,33E-01	8,16E-02
3,22E-02	1,19E-02
1,60E-02	9,15E-04

Boost Switch Characteristics

figure 9. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

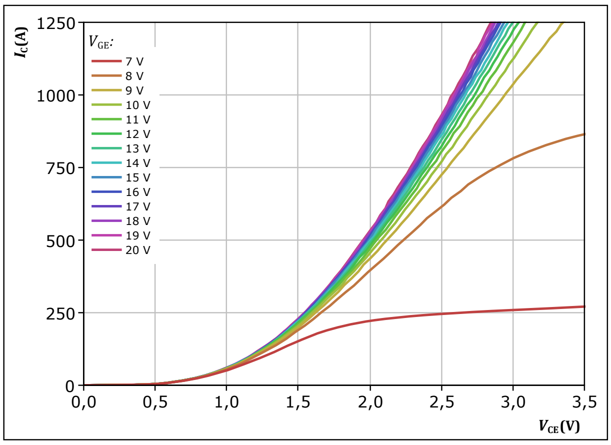


t_p = 250 µs
V_{GE} = 15 V
T_j: ━ 25 °C ━ 125 °C ━ 150 °C

figure 10. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

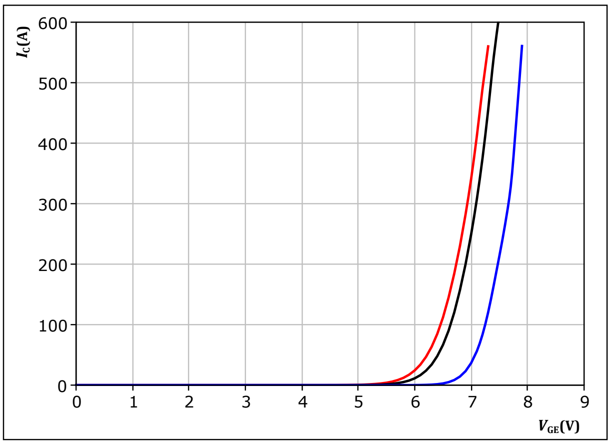


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 20 V in steps of 1 V

figure 11. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

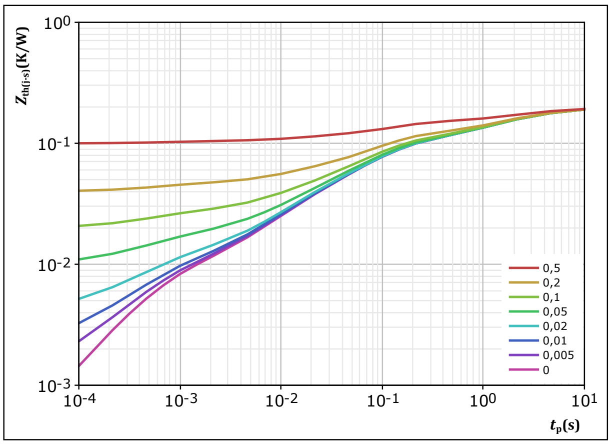


t_p = 250 µs
V_{CE} = 30 V
T_j: ━ 25 °C ━ 125 °C ━ 150 °C

figure 12. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 0,192 K/W

IGBT thermal model values

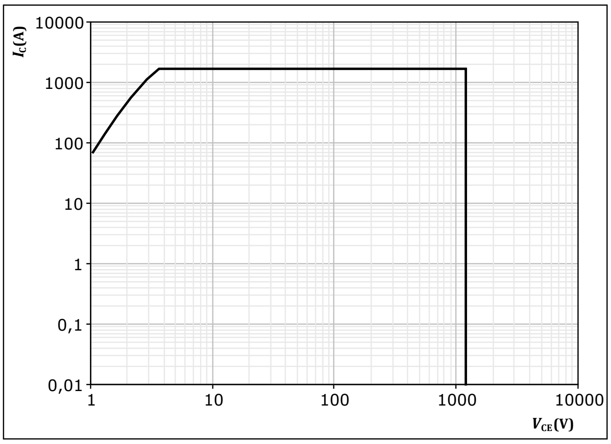
R (K/W)	τ (s)
3,88E-02	6,87E+00
6,56E-02	1,33E+00
7,12E-02	8,85E-02
1,67E-02	1,12E-02
7,15E-03	5,40E-04

Boost Switch Characteristics

figure 13. **IGBT**

Safe operating area

I_C = f(V_{CE})



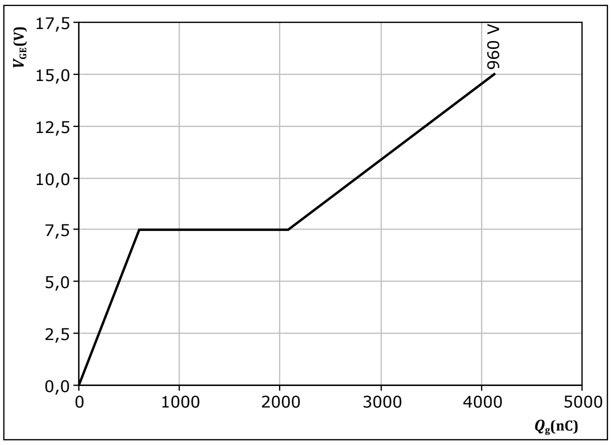
D = single pulse

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

figure 14. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



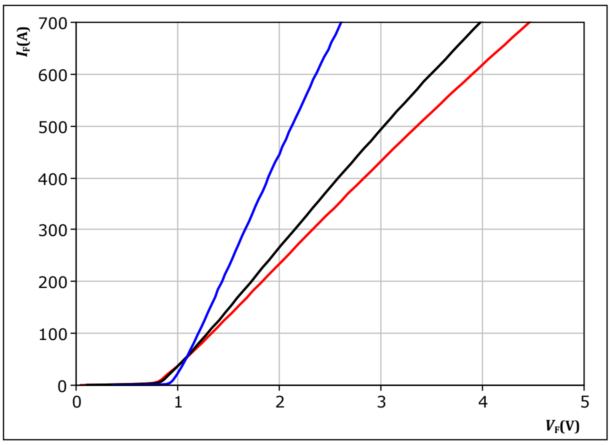
I_C =	560	A
T_j =	25	°C

Boost Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

I_F = f(V_F)



