Vincotech

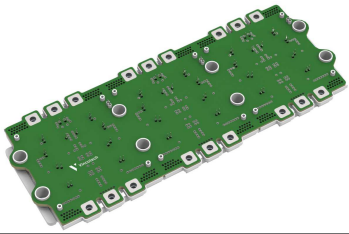
70-W624NIA1K2M702-L400FP70
datasheet

VINcoNPC X12 **1500 V / 1200 A**

Features

- Low inductive package
- Enables four-quadrant operation
- High efficiency

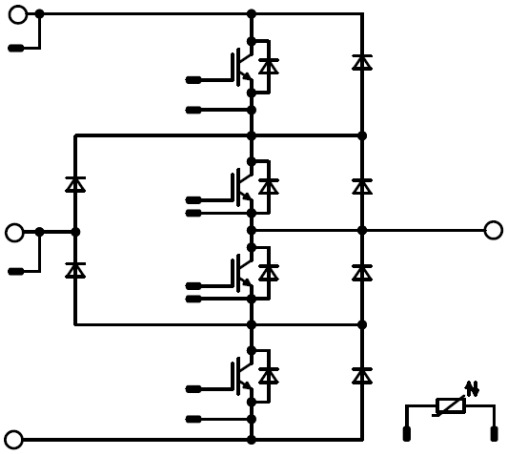
VINco X12 housing



Target applications

- Solar Inverters
- UPS

Schematic



Types

- 70-W624NIA1K2M702-L400FP70

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	1270	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	2400	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	2375	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}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	826	A
Repetitive peak forward current	I_{FRM}		2400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	1358	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	104	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	270	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	1270	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	2400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	2375	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	826	A
Repetitive peak forward current	I_{FRM}		2400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	1358	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}		1200	V
Continuous (direct) forward current	I_F	T_j = T_{jmax} T_s = 80 °C	826	A
Repetitive peak forward current	I_{FRM}		2400	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	1358	W
Maximum junction temperature	T_{jmax}		175	°C
Boost 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	104	A
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	270	W
Maximum junction temperature	T_{jmax}		175	°C
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…(T_{jmax} - 25)	°C
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			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,12	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		1200	25 125 150		1,53 1,70 1,75	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			1320	µA
Gate-emitter leakage current	I_{GES}		20	0		25			6	µA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}		0	10		25		252		nF
Output capacitance	C_{oes}							8,4		
Reverse transfer capacitance	C_{res}							3,36		
Gate charge	Q_g		15	600	1200	25		7800		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,040		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 0,417 Ω R_{gon} = 0,417 Ω	16/-8	600	1190	25 125 150		166 152 154		ns
Rise time	t_r					25 125 150		42 45 47		
Turn-off delay time	$t_{d(off)}$					25 125 150		217 249 257		
Fall time	t_f					25 125 150		74 85 101		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 122 µC Q_{rFWD} = 194 µC Q_{rFWD} = 207 µC				25 125 150		88 110 117		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		77 108 117		

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				1200	25 125		1,82 1,96	2,1	V
Reverse leakage current	I_R			1200		25			720	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,07		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 20584 A/µs di/dt = 24636 A/µs di/dt = 23099 A/µs	16/-8	600	1190	25 125 150		1081 1228 1262		A
Reverse recovery time	t_{rr}					25 125 150		270 408 431		ns
Recovered charge	Q_r					25 125 150		122 194 207		µC
Reverse recovered energy	E_{rec}					25 125 150		42,0 73,7 78,2		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		13899 12695 12576		A/µs
Buck Sw. Protection Diode										
Static										
Forward voltage	V_F				90	25		2,38	2,71	V
Reverse leakage current	I_R			1200		25 150			0,36 10,8	mA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,35		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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,12	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		1200	25 125 150		1,53 1,70 1,75	2,05	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			1320	µA
Gate-emitter leakage current	I_{GES}		20	0		25			6	µA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}		0	10		25		252		nF
Output capacitance	C_{oes}							8,4		
Reverse transfer capacitance	C_{res}							3,36		
Gate charge	Q_g		15	600	1200	25		7800		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,040		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 0,417 Ω R_{gon} = 0,417 Ω	16/-8	600	1179	25 125 150		163 156 157		ns
Rise time	t_r					25 125 150		44 42 45		
Turn-off delay time	$t_{d(off)}$					25 125 150		227 250 263		
Fall time	t_f					25 125 150		71 95 103		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 119 µC Q_{rFWD} = 192 µC Q_{rFWD} = 216 µC				25 125 150		85 98 104		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		76 107 114		

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				1200	25 125		1,82 1,96	2,1	V
Reverse leakage current	I_R			1200		25			720	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,07		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 21875 A/µs di/dt = 26999 A/µs di/dt = 25438 A/µs	16/-8	600	1179	25 125 150		951 1173 1199		A
Reverse recovery time	t_{rr}					25 125 150		286 413 452		ns
Recovered charge	Q_r					25 125 150		119 192 216		µC
Reverse recovered energy	E_{rec}					25 125 150		41 72 82		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		7710 8389 8083		A/µs
Boost Sw.Inv.Diode										
Static										
Forward voltage	V_F				1200	25 125		1,82 1,96	2,1	V
Reverse leakage current	I_R			1200		25			720	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,07		K/W

Characteristic Values

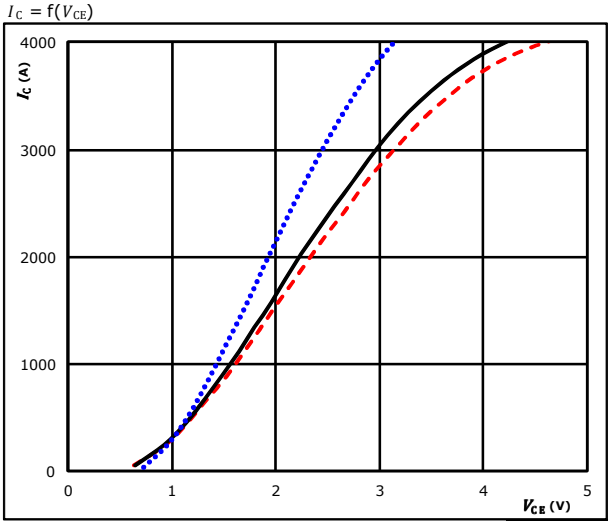
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				90	25		2,38	2,71	V
Reverse leakage current	I_R			1200		25 150			0,36 10,8	mA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,35		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

$I_C = f(V_{CE})$

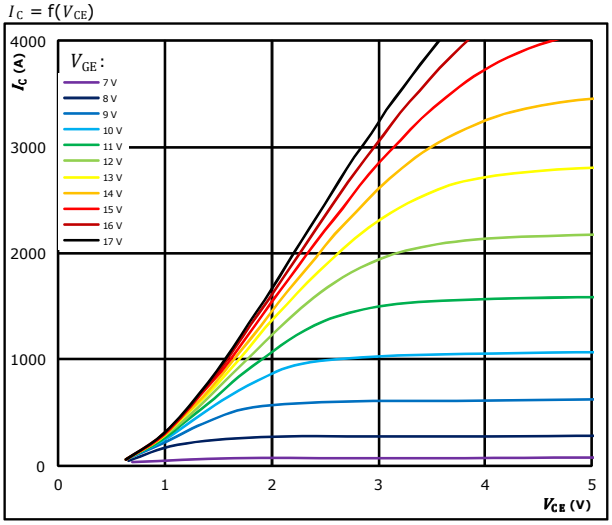


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

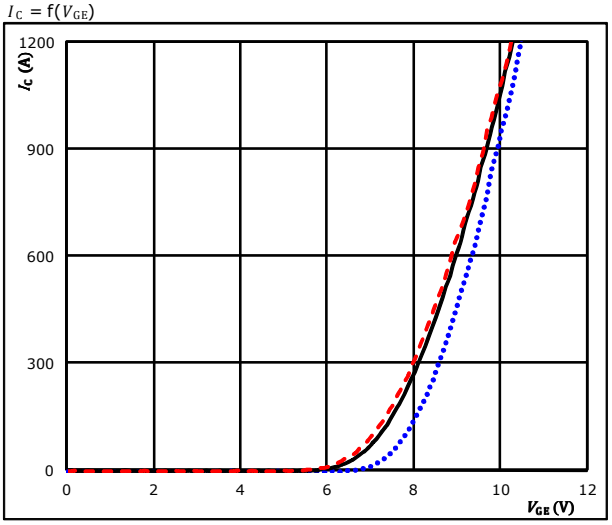


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

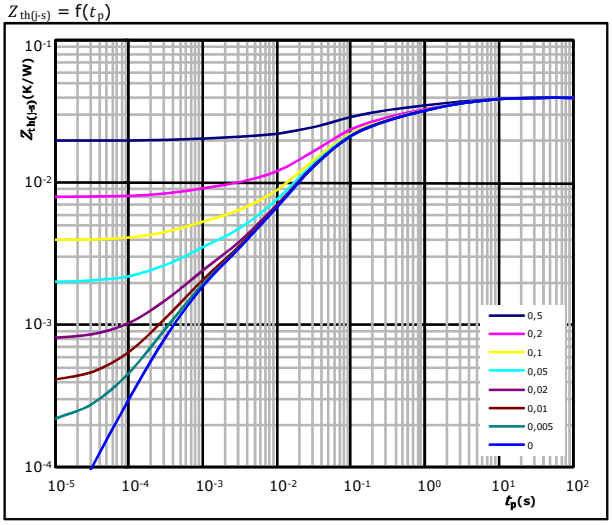


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,040	K/W

IGBT thermal model values

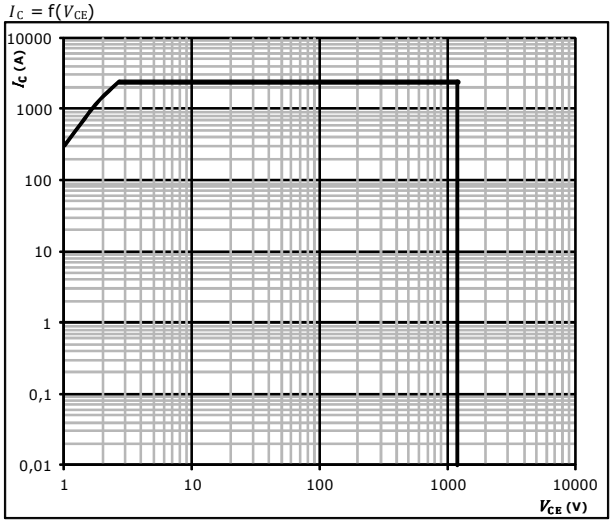
R (K/W)	τ (s)
4,77E-03	9,47E-01
7,48E-03	2,04E-01
7,36E-03	3,92E-02
1,45E-02	8,36E-03
3,81E-03	2,61E-03
8,43E-04	3,68E-04
1,21E-03	8,72E-05

