30-FT12NMA400H7-PL90F08

datasheet

*flow*MNPC 2 | 1200 V / 400 A

Topology features

- Mixed Voltage Neutral Point Clamped Topology (T-Type)
- Kelvin Emitter for improved switching performance
- Split output for elimination of X-conduction at fast turn-on
- Low inductive commutation loop
- Temperature sensor

Component features

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

Housing features

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

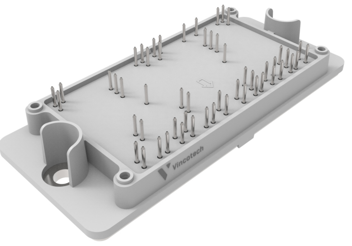
Target applications

- Energy Storage Systems
- Solar Inverters
- UPS

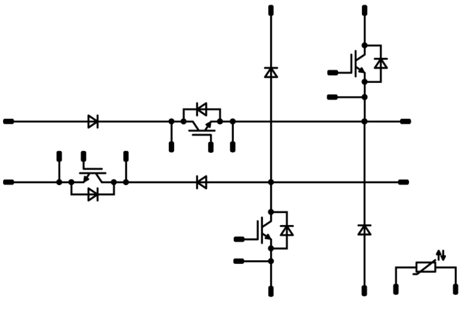
Types

- 30-FT12NMA400H7-PL90F08

flow 2 13 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	277	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	493	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Buck Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	268	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	361	W
Maximum junction temperature	T_{jmax}			175	°C
Buck Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s <= 80 °C	32 (1)	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		32	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 25 °C	200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	82	W
Maximum junction temperature	T_{jmax}			175	°C

(1) limited by I_{FRM}

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	255	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		800	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	398	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
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	178	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	342	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	38	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	69	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	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
Creepage distance			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0064	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,78 1,94 1,98	2,15(2)	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		52000		pF
Output capacitance	C_{oes}							960		pF
Reverse transfer capacitance	C_{res}							288		pF
Gate charge	Q_g	V_{CC} = 960 V	0/15		400	25		2856		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,19		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	350	400	25 125 150		301,43 303,18 304,04		ns
Rise time	t_r					25 125 150		41,07 42,3 42,91		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		236,32 264,89 272,42		ns
Fall time	t_f					25 125 150		33,04 55,72 61,08		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=8,01 μC Q_{rFWD}=18,63 μC Q_{rFWD}=21,67 μC				25 125 150		8,11 8,62 9,1		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		8,39 13,69 14,77		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				400	25 125 150		1,65 1,6 1,58	1,92[2]	V
Reverse leakage current	I_R	V_r = 650 V				25			21,2	µA
Thermal										
Thermal resistance junction to sink[3]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,26		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=7627 A/µs di/dt=8782 A/µs di/dt=9235 A/µs	±15	350	400	25 125 150		164,23 262,31 282,84		A
Reverse recovery time	t_{rr}					25 125 150		79,46 112,68 124,56		ns
Recovered charge	Q_r					25 125 150		8,01 18,63 21,67		µC
Reverse recovered energy	E_{rec}					25 125 150		1,52 3,89 4,54		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		3162,6 4351,17 3921,92		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	
Buck Sw. Protection Diode										
Static										
Forward voltage	V_F				16	25 125 150		2,82 2,36 2,24	3,2(2)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150			200 1000	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j\text{-}s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,16		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	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,004	25	3,25	4	4,75	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150	1,15	1,24 1,7 1,75	1,8(2)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		22800		pF
Output capacitance	C_{oes}							660		pF
Reverse transfer capacitance	C_{res}							77,2		pF
Gate charge	Q_g	V_{CC} = 400 V	±15		400	25		1680		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,24		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	350	400	25 125 150		97,76 98,55 99,09		ns
Rise time	t_r					25 125 150		27,88 30,53 31,04		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		93,03 107,99 112,19		ns
Fall time	t_f					25 125 150		19,37 24,92 27,44		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=6,87 µC Q_{rFWD}=22,13 µC Q_{rFWD}=25,97 µC				25 125 150		4,81 5,53 5,63		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,25 7,49 8,15		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				400	25 125 150		3,11 2,96 2,88	3(2)	V
Reverse leakage current	I_R	V_r = 1200 V				25			16	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,28		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=10646 A/µs d*i*/d*t*=10688 A/µs d*i*/d*t*=9460 A/µs	±15	350	400	25 125 150		224,99 334,75 363,92		A
Reverse recovery time	t_{rr}					25 125 150		55,29 216,45 239,55		ns
Recovered charge	Q_r					25 125 150		6,87 22,13 25,97		µC
Reverse recovered energy	E_{rec}					25 125 150		1,3 5,34 6,31		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		11788,95 11280,51 11364,75		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. Protection Diode										
Static										
Forward voltage	V_F				16	25 125 150		2,14 1,56 1,44	3[2]	V
Reverse leakage current	I_R	V_r = 650 V				25			20	µA
Thermal										
Thermal resistance junction to sink[3]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,38		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	

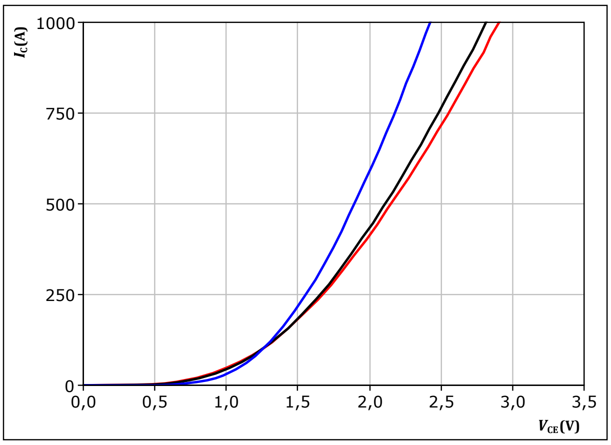
(2) Value at chip level
(3) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

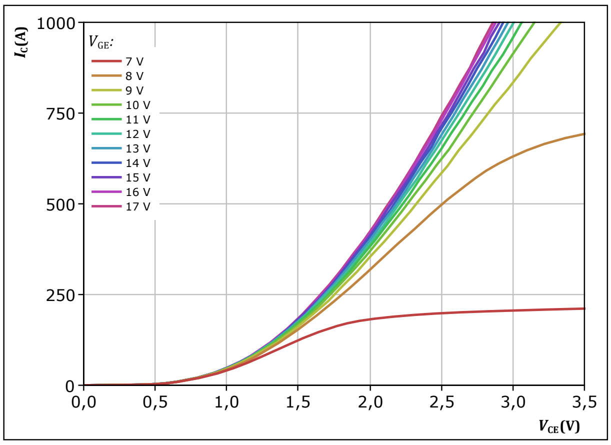


t_p =	250	μs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



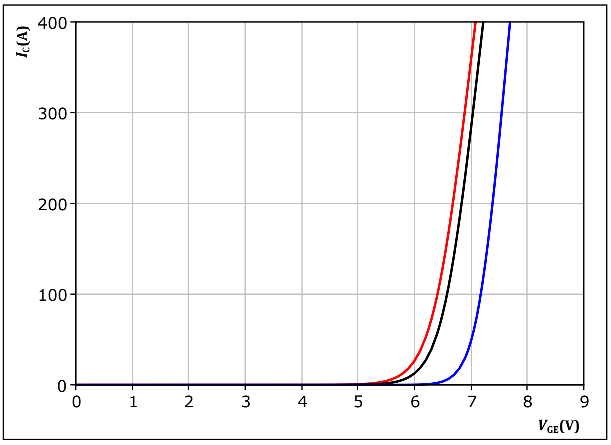
t_p =	250	μs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