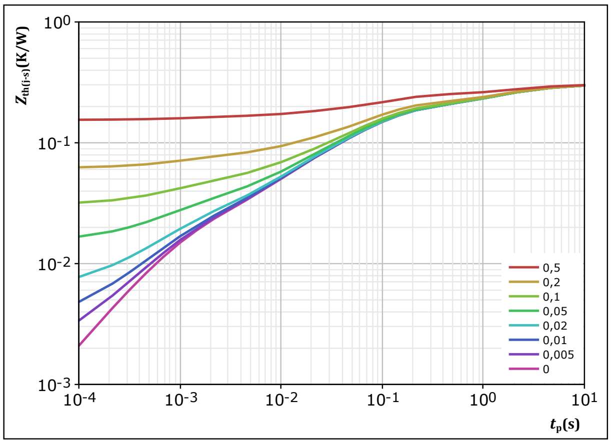
t_p = 250 µs

T_j:
- 25 °C
- 125 °C
- 150 °C

figure 16. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,3 K/W

FWD thermal model values

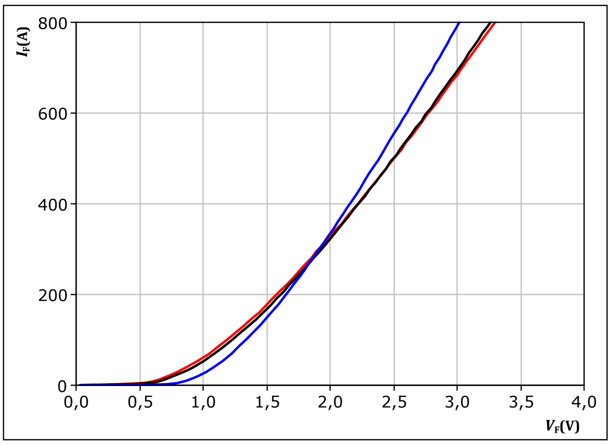
R (K/W)	τ (s)
3,83E-02	8,10E+00
8,96E-02	1,32E+00
1,33E-01	8,16E-02
3,22E-02	1,19E-02
1,60E-02	9,15E-04

Boost Sw. Inv. Diode Characteristics

figure 17. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



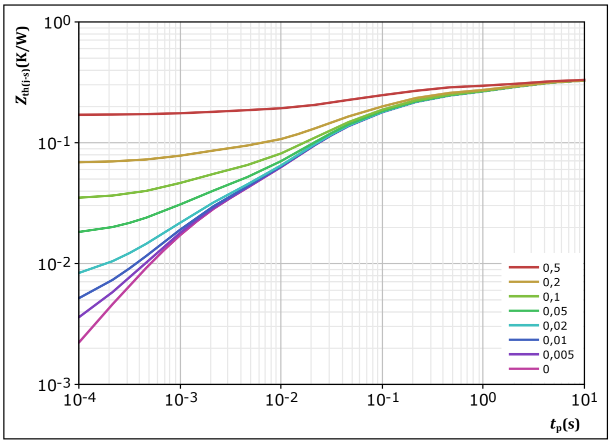
t_p = 250 µs

T_j:
25 °C
125 °C
150 °C

figure 18. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,331 K/W

FWD thermal model values

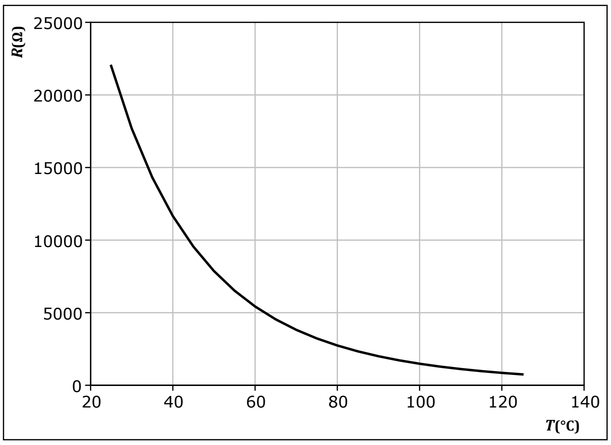
R (K/W)	τ (s)
3,16E-02	1,00E+01
7,88E-02	1,75E+00
1,21E-01	1,25E-01
8,68E-02	2,27E-02
2,22E-02	1,23E-03

Thermistor Characteristics

figure 19. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

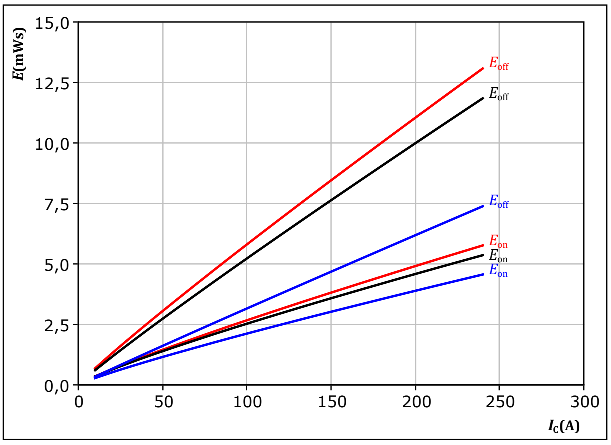


Buck Switching Characteristics

figure 20. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



With an inductive load at

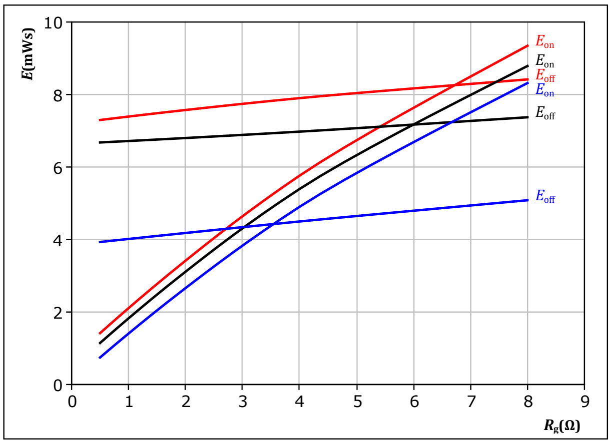
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω
R_{goff} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 21. **IGBT**

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

E = f(R_g)