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



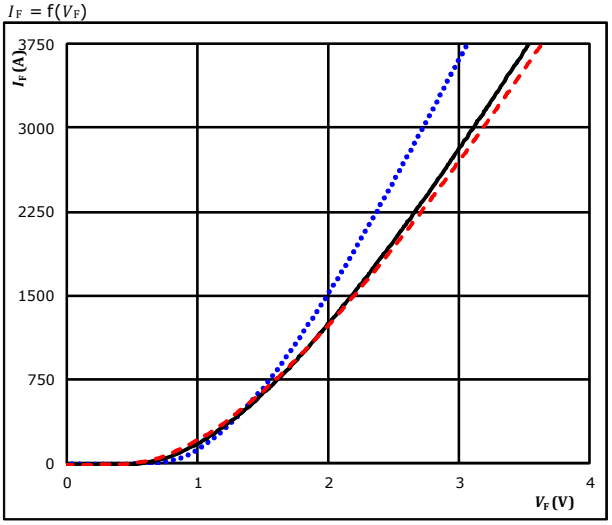
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



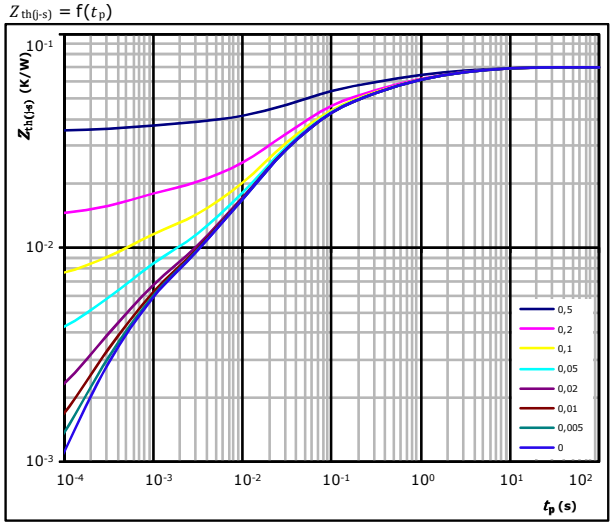
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,07 K/W

FWD thermal model values

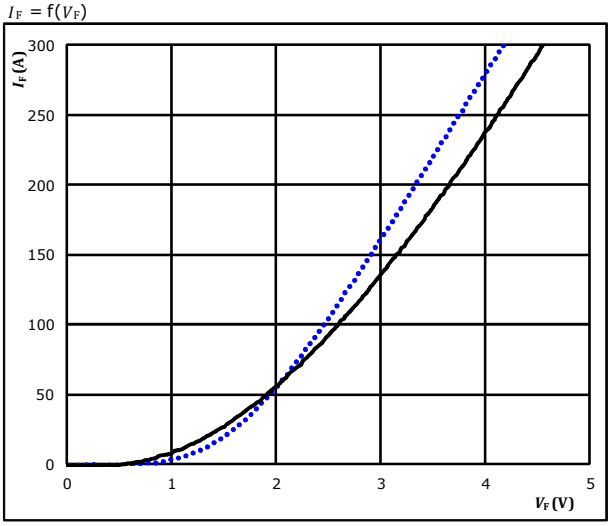
R (K/W)	τ (s)
4,91E-03	1,04E+00
1,02E-02	2,14E-01
1,57E-02	4,54E-02
2,42E-02	7,86E-03
8,72E-03	2,17E-03
2,15E-03	3,47E-04
4,02E-03	7,64E-05

Buck Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

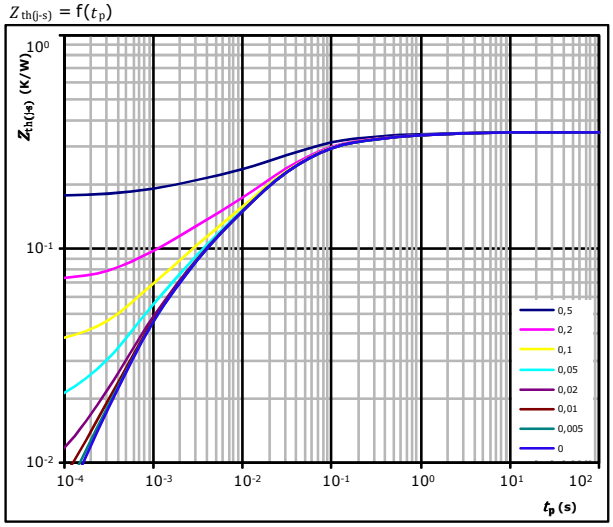
T_j: 25 °C

125 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,35 K/W

FWD thermal model values

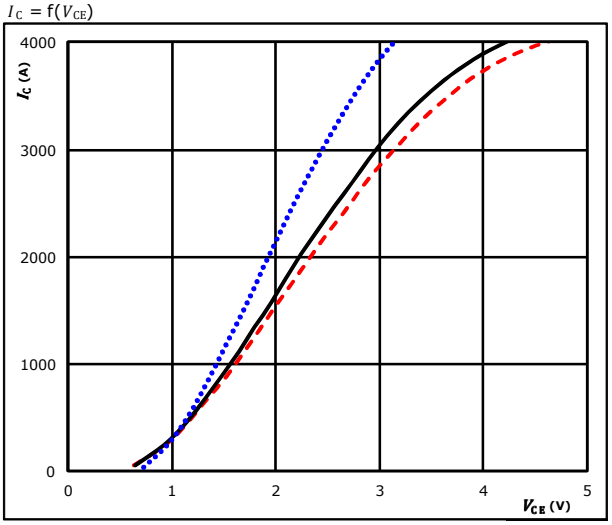
R (K/W)	τ (s)
1,68E-02	5,53E-01
3,42E-02	7,61E-02
1,32E-01	1,28E-02
9,39E-02	3,66E-03
3,70E-02	9,02E-04
3,86E-02	2,43E-04

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

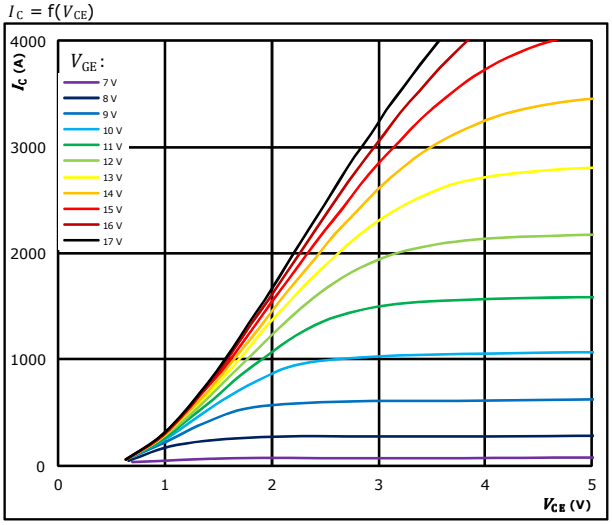


t_p =	250	µs		25 °C	
V_{GE} =	15	V	T_j:	125 °C	
				150 °C	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

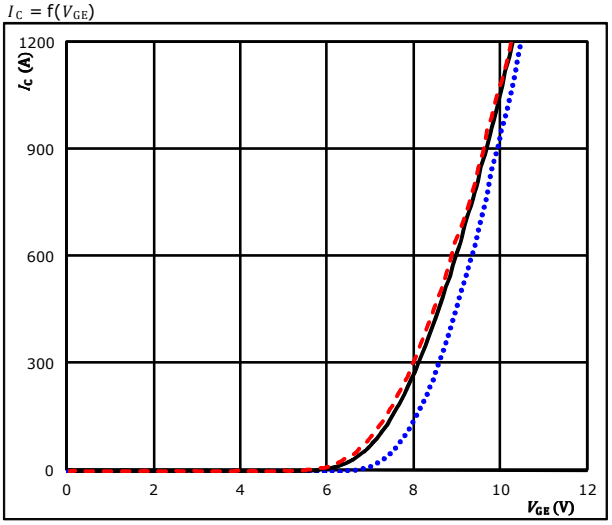


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

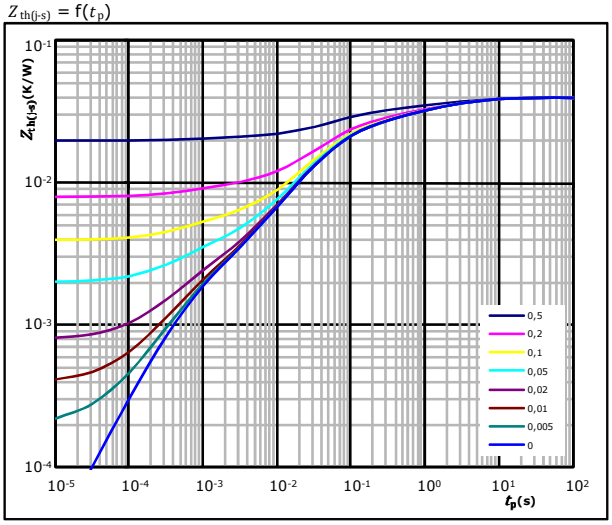


t_p =	100	µs		25 °C	
V_{CE} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,040	K/W

