70-W612NMA1K8M702-LC09FP70

datasheet

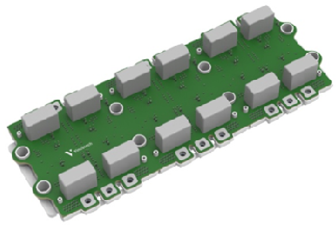
Vincotech

VINcoMNPC X12 **1200 V / 1800 A**

Features

- IGBT M7 technology
- Low V_{CEsat} and improved EMC behavior
- Low inductive package
- High efficiency
- Integrated snubber capacitors

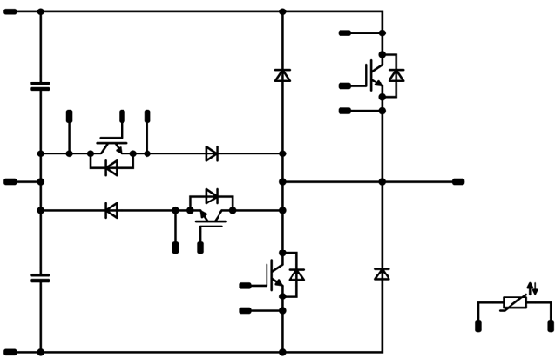
VINco X12 housing



Target applications

- Solar Inverters

Schematic



Types

- 70-W612NMA1K8M702-LC09FP70

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	1454	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		3600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	2500	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	Condition		Value	Unit
Buck Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	1078	A
Repetitive peak forward current	I_{FRM}			3600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1417	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			90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	271	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Switch					
Collector-emitter voltage	V_{CES}	Relative moisture level	≤ 50% > 50%	650 500	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	1408	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		3600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1865	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	1051	A
Repetitive peak forward current	I_{FRM}			3600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	1557	W
Maximum junction temperature	T_{jmax}			175	°C

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Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	91	A
Repetitive peak forward current	I_{FRM}			240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	127	W
Maximum junction temperature	T_{jmax}			175	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-40…+105	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Maximum allowed PCB temperature	T_{PCB}			125	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	4000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				11,94	mm
Clearance				11,94	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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,18	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		1800	25 125 150		1,57 1,80 1,86	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			1920	µA
Gate-emitter leakage current	I_{GES}		20	0		25			6000	nA
Internal gate resistance	r_g							0,25		Ω
Input capacitance	C_{ies}		0	10		25		360000		pF
Output capacitance	C_{oes}							10560		
Reverse transfer capacitance	C_{res}							3840		
Gate charge	Q_g		15	600	1800	25		12000		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,038		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 0,25 Ω R_{goff} = 0,25 Ω	-8 / 16	350	1200	25 125 150		359 353 348		ns
Rise time	t_r					25 125 150		79 74 76		
Turn-off delay time	$t_{d(off)}$					25 125 150		281 314 327		
Fall time	t_f					25 125 150		68 83 89		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 105,8 µC Q_{rFWD} = 219,8 µC Q_{rFWD} = 248,7 µC				25 125 150		51,07 67,02 66,08		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		55,22 73,63 76,02		

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				1800	25 125		1,62 1,63	1,85	V
Reverse leakage current	I_R			650		25 150				µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,067		K/W
Dynamic										
Peak recovery current	I_{RRM}					25 125 150		724 939 966		A
Reverse recovery time	t_{rr}					25 125 150		397 643 738		ns
Recovered charge	Q_r	di/dt = 16335 A/µs di/dt = 16268 A/µs di/dt = 16042 A/µs	-8 / 16	350	1200	25 125 150		105,80 219,82 248,67		µC
Reverse recovered energy	E_{rec}					25 125 150		25,97 58,20 64,59		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		10017 8141 8083		A/µs
Buck Sw. Protection Diode										
Static										
Forward voltage	V_F				90	25		2,37	2,71	V
Reverse leakage current	I_R			1200		25 150			360 10800	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,350		K/W

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
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,18	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		1800	25 125 150		1,37 1,44 1,45	1,8	V
Collector-emitter cut-off current	I_{CES}		0	650		25			2880	µA
Gate-emitter leakage current	I_{GES}		20	0		25			6000	nA
Internal gate resistance	r_g							0,33		Ω
Input capacitance	C_{ies}		0	10		25		228000		pF
Output capacitance	C_{oes}		0	10		25		9840		pF
Reverse transfer capacitance	C_{res}		0	10		25		4200		pF
Gate charge	Q_g		15	300	1800	25		8760		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,051		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 0,25 Ω R_{goff} = 0,25 Ω	-8 / 16	350	800	25 125 150		218 220 220		ns
Rise time	t_r					25 125 150		49 48 49		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		248 290 298		ns
Fall time	t_f					25 125 150		75 103 109		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 98,7 µC Q_{rFWD} = 161,5 µC Q_{rFWD} = 196,4 µC				25 125 150		20 26 29		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		38 51 53		mWs

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
Boost Diode										
Static										
Forward voltage	V_F				1800	25 125		1,80 1,90	2,15	V
Reverse leakage current	I_R			1200		25 150				µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,061		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 18140 A/µs di/dt = 16879 A/µs di/dt = 16744 A/µs	-8 / 16	350	800	25 125 150		940 1112 1188		A
Reverse recovery time	t_{rr}					25 125 150		255 385 449		ns
Recovered charge	Q_r					25 125 150		99 161 196		µC
Reverse recovered energy	E_{rec}					25 125 150		26 44 53		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		16727 14031 13253		A/µs
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				120	25 125 150		1,74 1,66 1,61	1,87	V
Reverse leakage current	I_R			650		25 150			1,44	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,749		K/W

Characteristic Values

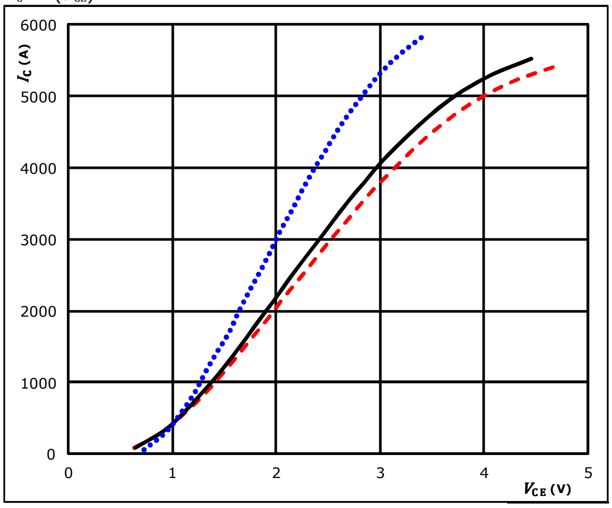
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Capacitor (DC)										
Capacitance	C							4080		nF
Tolerance							-10		+10	%
Dissipation factor		f = 1 kHz				20			0,04	%
Climatic category								40/105/56		
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