With an inductive load at

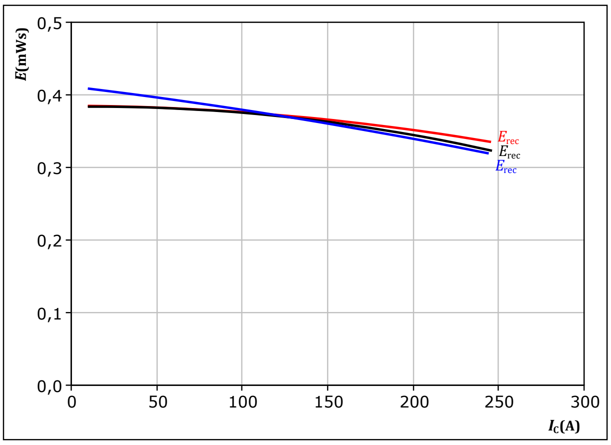
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

T_j:
25 °C
125 °C
150 °C

figure 22. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



With an inductive load at

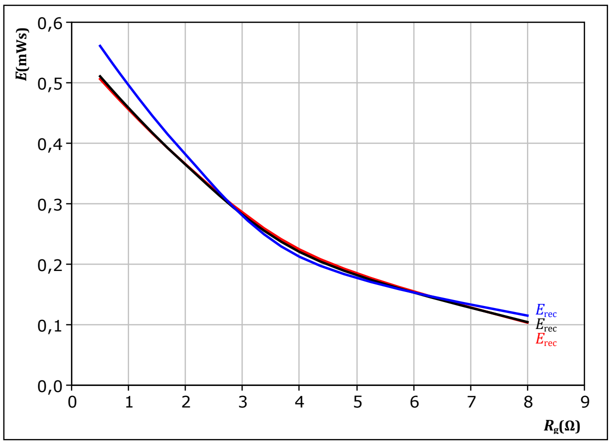
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 23. **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} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

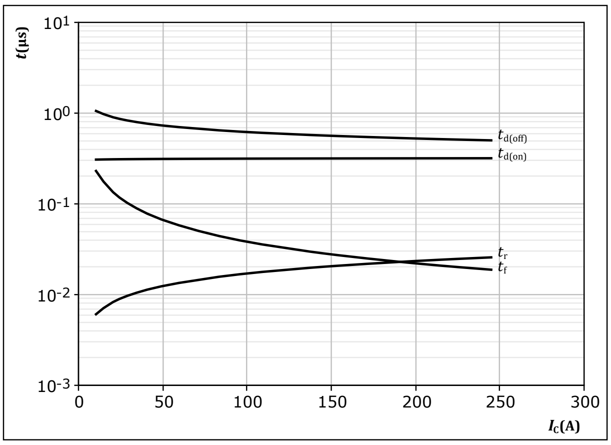
T_j:
25 °C
125 °C
150 °C

Buck Switching Characteristics

figure 24. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



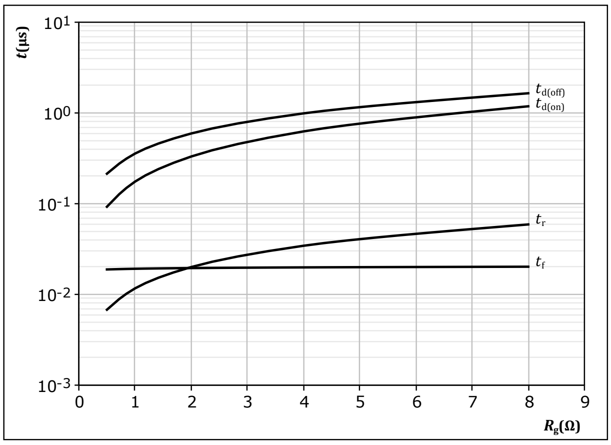
With an inductive load at

T_j = 150 °C
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω
R_{goff} = 2 Ω

figure 25. **IGBT**

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

t = f(R_g)



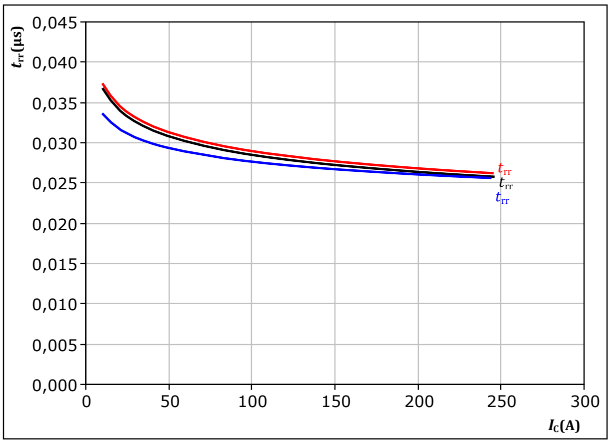
With an inductive load at

T_j = 150 °C
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

figure 26. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

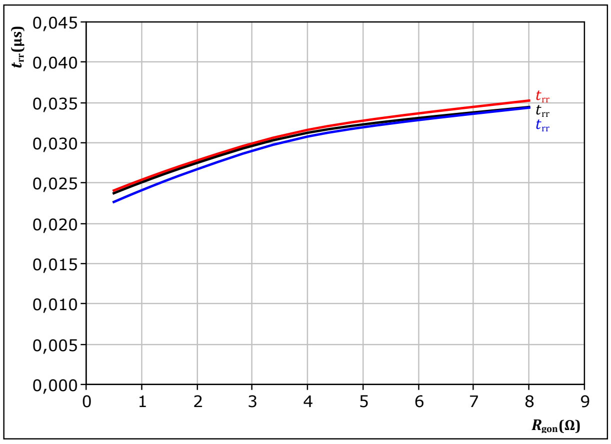
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 27. **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} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