IGBT thermal model values

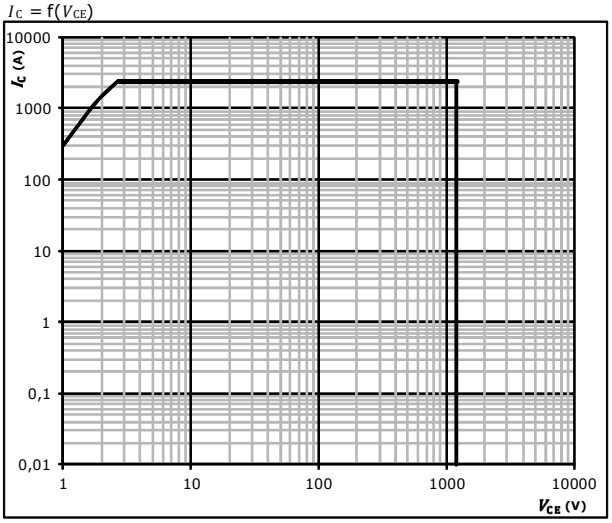
R (K/W)	τ (s)
4,77E-03	9,47E-01
7,48E-03	2,04E-01
7,36E-03	3,92E-02
1,45E-02	8,36E-03
3,81E-03	2,61E-03
8,43E-04	3,68E-04
1,21E-03	8,72E-05

Boost Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



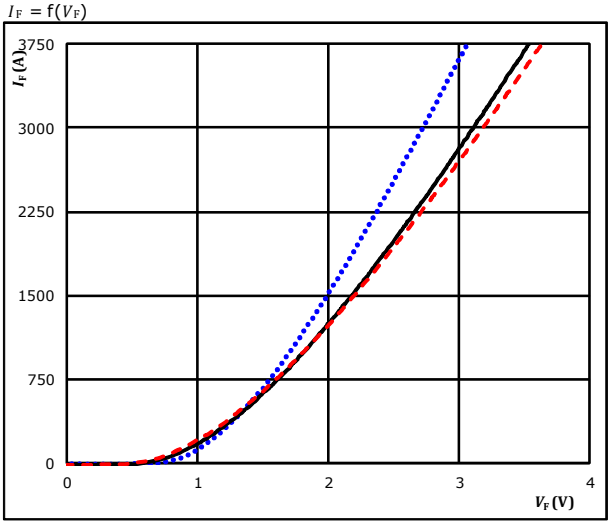
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



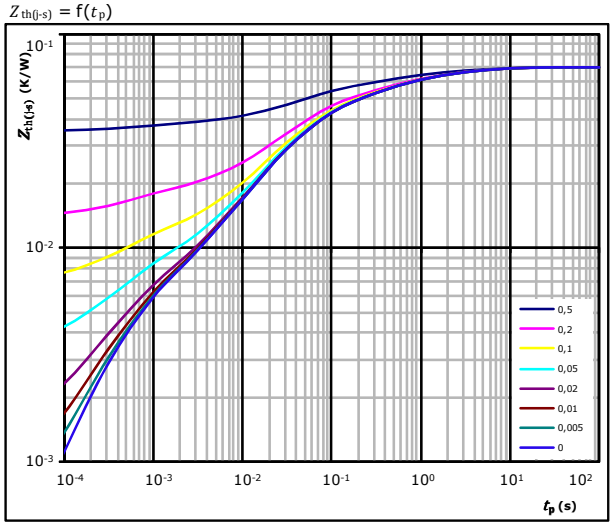
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,07 K/W

FWD thermal model values

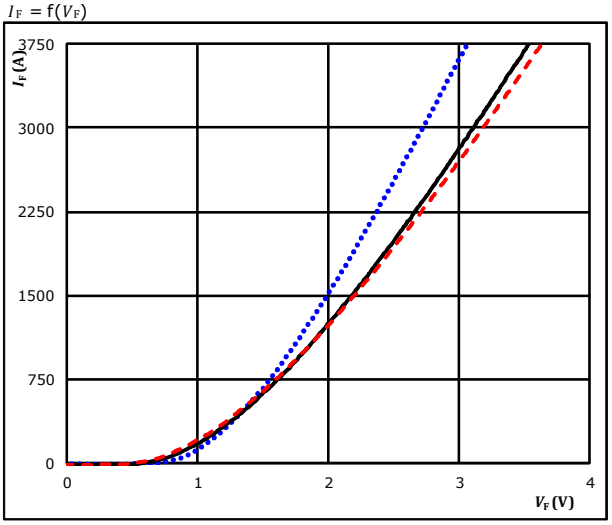
R (K/W)	τ (s)
4,91E-03	1,04E+00
1,02E-02	2,14E-01
1,57E-02	4,54E-02
2,42E-02	7,86E-03
8,72E-03	2,17E-03
2,15E-03	3,47E-04
4,02E-03	7,64E-05

Boost Sw.Inv.Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



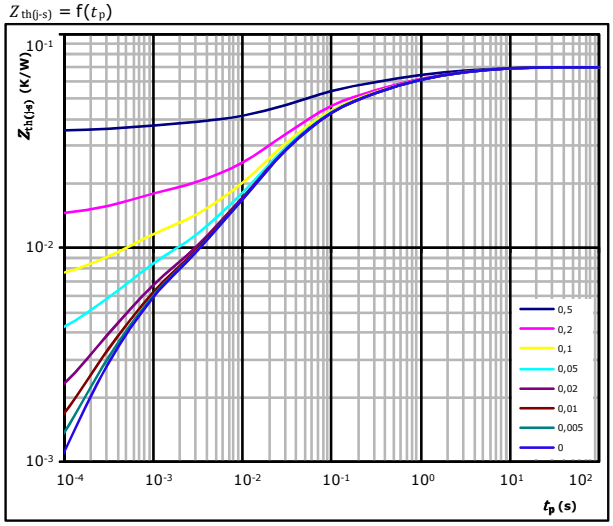
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,07 K/W

FWD thermal model values

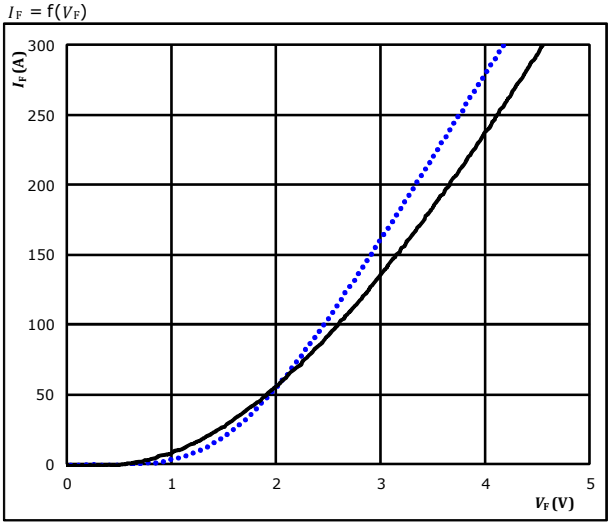
R (K/W)	τ (s)
4,91E-03	1,04E+00
1,02E-02	2,14E-01
1,57E-02	4,54E-02
2,42E-02	7,86E-03
8,72E-03	2,17E-03
2,15E-03	3,47E-04
4,02E-03	7,64E-05

Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

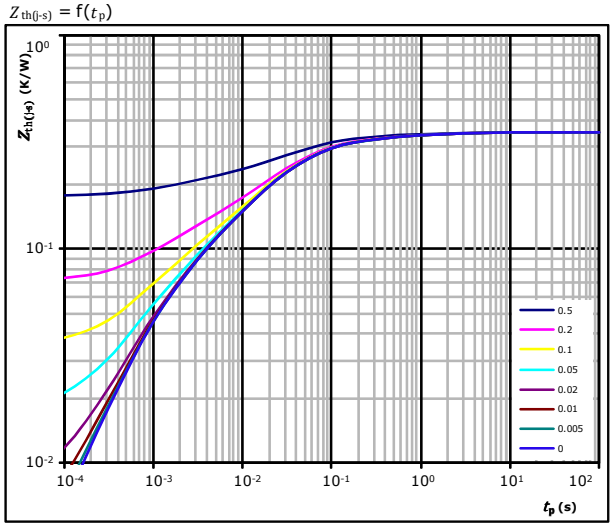
T_j: 25 °C

125 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,35 K/W

FWD thermal model values

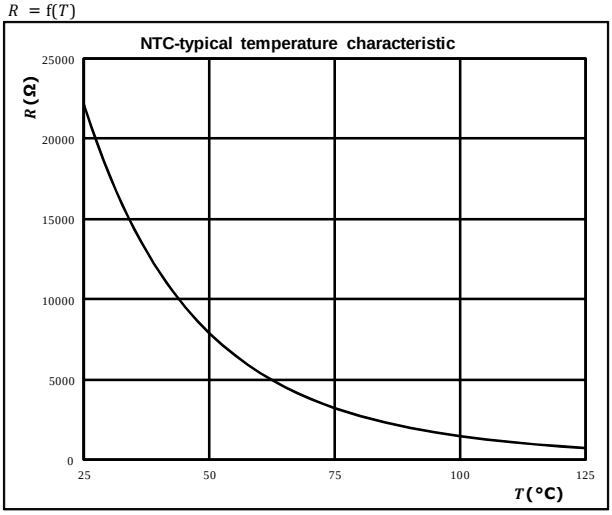
R (K/W)	τ (s)
1,68E-02	5,53E-01
3,42E-02	7,61E-02
1,32E-01	1,28E-02
9,39E-02	3,66E-03
3,70E-02	9,02E-04
3,86E-02	2,43E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

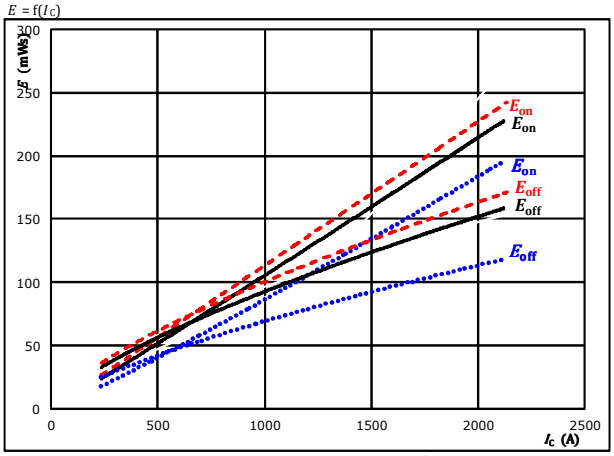


Buck Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



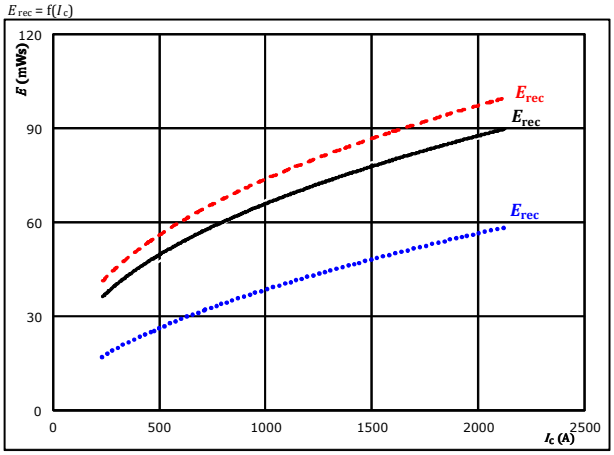
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	16/-8	V		125 °C
R_{gon} =	0,417	Ω		150 °C
R_{goff} =	0,417	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