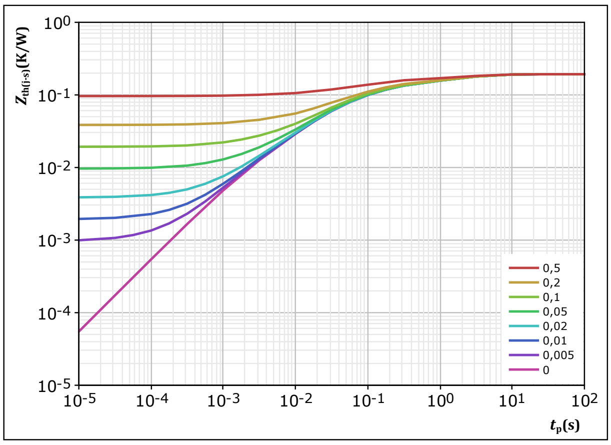


t_p =	250	μs		25 °C
V_{CE} =	48	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,193	K/W

IGBT thermal model values

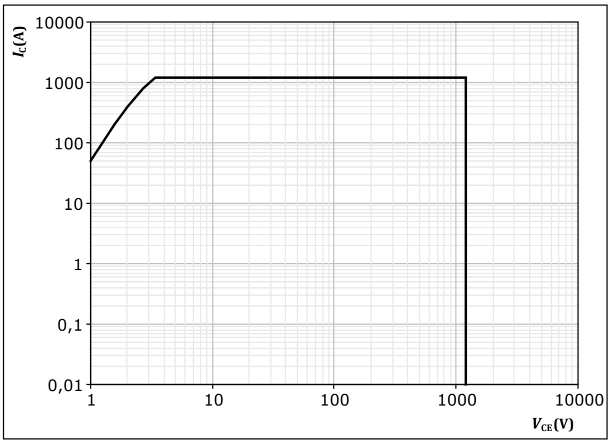
R (K/W)	τ (s)
3,10E-02	3,44E+00
3,88E-02	8,75E-01
7,89E-02	9,78E-02
3,92E-02	1,92E-02
4,98E-03	1,93E-03

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})

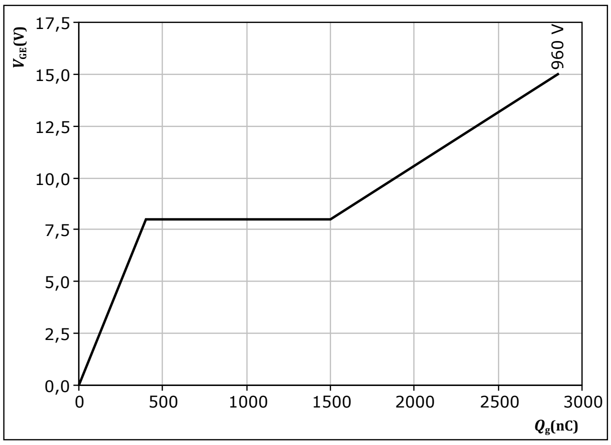


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



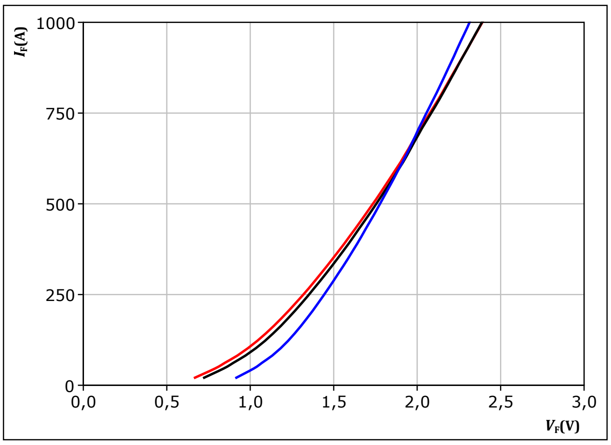
I_C =	100	A
T_j =	25	°C

Buck Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

I_F = f(V_F)



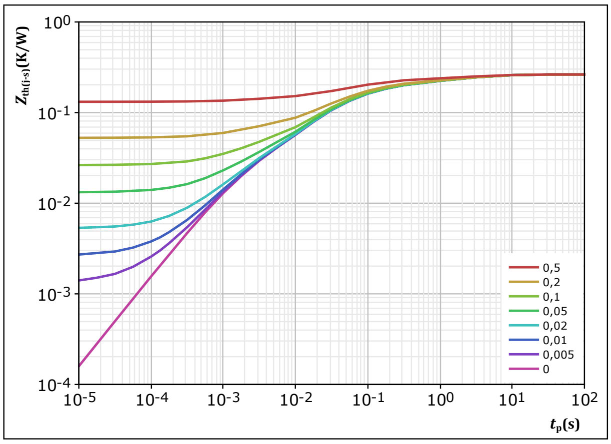
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,263 K/W

FWD thermal model values

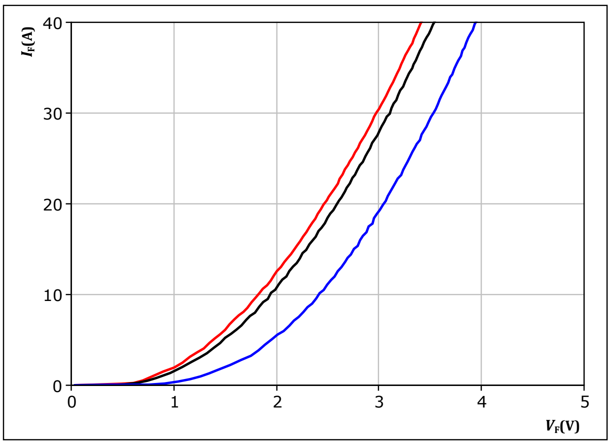
R (K/W)	τ (s)
3,39E-02	4,63E+00
3,97E-02	8,15E-01
8,56E-02	1,01E-01
8,53E-02	2,34E-02
1,86E-02	1,64E-03

Buck Sw. Protection Diode Characteristics

figure 9. **FWD**

Typical forward characteristics

I_F = f(V_F)



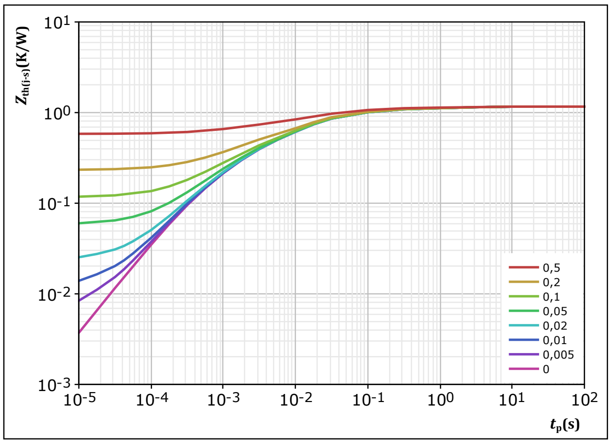
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 10. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,164 K/W

FWD thermal model values

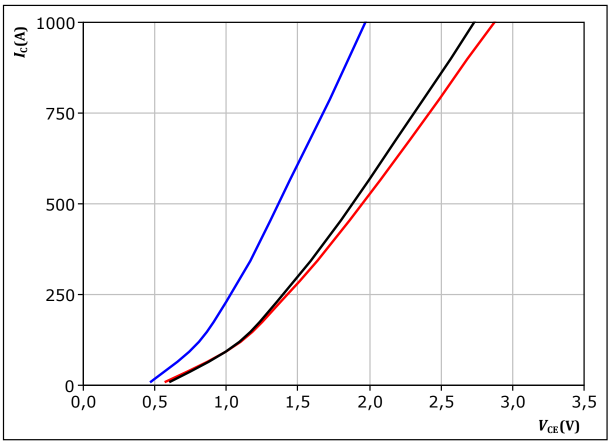
R (K/W)	τ (s)
7,05E-02	2,32E+00
1,99E-01	1,21E-01
5,32E-01	1,69E-02
2,77E-01	2,12E-03
8,54E-02	4,04E-04