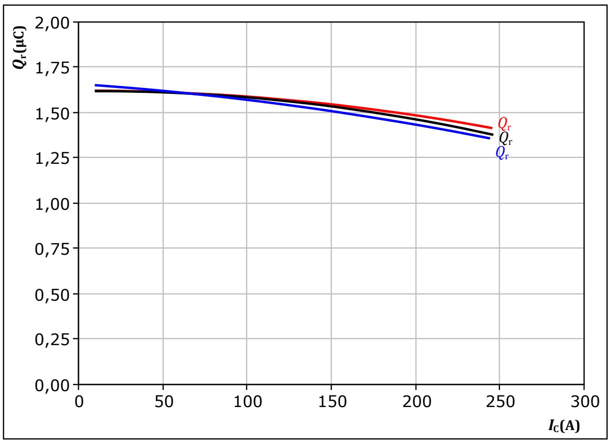
T_j:
— 25 °C
— 125 °C
— 150 °C

Buck Switching Characteristics

figure 28. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



With an inductive load at

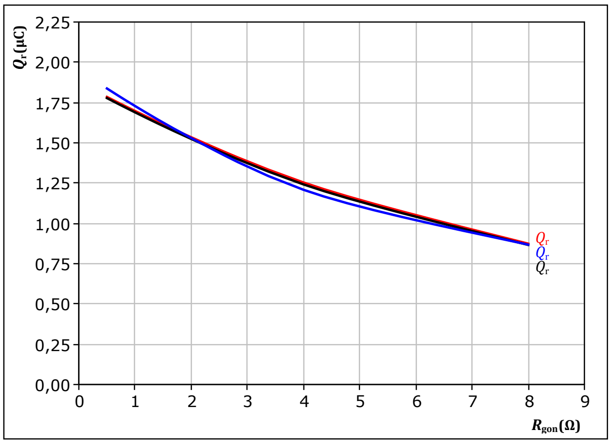
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 29. **FWD**

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

Q_r = f(R_{gon})



With an inductive load at

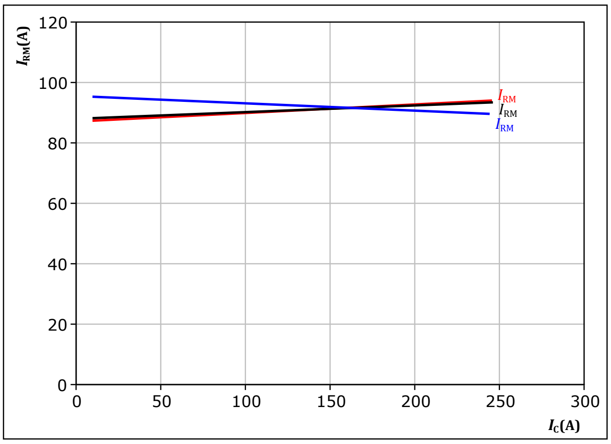
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

T_j:
25 °C
125 °C
150 °C

figure 30. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

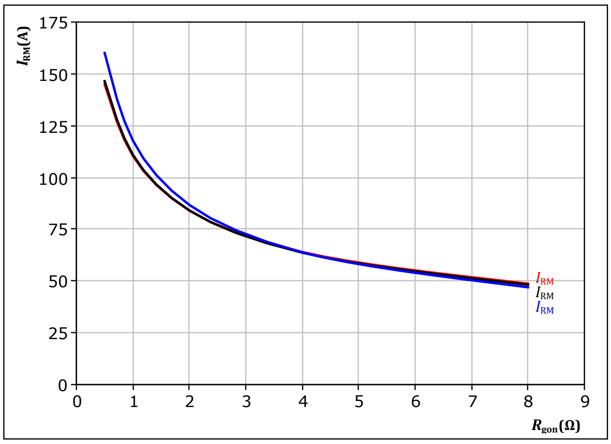
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 31. **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} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

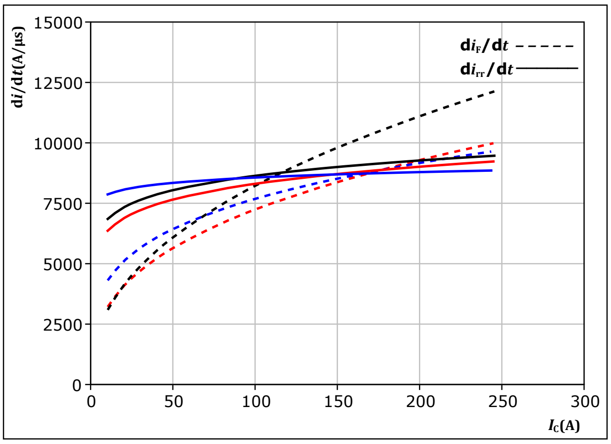
T_j:
25 °C
125 °C
150 °C

Buck Switching Characteristics

figure 32. **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

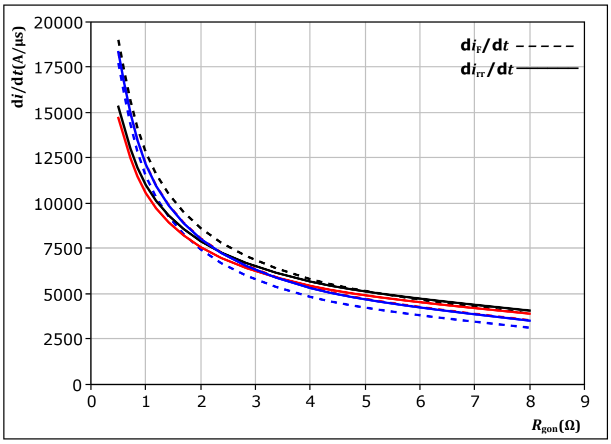
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 33. **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

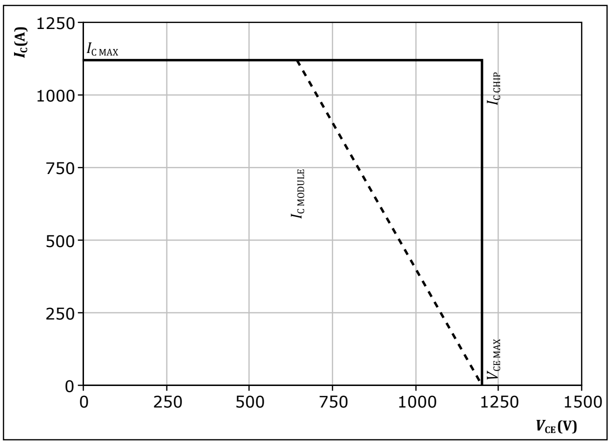
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 133 A

T_j: 25 °C, 125 °C, 150 °C

figure 34. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



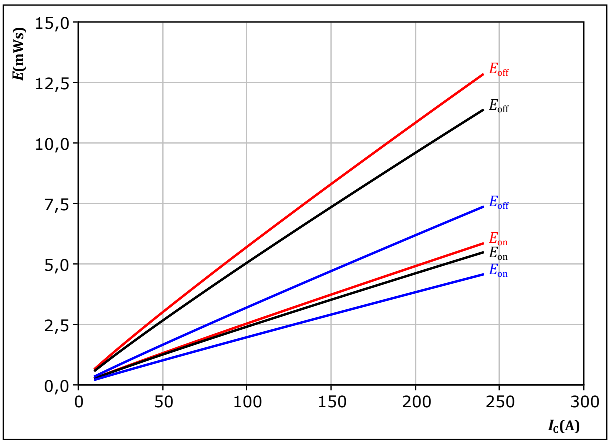
At T_j = 150 °C
R_{gon} = 2 Ω
R_{goff} = 2 Ω

