Vincotech

10-F124NID150SH03-LG18F98
10-F124NIE150SH03-LG28F98
datasheet

flow **NPC 1 split** **2400 V / 150 A**

Features

- Enhanced efficiency
- Low inductive package
- Tandem diodes

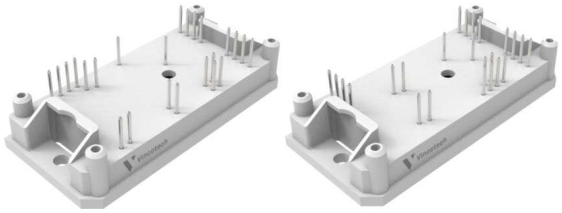
Target applications

- Solar Inverters

Types

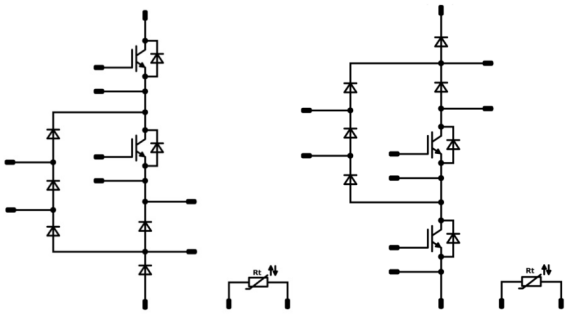
- 10-F124NID150SH03-LG18F98
- 10-F124NIE150SH03-LG28F98

flow 1 housing



LG18F98 LG28F98

Schematic



LG18F98 LG28F98

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	T_j = T_{jmax} T_s = 80 °C	109	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	243	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V	10 800	µs V
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1300	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	115	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	300	W
Maximum Junction Temperature	T_{jmax}		175	°C
Buck Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	46	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 8,3 ms T_j = 150 °C	270	A
Surge current capability	I^2t		365	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	94	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	139	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	254	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	46	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 8,3 ms T_j = 150 °C	270	A
Surge current capability	I^2t		365	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	94	W
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Sw. Inv. Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		50	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	490	A
Surge current capability	I^2t		1200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	78	W
Maximum Junction Temperature	T_{jmax}		150	°C
Boost Sw. Protection Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		50	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	490	A
Surge current capability	I^2t		1200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	78	W
Maximum Junction Temperature	T_{jmax}		150	°C
Boost D. Protection Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	32	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	170	A
Surge current capability	I^2t		145	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	71	W
Maximum Junction Temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
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 s	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		> 200	

*100% Tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0052	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150	1,78	2,16 2,48 2,56	2,42	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			2	µA
Gate-emitter leakage current	I_{GES}		20	0		25			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 MHz	0	25		25		8800		pF
Reverse transfer capacitance	C_{res}							470		
Gate charge	Q_g		15			25		1140		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,39		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	150	25 125 150		116 120 120		ns
Rise time	t_r					25 125 150		20 23 24		
Turn-off delay time	$t_{d(off)}$					25 125 150		213 267 279		
Fall time	t_f					25 125 150		20 66 75		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,4 µC Q_{rFWD} = 8,4 µC Q_{rFWD} = 9,7 µC				25 125 150		6,23 8,57 9,33		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,36 9,58 10,74		

Characteristic Values

Parameter	Symbol	Conditions					Value			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				150	25 125 150		3,12 3,00 2,96	3,84	V
Reverse leakage current	I_r			1300		25			7,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,32		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 8628 A/µs di/dt = 8113 A/µs di/dt = 8006 A/µs	±15	600	150	25 125 150		110 139 151		A
Reverse recovery time	t_{rr}					25 125 150		79 111 124		ns
Recovered charge	Q_r					25 125 150		4,42 8,38 9,74		µC
Reverse recovered energy	E_{rec}					25 125 150		1,50 3,08 3,62		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		7069 1003 1214		A/µs
Buck Sw. Protection Diode										
Static										
Forward voltage	V_F				50	25 125 150		2,21 2,31 2,22	2,54	V
Reverse leakage current	I_R			1200		25 150			60 8800	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,02		K/W

Characteristic Values

Parameter	Symbol	Conditions					Value			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,015	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,63 1,80 1,85	1,9	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			220	µA
Gate-emitter leakage current	I_{GES}		20	0		25			1000	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}		0	10		25		32000		pF
Output capacitance	C_{oes}							960		
Reverse transfer capacitance	C_{res}							380		
Gate charge	Q_g		15	600	150	25		980		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,37		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	600	156	25 125 150		617 616 613		ns
Rise time	t_r					25 125 150		89 106 109		
Turn-off delay time	$t_{d(off)}$					25 125 150		407 440 451		
Fall time	t_f					25 125 150		78 101 107		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 5 µC Q_{rFWD} = 8,8 µC Q_{rFWD} = 10,5 µC				25 125 150		17,98 22,93 22,80		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		11,54 15,65 15,94		

Characteristic Values

Parameter	Symbol	Conditions					Value			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				50	25 125 150		2,21 2,31 2,22	2,54	V
Reverse leakage current	I_R			1200		25 150			60 8800	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,02		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1701 A/µs di/dt = 1425 A/µs di/dt = 1456 A/µs	±15	600	156	25 125 150		43 48 50		A
Reverse recovery time	t_{rr}					25 125 150		388 590 672		ns
Recovered charge	Q_r					25 125 150		4,99 8,80 10,49		µC
Reverse recovered energy	E_{rec}					25 125 150		1,69 3,15 3,81		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		1139 326 238		A/µs
Boost Sw. Inv. Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,14 1,08 1,07	1,21	V
Reverse leakage current	I_r			1600		25 145			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,90		K/W

Characteristic Values

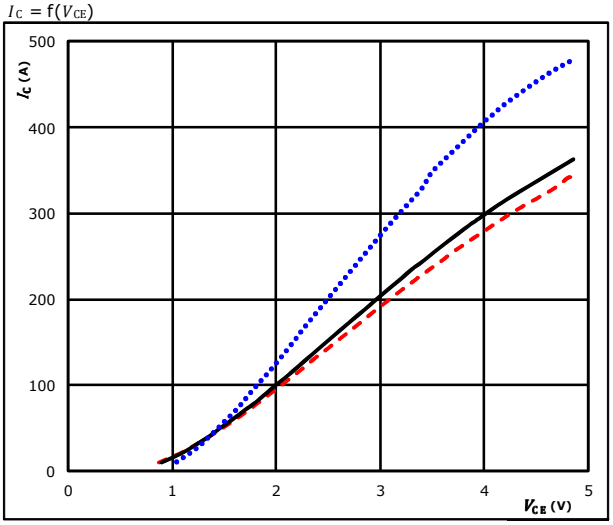
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,14 1,08 1,07	1,21	V
Reverse leakage current	I_r			1600		25 145			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,90		K/W
Boost D. Protection Diode										
Static										
Forward voltage	V_F				35	25 125 150		2,38 2,41 2,37	2,62	V
Reverse leakage current	I_r			1200		25 150			60 5500	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,34		K/W
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta R/R$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

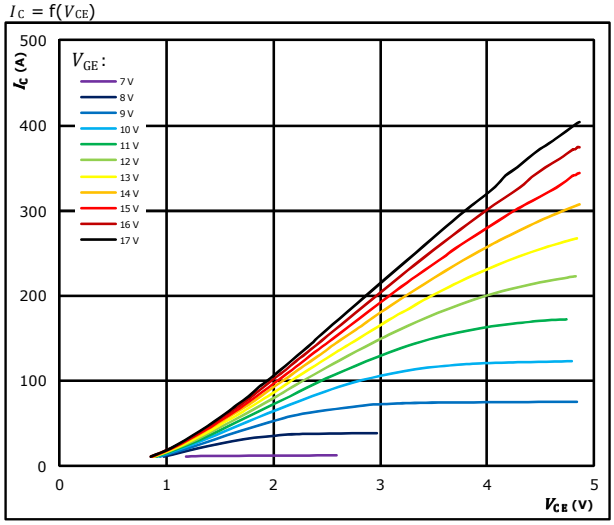


t_p =	250	µs		25 °C	
V_{GE} =	15	V	T_j:	125 °C	
				150 °C	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

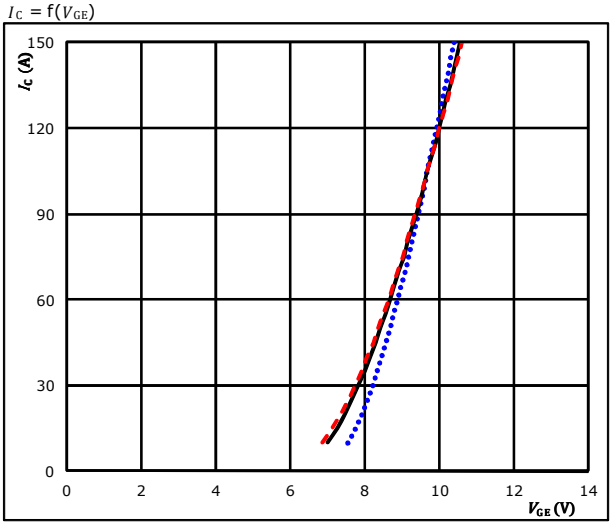


t_p =	250	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

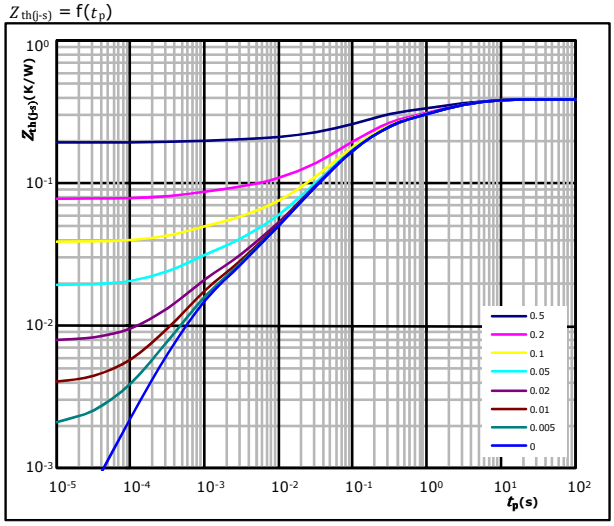


t_p =	100	µs		25 °C	
V_{CE} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,39	K/W

IGBT thermal model values

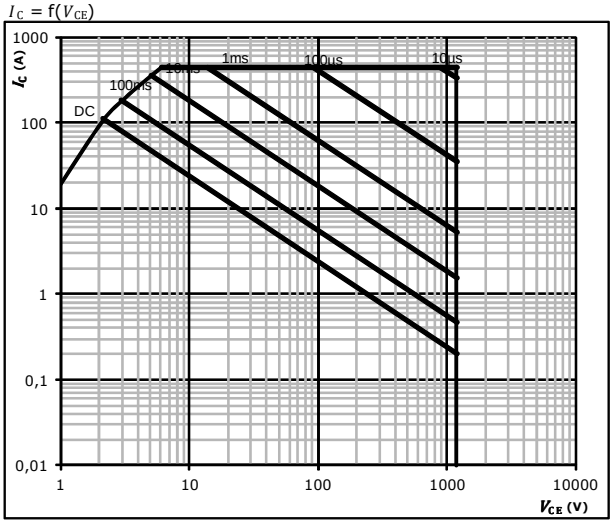
R (K/W)	τ (s)
6,04E-02	3,83E+00
8,82E-02	1,06E+00
1,40E-01	1,49E-01
6,72E-02	4,78E-02
2,05E-02	8,33E-03
1,38E-02	7,18E-04