Boost Switch Characteristics

figure 11. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



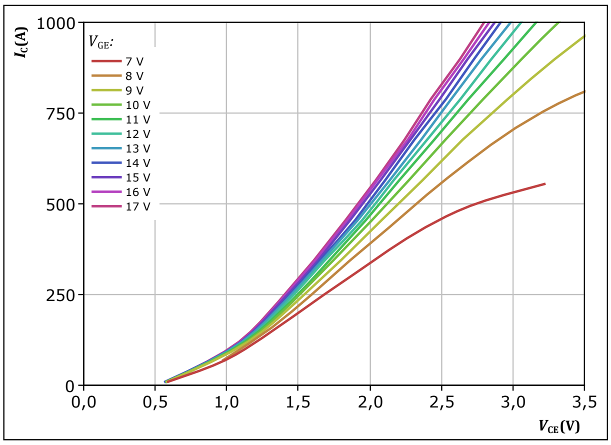
t_p =	250	µs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 12. IGBT

Typical output characteristics

$I_C = f(V_{CE})$



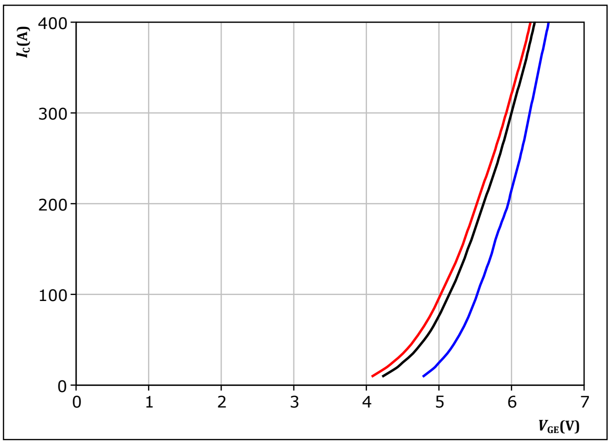
t_p =	250	µs
T_j =	150	°C

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

figure 13. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



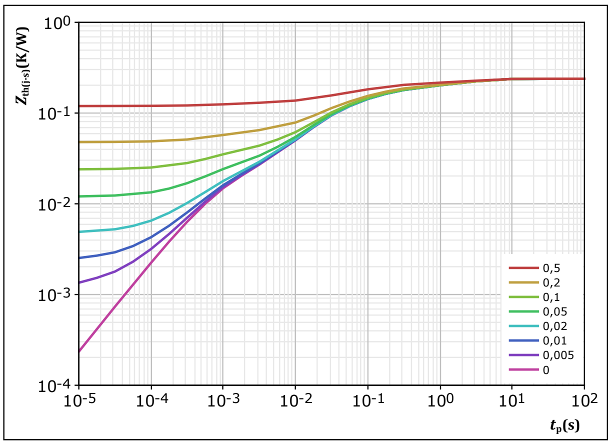
t_p =	250	µs
V_{CE} =	10	V

T_j: 25 °C, 125 °C, 150 °C

figure 14. IGBT

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,239	K/W

IGBT thermal model values

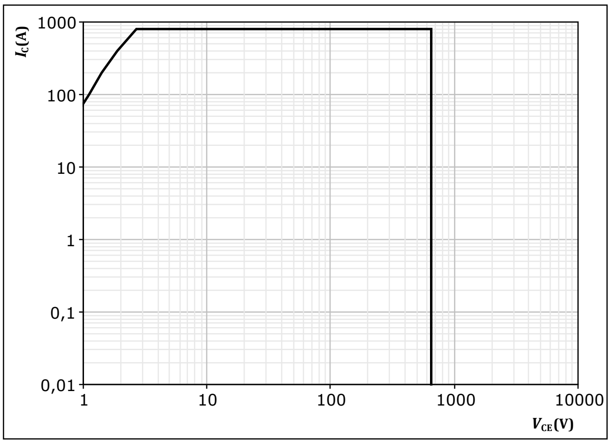
R (K/W)	τ (s)
4,66E-02	2,79E+00
2,64E-02	5,14E-01
7,71E-02	1,01E-01
7,43E-02	2,15E-02
1,45E-02	7,51E-04

Boost Switch Characteristics

figure 15. **IGBT**

Safe operating area

I_C = f(V_{CE})



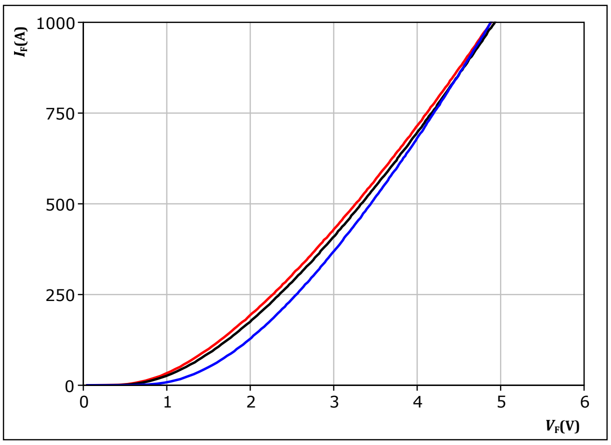
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 16. **FWD**

Typical forward characteristics

I_F = f(V_F)



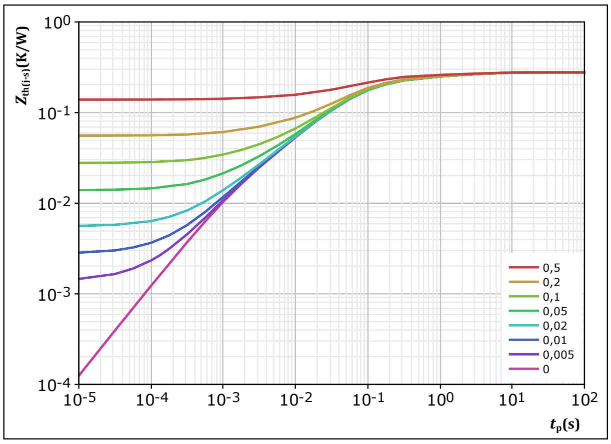
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 17. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,278 K/W

FWD thermal model values

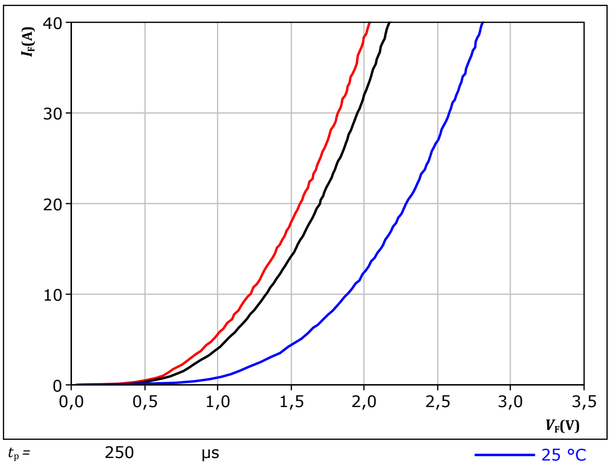
R (K/W)	τ (s)
3,05E-02	3,34E+00
4,34E-02	4,59E-01
1,55E-01	6,92E-02
3,94E-02	1,23E-02
9,73E-03	1,39E-03

Boost Sw. Protection Diode Characteristics

figure 18. **FWD**

Typical forward characteristics

I_F = f(V_F)



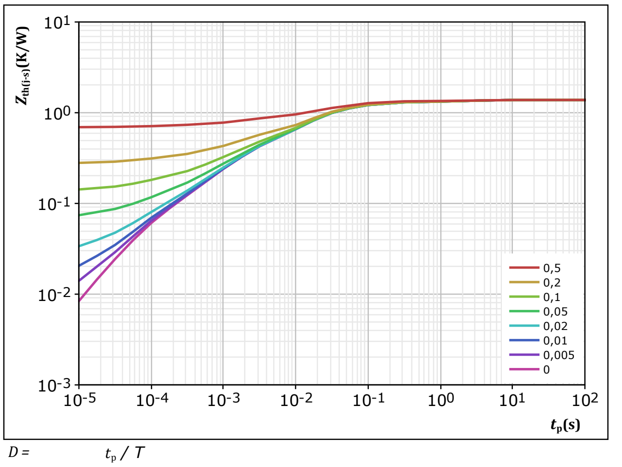
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 19. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,382 K/W