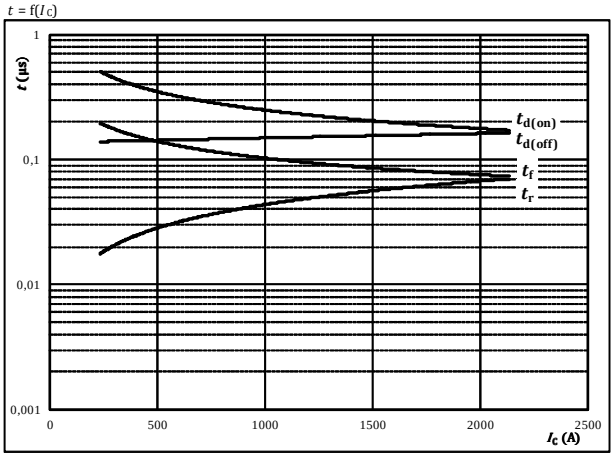
V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	16/-8	V		125 °C
R_{gon} =	0,417	Ω		150 °C

Buck Switching Characteristics

figure 3. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



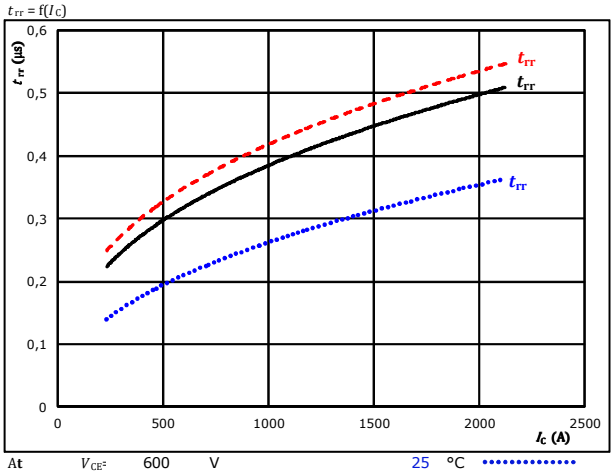
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	16/-8	V
R_{gon} =	0,417	Ω
R_{goff} =	0,417	Ω

figure 4. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



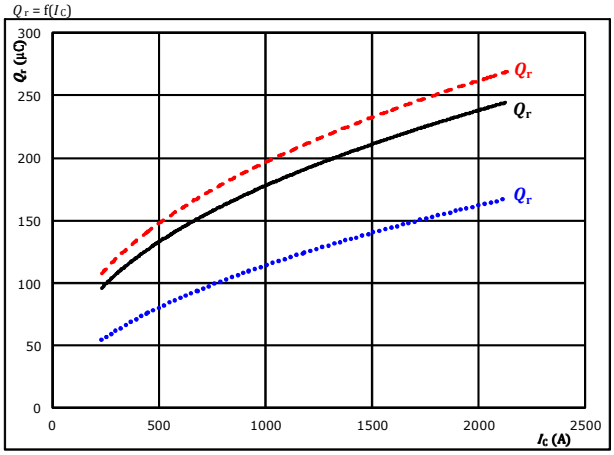
At	V_{CE} =	600	V	T_j:	25 °C
	V_{GE} =	16/-8	V		125 °C
	R_{gon} =	0,417	Ω		150 °C

Buck Switching Characteristics

figure 5. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

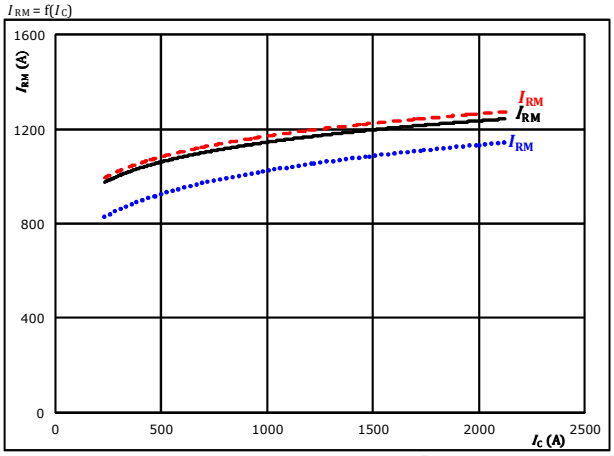


At	V_{CE} =	600	V		25 °C	
	V_{GE} =	16/-8	V	T_j:	125 °C	
	R_{gon} =	0,417	Ω		150 °C	

figure 6. **FWD**

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

$I_{RM} = f(I_C)$



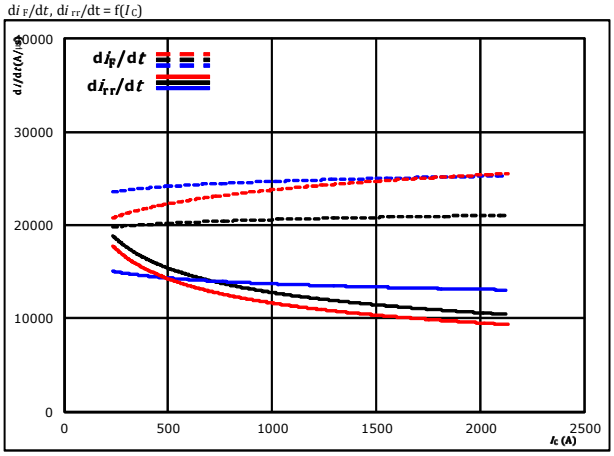
At	V_{CE}:	600	V		25 °C	
	V_{GE} =	16/-8	V	T_j:	125 °C	
	R_{gon} =	0,417	Ω		150 °C	

Buck Switching Characteristics

figure 7. **FWD**

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

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

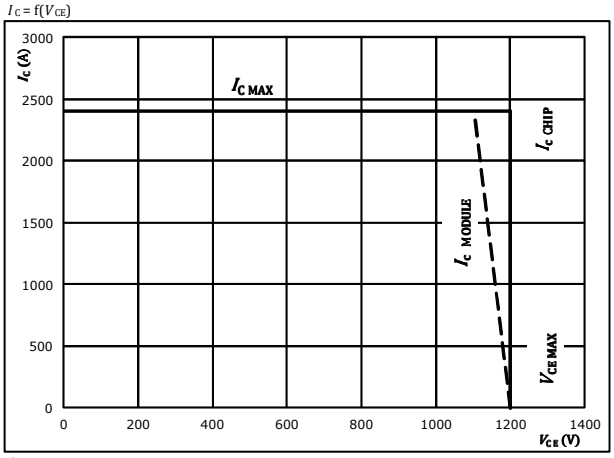


At	V_{CE} =	600	V		
	V_{GE} =	16/-8	V	T_j:	25 °C
	R_{gon} =	0,417	Ω		125 °C
					150 °C

figure 8. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C	
R_{gon} =	0,417	Ω	
R_{goff} =	0,417	Ω	

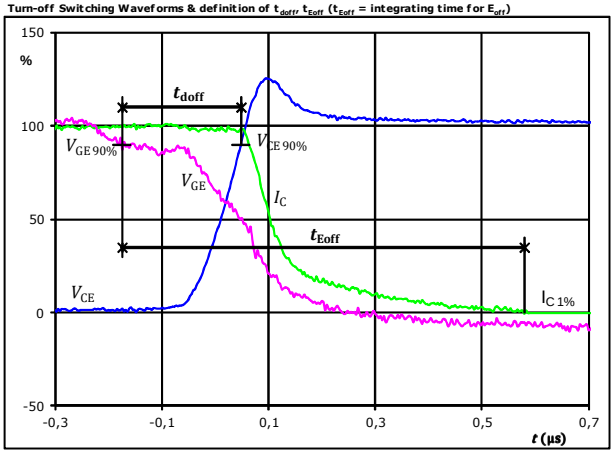
Buck Switching Definitions

General conditions

T_j	=	**125 °C**
R_{gon}	=	**0,417 Ω**
R_{goff}	=	**0,417 Ω**

figure 1. **IGBT**

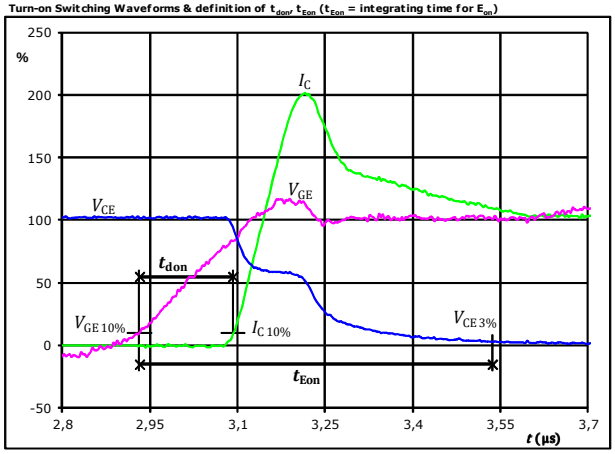
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-8	V
$V_{GE}(100\%)$ =	16	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1209	A
t_{doff} =	0,249	µs
t_{Eoff} =	0,754	µs