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$

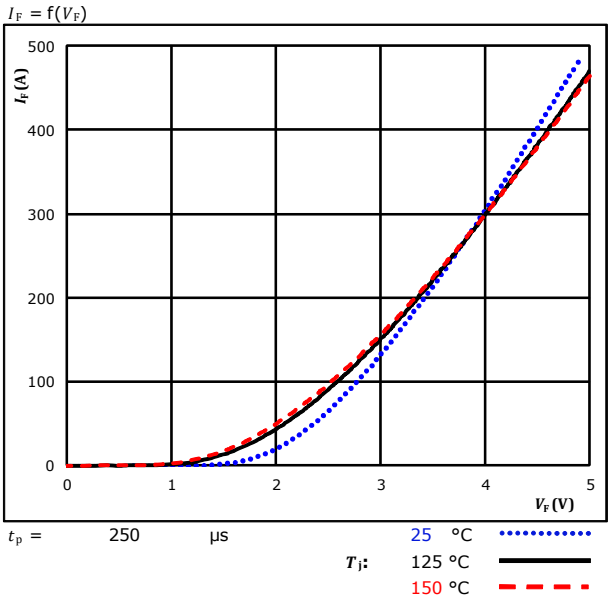


D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

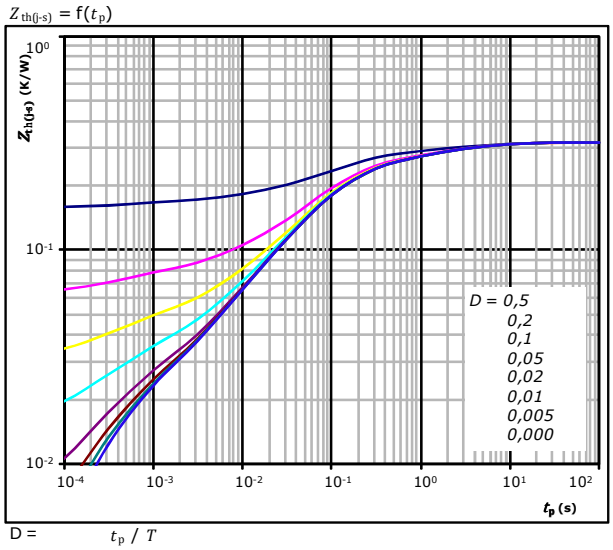


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 0,32 K/W

FWD thermal model values

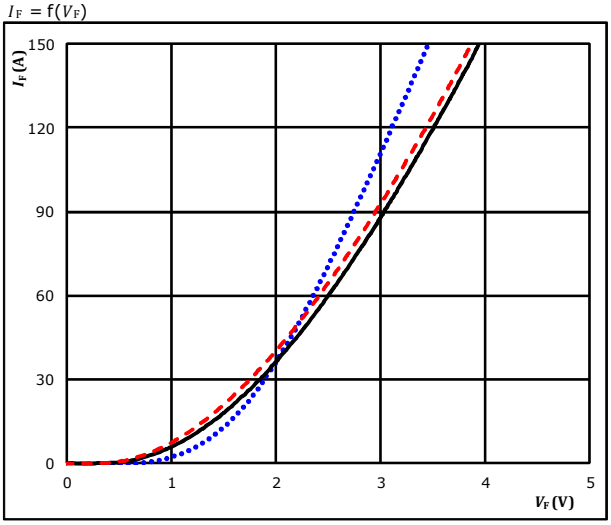
R (K/W)	τ (s)
2,36E-02	6,39E+00
4,54E-02	1,45E+00
6,78E-02	2,29E-01
1,22E-01	6,68E-02
3,48E-02	9,88E-03
7,34E-03	1,81E-03
1,51E-02	3,29E-04

Buck Sw. Protection Diode Characteristics

figure 1. **Prot. Diode**

Typical forward characteristics

$I_F = f(V_F)$



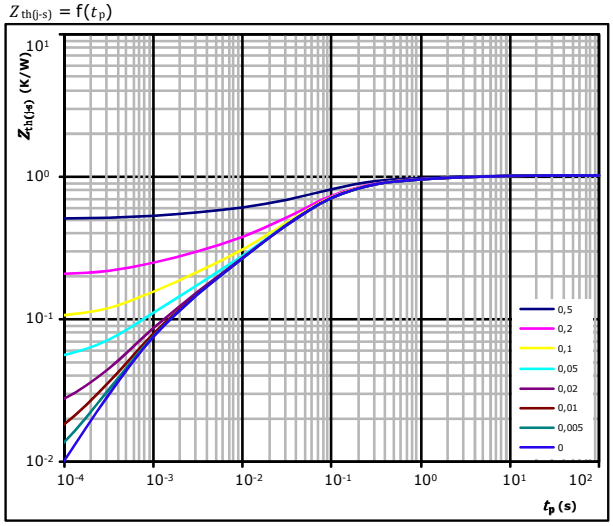
t_p = 250 µs

T_j: 25 °C
125 °C
150 °C

figure 2. **Prot. Diode**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,02 K/W

Prot. Diode thermal model values

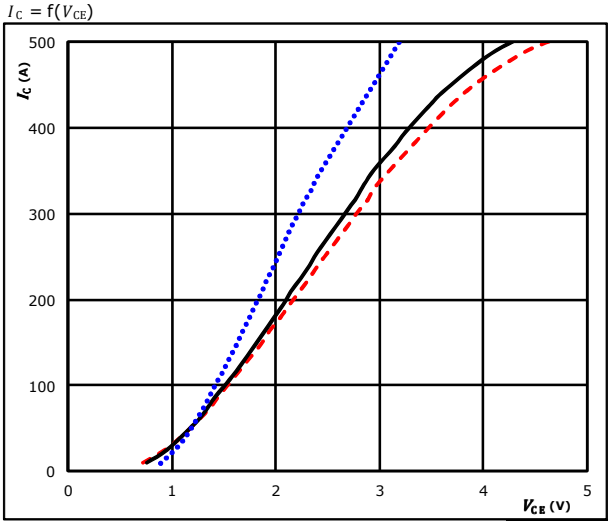
R (K/W)	τ (s)
5,56E-02	3,42E+00
1,14E-01	5,52E-01
4,09E-01	9,78E-02
2,64E-01	3,21E-02
9,94E-02	6,42E-03
7,49E-02	9,84E-04

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

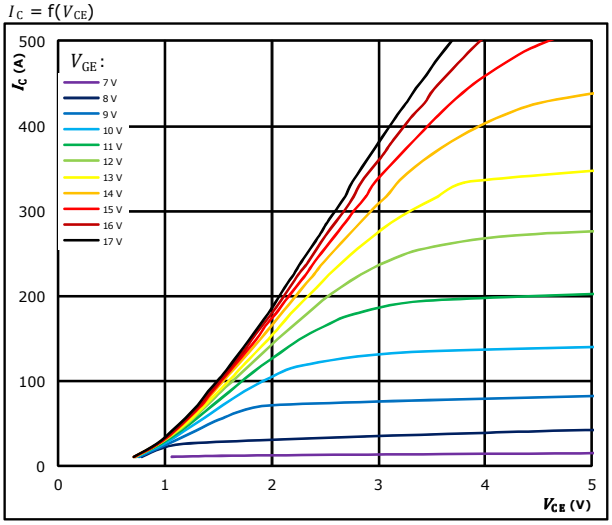


t_p =	250	µs		25 °C	
V_{GE} =	15	V	T_j:	125 °C	
				150 °C	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

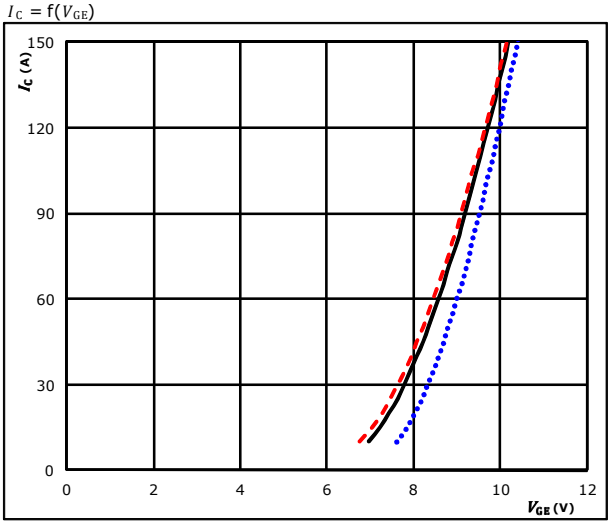


t_p =	250	µs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{CE})$

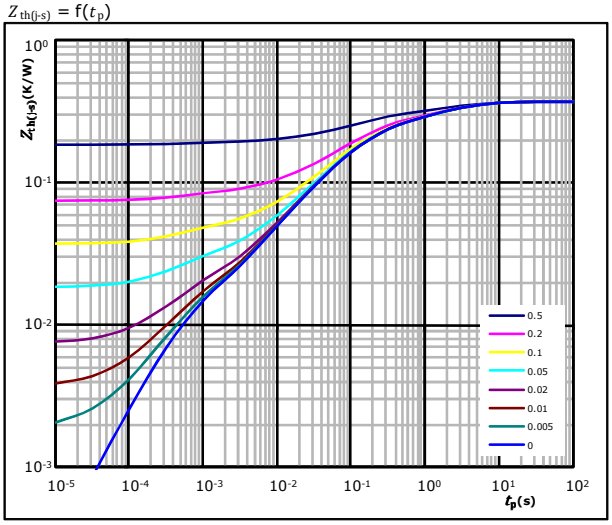


t_p =	100	µs		25 °C	
V_{CE} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,37	K/W

IGBT thermal model values

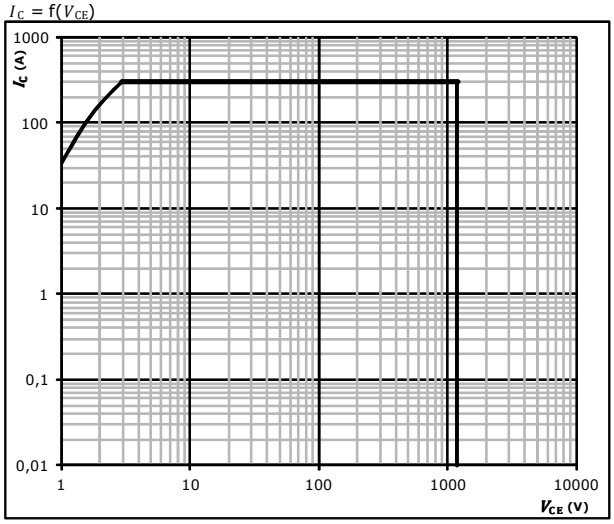
R (K/W)	τ (s)
6,05E-02	4,47E+00
8,70E-02	9,84E-01
1,28E-01	1,45E-01
6,38E-02	4,36E-02
2,32E-02	8,52E-03
1,16E-02	5,08E-04

Boost Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



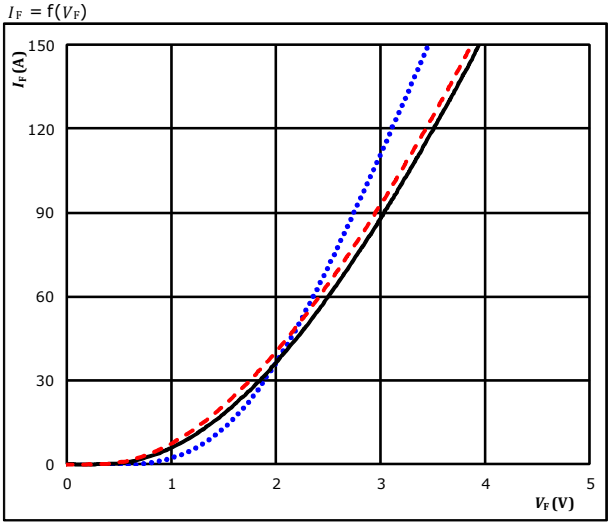
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