FWD thermal model values

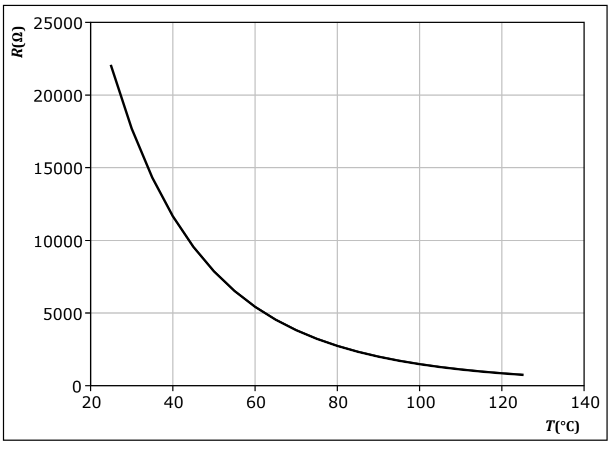
R (K/W)	τ (s)
8,42E-02	2,44E+00
2,61E-01	8,79E-02
7,08E-01	1,80E-02
2,77E-01	1,32E-03
5,21E-02	8,34E-05

Thermistor Characteristics

figure 20.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

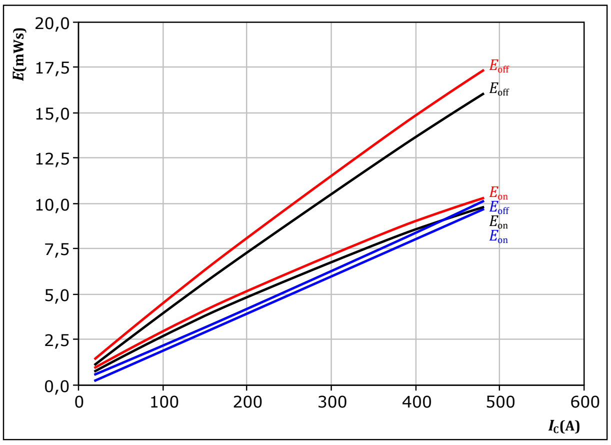


Buck Switching Characteristics

figure 21. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



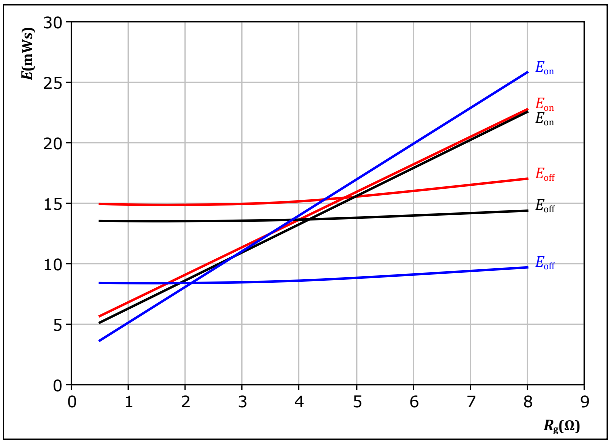
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 22. **IGBT**

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

$E = f(R_g)$



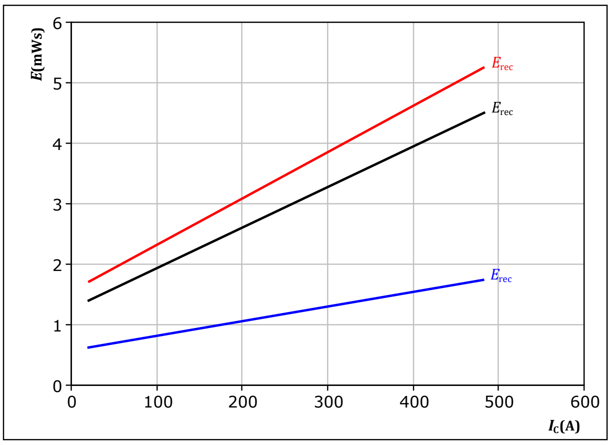
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

figure 23. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



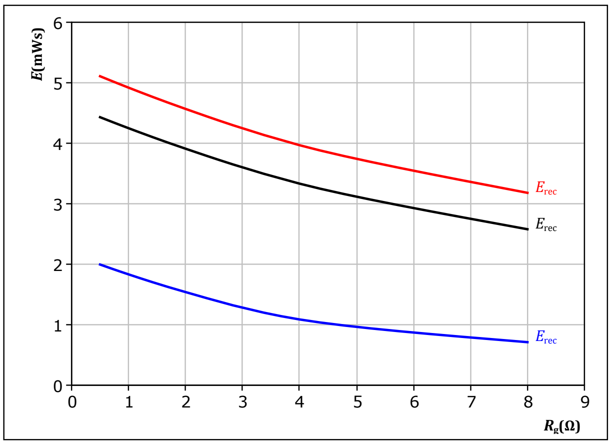
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 24. **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

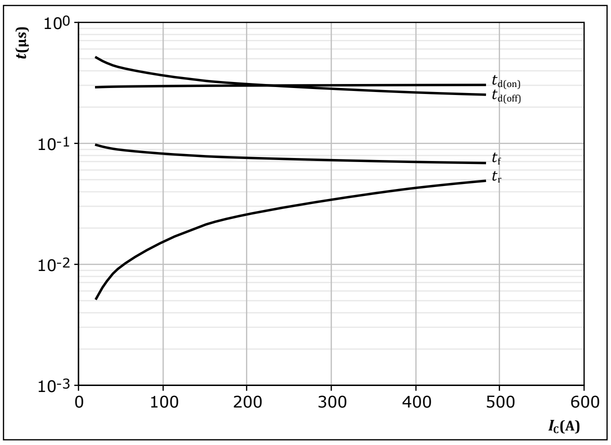
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

Buck Switching Characteristics

figure 25. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



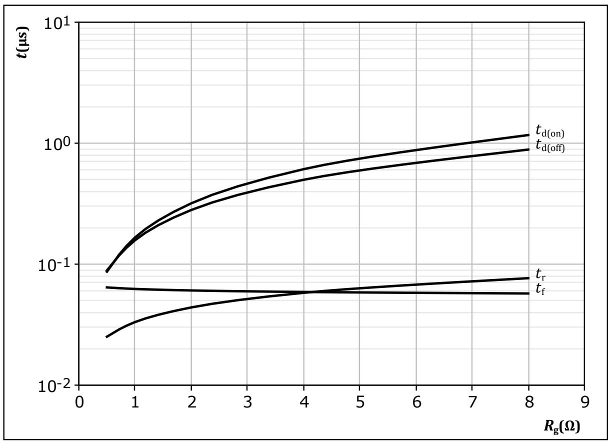
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 26. **IGBT**

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

t = f(R_g)



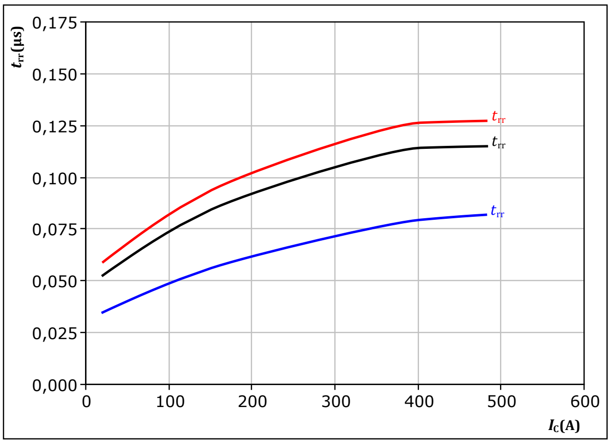
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	400	A

figure 27. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

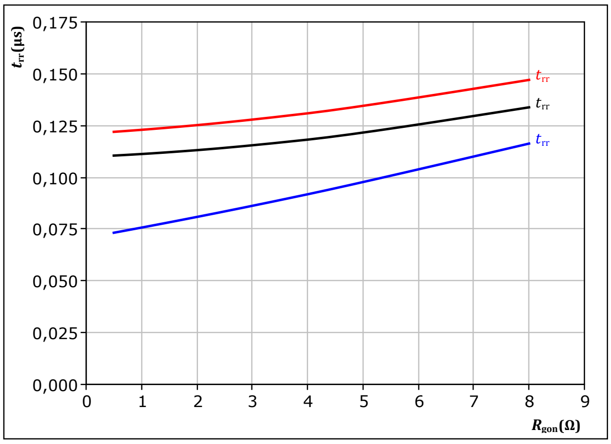
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 28. **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} =	350	V
V_{GE} =	±15	V
I_C =	400	A