figure 2. **IGBT**

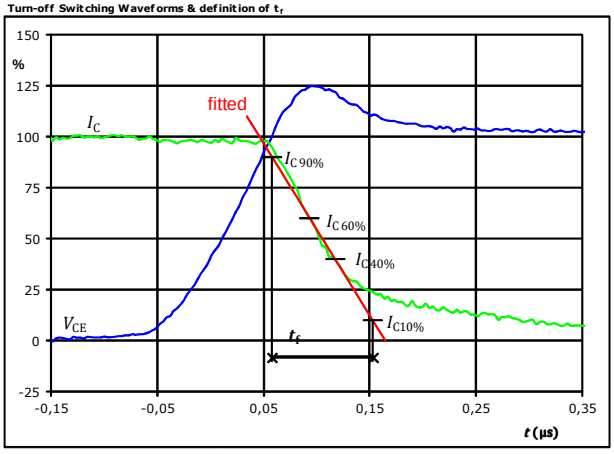
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-8	V
$V_{GE}(100\%)$ =	16	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1209	A
t_{don} =	0,152	µs
t_{Eon} =	0,604	µs

figure 3. **IGBT**

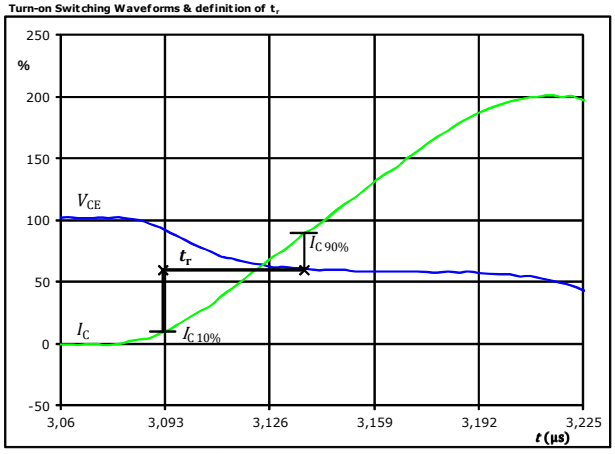
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1209	A
t_f =	0,085	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

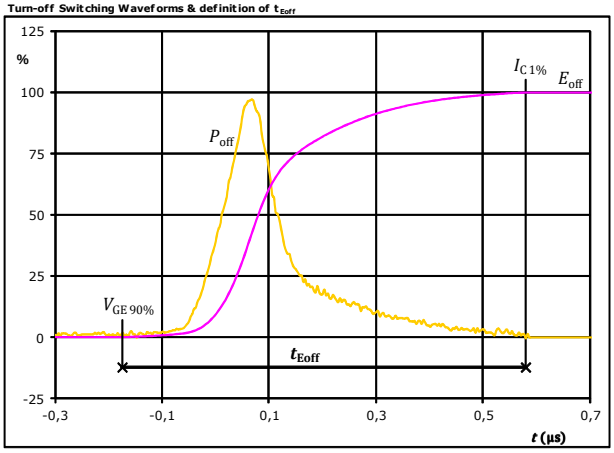


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1209	A
t_r =	0,045	µs

Buck Switching Characteristics

figure 5. **IGBT**

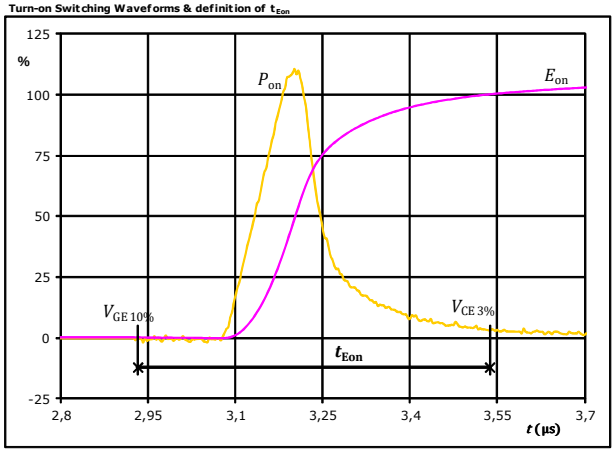
Turn-off Switching Waveforms & definition of t_{Eoff}



$P_{off}(100\%)$ =	725,65	kW
$E_{off}(100\%)$ =	108,21	mJ
t_{Eoff} =	0,75	µs

figure 6. **IGBT**

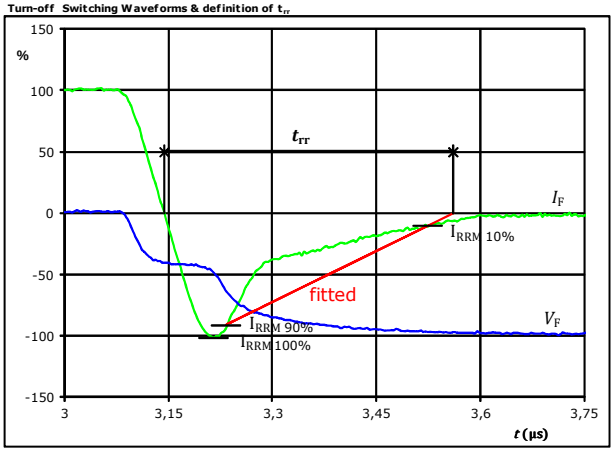
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%)$ =	725,65	kW
$E_{on}(100\%)$ =	109,70	mJ
t_{Eon} =	0,60	µs

figure 7. **FWD**

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

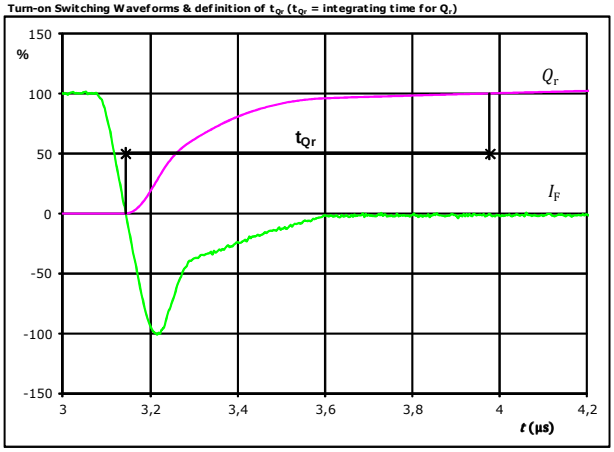


$V_F(100\%)$ =	600	V
$I_F(100\%)$ =	1209	A
$I_{RRM}(100\%)$ =	-1228	A
t_{rr} =	0,408	µs

Buck Switching Characteristics

figure 8. FWD

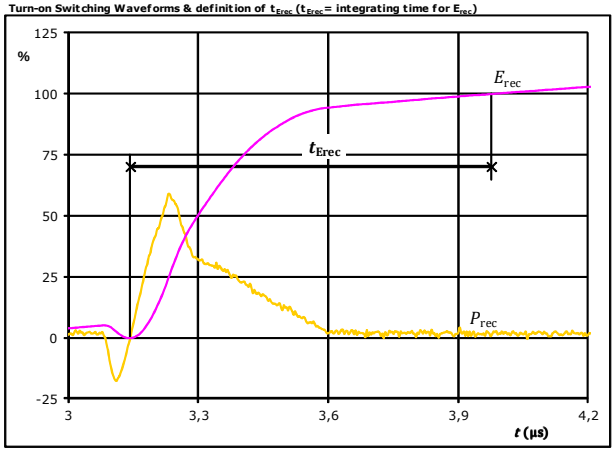
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	1209	A
Q_r (100%) =	194,17	µC
t_{Qr} =	0,83	µs