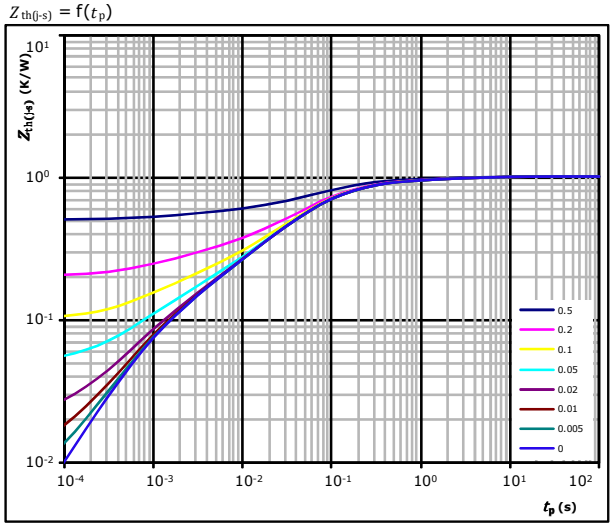
t_p = 250 µs

T_j: 25 °C
125 °C
150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,02 K/W

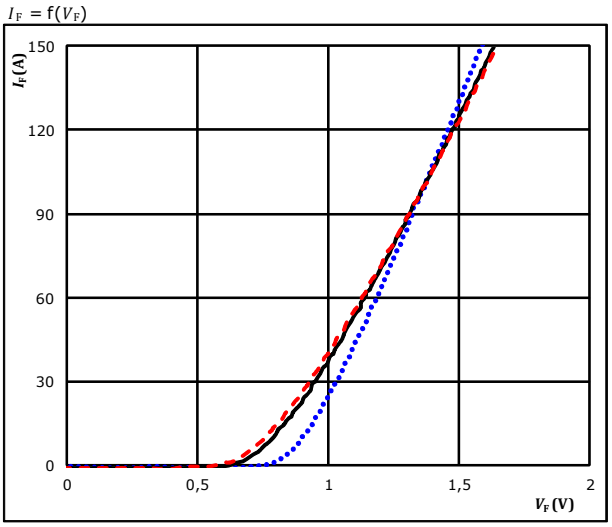
FWD thermal model values

R (K/W)	τ (s)
5,56E-02	3,42E+00
1,14E-01	5,52E-01
4,09E-01	9,78E-02
2,64E-01	3,21E-02
9,94E-02	6,42E-03
7,49E-02	9,84E-04

Boost Sw. Inv. Diode Characteristics

figure 1. **Inverse Diode**

Typical forward characteristics

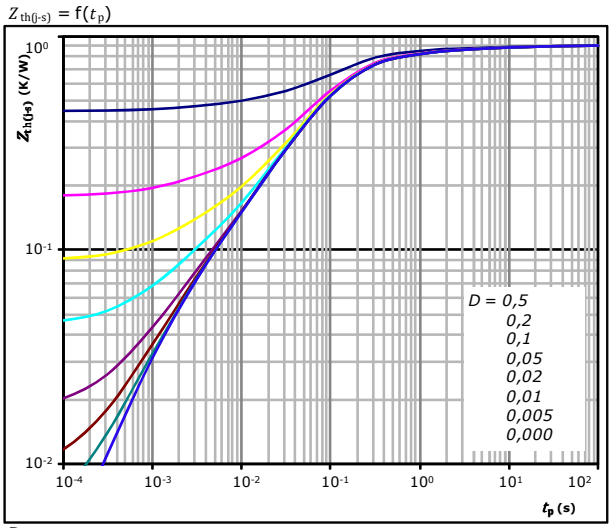


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **Inverse Diode**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 0,90 K/W

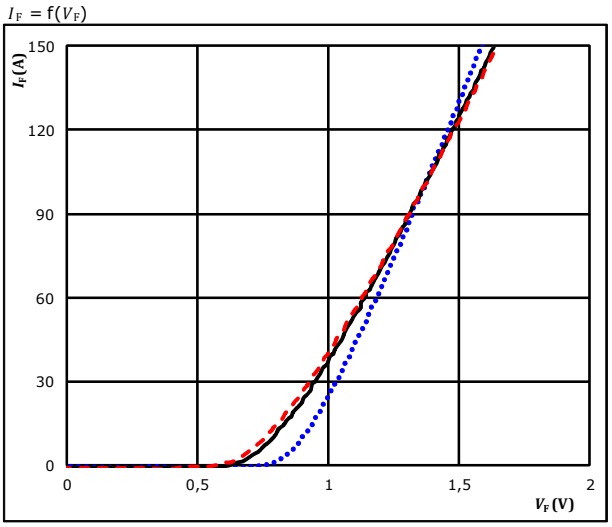
Inverse Diode thermal model values

R (K/W)	τ (s)
2,22E-01	2,31E-01
4,39E-01	7,58E-02
8,14E-02	1,11E-02
3,58E-02	1,56E-03

Boost Sw. Protection Diode Characteristics

figure 1. **Prot. Diode**

Typical forward characteristics

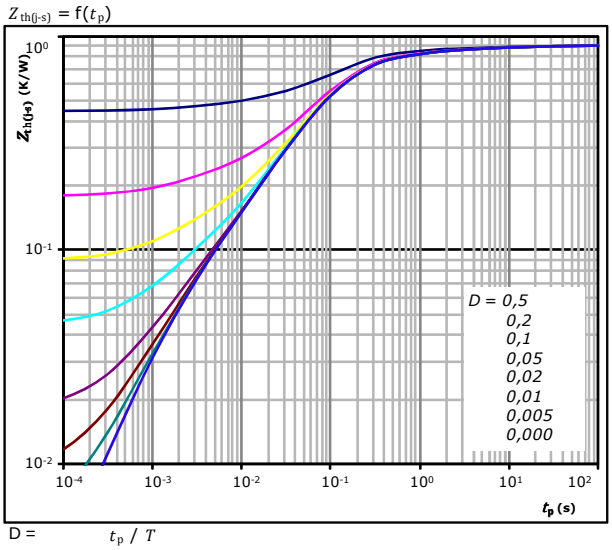


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **Prot. Diode**

Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 0,90 K/W

Prot. Diode thermal model values

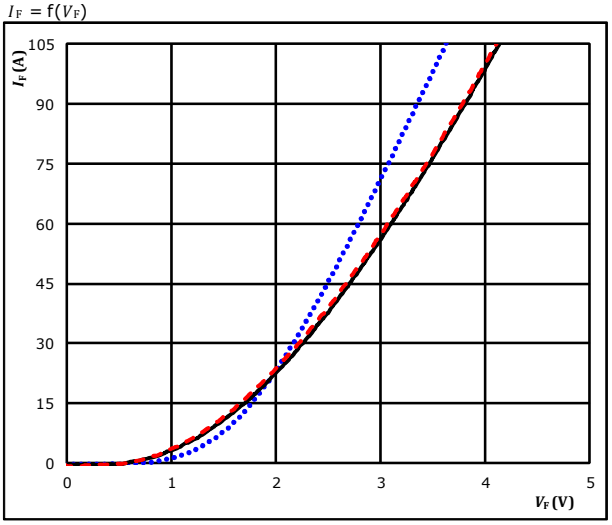
R (K/W)	τ (s)
2,22E-01	2,31E-01
4,39E-01	7,58E-02
8,14E-02	1,11E-02
3,58E-02	1,56E-03

Boost D. Protection Diode Characteristics

figure 1. **Prot. Diode**

Typical forward characteristics

$I_F = f(V_F)$



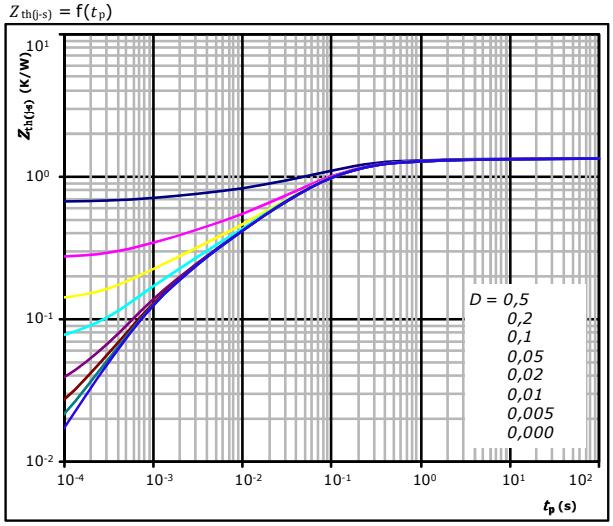
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **Prot. Diode**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,34 K/W

Prot. Diode thermal model values

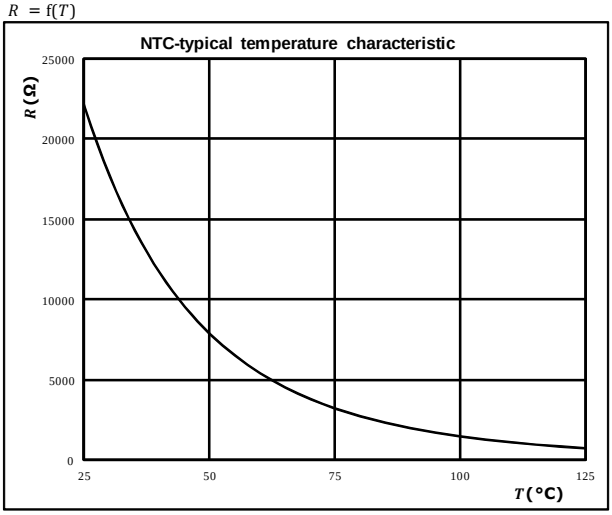
R (K/W)	τ (s)
3,06E-02	9,16E+00
1,47E-01	6,10E-01
6,10E-01	8,89E-02
2,96E-01	2,14E-02
1,39E-01	5,05E-03
1,19E-01	9,19E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

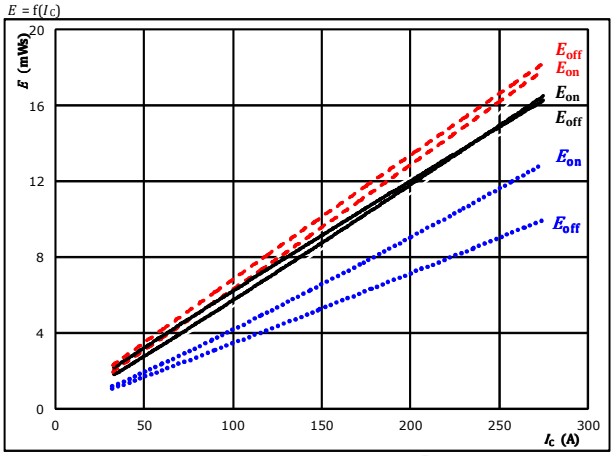


Buck Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



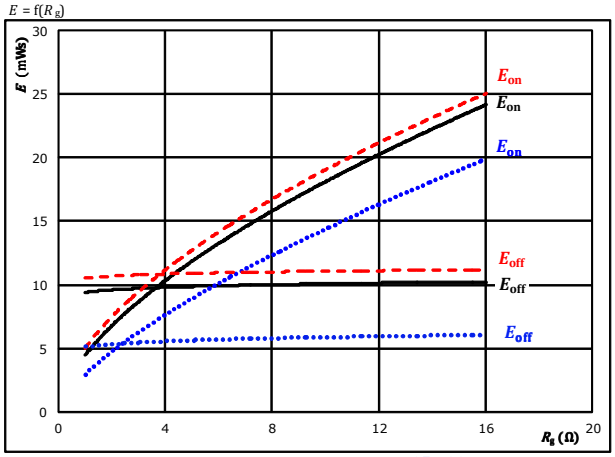
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –
R_{goff} =	4	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



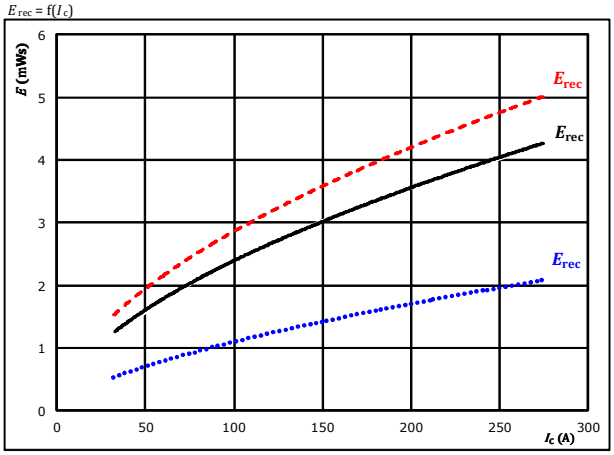
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
I_C =	150	A		150 °C	– – –