Boost Switching Characteristics

figure 35. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



With an inductive load at

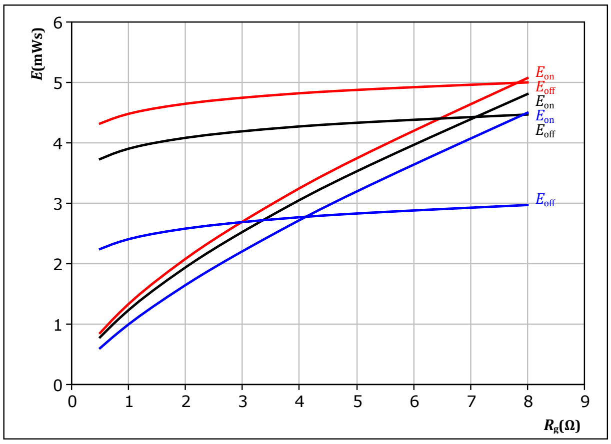
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω
R_{goff} = 2 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 36. **IGBT**

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

E = f(R_g)



With an inductive load at

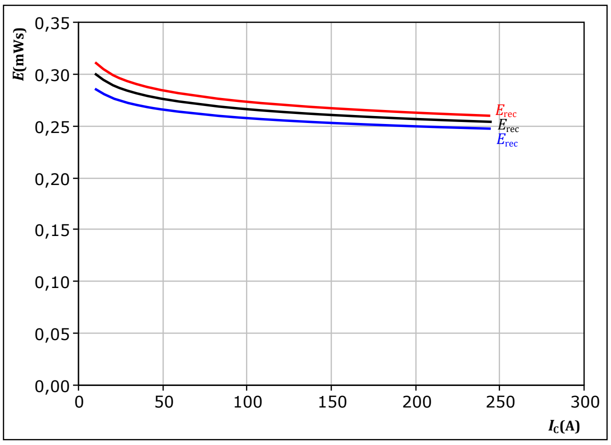
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 37. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



With an inductive load at

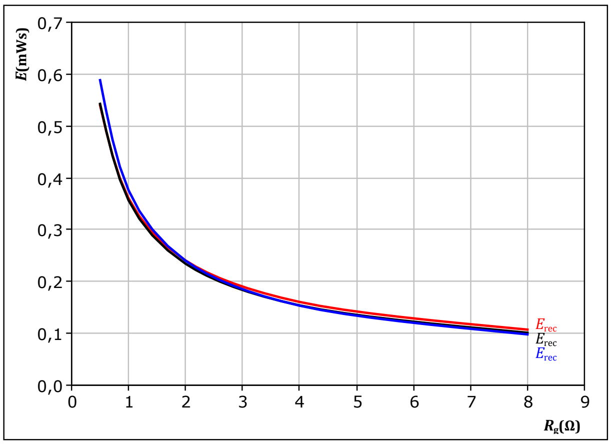
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 38. **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} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

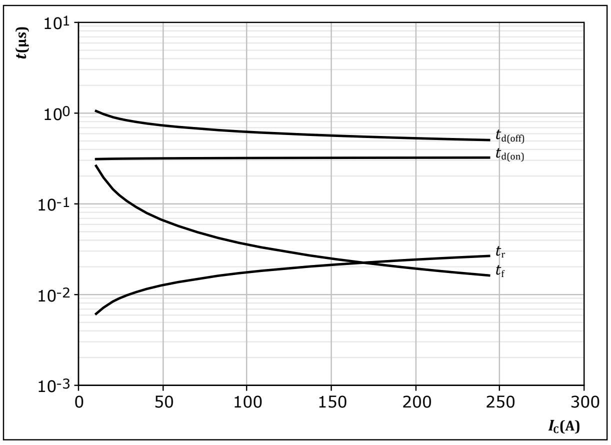
T_j:
— 25 °C
— 125 °C
— 150 °C

Boost Switching Characteristics

figure 39. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



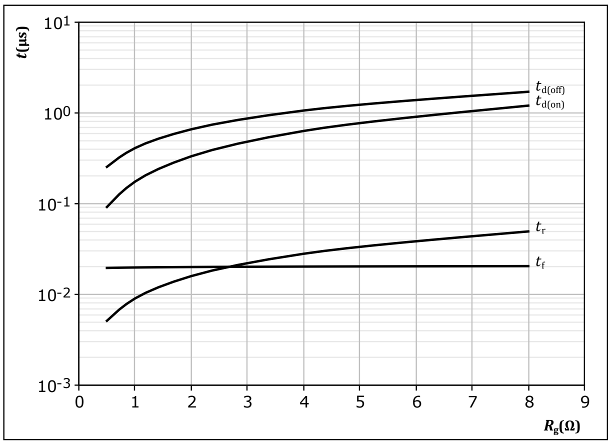
With an inductive load at

T_j = 150 °C
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω
R_{goff} = 2 Ω

figure 40. **IGBT**

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

t = f(R_g)



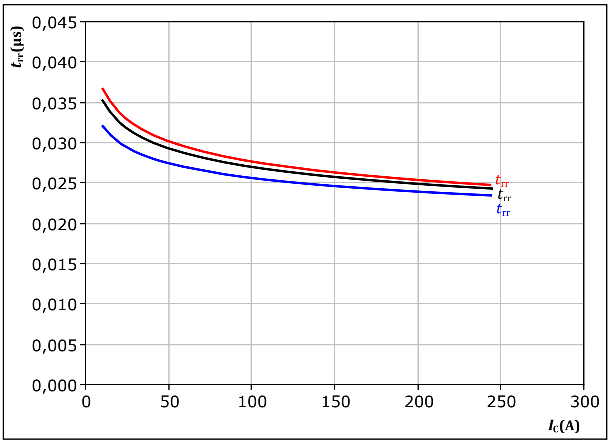
With an inductive load at

T_j = 150 °C
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

figure 41. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

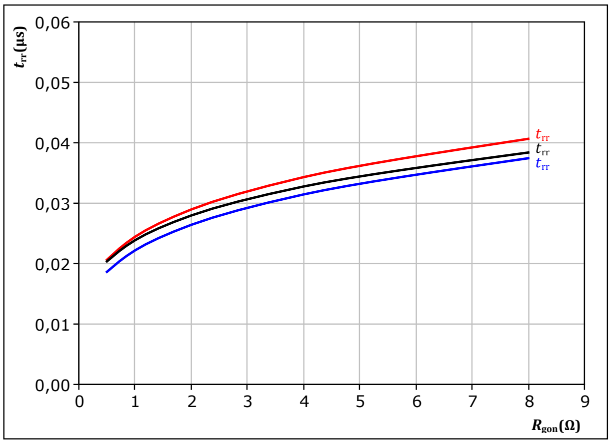
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
— 25 °C
— 125 °C
— 150 °C

figure 42. **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} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