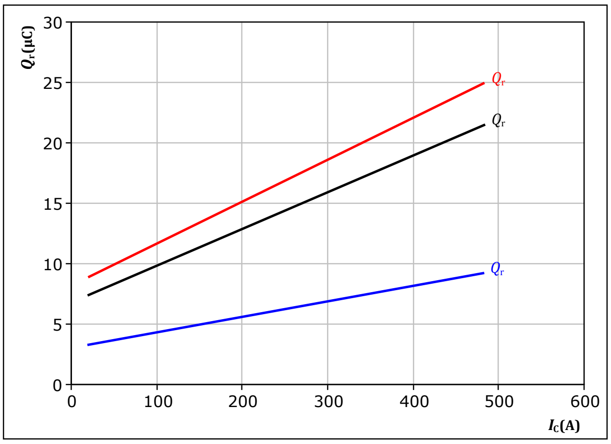
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

figure 29. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



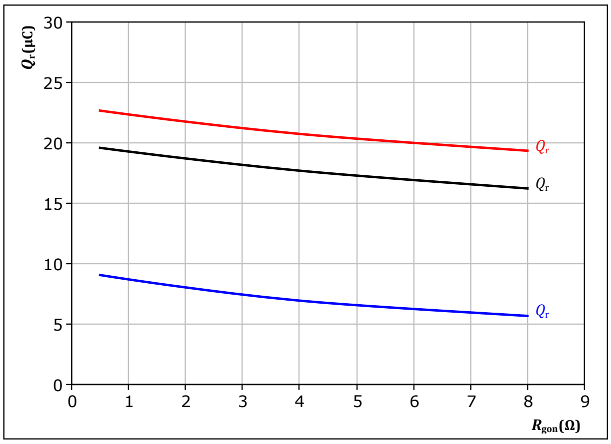
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 30. **FWD**

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

Q_r = f(R_{gon})



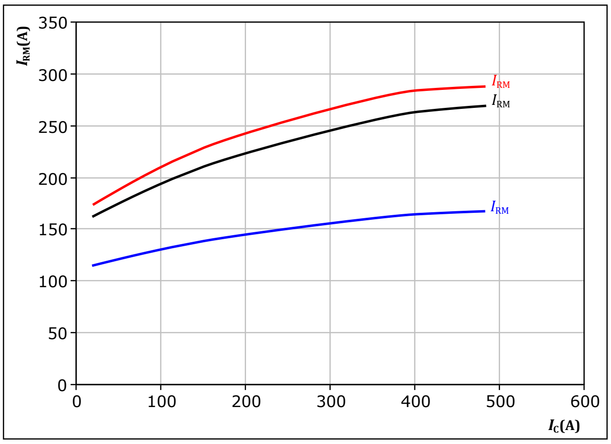
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

figure 31. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



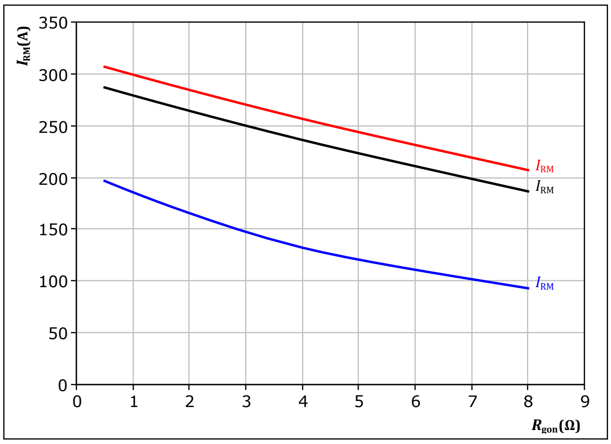
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 32. **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

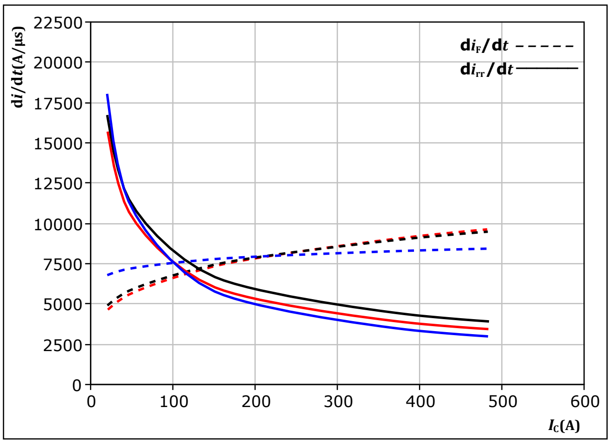
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

Buck Switching Characteristics

figure 33. **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

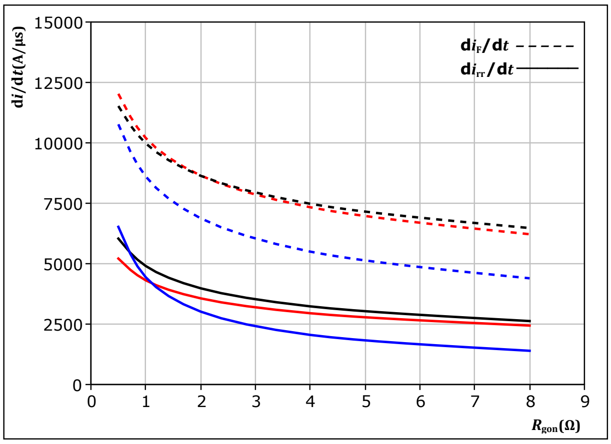
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 34. **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

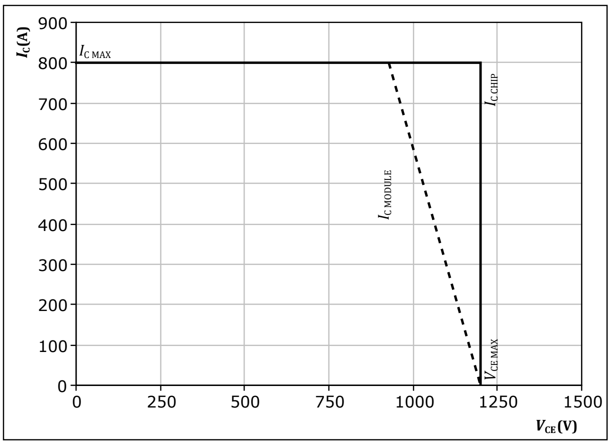
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	400	A

T_j: 25 °C, 125 °C, 150 °C

figure 35. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



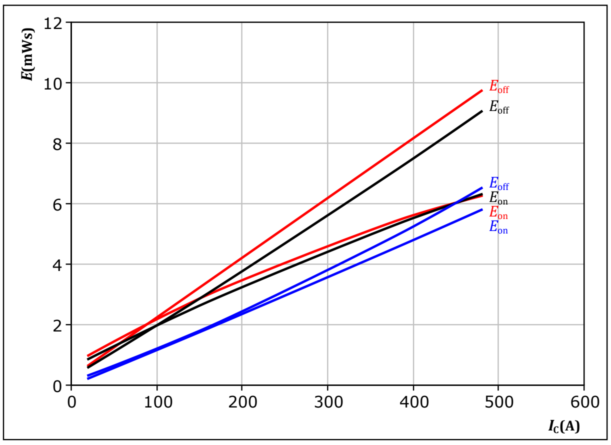
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Boost Switching Characteristics

figure 36. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

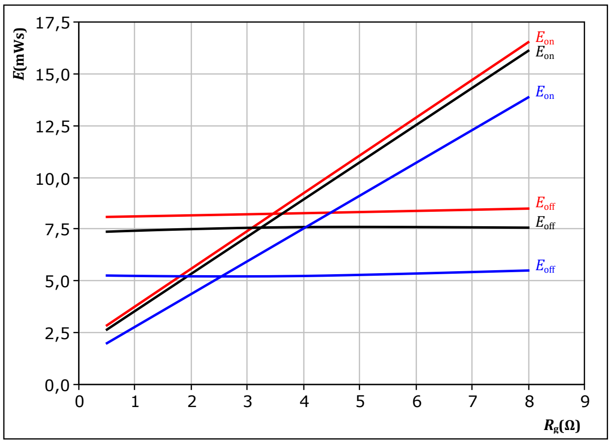
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	
R_{goff} =	2	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 37. **IGBT**