$I_C = f(V_{CE})$

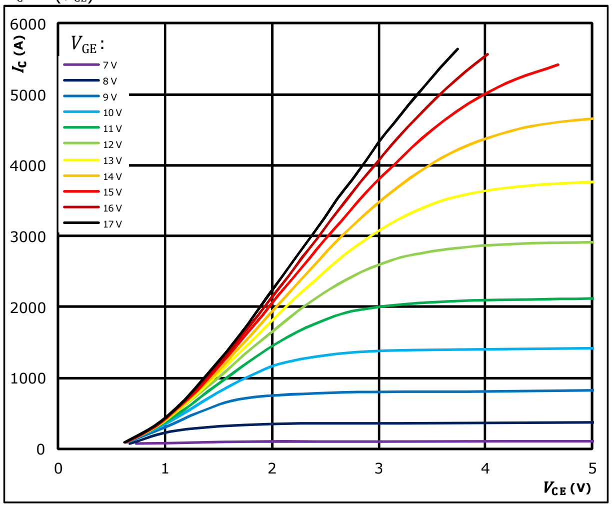


t_p =	250	µs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

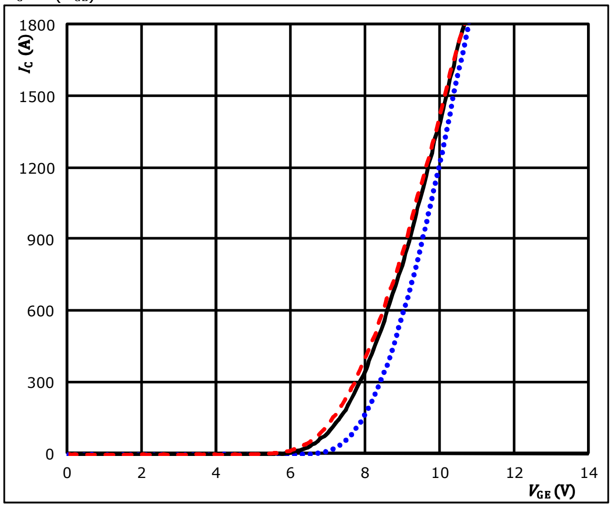


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

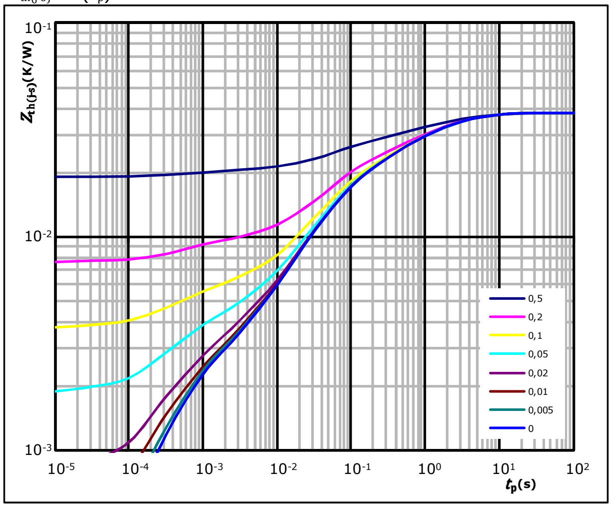


t_p =	100	µs		25 °C	············
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – –

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j\text{-}s)}$ = 0,038 K/W

IGBT thermal model values

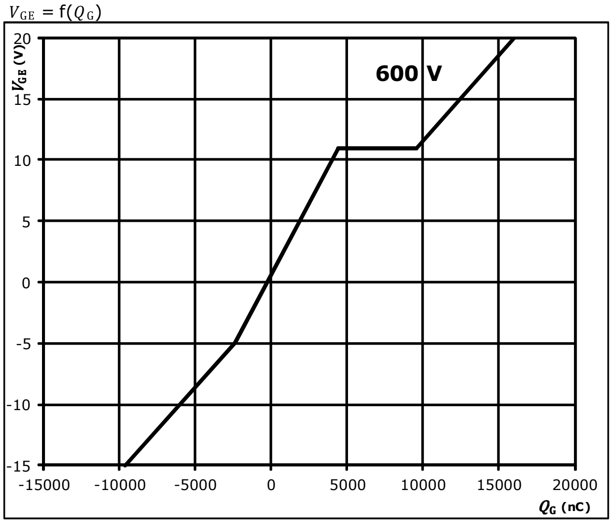
R (K/W)	τ (s)
5,60E-03	6,56E-01
9,64E-03	1,54E-01
8,03E-03	3,48E-02
1,06E-02	6,87E-03
1,75E-03	1,56E-03
1,31E-03	1,53E-04
1,08E-03	4,78E-05

Buck Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

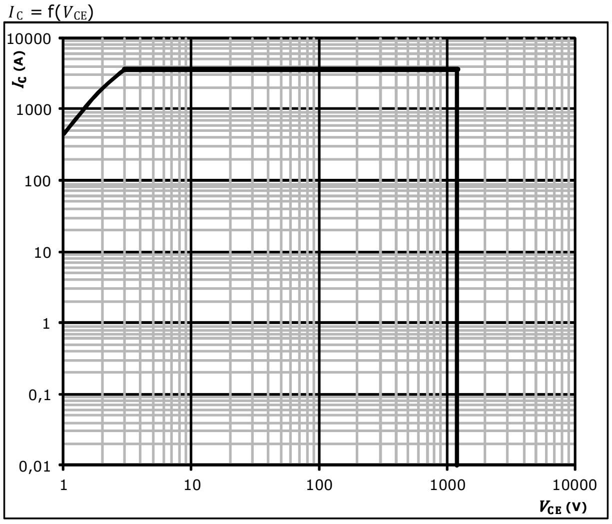


I_C= 1800 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



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

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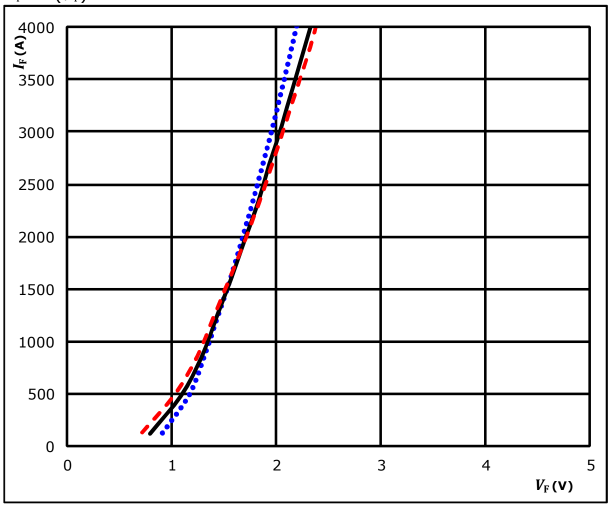
Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



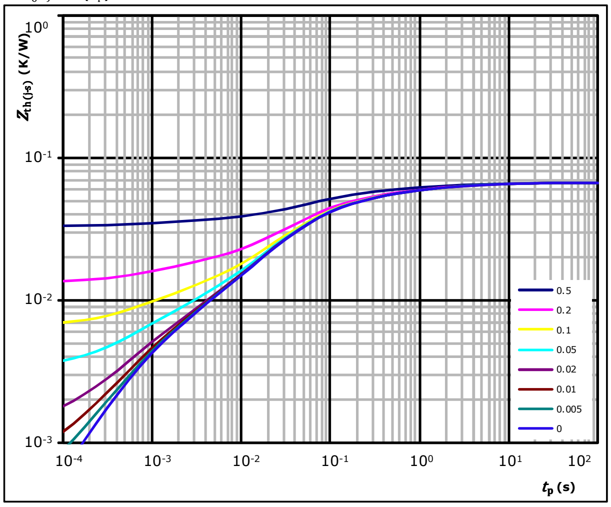
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,067 K/W

FWD thermal model values

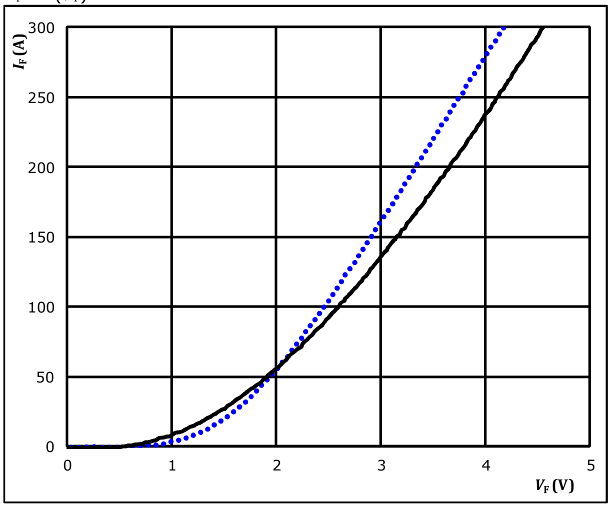
R (K/W)	τ (s)
4,72E-03	8,31E-01
9,38E-03	1,39E-01
1,36E-02	2,92E-02
2,45E-02	7,11E-03
8,70E-03	2,38E-03
3,44E-03	3,38E-04
2,66E-03	9,17E-05