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



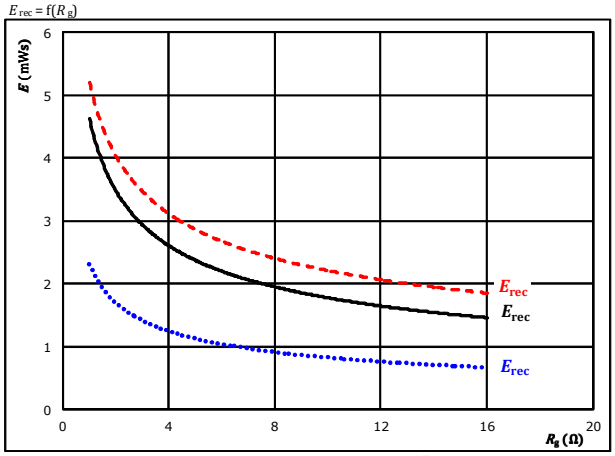
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

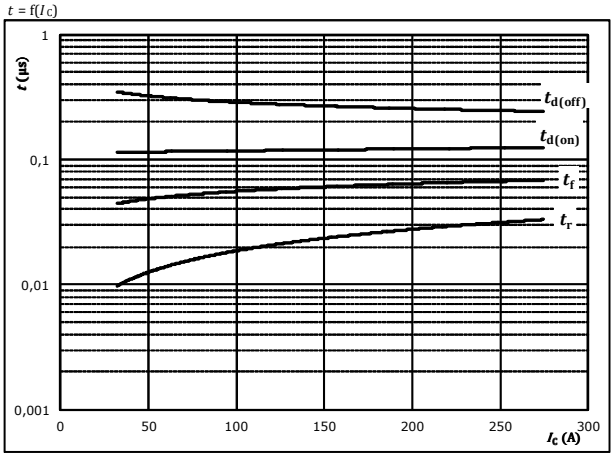
V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
I_C =	150	A		150 °C	– – –

Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



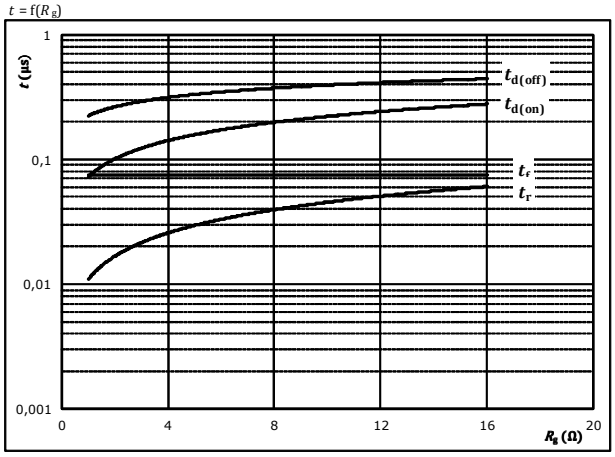
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



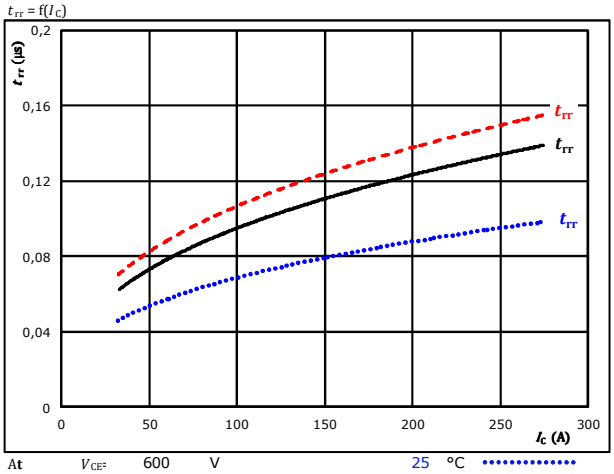
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	150	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



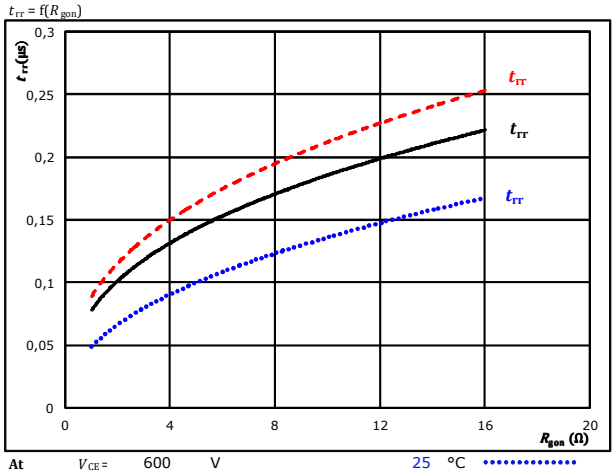
At

V_{CE} =	600	V	T_j:	25	°C
V_{GE} =	±15	V		125	°C
R_{gon} =	4	Ω		150	°C

figure 8. **FWD**

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

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



At

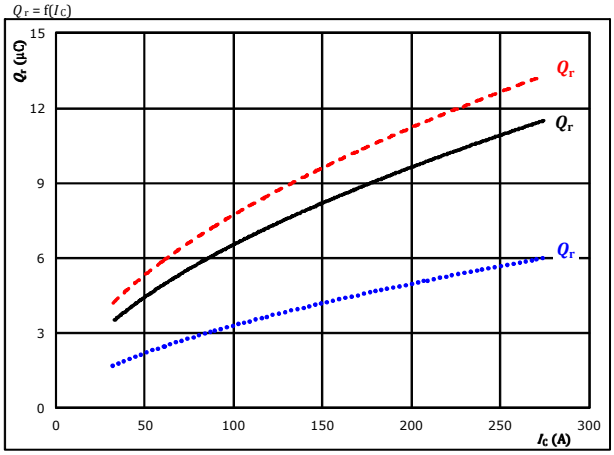
V_{CE} =	600	V	T_j:	25	°C
V_{GE} =	±15	V		125	°C
I_C =	150	A		150	°C

Buck Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

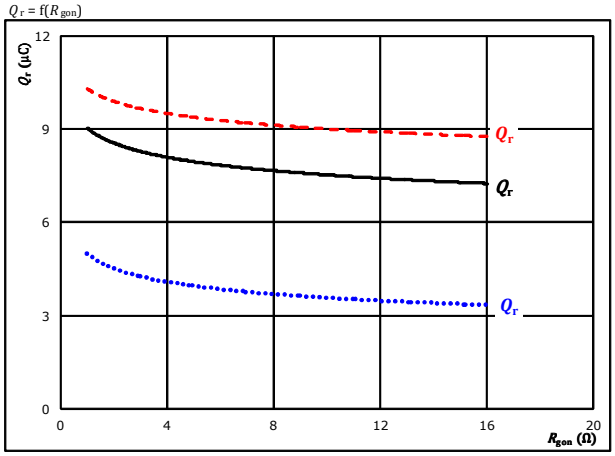


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

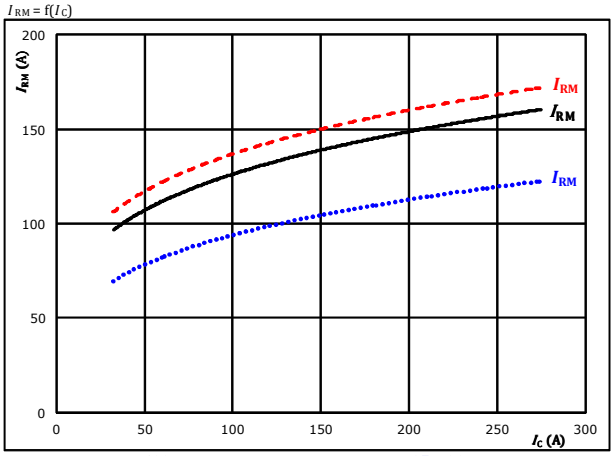


At						
	V_{CE}=	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C=	150	A		150 °C	

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

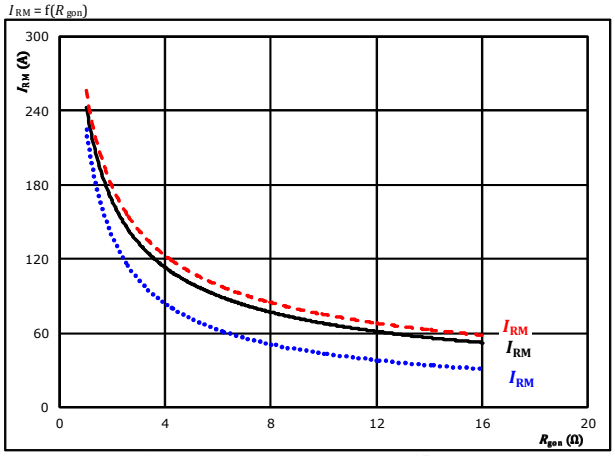


At						
	V_{CE}:	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	4	Ω		150 °C	

figure 12. **FWD**

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

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



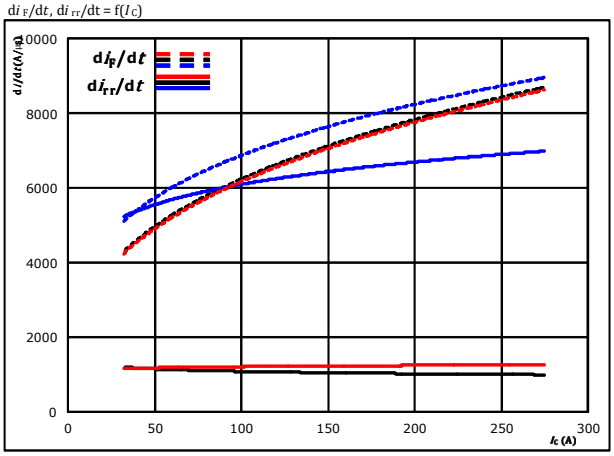
At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C =	150	A		150 °C	

Buck Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

di_F/dt, $di_{rr}/dt = f(I_C)$

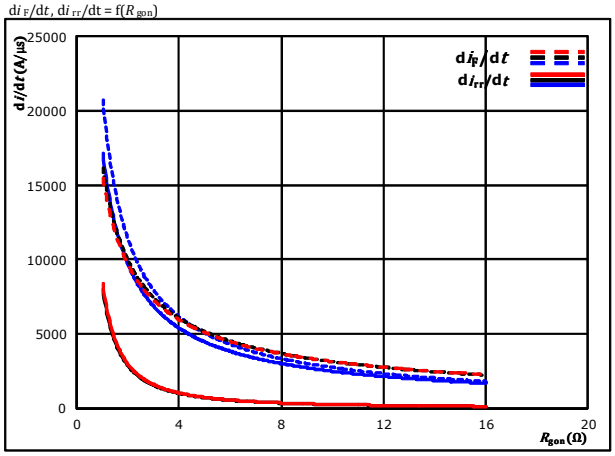


At						
V_{CE} =	600	V	T_j:	25 °C	•••••••••••••••
V_{GE} =	±15	V		125 °C	———
R_{gon} =	4	Ω		150 °C	– – – –