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

$E = f(R_g)$



With an inductive load at

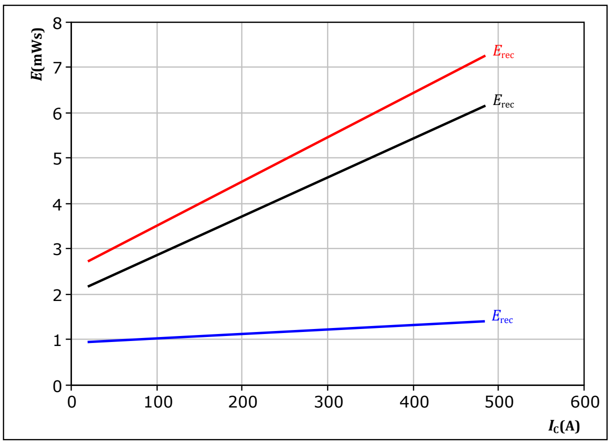
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	400	A

T_j: 25 °C, 125 °C, 150 °C

figure 38. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

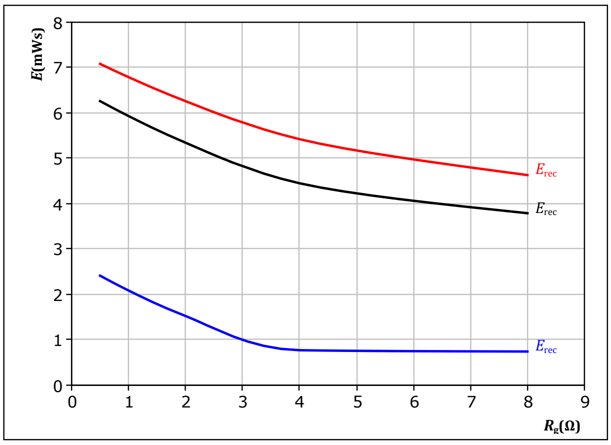
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 39. **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} =	350	V
V_{GE} =	±15	V
I_C =	400	A

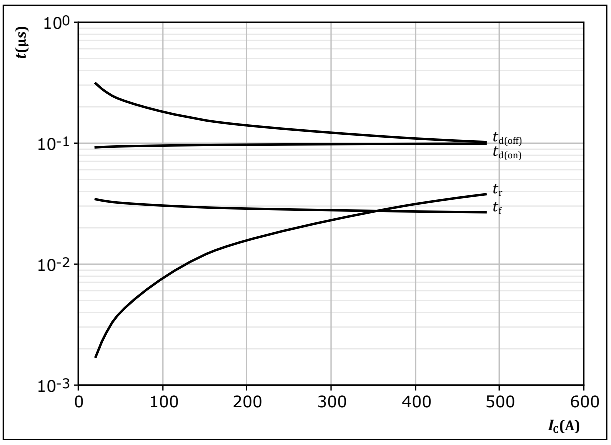
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 40. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



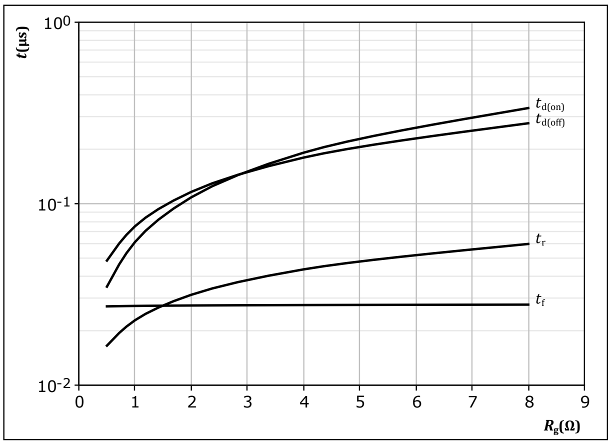
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 41. **IGBT**

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

$t = f(R_g)$



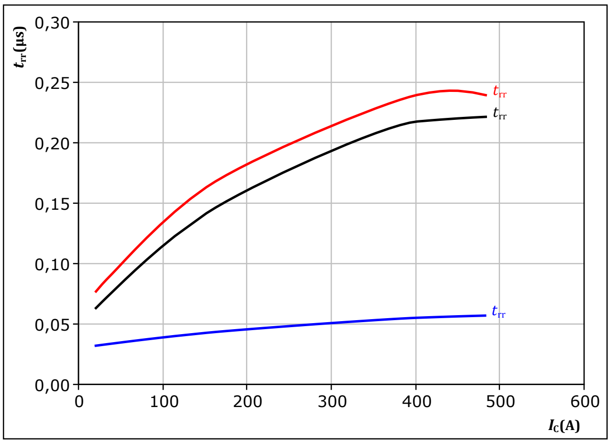
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	400	A

figure 42. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

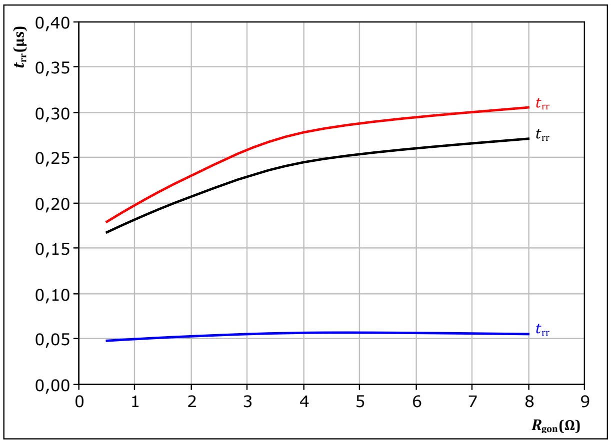
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 43. **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} =	350	V
V_{GE} =	±15	V
I_C =	400	A

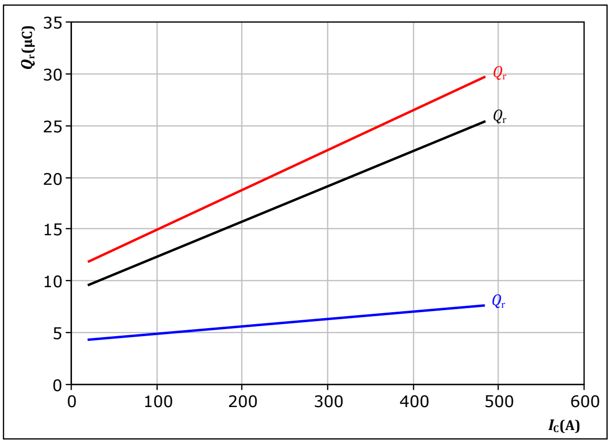
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 44. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



With an inductive load at

V_{CE} = 350 V

V_{GE} = ±15 V

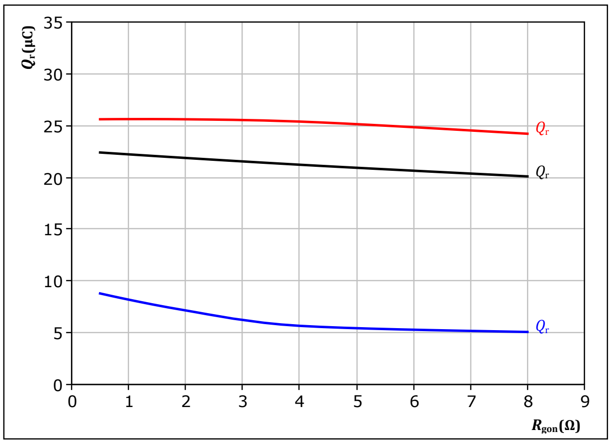
R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 45. 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} = 350 V