Buck Sw. Protection Diode Characteristics

figure 1. FWD

Typical forward characteristics

$I_F = f(V_F)$



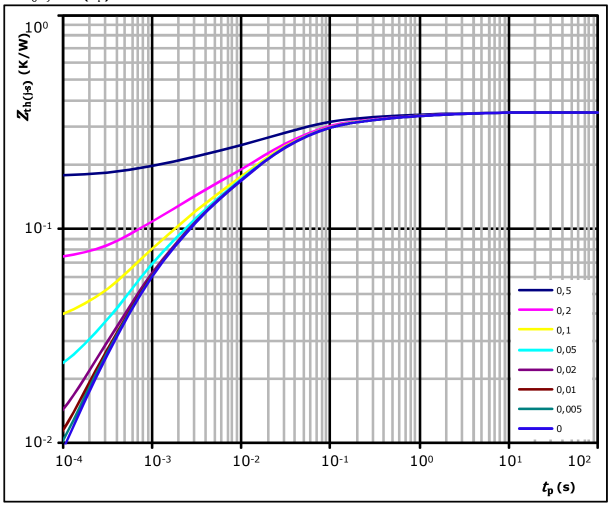
t_p = 250 µs

T_j: 25 °C
125 °C

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,350 K/W

FWD thermal model values

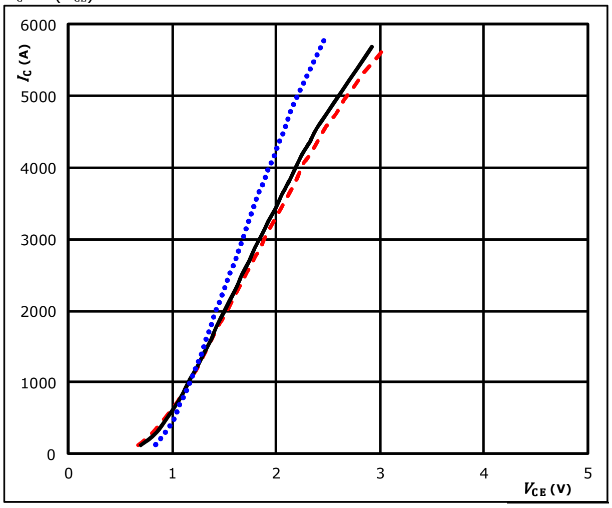
R (K/W)	τ (s)
1,65E-02	4,88E-01
3,35E-02	5,92E-02
8,98E-02	9,33E-03
1,07E-01	3,01E-03
6,29E-02	5,15E-04
2,24E-02	1,38E-04
1,78E-02	9,12E-05

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

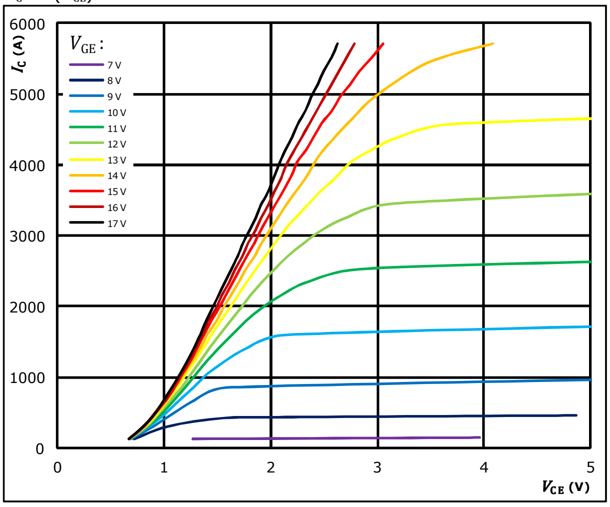


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

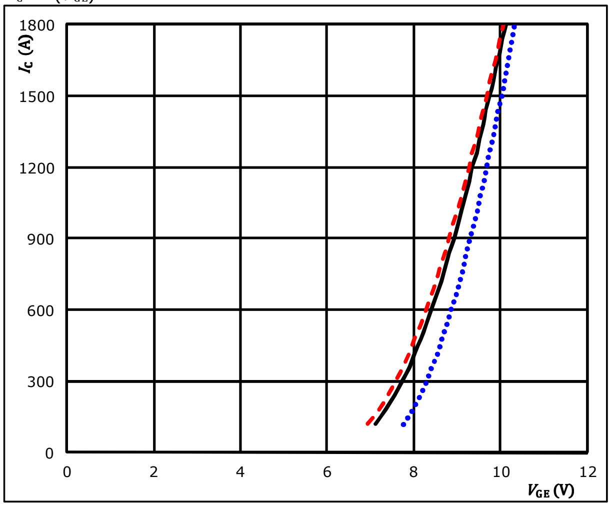


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

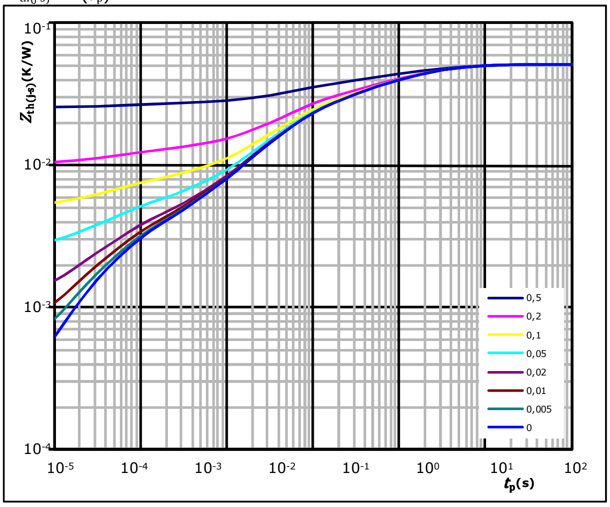


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,051 K/W

IGBT thermal model values

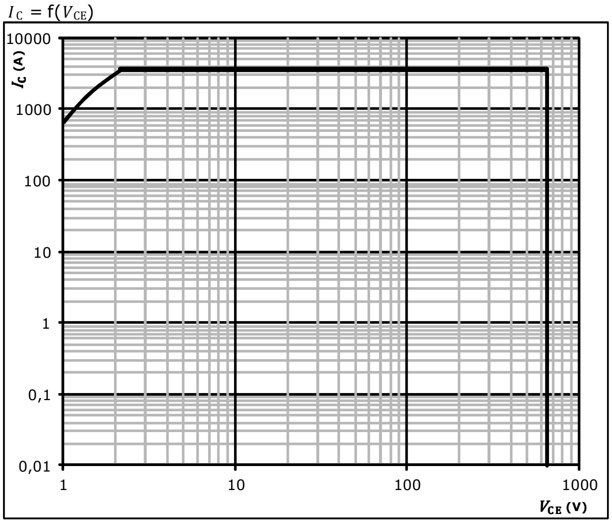
R (K/W)	τ (s)
7,51E-03	8,80E-01
1,29E-02	2,07E-01
1,08E-02	4,67E-02
1,42E-02	9,23E-03
2,35E-03	2,10E-03
1,76E-03	2,05E-04
1,45E-03	6,42E-05

Boost Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



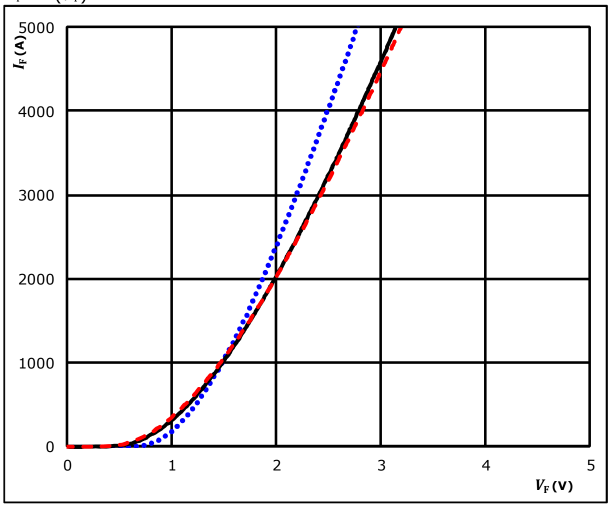
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



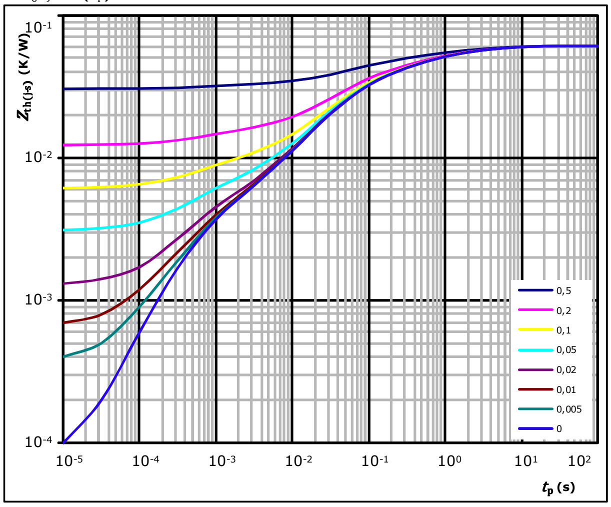
t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,061 K/W