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

di_F/dt, $di_{rr}/dt = f(R_{gon})$

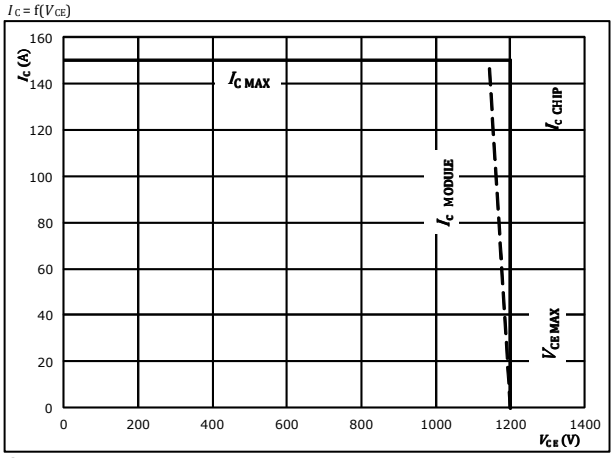


At						
V_{CE} =	600	V	T_j:	25 °C	•••••••••••••••
V_{GE} =	±15	V		125 °C	———
I_C =	150	A		150 °C	– – – –

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

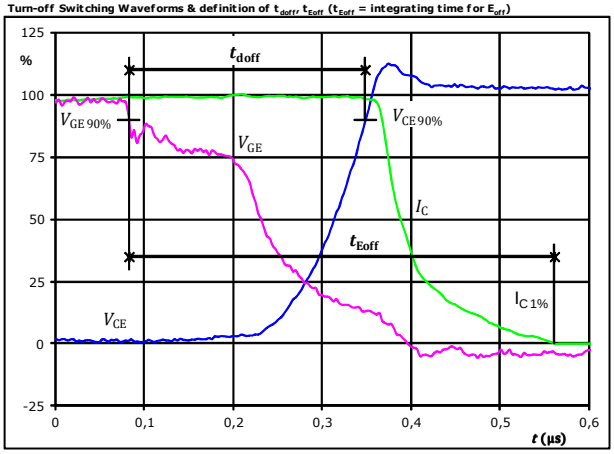
Buck Switching Characteristics

General conditions

T_j	=	**125 °C**
R_{gon}	=	**4 Ω**
R_{goff}	=	**4 Ω**

figure 1. IGBT

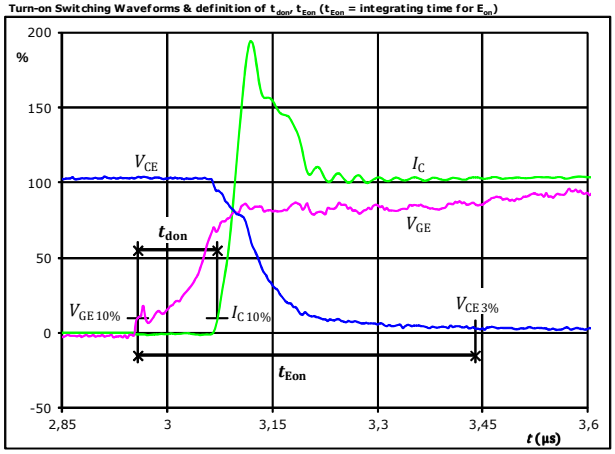
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_{doff} =	0,267	µs
t_{Eoff} =	0,479	µs

figure 2. IGBT

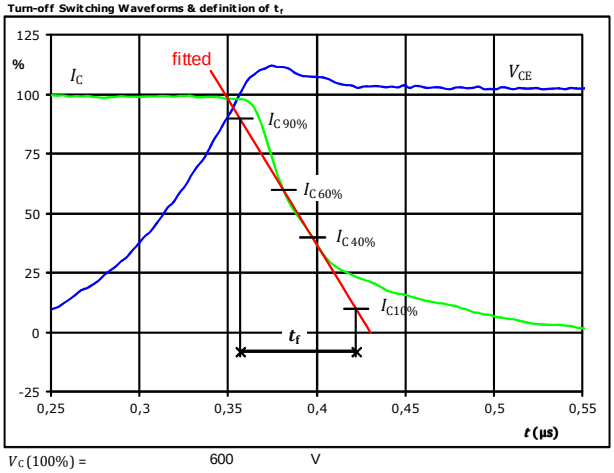
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_{don} =	0,120	µs
t_{Eon} =	0,481	µs

figure 3. IGBT

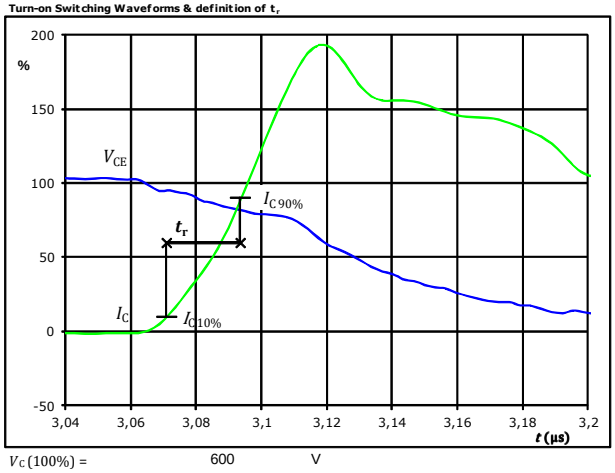
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_f =	0,066	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

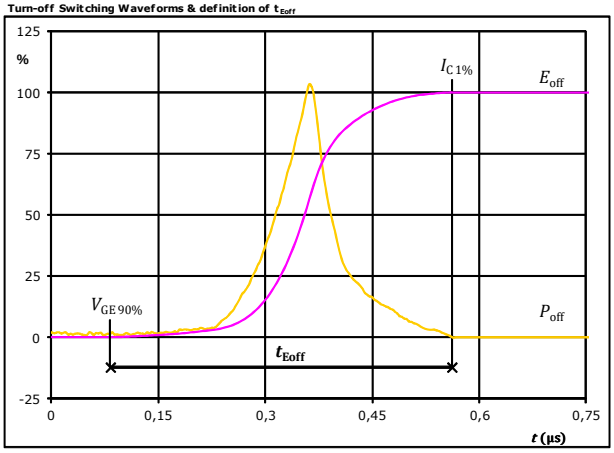


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	150	A
t_r =	0,023	µs

Buck Switching Characteristics

figure 5. **IGBT**

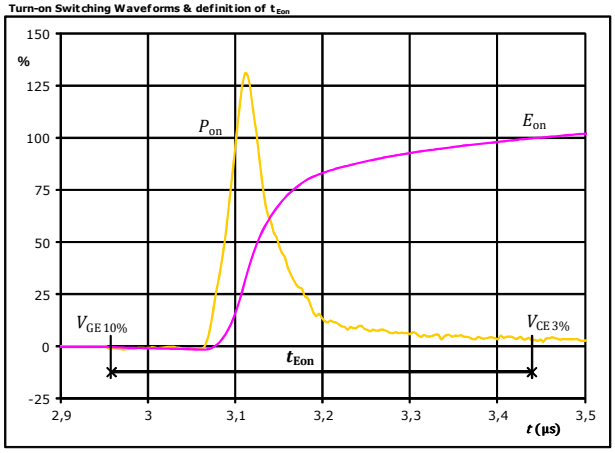
Turn-off Switching Waveforms & definition of t_{Eoff}



$P_{off}(100\%)$ =	90,12	kW
$E_{off}(100\%)$ =	9,58	mJ
t_{Eoff} =	0,48	µs

figure 6. **IGBT**

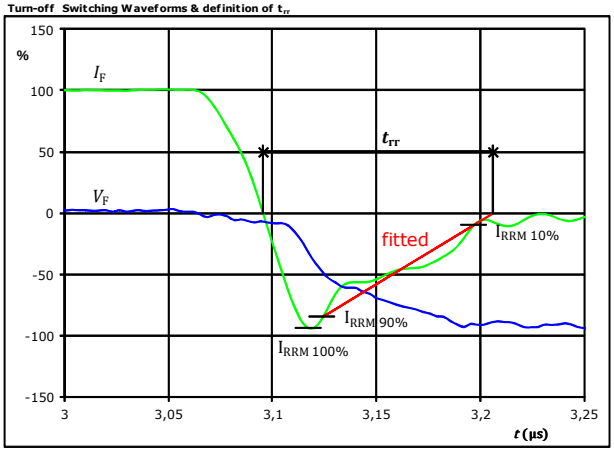
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%)$ =	90,12	kW
$E_{on}(100\%)$ =	8,57	mJ
t_{Eon} =	0,48	µs

figure 7. **FWD**

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

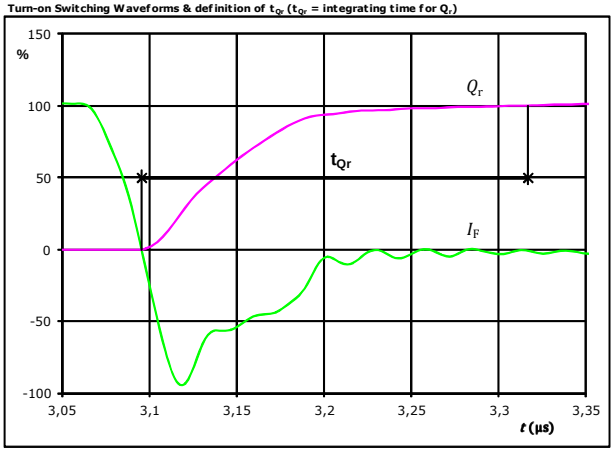


$V_F(100\%)$ =	600	V
$I_F(100\%)$ =	150	A
$I_{RRM}(100\%)$ =	-139	A
t_{rr} =	0,111	µs

Buck Switching Characteristics

figure 8. **FWD**

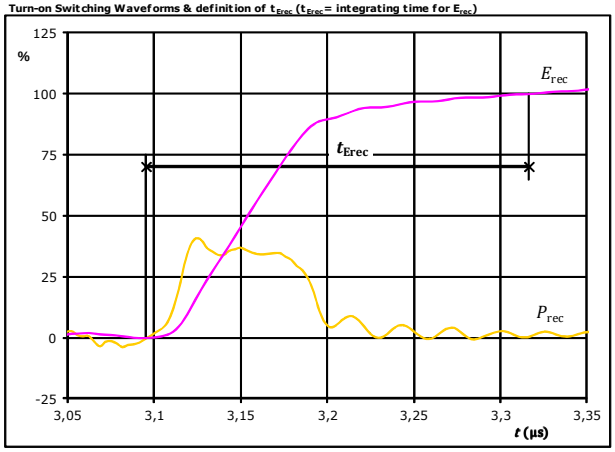
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	150	A
Q_r (100%) =	8,38	µC
t_{Qr} =	0,22	µs

figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



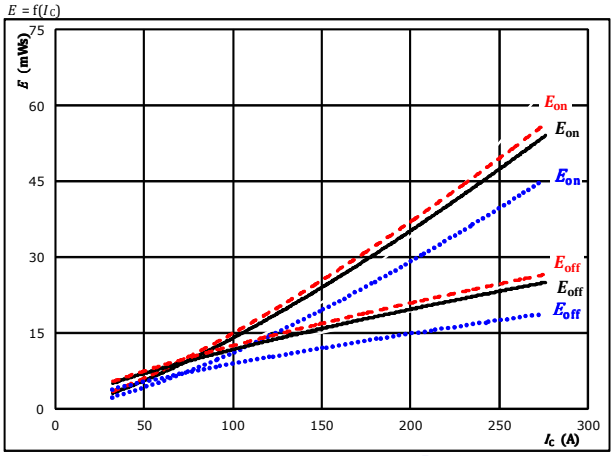
P_{rec} (100%) =	90,12	kW
E_{rec} (100%) =	3,08	mJ
t_{Erec} =	0,22	µs

Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



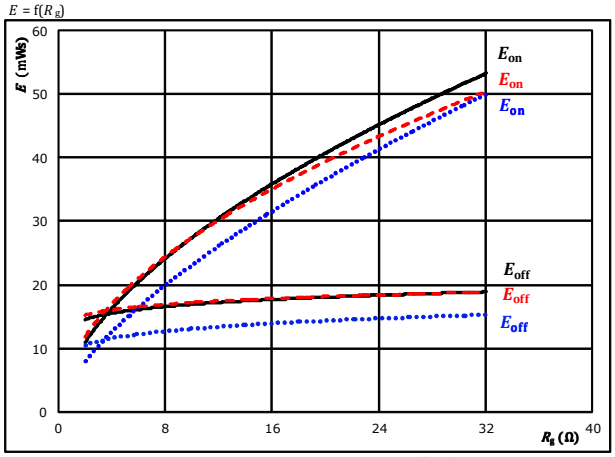
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	
V_{GE} =	±15	V		125 °C	
R_{gon} =	8	Ω		150 °C	
R_{goff} =	8	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