figure 9. FWD

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

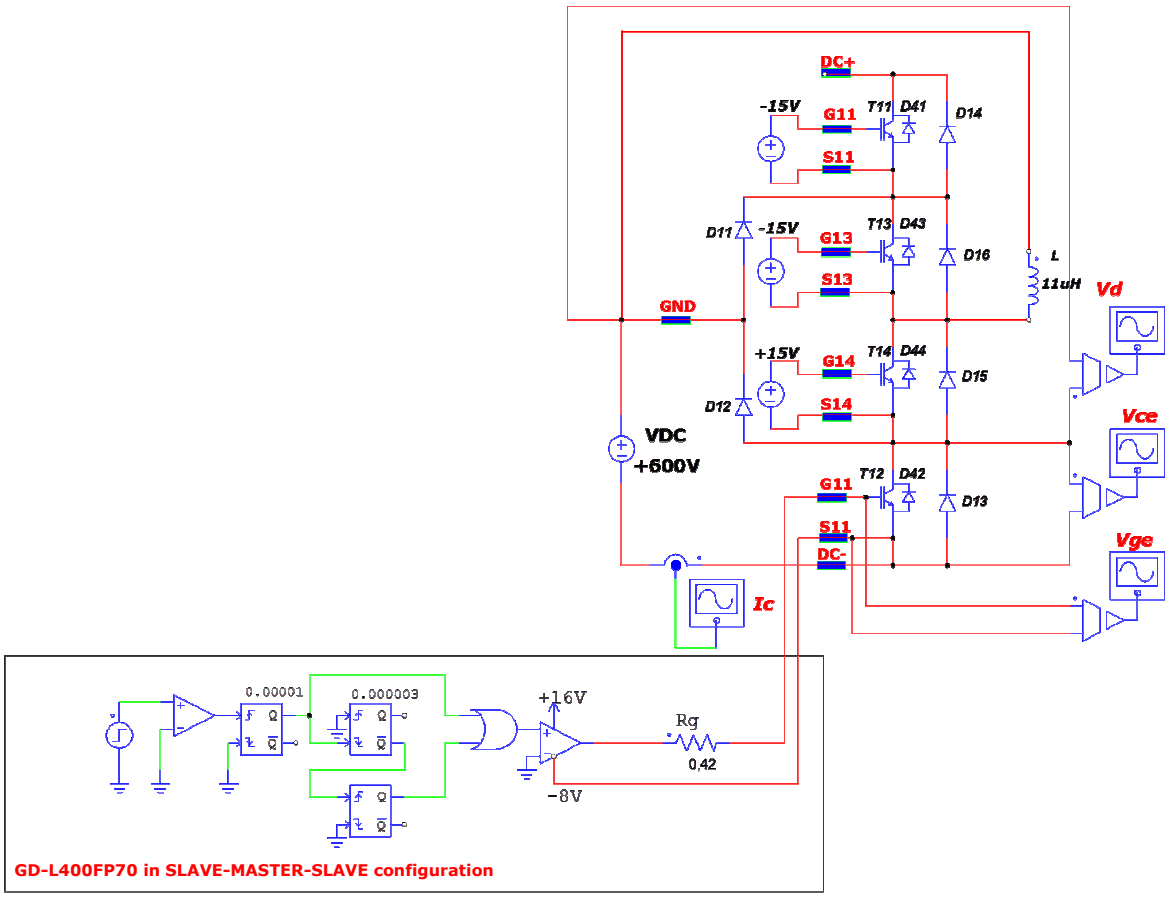


P_{rec} (100%) =	725,65	kW
E_{rec} (100%) =	73,73	mJ
t_{Erec} =	0,83	µs

Gate Driver at measurement

For more information see L40x gate driver application note

T12-D12 Switching measurement circuit

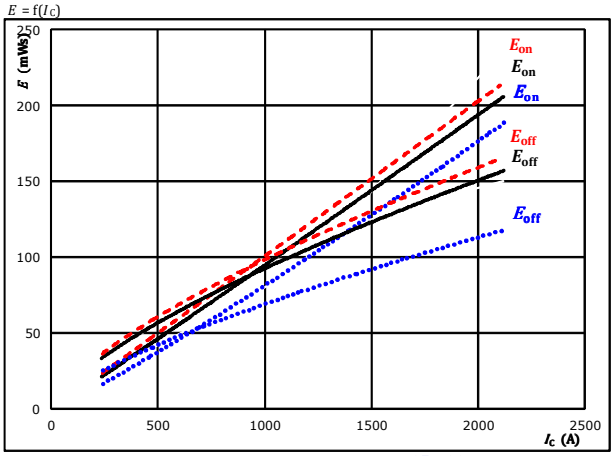


Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



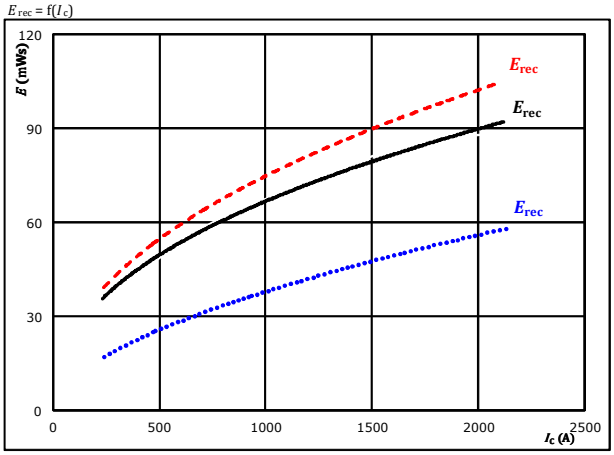
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	16/-8	V		125 °C
R_{gon} =	0,417	Ω		150 °C
R_{goff} =	0,417	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

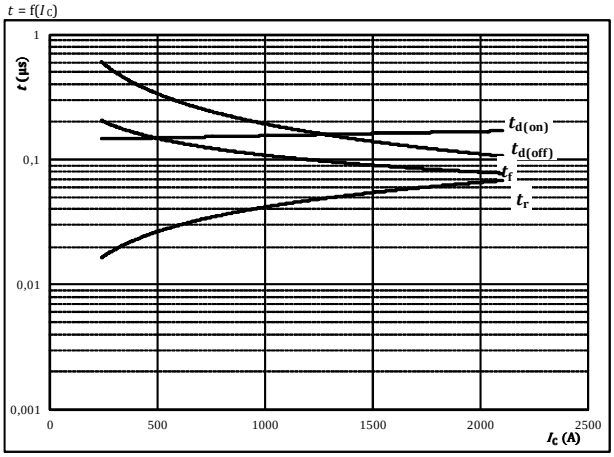
V_{CE} =	600	V	T_J:	25 °C
V_{GE} =	16/-8	V		125 °C
R_{gon} =	0,417	Ω		150 °C

Boost Switching Characteristics

figure 3. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



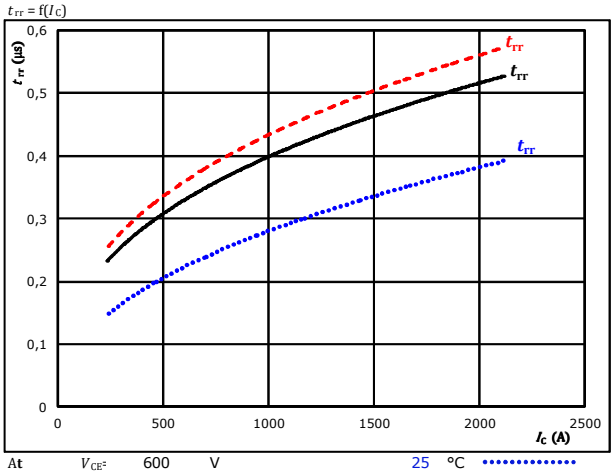
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	16/-8	V
R_{gon} =	0,417	Ω
R_{goff} =	0,417	Ω

figure 4. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



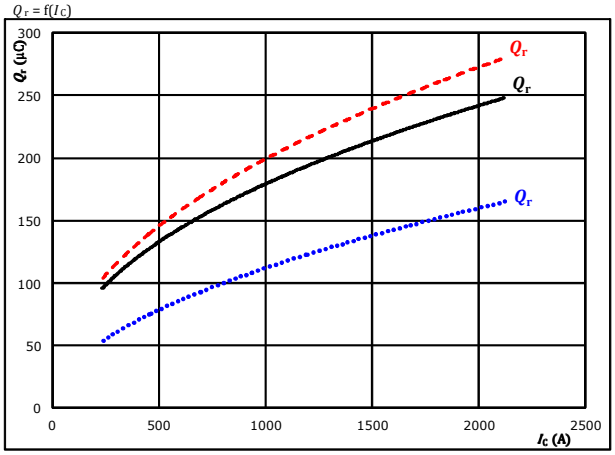
At	V_{CE} =	600	V	T_j:	25 °C
	V_{GE} =	16/-8	V		125 °C
	R_{gon} =	0,417	Ω		150 °C

Boost Switching Characteristics

figure 5. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

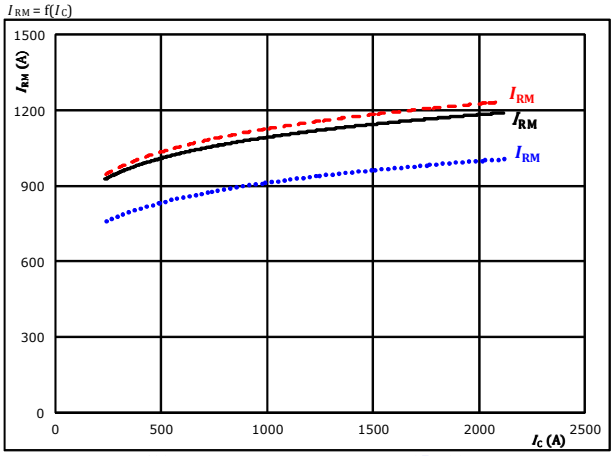


At	V_{CE} =	600	V		25	°C
	V_{GE} =	16/-8	V	T_j:	125	°C
	R_{gon} =	0,417	Ω		150	°C

figure 6. **FWD**

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

$I_{RM} = f(I_C)$



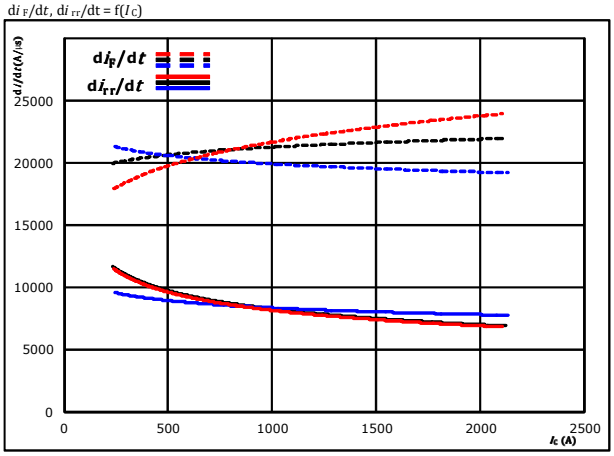
At	V_{CE}:	600	V		25	°C
	V_{GE} =	16/-8	V	T_j:	125	°C
	R_{gon} =	0,417	Ω		150	°C

Boost Switching Characteristics

figure 7. **FWD**

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

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

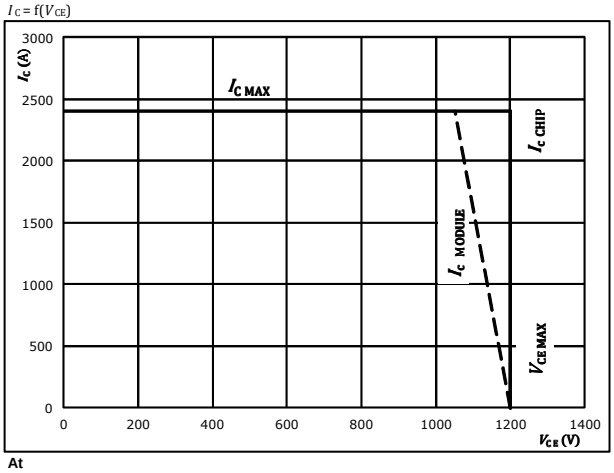


At	V_{CE} =	600	V	T_j = 25 °C	•••••••••••••••
	V_{GE} =	16/-8	V	125 °C	———
	R_{gon} =	0,417	Ω	150 °C	— — — —

figure 8. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	0,417	Ω
R_{goff} =	0,417	Ω