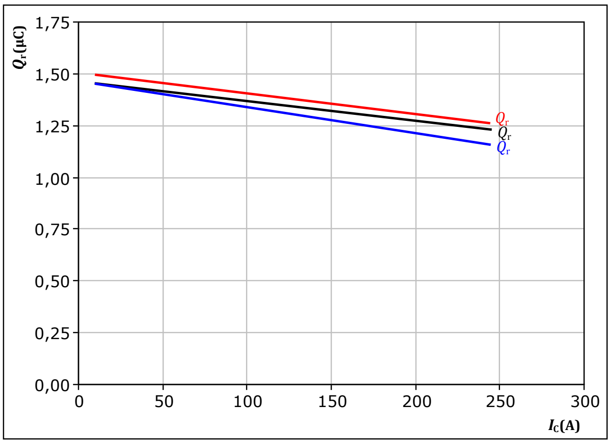
T_j:
— 25 °C
— 125 °C
— 150 °C

Boost Switching Characteristics

figure 43. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



With an inductive load at

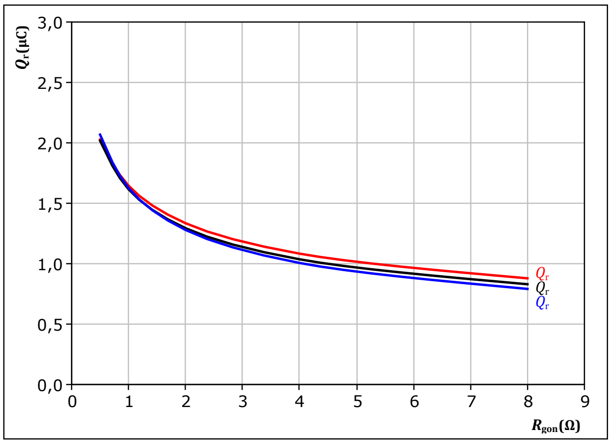
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 44. **FWD**

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

Q_r = f(R_{gon})



With an inductive load at

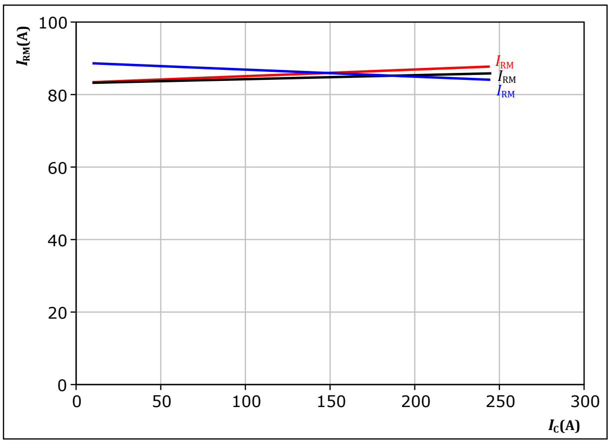
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

T_j:
25 °C
125 °C
150 °C

figure 45. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

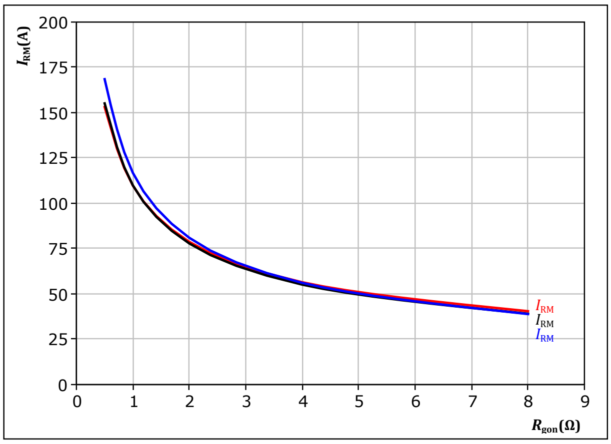
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 46. **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} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

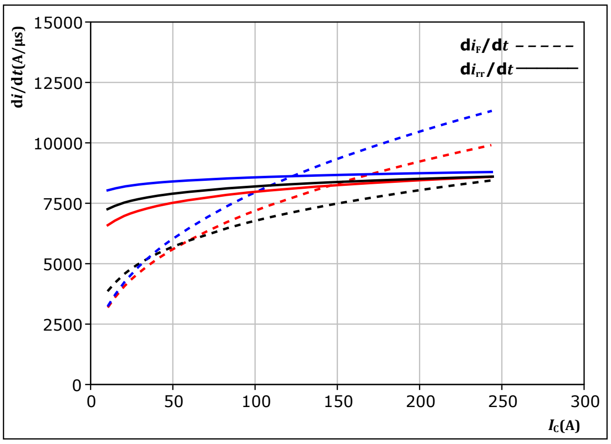
T_j:
25 °C
125 °C
150 °C

Boost Switching Characteristics

figure 47. **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

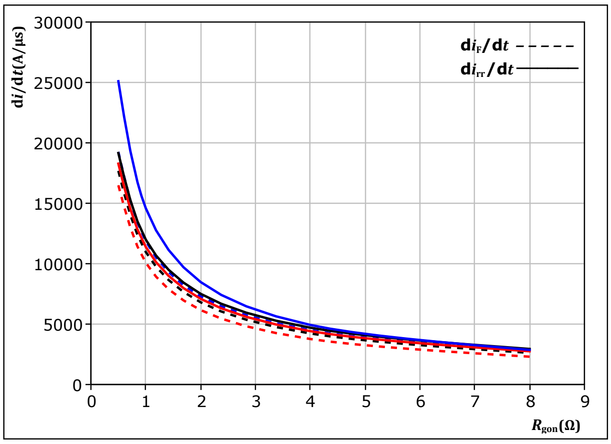
V_{CE} = 600 V
V_{GE} = -10/15 V
R_{gon} = 2 Ω