V_{GE} = ±15 V

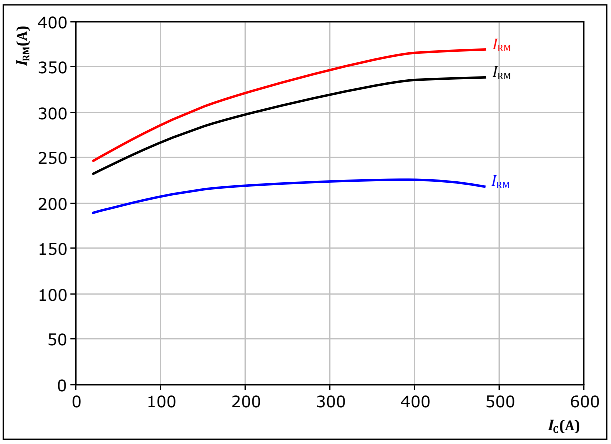
I_C = 400 A

T_j: 25 °C, 125 °C, 150 °C

figure 46. FWD

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



With an inductive load at

V_{CE} = 350 V

V_{GE} = ±15 V

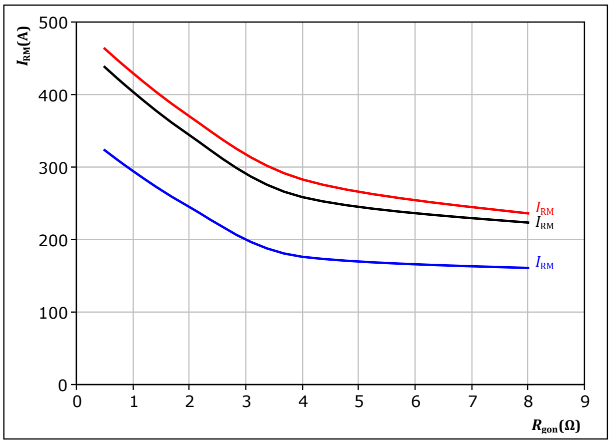
R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 47. 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} = 350 V

V_{GE} = ±15 V

I_C = 400 A

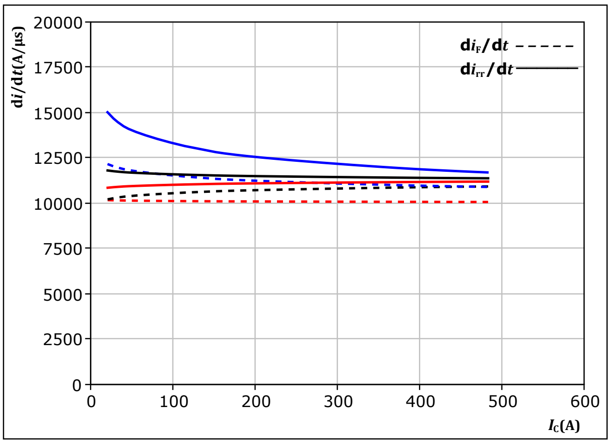
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 48. **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)



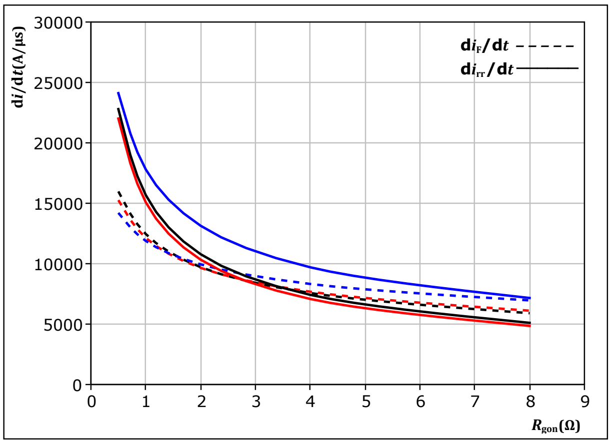
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 49. **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})



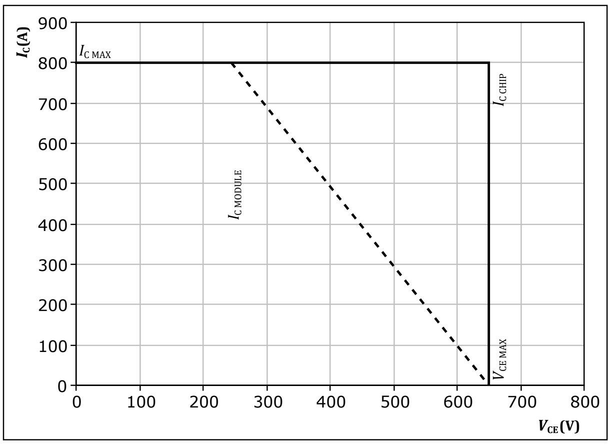
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

figure 50. **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 51. **IGBT**

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

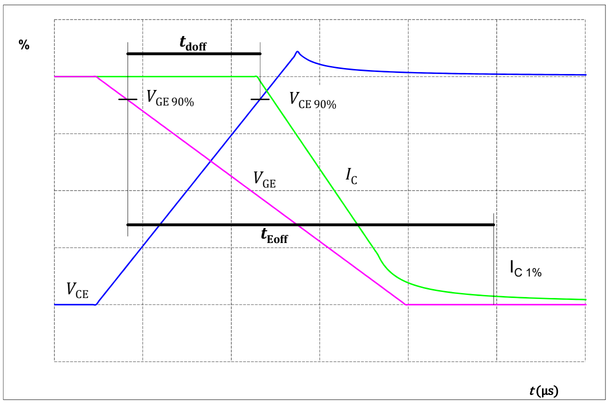


figure 52. **IGBT**

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

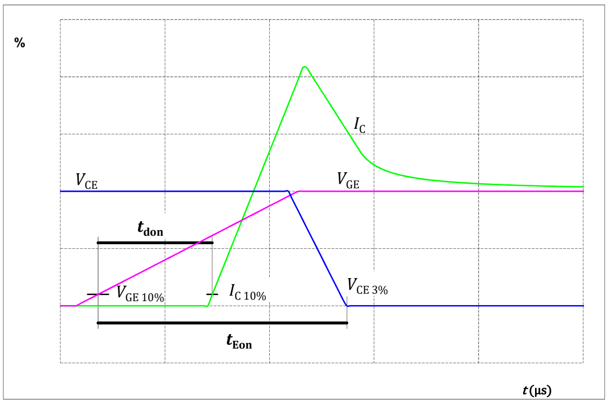


figure 53. **IGBT**

Turn-off Switching Waveforms & definition of t_f

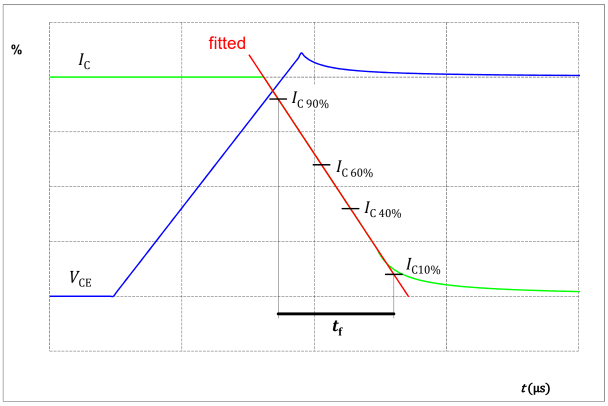
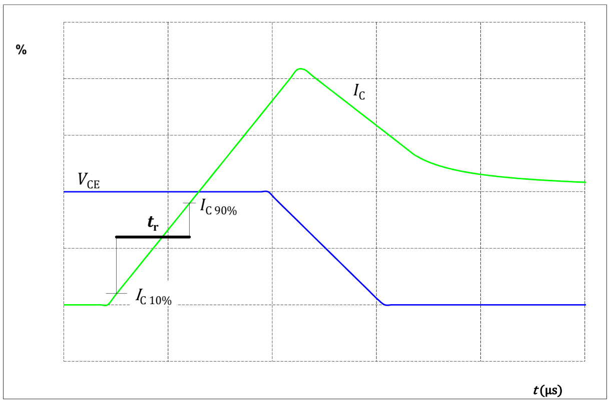