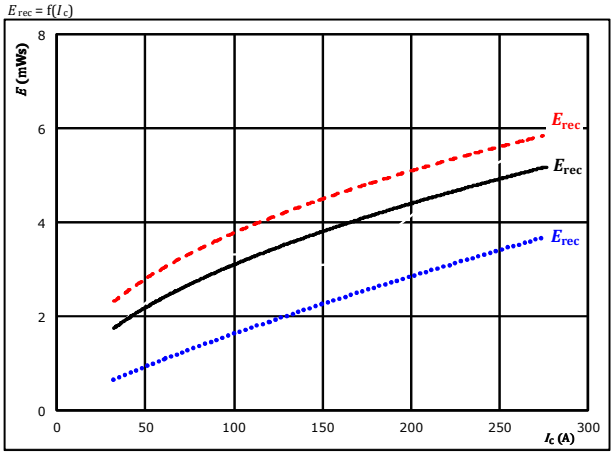
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	
V_{GE} =	±15	V		125 °C	
I_C =	156	A		150 °C	

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



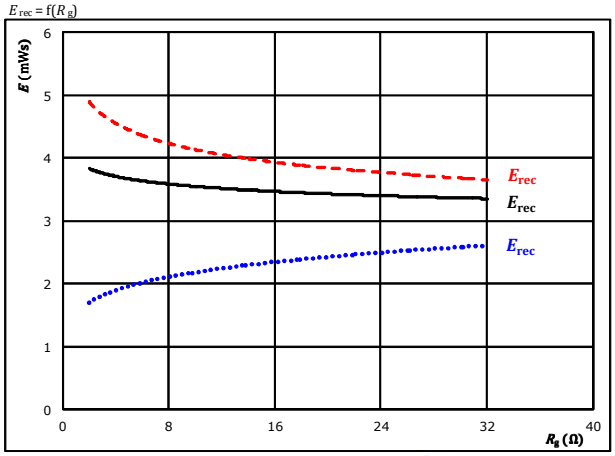
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	
V_{GE} =	±15	V		125 °C	
R_{gon} =	8	Ω		150 °C	

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

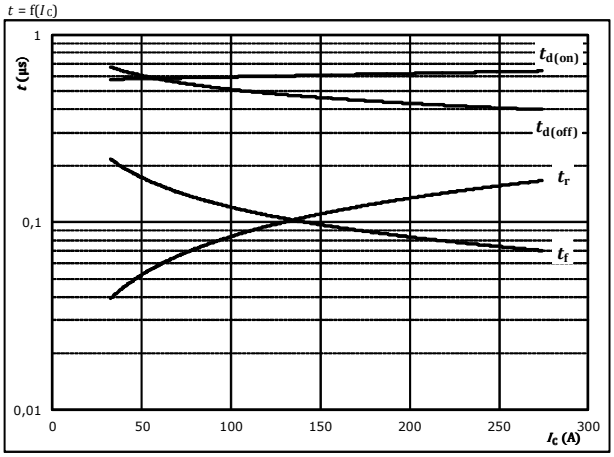
V_{CE} =	600	V	T_j:	25 °C	
V_{GE} =	±15	V		125 °C	
I_C =	156	A		150 °C	

Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



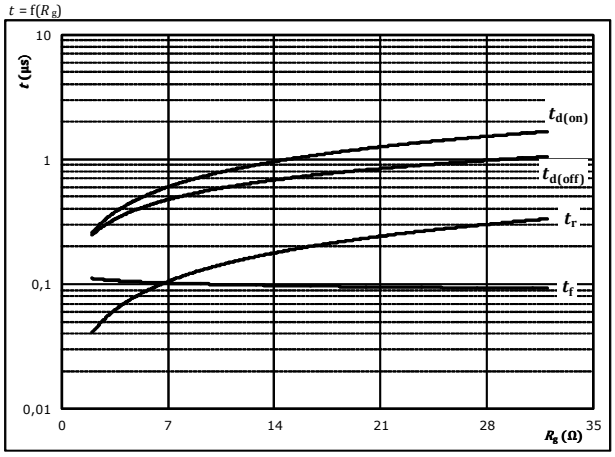
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



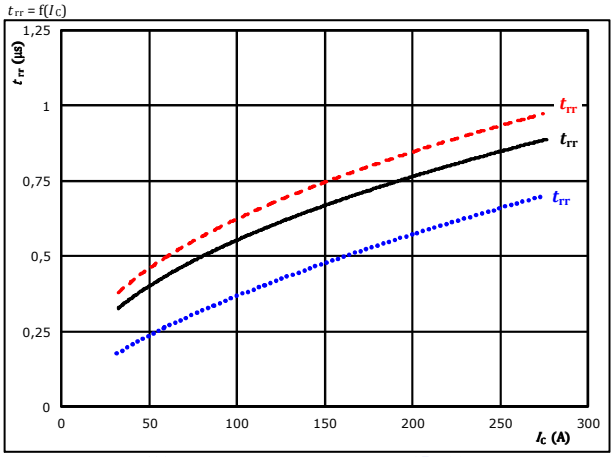
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	156	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

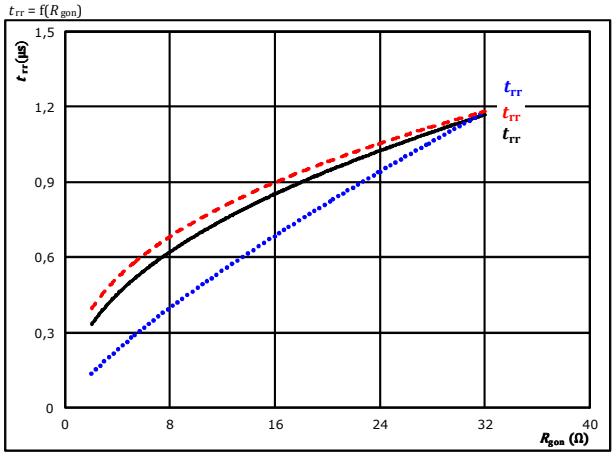


At					
V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
R_{gon} =	8	Ω		150 °C	– – –

figure 8. **FWD**

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

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



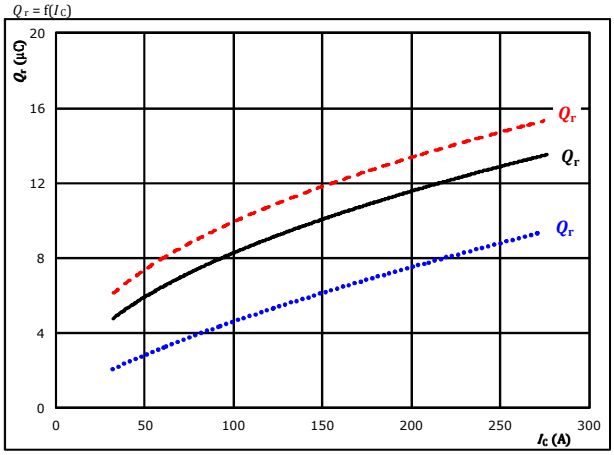
At					
V_{CE} =	600	V	T_j:	25 °C	·····
V_{GE} =	±15	V		125 °C	———
I_C =	156	A		150 °C	– – –

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

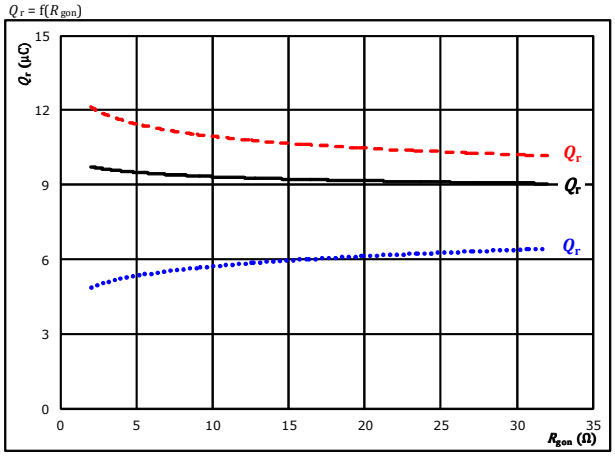


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	8	Ω		150 °C	

figure 10. FWD

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

$Q_r = f(R_{gon})$

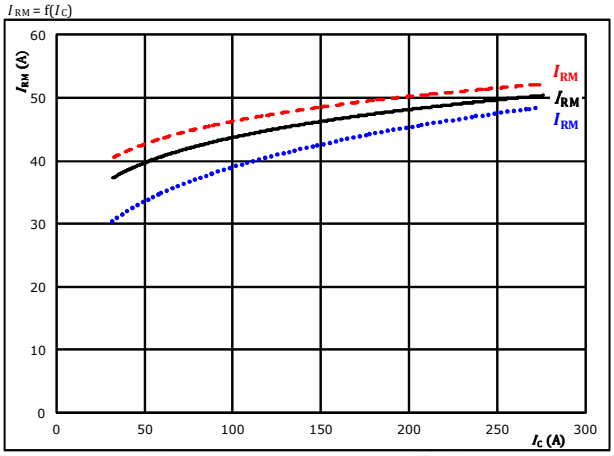


At						
	V_{CE}=	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C=	156	A		150 °C	

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

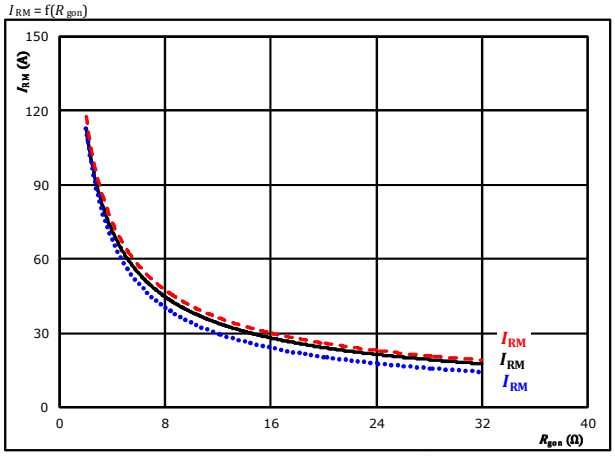


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	8	Ω		150 °C	

figure 12. FWD

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

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



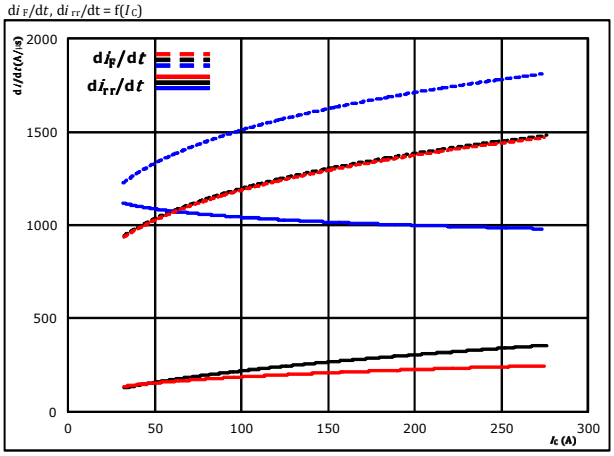
At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C =	156	A		150 °C	