T_j:
25 °C
125 °C
150 °C

figure 48. **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

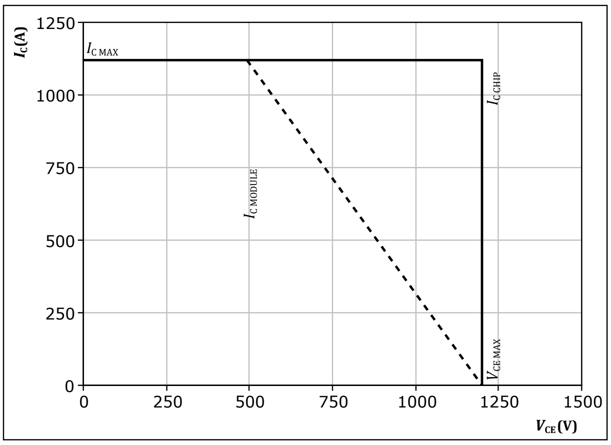
V_{CE} = 600 V
V_{GE} = -10/15 V
I_C = 80 A

T_j:
25 °C
125 °C
150 °C

figure 49. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At T_j = 150 °C
R_{gon} = 2 Ω
R_{goff} = 2 Ω

Switching Definitions

figure 50. **IGBT**

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

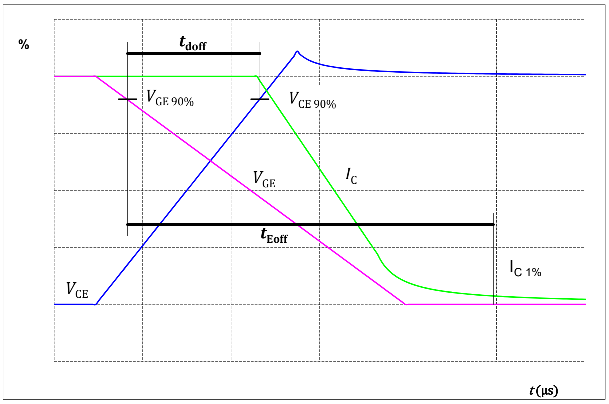


figure 51. **IGBT**

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

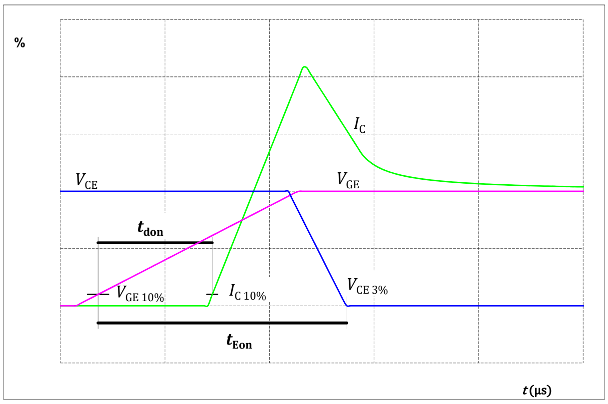


figure 52. **IGBT**

Turn-off Switching Waveforms & definition of t_f

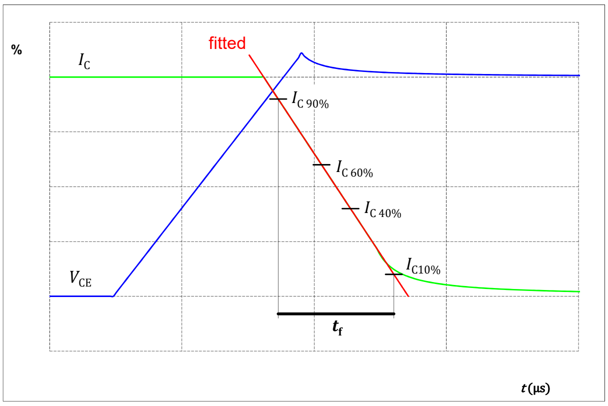
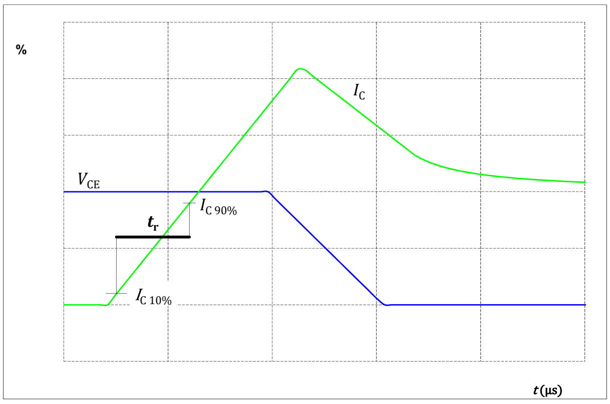


figure 53. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 54. **FWD**

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

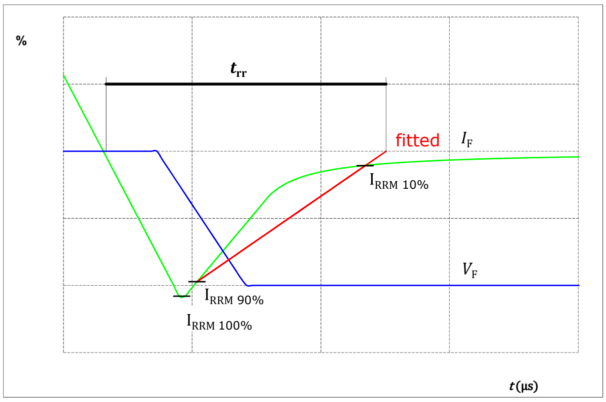
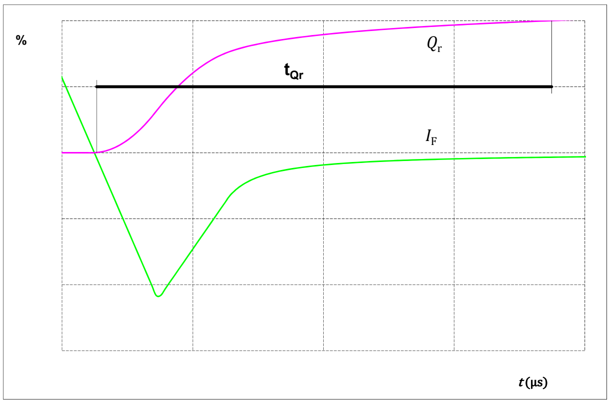


figure 55. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	30-E312NIC560H7-PU10F57Z
With thermal paste (5,2 W/mK, PTM6000HV)	30-E312NIC560H7-PU10F57Z-/7/