FWD thermal model values

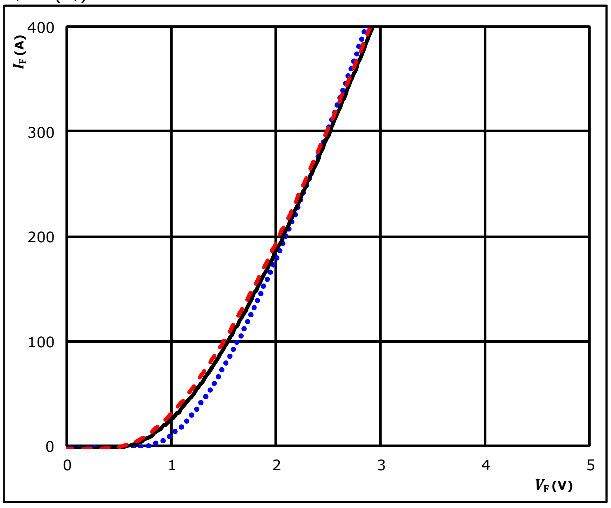
R (K/W)	τ (s)
5,55E-03	8,74E-01
1,06E-02	1,82E-01
1,36E-02	4,64E-02
1,75E-02	9,66E-03
9,19E-03	3,12E-03
1,97E-03	4,08E-04
2,64E-03	7,64E-05

Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



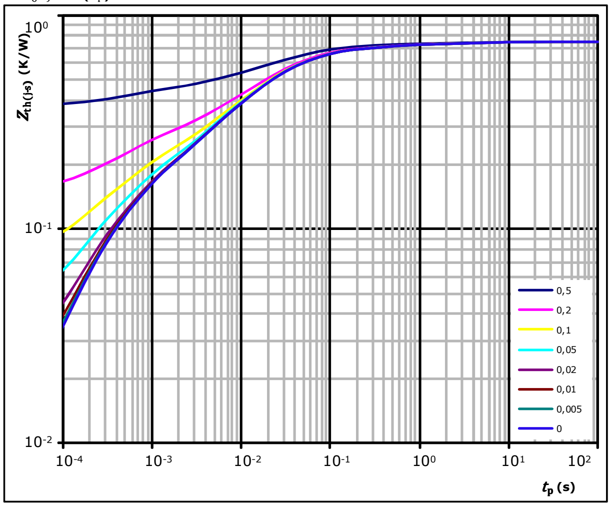
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,749 K/W

FWD thermal model values

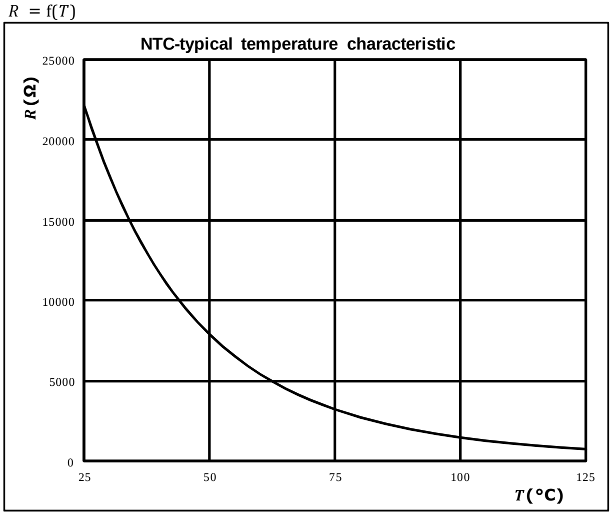
R (K/W)	τ (s)
2,40E-02	1,91E+00
5,23E-02	1,67E-01
1,96E-01	2,18E-02
2,51E-01	6,18E-03
1,12E-01	1,21E-03
1,14E-01	1,50E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

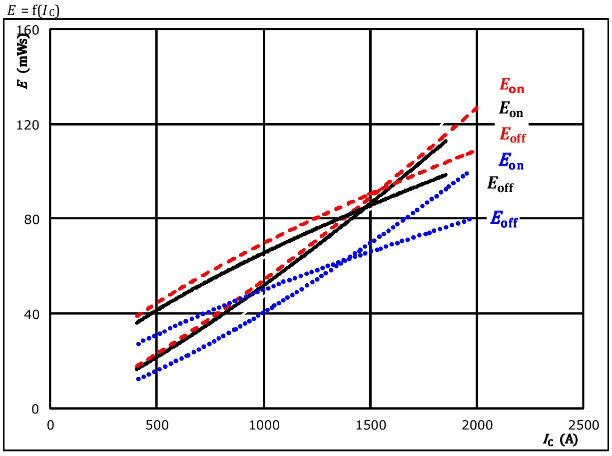


Buck Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



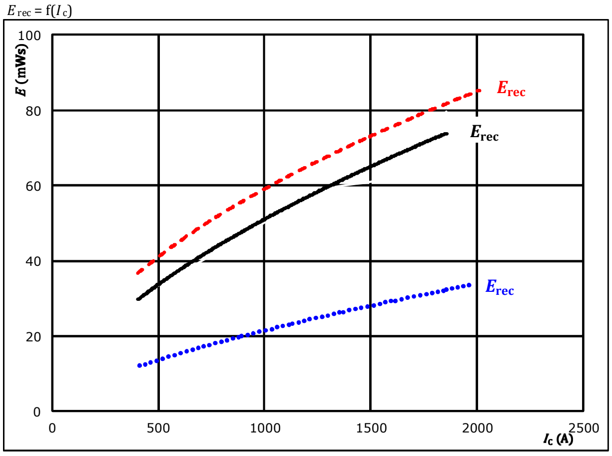
With an inductive load at

V_{CE} =	350	V		25 °C	dotted
V_{GE} =	-8 / 16	V	T_j:	125 °C	solid
R_{gon} =	0,25	Ω		150 °C	dashed
R_{goff} =	0,25	Ω			

figure 2. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



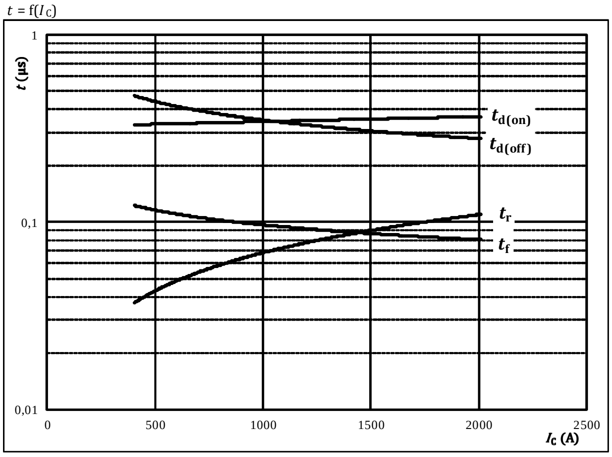
With an inductive load at

V_{CE} =	350	V		25 °C	dotted
V_{GE} =	-8 / 16	V	T_j:	125 °C	solid
R_{gon} =	0,25	Ω		150 °C	dashed

figure 3. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



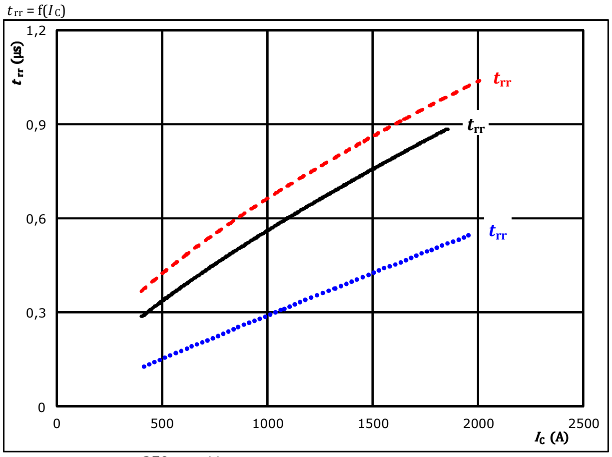
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-8 / 16	V
R_{gon} =	0,25	Ω
R_{goff} =	0,25	Ω

figure 4. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



At	V_{CE}=	350	V		25 °C	dotted
	V_{GE} =	-8 / 16	V	T_j:	125 °C	solid
	R_{gon} =	0,25	Ω		150 °C	dashed