Boost Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

di_F/dt, $di_{rr}/dt = f(I_C)$

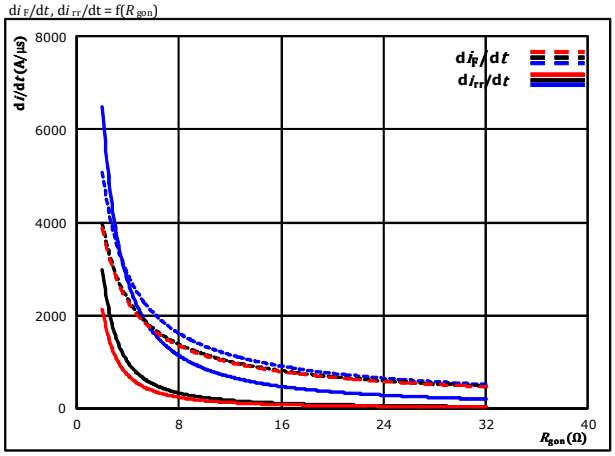


At						
V_{CE} =	600	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
R_{gon} =	8	Ω		150	°C	

figure 14. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor

di_F/dt, $di_{rr}/dt = f(R_{gon})$

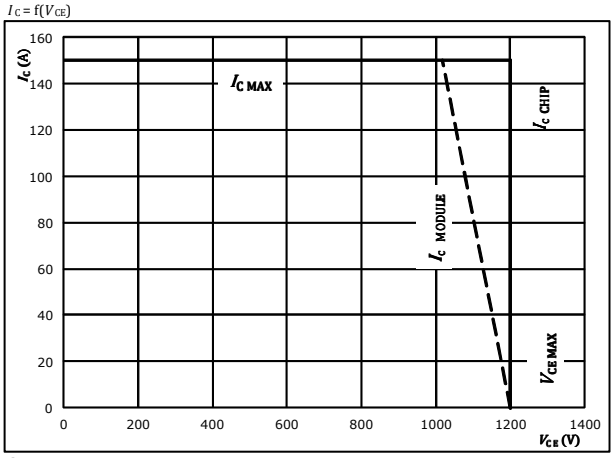


At						
V_{CE} =	600	V		25	°C	
V_{GE} =	±15	V	T_j:	125	°C	
I_C=	156	A		150	°C	

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	8	Ω

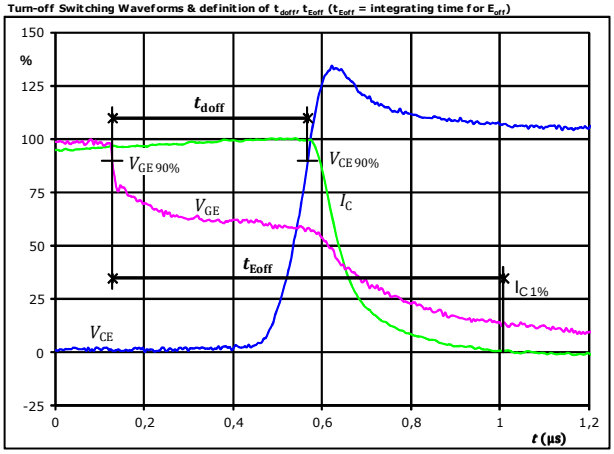
Boost Switching Characteristics

General conditions

T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

figure 1. IGBT

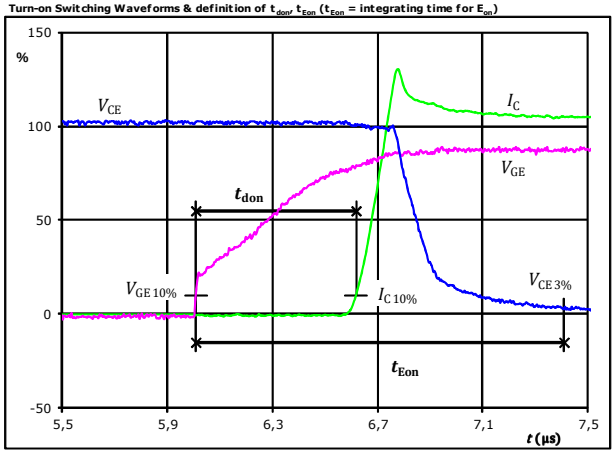
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	156	A
t_{doff} =	0,440	µs
t_{Eoff} =	0,880	µs

figure 2. IGBT

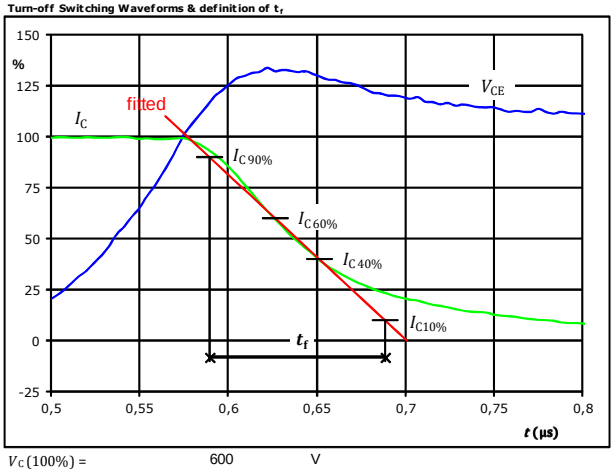
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	156	A
t_{don} =	0,616	µs
t_{Eon} =	1,401	µs

figure 3. IGBT

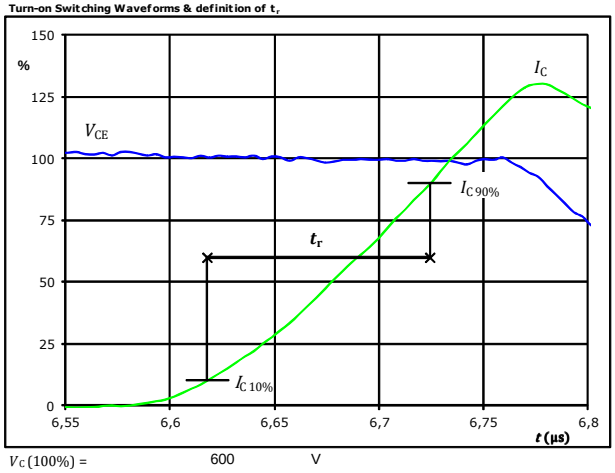
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	156	A
t_f =	0,101	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

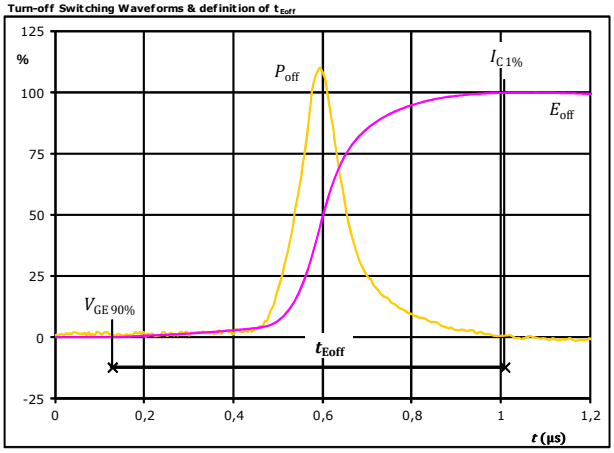


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	156	A
t_r =	0,106	µs

Boost Switching Characteristics

figure 5. **IGBT**

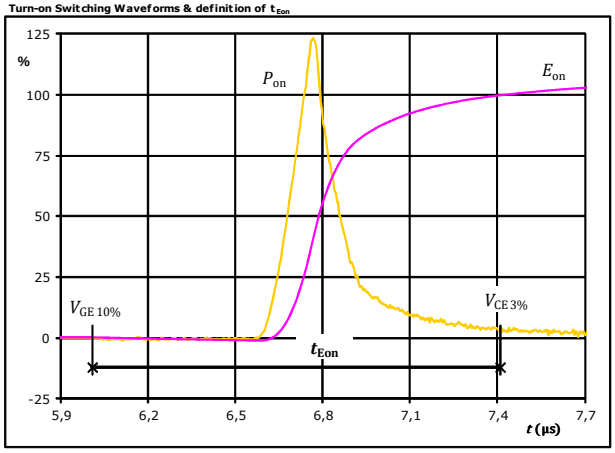
Turn-off Switching Waveforms & definition of t_{Eoff}



$P_{off}(100\%)$ =	93,69	kW
$E_{off}(100\%)$ =	15,65	mJ
t_{Eoff} =	0,88	µs

figure 6. **IGBT**

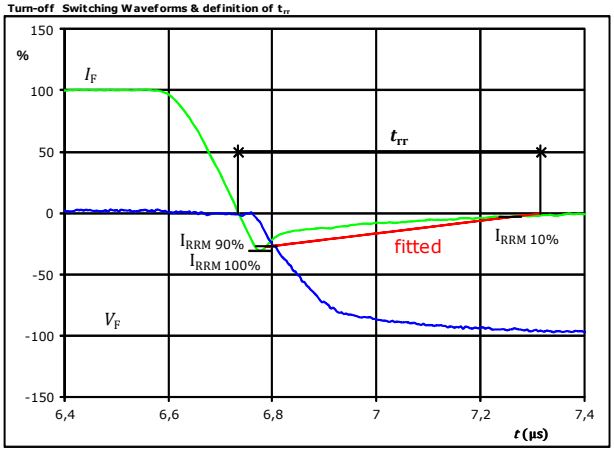
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%)$ =	93,69	kW
$E_{on}(100\%)$ =	22,93	mJ
t_{Eon} =	1,40	µs

figure 7. **FWD**

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

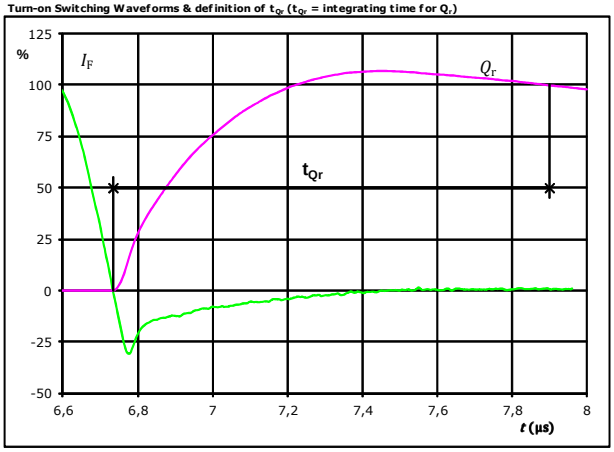


$V_F(100\%)$ =	600	V
$I_F(100\%)$ =	156	A
$I_{RRM}(100\%)$ =	-48	A
t_{rr} =	0,590	µs