figure 54. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 55. **FWD**

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

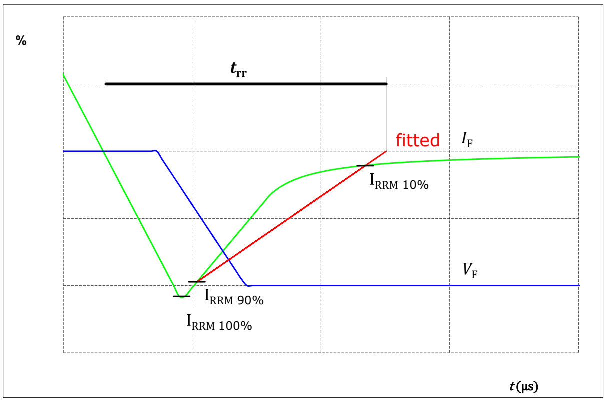
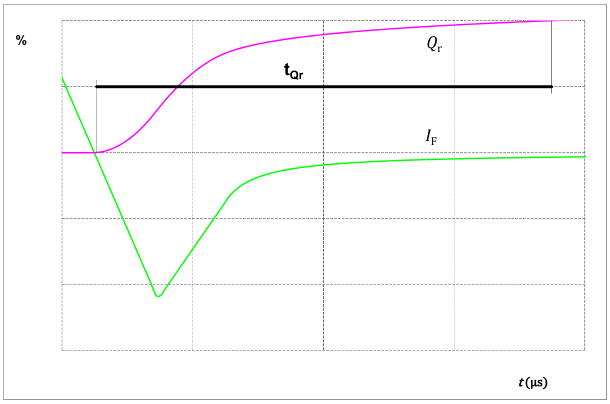


figure 56. **FWD**

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



Ordering Code	
Version	**Ordering Code**
Without thermal paste	30-FT12NMA400H7-PL90F08
With thermal paste (3,4 W/mK, PSX-P7)	30-FT12NMA400H7-PL90F08-/3/

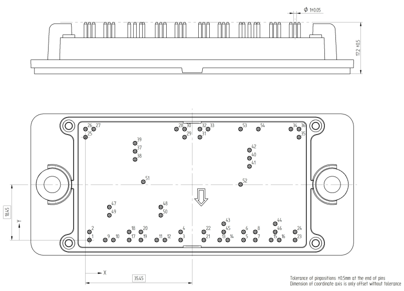
Marking

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

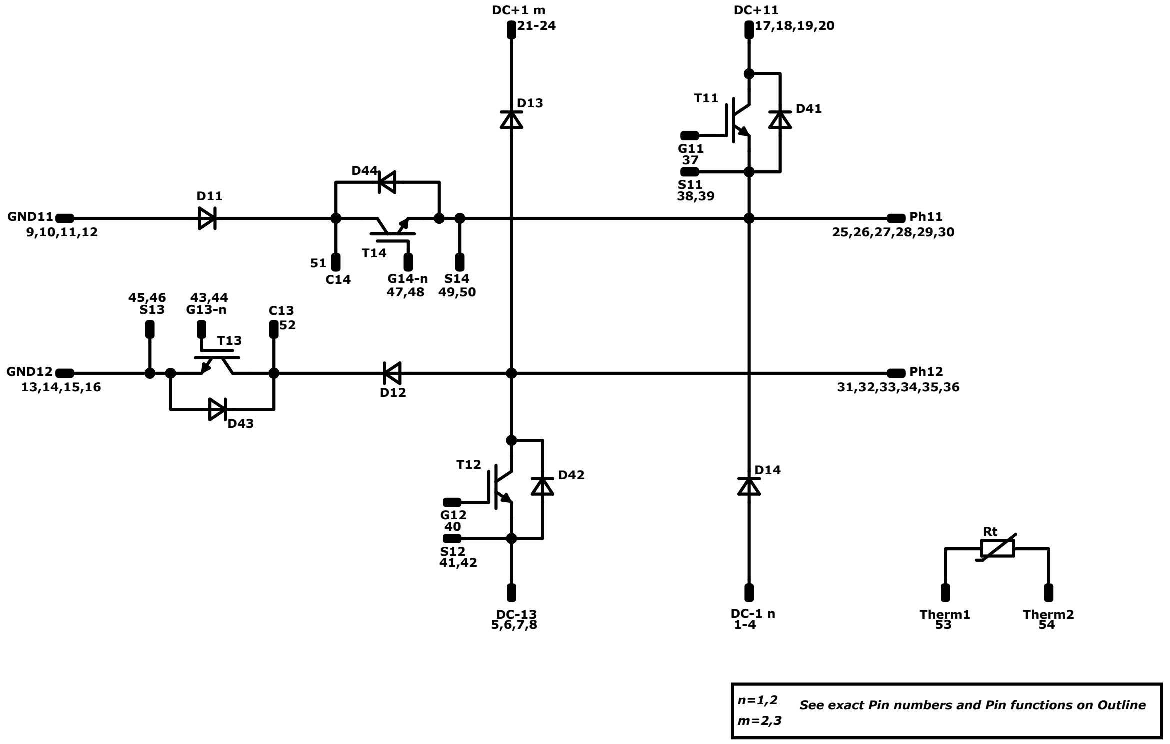
Outline

Pin table [mm]

Pin	X	Y	Function	28	30,2	36,9	Ph11
1	1,3	0	DC-11	29	32,9	34,2	Ph11
2	1,3	2,7	DC-11	30	32,9	36,9	Ph11
3	31,6	0	DC-12	31	38	34,2	Ph12
4	31,6	2,7	DC-12	32	38	36,9	Ph12
5	52,5	0	DC-13	33	40,7	36,9	Ph12
6	52,5	2,7	DC-13	34	68,2	36,9	Ph12
7	56,4	0	DC-13	35	70,9	34,2	Ph12
8	56,4	2,7	DC-13	36	70,9	36,9	Ph12
9	6,55	0	GND11	37	16,45	29,5	G11
10	9,25	0	GND11	38	16,45	26,8	S11
11	23,65	0	GND11	39	16,45	32,2	S11
12	26,35	0	GND11	40	54,45	27,2	G12
13	44,55	0	GND12	41	54,45	24,5	S12
14	47,25	0	GND12	42	54,45	29,9	S12
15	61,65	0	GND12	43	45,9	5,4	G13-1
16	64,35	0	GND12	44	63	5,4	G13-2
17	14,5	0	DC+11	45	45,9	2,7	S13
18	14,5	2,7	DC+11	46	63	2,7	S13
19	18,4	0	DC+11	47	7,9	10,95	G14-1
20	18,4	2,7	DC+11	48	25	10,95	G14-2
21	39,3	0	DC+12	49	7,9	8,25	S14
22	39,3	2,7	DC+12	50	25	8,25	S14
23	69,6	0	DC+13	51	19,2	19,35	C14
24	69,6	2,7	DC+13	52	51,5	18,5	C13
25	0	34,2	Ph11	53	51,5	36,9	Therm1
26	0	36,9	Ph11	54	57,4	36,9	Therm2
27	2,7	36,9	Ph11				



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	400 A	Buck Switch	
D11, D12	FWD	650 V	400 A	Buck Diode	
D41, D42	FWD	1200 V	16 A	Buck Sw. Protection Diode	
T13, T14	IGBT	650 V	400 A	Boost Switch	Parallel devices with separate control. Values apply to complete device.
D13, D14	FWD	1200 V	400 A	Boost Diode	
D43, D44	FWD	650 V	16 A	Boost Sw. Protection Diode	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 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 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
30-FT12NMA400H7-PL90F08-D1-14	6 Jun. 2024	Initial Release	