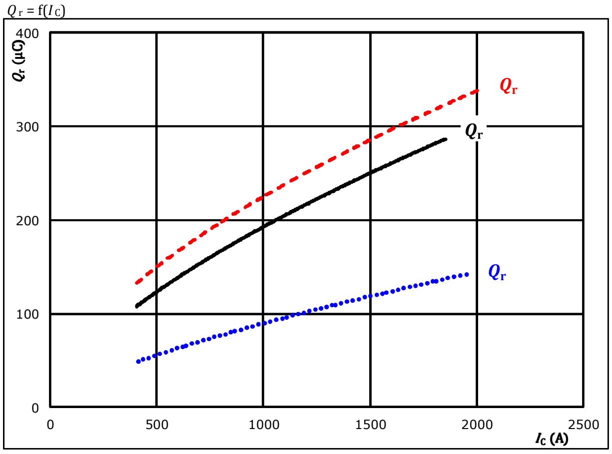
Vincotech

Buck Switching Characteristics

figure 5. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

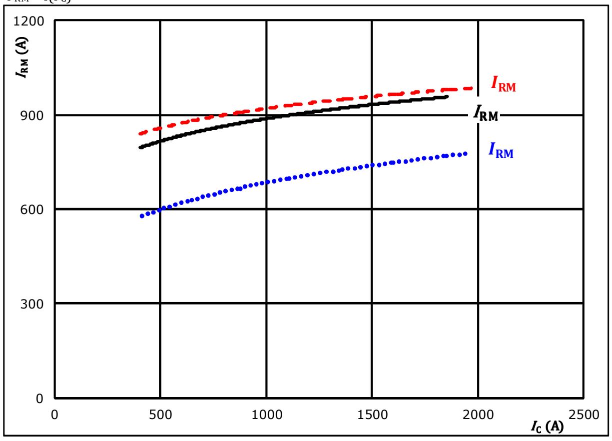


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-8 / 16	V		125 °C	solid
R_{gon} =	0,25	Ω		150 °C	dashed

figure 6. FWD

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

$I_{RM} = f(I_C)$

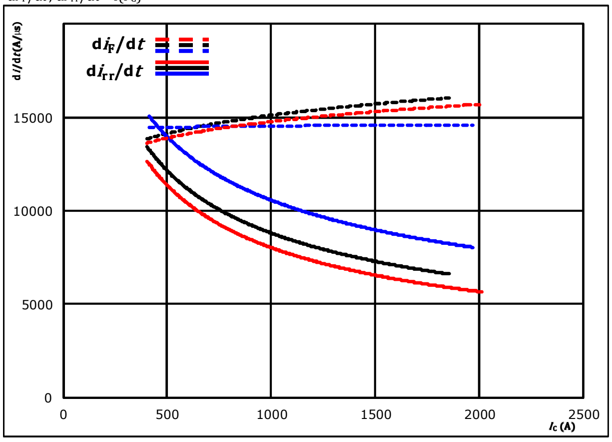


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-8 / 16	V		125 °C	solid
R_{gon} =	0,25	Ω		150 °C	dashed

figure 7. FWD

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

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

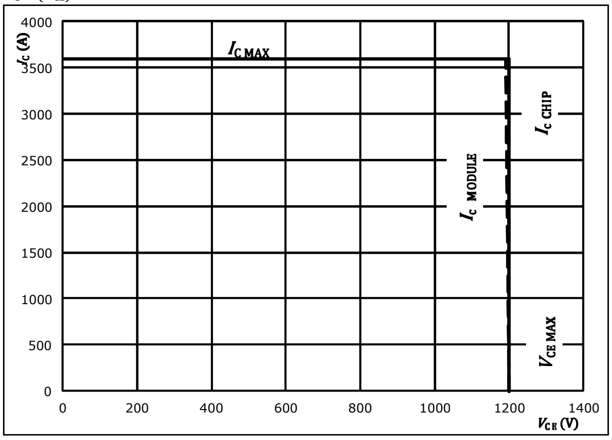


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	-8 / 16	V		125 °C
R_{gon} =	0,25	Ω		150 °C

figure 8. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	0,25	Ω
R_{goff} =	0,25	Ω

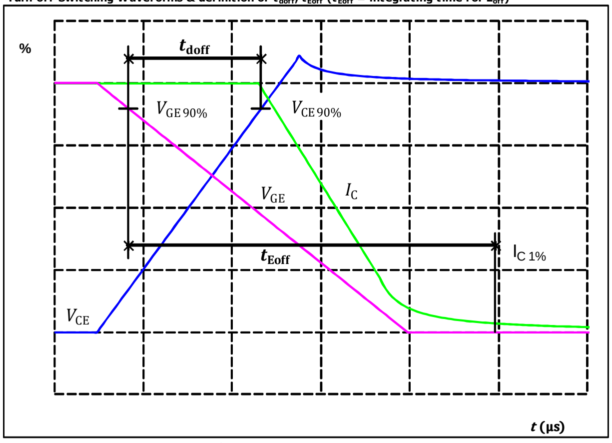
Vincotech

Buck Switching Definitions

General conditions		
T_j	=	125 °C
R_{gon}	=	0,25 Ω
R_{goff}	=	0,25 Ω

figure 1. IGBT

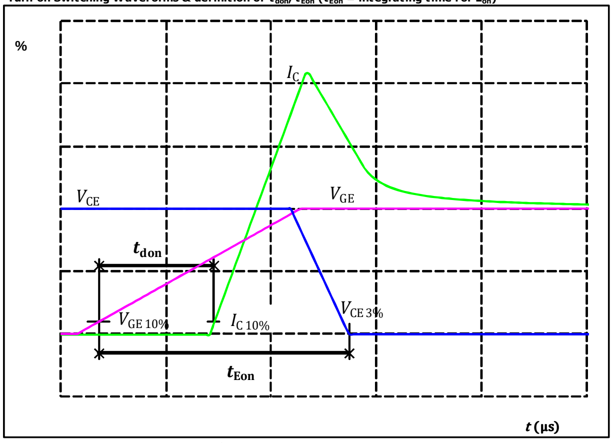
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-8	V
$V_{GE}(100\%)$ =	16	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	1200	A
t_{doff} =	314	ns

figure 2. IGBT

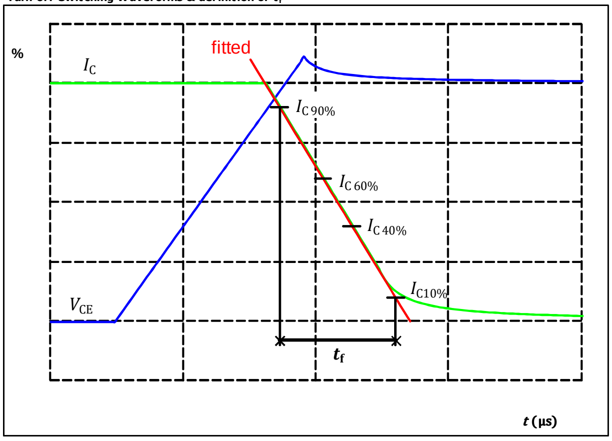
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-8	V
$V_{GE}(100\%)$ =	16	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	1200	A
t_{don} =	353	ns

figure 3. IGBT

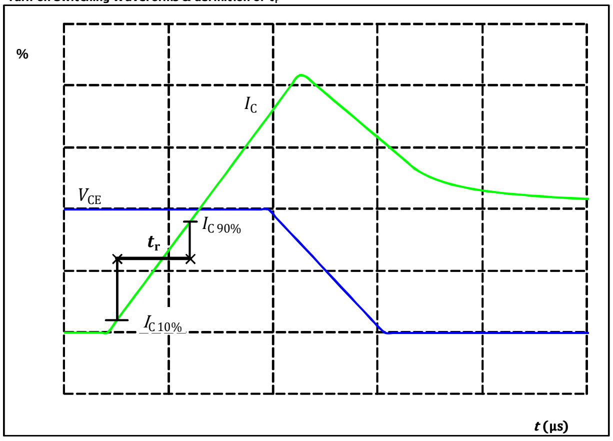
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	1200	A
t_f =	83	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

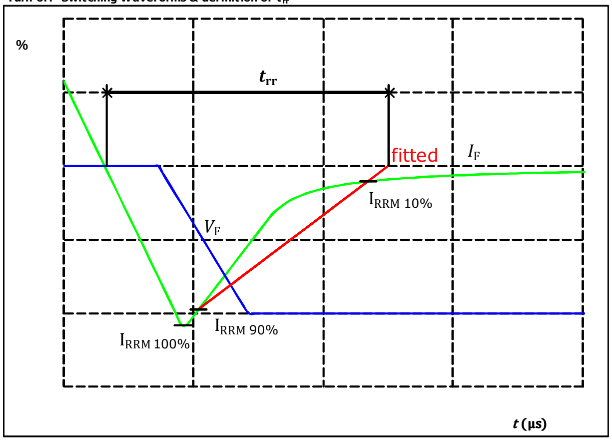


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	1200	A
t_r =	74	ns

Buck Switching Characteristics

figure 5. **FWD**

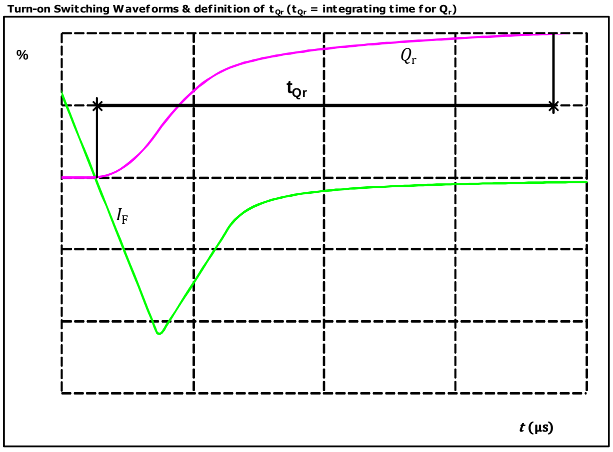
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	1200	A
I_{RRM} (100%) =	939	A
t_{rr} =	643	ns