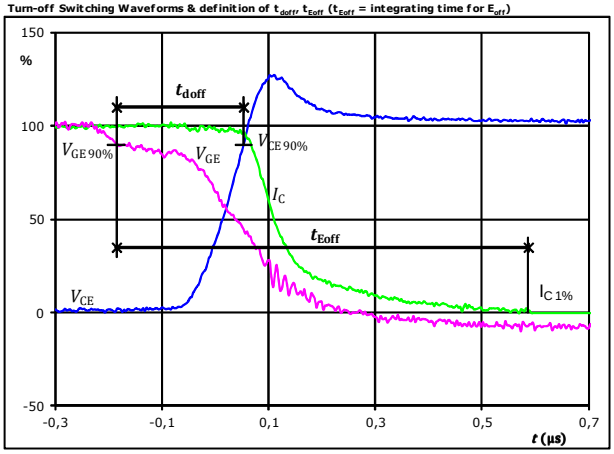
Boost Switching Definitions

General conditions

T_j	=	**125 °C**
R_{gon}	=	**0,417 Ω**
R_{goff}	=	**0,417 Ω**

figure 1. **IGBT**

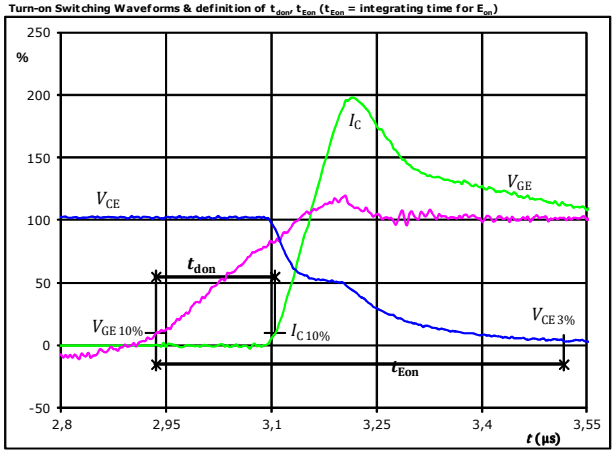
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-8	V
$V_{GE}(100\%)$ =	16	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1180	A
t_{doff} =	0,250	µs
t_{Eoff} =	0,772	µs

figure 2. **IGBT**

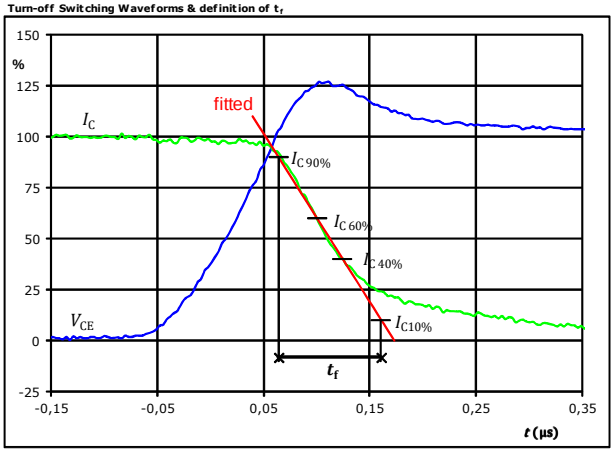
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-8	V
$V_{GE}(100\%)$ =	16	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1180	A
t_{don} =	0,156	µs
t_{Eon} =	0,582	µs

figure 3. **IGBT**

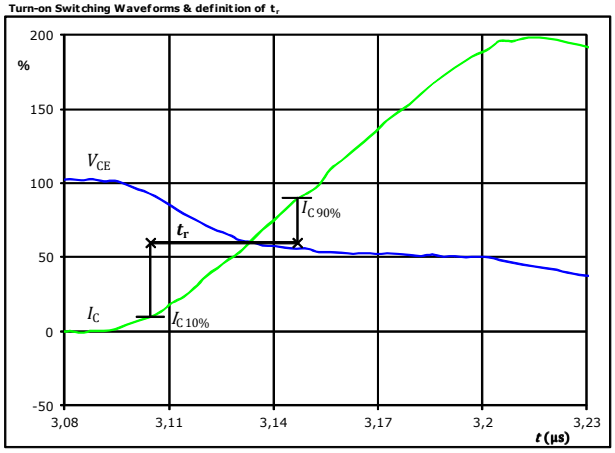
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1180	A
t_f =	0,095	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

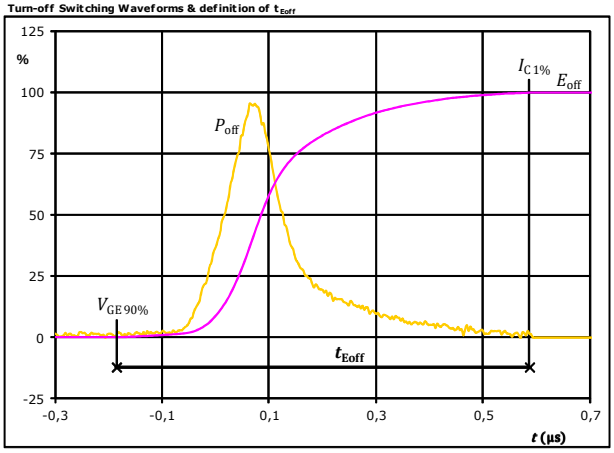


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	1180	A
t_r =	0,042	µs

Boost Switching Characteristics

figure 5. **IGBT**

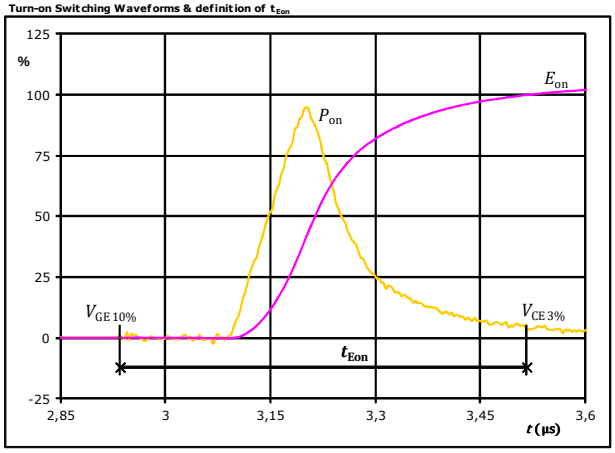
Turn-off Switching Waveforms & definition of t_{Eoff}



$P_{off}(100\%)$ =	707,96	kW
$E_{off}(100\%)$ =	107,48	mJ
t_{Eoff} =	0,77	µs

figure 6. **IGBT**

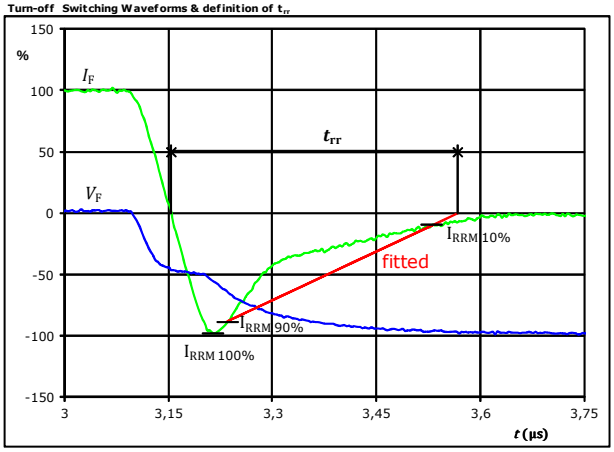
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%)$ =	707,96	kW
$E_{on}(100\%)$ =	97,83	mJ
t_{Eon} =	0,58	µs

figure 7. **FWD**

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

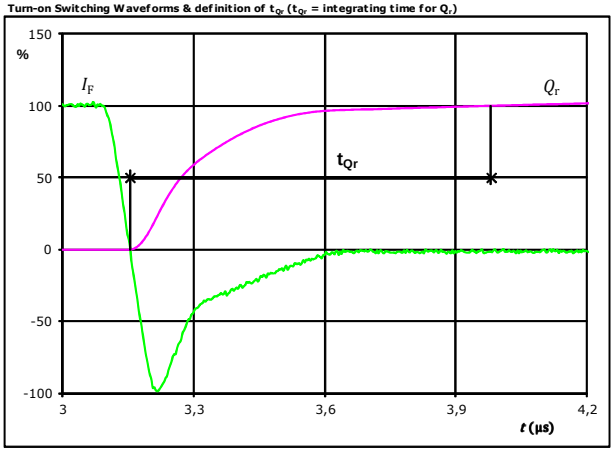


$V_F(100\%)$ =	600	V
$I_F(100\%)$ =	1180	A
$I_{RRM}(100\%)$ =	-1173	A
t_{rr} =	0,413	µs

Boost Switching Characteristics

figure 8. **FWD**

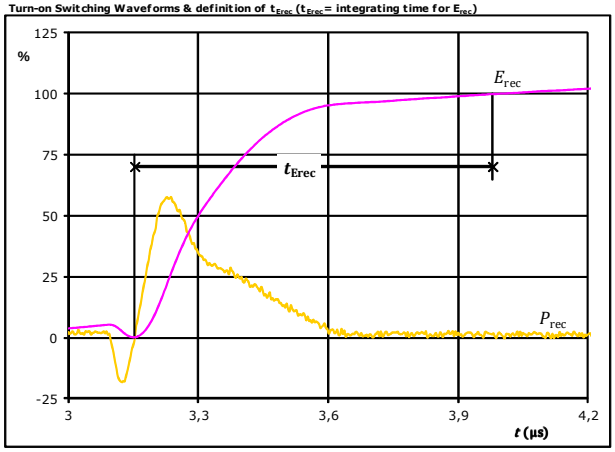
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	1180	A
Q_r (100%) =	192,45	µC
t_{Qr} =	0,83	µs