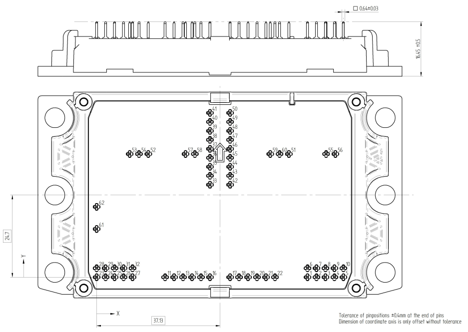
Marking

<table>
<tr><td rowspan="4"> </td><td rowspan="2">Text</td><td colspan="2">Name</td><td>Date code</td><td>UL & VIN</td><td>Lot</td><td>Serial</td></tr>
<tr><td colspan="2">NN-NNNNNNNNNNNNNN-TTTTTTVV</td><td>WWYY</td><td>UL VIN</td><td>LLLLL</td><td>SSSS</td></tr>
<tr><td rowspan="2">Datamatrix</td><td>Type&Ver</td><td>Lot number</td><td>Serial</td><td>Date code</td><td></td><td></td></tr>
<tr><td>TTTTTTTVV</td><td>LLLLL</td><td>SSSS</td><td>WWYY</td><td></td><td></td></tr>
</table>

Outline

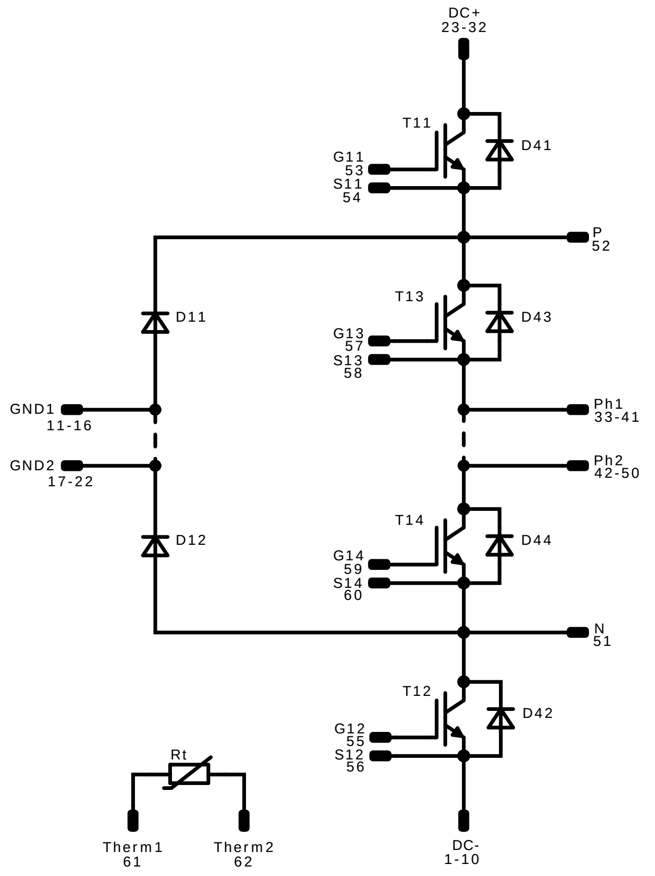
Pin table [mm]

Pin	X	Y	Function
1	63,46	0	DC-
2	66,16	0	DC-
3	68,86	0	DC-
4	71,56	0	DC-
5	74,26	0	DC-
6	63,46	2,7	DC-
7	66,16	2,7	DC-
8	68,86	2,7	DC-
9	71,56	2,7	DC-
10	74,26	2,7	DC-
11	20,6	0	GND
12	23,3	0	GND
13	26	0	GND
14	28,7	0	GND
15	31,4	0	GND
16	34,1	0	GND
17	40,16	0	GND
18	42,86	0	GND
19	45,56	0	GND
20	48,26	0	GND
21	50,96	0	GND
22	53,66	0	GND
23	0	0	DC+
24	2,7	0	DC+
25	5,4	0	DC+
26	8,1	0	DC+
27	10,8	0	DC+
28	0	2,7	DC+
29	2,7	2,7	DC+
30	5,4	2,7	DC+
31	8,1	2,7	DC+
32	10,8	2,7	DC+
33	34,1	27,8	Ph
34	34,1	30,5	Ph
35	34,1	33,2	Ph
36	34,1	35,9	Ph
37	34,1	38,6	Ph
38	34,1	41,3	Ph
39	34,1	44	Ph
40	34,1	46,7	Ph
41	34,1	49,4	Ph
42	40,16	27,8	Ph
43	40,16	30,5	Ph
44	40,16	33,2	Ph
45	40,16	35,9	Ph
46	40,16	38,6	Ph
47	40,16	41,3	Ph
48	40,16	44	Ph
49	40,16	46,7	Ph
50	40,16	49,4	Ph
51	57,85	37,05	N
52	15,55	37,05	Ph
53	9,95	37,05	G11
54	12,75	37,05	S11
55	69,05	37,05	G12
56	71,85	37,05	S12
57	26,75	37,05	G13
58	29,55	37,05	S13
59	52,25	37,05	G14
60	55,05	37,05	S14
61	0	14,5	Therm1
62	0	21,15	Therm2



Tolerance of pinpositions: ±0.4mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	560 A	Buck Switch	
D11, D12	FWD	1200 V	240 A	Buck Diode	
T13, T14	IGBT	1200 V	560 A	Boost Switch	
D42, D41	FWD	1200 V	240 A	Boost Diode	
D43, D44	FWD	1200 V	300 A	Boost Sw. Inv. Diode	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 24	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* E3BP packages see vincotech.com website.

Package data
Package data for *flow* E3BP 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°C and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
30-E312NIC560H7-PU10F57Z-D1-14	27 Mar. 2026	Initial release	

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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.