figure 6. **FWD**

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



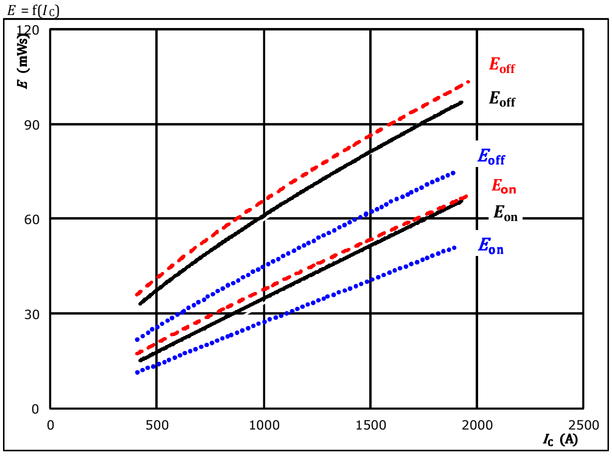
I_F (100%) =	1200	A
Q_r (100%) =	219,82	µC

Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



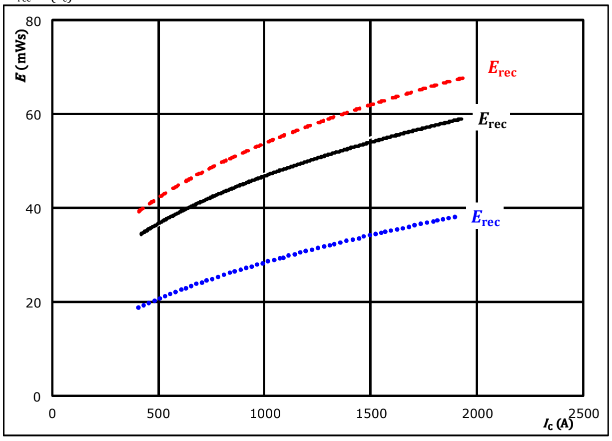
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	-8 / 16	V		125 °C (solid)
R_{gon} =	0,25	Ω		150 °C (dashed)
R_{goff} =	0,25	Ω		

figure 2. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



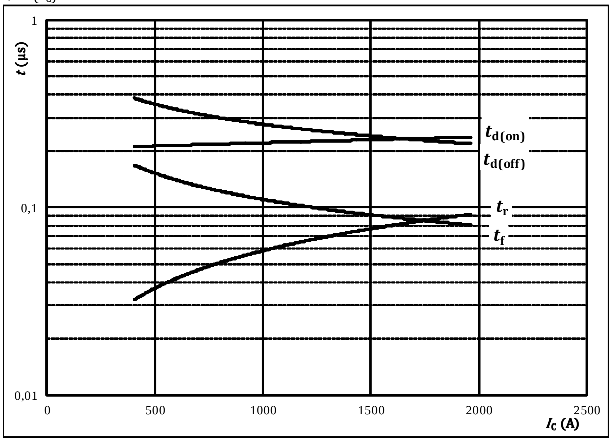
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	-8 / 16	V		125 °C (solid)
R_{gon} =	0,25	Ω		150 °C (dashed)

figure 3. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



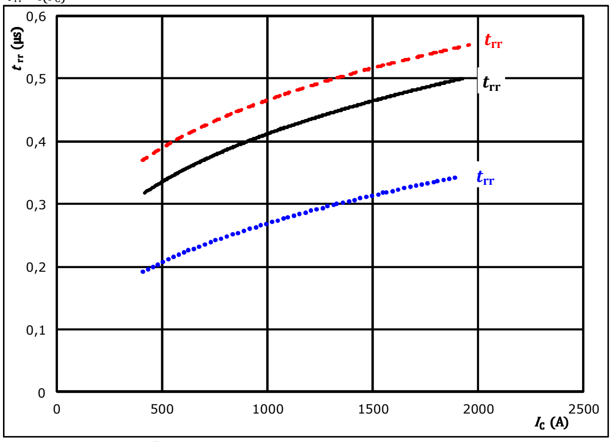
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-8 / 16	V
R_{gon} =	0,25	Ω
R_{goff} =	0,25	Ω

figure 4. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



At

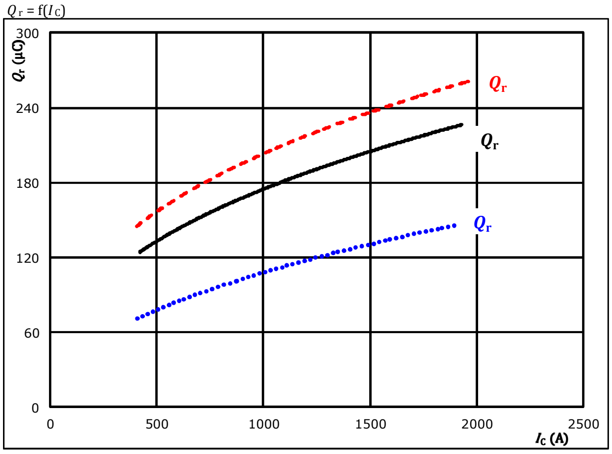
V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	-8 / 16	V		125 °C (solid)
R_{gon} =	0,25	Ω		150 °C (dashed)

Boost Switching Characteristics

figure 5. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

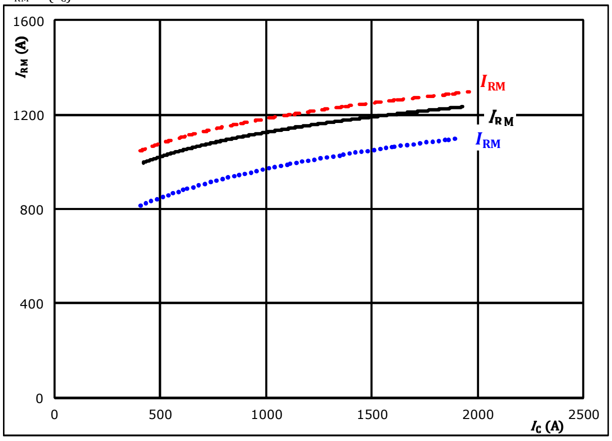


At					
V_{CE} =	350	V		25 °C	dotted
V_{GE} =	-8 / 16	V	T_j:	125 °C	solid
R_{gon} =	0,25	Ω		150 °C	dashed

figure 6. FWD

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

$I_{RM} = f(I_C)$

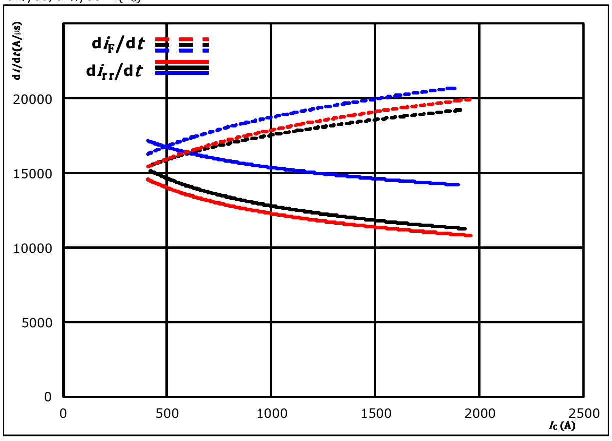


At					
V_{CE}:	350	V		25 °C	dotted
V_{GE} =	-8 / 16	V	T_j:	125 °C	solid
R_{gon} =	0,25	Ω		150 °C	dashed

figure 7. FWD

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

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

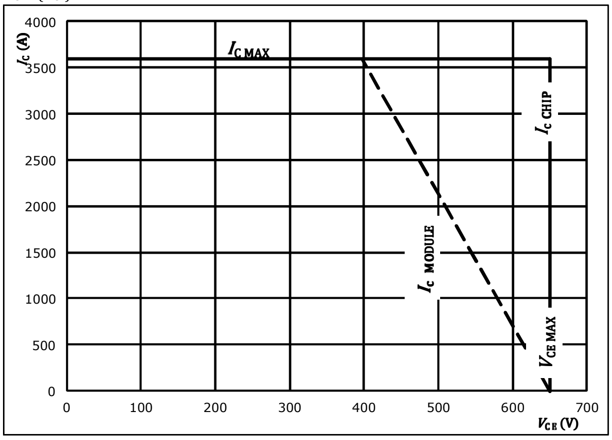


At				
V_{CE}:	350	V		25 °C
V_{GE} =	-8 / 16	V	T_j:	125 °C
R_{gon} =	0,25	Ω		150 °C

figure 8. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	0,25	Ω
R_{goff} =	0,25	Ω