Boost Switching Characteristics

figure 8. **FWD**

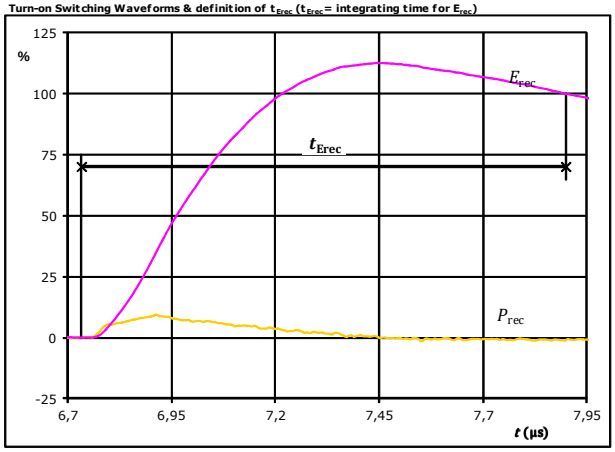
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	156	A
Q_r (100%) =	8,80	µC
t_{Qr} =	1,17	µs

figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



P_{rec} (100%) =	93,69	kW
E_{rec} (100%) =	3,15	mJ
t_{Erec} =	1,17	µs

Ordering Code & Marking

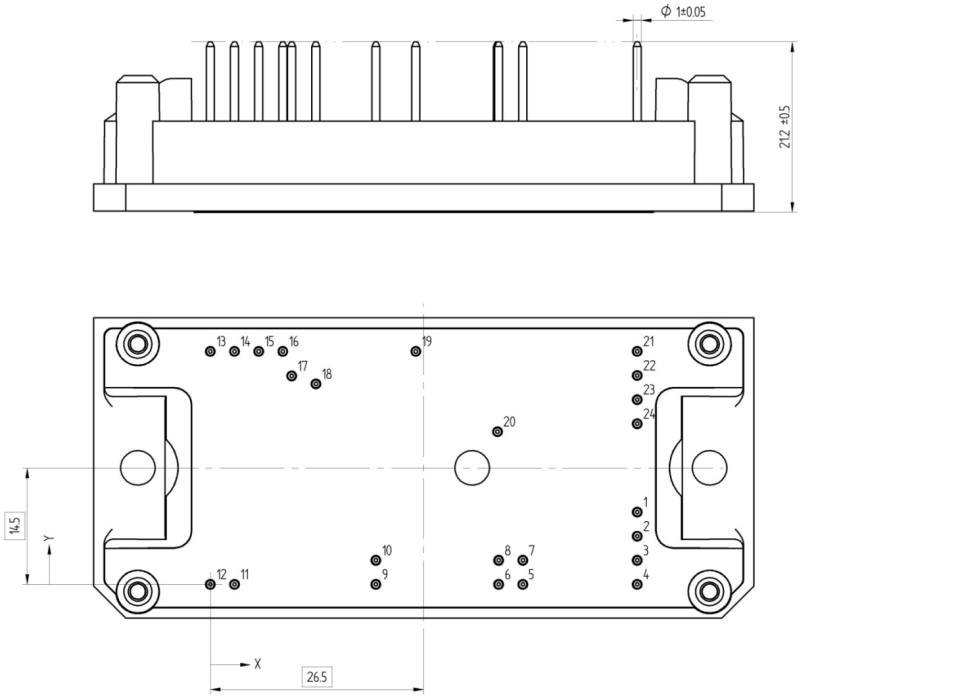
Version	Ordering Code
without thermal paste 17 mm housing with solder pins	10-F124NID150SH03-LG18F98
with thermal paste 17 mm housing with solder pins	10-F124NID150SH03-LG18F98-/3/

	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Type&Ver	**Lot number**	**Serial**	**Date code**		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

High Side Module 10-F124NID150SH03-LG18F98

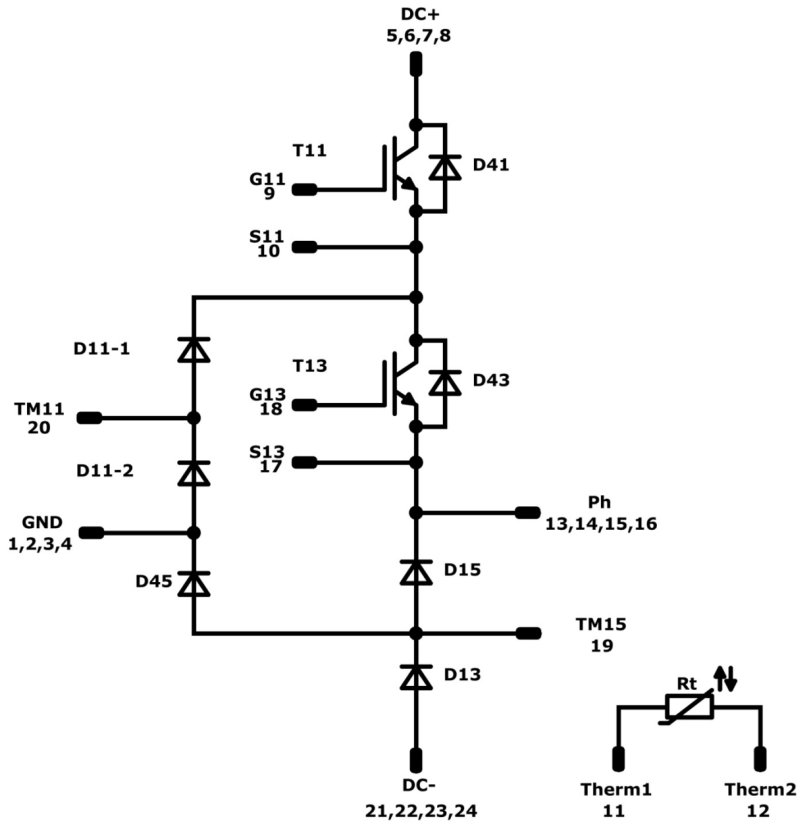
Outline

Pin table [mm]			
Pin	X	Y	Function
1	53	9	GND
2	53	6	GND
3	53	3	GND
4	53	0	GND
5	38,8	0	DC+
6	35,8	0	DC+
7	38,8	3	DC+
8	35,8	3	DC+
9	20,55	0	G11
10	20,55	3	S11
11	3	0	Therm1
12	0	0	Therm2
13	0	29	Ph
14	3	29	Ph
15	6	29	Ph
16	9	29	Ph
17	10,1	25,95	S13
18	13,1	24,95	G13
19	25,5	29	TM15
20	35,65	19	TM11
21	53	29	DC-
22	53	26	DC-
23	53	23	DC-
24	53	20	DC-



High Side Module 10-F124NID150SH03-LG18F98

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11	IGBT	1200 V	150 A	Buck Switch	
D11-1, D11-2	FWD	1300 V	150 A	Buck Diode	Serial devices. Values apply to complete device.
D15	FWD	1200 V	50 A	Buck Sw. Protection Diode	
T13	IGBT	1200 V	150 A	Boost Switch	
D13	Rectifier	1600 V	50 A	Boost Diode	
D41	FWD	1200 V	50 A	Boost Sw. Inv. Diode	
D43	Rectifier	1600 V	50 A	Boost Sw. Protection Diode	
D45	FWD	1200 V	35 A	Boost D. Protection Diode	
Rt	NTC			Thermistor	

Ordering Code & Marking

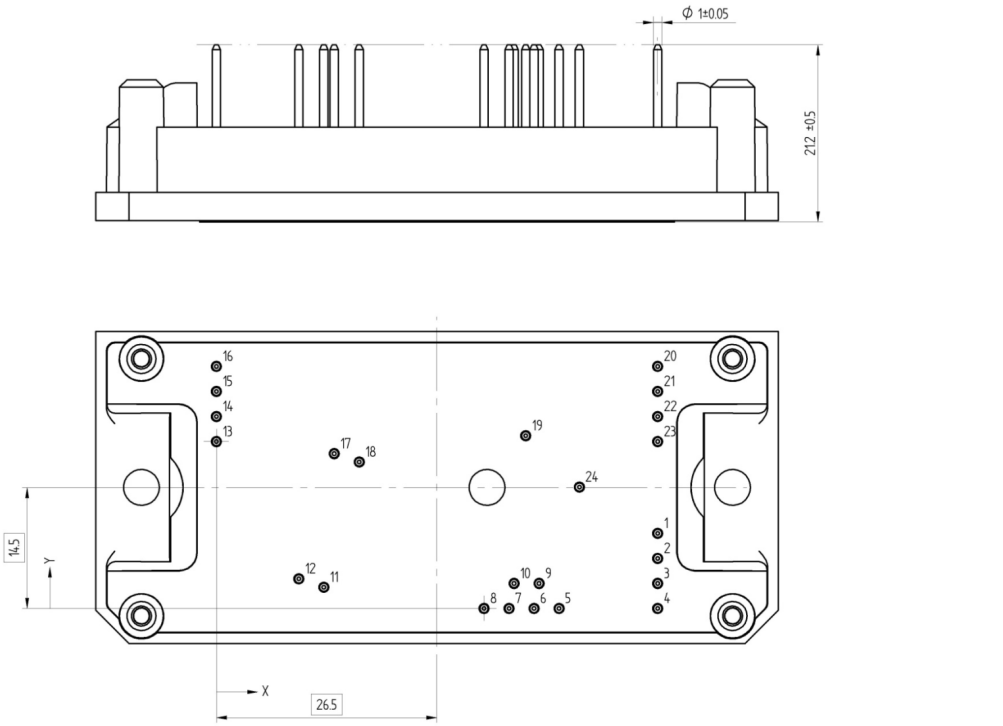
Version	Ordering Code
without thermal paste 17 mm housing with solder pins	10-F124NID150SH03-LG28F98
with thermal paste 17 mm housing with solder pins	10-F124NID150SH03-LG28F98-/3/

Text	**Name**		**Date code**	**UL & VIN**	**Lot**	**Serial**
	NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Low Side Module 10-F124NIE150SH03-LG28F98

Outline

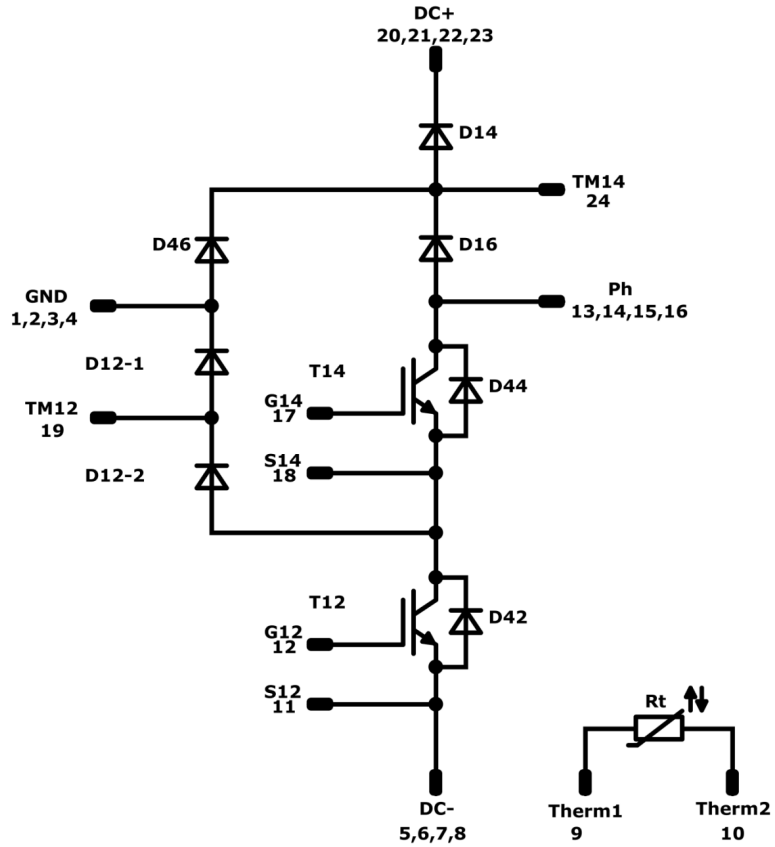
Pin table [mm]			
Pin	X	Y	Function
1	53	9	GND
2	53	6	GND
3	53	3	GND
4	53	0	GND
5	41,15	0	DC-
6	38,15	0	DC-
7	35,15	0	DC-
8	32,15	0	DC-
9	38,75	3	Therm1
10	35,75	3	Therm2
11	12,9	2,55	S12
12	9,9	3,55	G12
13	0	20	Ph
14	0	23	Ph
15	0	26	Ph
16	0	29	Ph
17	14,15	18,55	G14
18	17,15	17,55	S14
19	37,15	20,7	TM12
20	53	29	DC+
21	53	26	DC+
22	53	23	DC+
23	53	20	DC+
24	43,6	14,55	TM14



Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Low Side Module 10-F124NIE150SH03-LG28F98

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T12	IGBT	1200 V	150 A	Buck Switch	
D12-1, D12-2	FWD	1300 V	150 A	Buck Diode	Serial devices. Values apply to complete device.
D16	FWD	1200 V	50 A	Buck Sw. Protection Diode	
T14	IGBT	1200 V	150 A	Boost Switch	
D14	Rectifier	1600 V	50 A	Boost Diode	
D42	FWD	1200 V	50 A	Boost Sw. Inv. Diode	
D44	Rectifier	1600 V	50 A	Boost Sw. Protection Diode	
D46	FWD	1200 V	35 A	Boost D. Protection Diode	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-F124NIx150SH03-LGx8F98-D1-14	12 Dec. 2017		