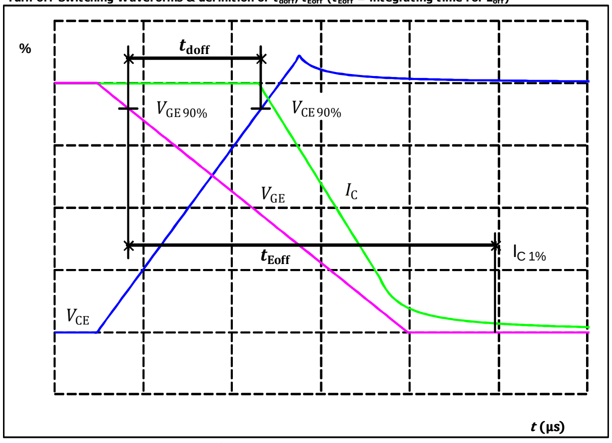
Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	0,25 Ω
R_{goff}	=	0,25 Ω

figure 1. **IGBT**

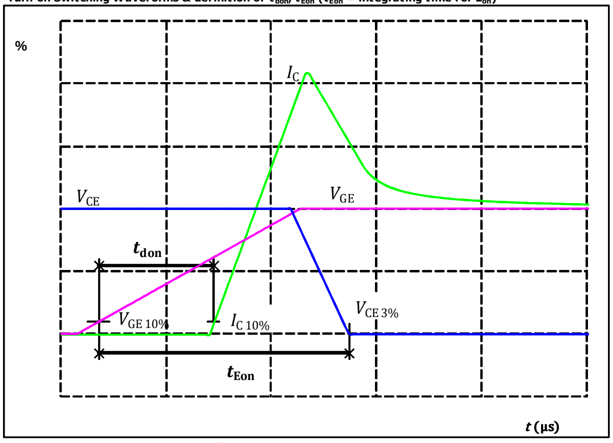
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE}(0%) =	-8	V
V_{GE}(100%) =	16	V
V_C(100%) =	350	V
I_C(100%) =	800	A
t_{doff} =	290	ns

figure 2. **IGBT**

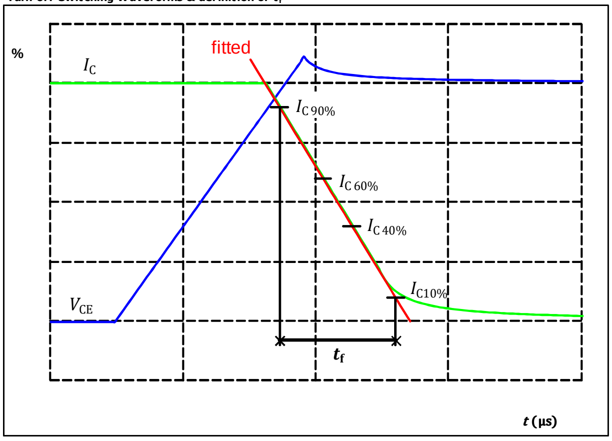
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE}(0%) =	-8	V
V_{GE}(100%) =	16	V
V_C(100%) =	350	V
I_C(100%) =	800	A
t_{don} =	220	ns

figure 3. **IGBT**

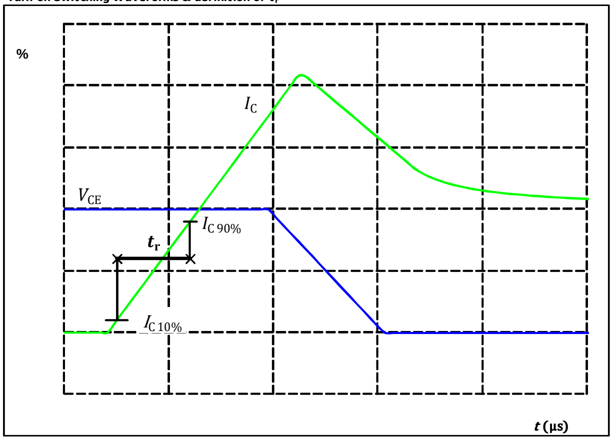
Turn-off Switching Waveforms & definition of t_f



V_C(100%) =	350	V
I_C(100%) =	800	A
t_f =	103	ns

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

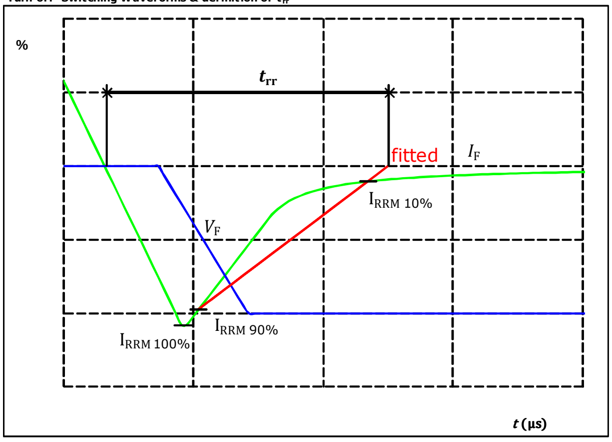


V_C(100%) =	350	V
I_C(100%) =	800	A
t_r =	48	ns

Boost Switching Characteristics

figure 5. FWD

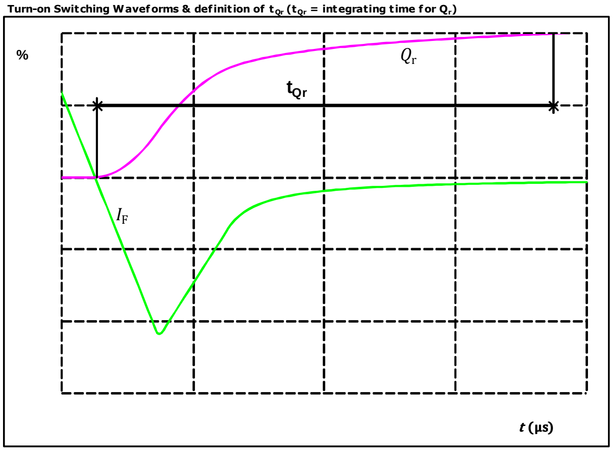
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	800	A
I_{RRM} (100%) =	1112	A
t_{rr} =	385	ns

figure 6. FWD

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



I_F (100%) =	800	A
Q_r (100%) =	161,46	µC

70-W612NMA1K8M702-LC09FP70

datasheet

Vincotech

Ordering Code & Marking

Version	Ordering Code
without thermal paste	70-W612NMA1K8M702-LC09FP70
with thermal paste	70-W612NMA1K8M702-LC09FP70-/3/

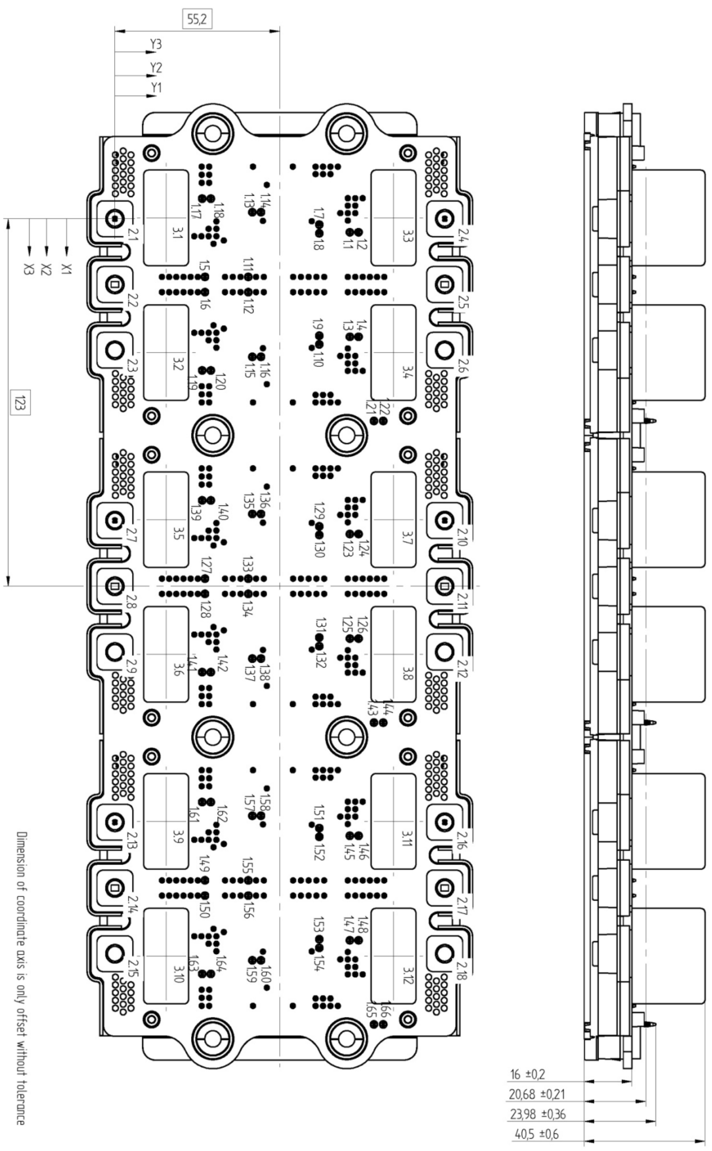
Name / YK/Date code / Lot / Serial / Vincotech UL							
	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
		TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

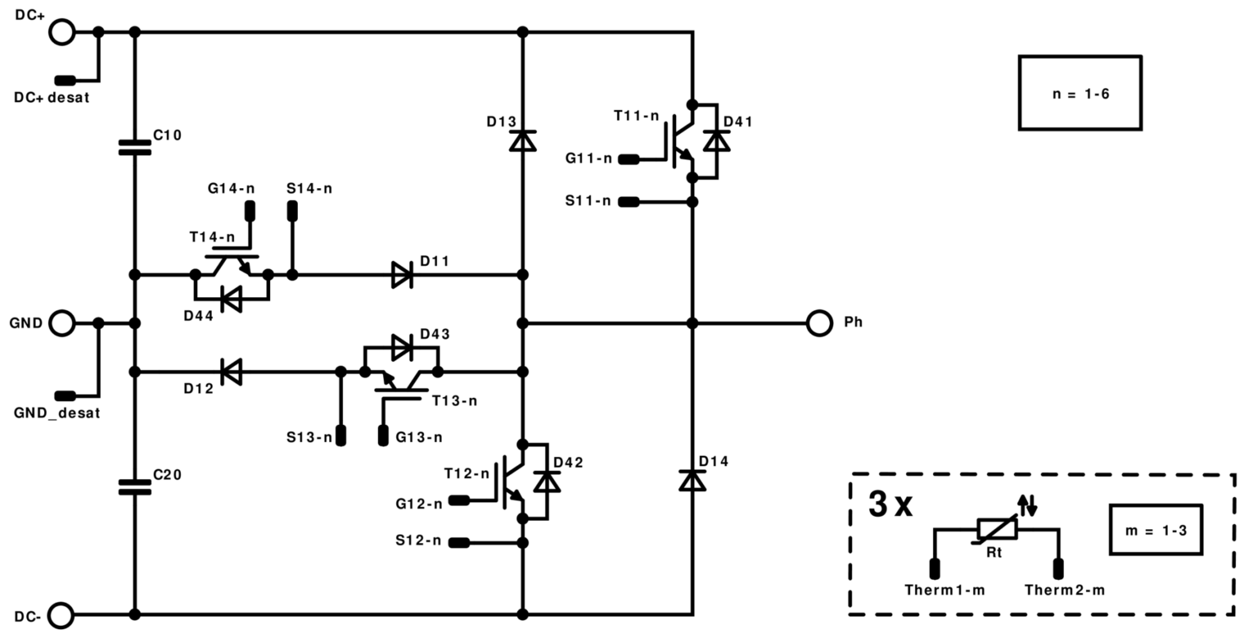
Driver pins				Driver pins			
Pin	X1	Y1	Function	Pin	X1	Y1	Function
1.1	4,5	78,65	G11-1	1.52	206,85	68,4	G14-5
1.2	4,5	81,55	S11-1	1.53	241,15	68,4	G14-6
1.3	39,5	78,65	G11-2	1.54	244,05	68,4	S14-6
1.4	39,5	81,55	S11-2	1.55	221,45	44,65	GND_desat
1.5	19,45	30,15	DC+desat	1.56	226,55	44,65	GND_desat
1.6	24,55	30,15	DC+desat	1.57	199,8	46	G13-5
1.7	1,95	68,4	S14-1	1.58	199,8	48,9	S13-5
1.8	4,85	68,4	G14-1	1.59	248,2	46	G13-6
1.9	39,15	68,4	G14-2	1.60	248,2	48,9	S13-6
1.10	42,05	68,4	S14-2	1.61	195,25	29,2	S12-5
1.11	19,45	44,65	GND_desat	1.62	195,25	32,1	G12-5
1.12	24,55	44,65	GND_desat	1.63	252,75	29,2	S12-6
1.13	-2,2	46	G13-1	1.64	252,75	32,1	G12-6
1.14	-2,2	48,9	S13-1	1.65	269,65	86,7	Therm2-3
1.15	46,2	46	G13-2	1.66	269,65	89,8	Therm1-3
1.16	46,2	48,9	S13-2				
1.17	-6,75	29,2	S12-1				
1.18	-6,75	32,1	G12-1				
1.19	50,75	29,2	S12-2				
1.20	50,75	32,1	G12-2				
1.21	67,65	86,7	Therm2-1				
1.22	67,65	89,8	Therm1-1				
1.23	105,5	78,65	G11-3				
1.24	105,5	81,55	S11-3				
1.25	140,5	78,65	G11-4				
1.26	140,5	81,55	S11-4				
1.27	120,45	30,15	DC+desat				
1.28	125,55	30,15	DC+desat				
1.29	102,95	68,4	S14-3				
1.30	105,85	68,4	G14-3				
1.31	140,15	68,4	G14-4				
1.32	143,05	68,4	S14-4				
1.33	120,45	44,65	GND_desat				
1.34	125,55	44,65	GND_desat				
1.35	98,8	46	G13-3				
1.36	98,8	48,9	S13-3				
1.37	147,2	46	G13-4				
1.38	147,2	48,9	S13-4				
1.39	94,25	29,2	S12-3				
1.40	94,25	32,1	G12-3				
1.41	151,75	29,2	S12-4				
1.42	151,75	32,1	G12-4				
1.43	168,65	86,7	Therm2-2				
1.44	168,65	89,8	Therm1-2				
1.45	206,5	78,65	G11-5				
1.46	206,5	81,55	S11-5				
1.47	241,5	78,65	G11-6				
1.48	241,5	81,55	S11-6				
1.49	221,45	30,15	DC+desat				
1.50	226,55	30,15	DC+desat				
1.51	203,95	68,4	S14-5				

Power connections			
M6 screw	X2	Y2	Function
2.1	0	0	Phase
2.2	22	0	Phase
2.3	44	0	Phase
2.4	0	110,4	DC+
2.5	22	110,4	Neutral
2.6	44	110,4	DC-
2.7	101	0	Phase
2.8	123	0	Phase
2.9	145	0	Phase
2.10	101	110,4	DC+
2.11	123	110,4	Neutral
2.12	145	110,4	DC-
2.13	202	0	Phase
2.14	224	0	Phase
2.15	246	0	Phase
2.16	202	110,4	DC+
2.17	224	110,4	Neutral
2.18	246	110,4	DC-

Capacitor positions		
Capacitor	X3	Y3
3.1	-0,3	17,15
3.2	44,8	17,15
3.3	-0,3	93,25
3.4	44,8	93,25
3.5	100,7	17,15
3.6	145,8	17,15
3.7	100,7	93,25
3.8	145,8	93,25
3.9	201,7	17,15
3.10	246,8	17,15
3.11	201,7	93,25
3.12	246,8	93,25



Pinout



NOTE: Driver pins for parallel devices are not connected inside the module!

Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	1800 A	Buck Switch	
D11, D12	FWD	650 V	1800 A	Buck Diode	
D41, D42	FWD	1200 V	90 A	Buck Sw. Protection Diode	
T13, T14	IGBT	650 V	1800 A	Boost Switch	
D13, D14	FWD	1200 V	1800 A	Boost Diode	
D43, D44	FWD	650 V	120 A	Boost Sw. Protection Diode	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	NTC			Thermistor	

70-W612NMA1K8M702-LC09FP70
datasheet

Vincotech

Packaging instruction				
Standard packaging quantity (SPQ) 4	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for VINco X12 packages see vincotech.com website.

Package data
Package data for VINco X12 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.

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