figure 9. **FWD**

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

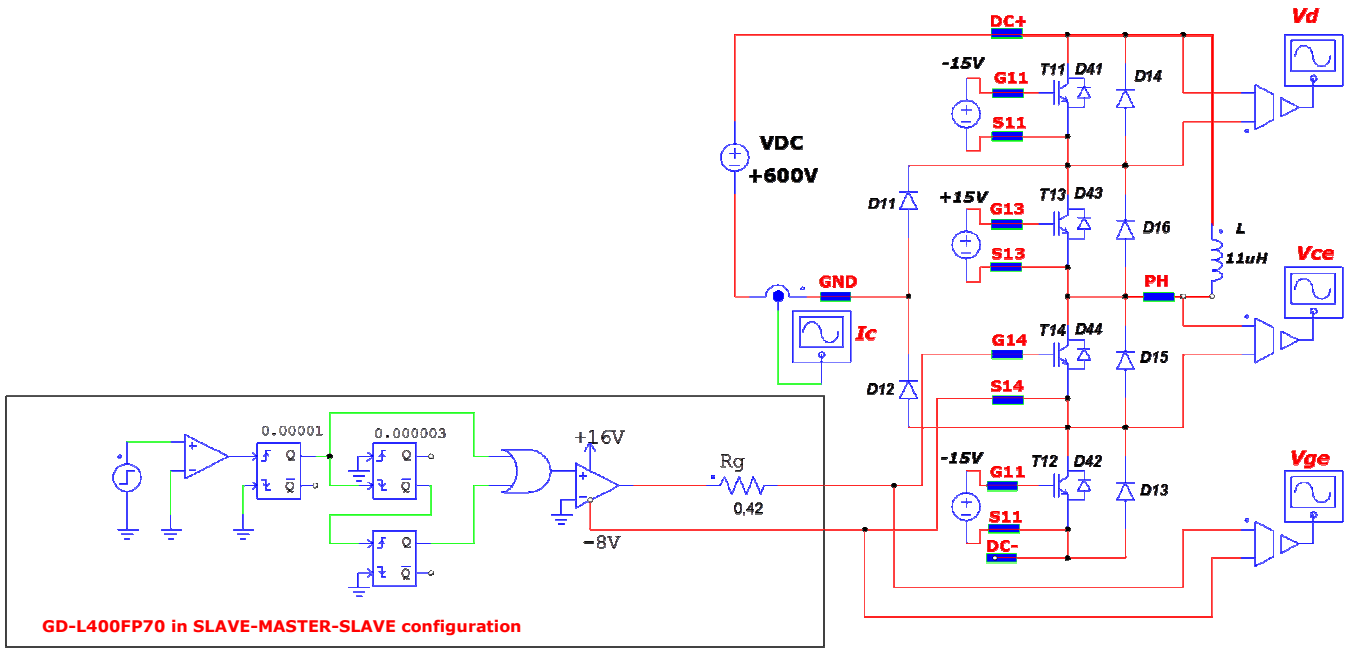


P_{rec} (100%) =	707,96	kW
E_{rec} (100%) =	72,46	mJ
t_{Erec} =	0,83	µs

Gate Driver at measurement

For more information see L40x gate driver application note

T14-D14 Switching measurement circuit



Vincotech

Ordering Code & Marking

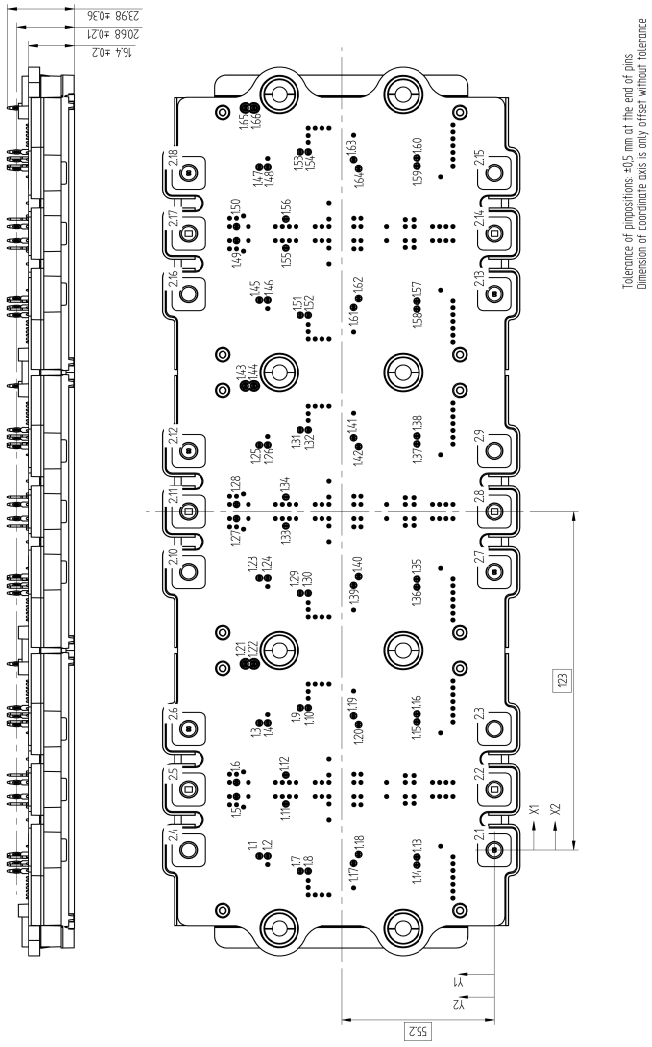
Version	Ordering Code
without thermal paste	70-W624NIA1K2M702-L400FP70

Name
YK/Date code
Lot
Serial
Vincotech UL

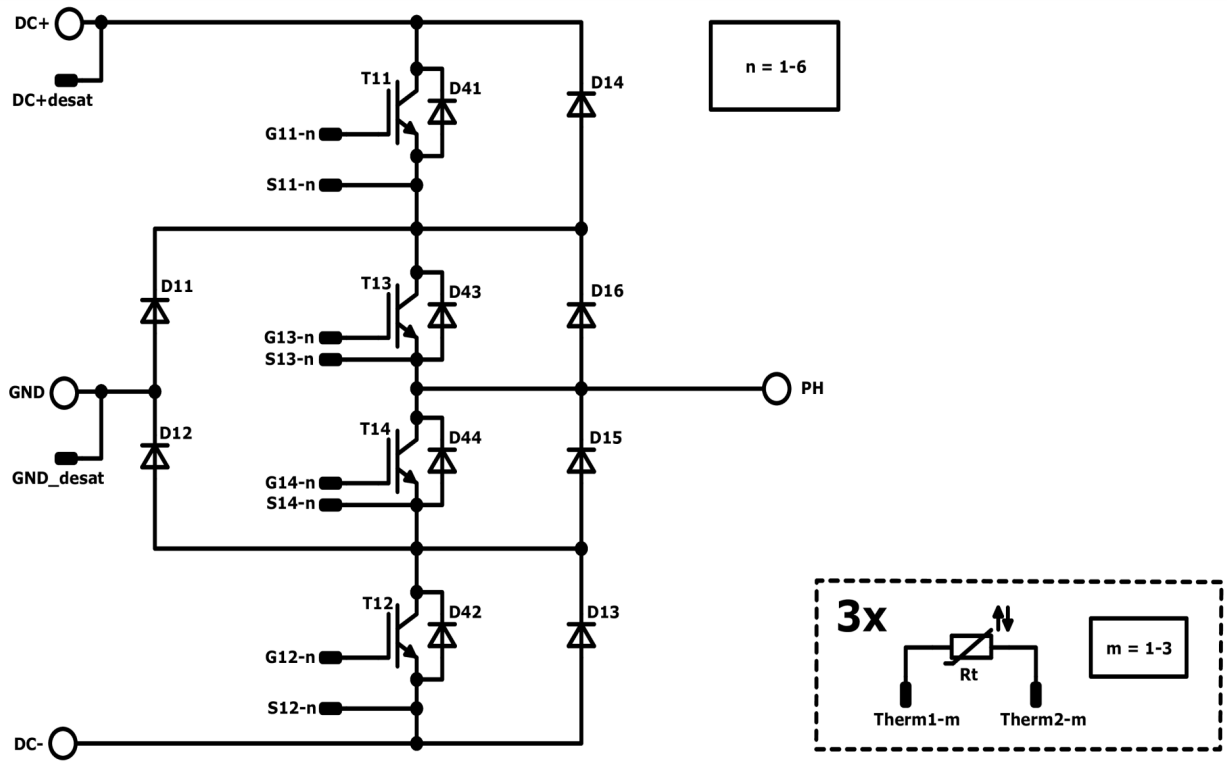
		Name		Date code	UL & VIN	Lot	Serial
Text		NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix		Type&Ver	Lot number	Serial	Date code		
		TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Driver pins				Power connections			
Pin	X1	Y1	Function	M6 screw	X2	Y2	Function
1.1	-2,15	84,85	G11-1	2.1	0	0	PH
1.2	-2,15	81,95	S11-1	2.2	22	0	PH
1.3	46,15	84,85	G11-2	2.3	44	0	PH
1.4	46,15	81,95	S11-2	2.4	0	110,41	DC+
1.5	19,45	93,05	DC+desat	2.5	22	110,41	GND
1.6	24,55	93,05	DC+desat	2.6	44	110,41	DC-
1.7	-7,65	70,05	G13-1	2.7	101	0	PH
1.8	-7,65	67,15	S13-1	2.8	123	0	PH
1.9	51,65	70,05	G13-2	2.9	145	0	PH
1.10	51,65	67,15	S13-2	2.10	101	110,41	DC+
1.11	16,75	75,35	GND desat	2.11	123	110,41	GND
1.12	27,25	75,35	GND desat	2.12	145	110,41	DC-
1.13	-2,55	28	G14-1	2.13	202	0	PH
1.14	-5,45	28	S14-1	2.14	224	0	PH
1.15	46,55	28	G14-2	2.15	246	0	PH
1.16	49,45	28	S14-2	2.16	202	110,41	DC+
1.17	-4,8	50,85	G12-1	2.17	224	110,41	GND
1.18	-1,6	49,05	S12-1	2.18	246	110,41	DC-
1.19	48,8	50,85	G12-2				
1.20	45,6	49,05	S12-2				
1.21	67,65	89,8	Therm1-1				
1.22	67,65	86,7	Therm2-1				
1.23	98,85	84,85	G11-3				
1.24	98,85	81,95	S11-3				
1.25	147,15	84,85	G11-4				
1.26	147,15	81,95	S11-4				
1.27	120,45	93,05	DC+desat				
1.28	125,55	93,05	DC+desat				
1.29	93,35	70,05	G13-3				
1.30	93,35	67,15	S13-3				
1.31	152,65	70,05	G13-4				
1.32	152,65	67,15	S13-4				
1.33	117,75	75,35	GND desat				
1.34	128,25	75,35	GND desat				
1.35	98,45	28	G14-3				
1.36	95,55	28	S14-3				
1.37	147,55	28	G14-4				
1.38	150,45	28	S14-4				
1.39	96,2	50,85	G12-3				
1.40	99,4	49,05	S12-3				
1.41	149,8	50,85	G12-4				
1.42	146,6	49,05	S12-4				
1.43	168,65	89,8	Therm1-2				
1.44	168,65	86,7	Therm2-2				
1.45	199,85	84,85	G11-5				
1.46	199,85	81,95	S11-5				
1.47	248,15	84,85	G11-6				
1.48	248,15	81,95	S11-6				
1.49	221,45	93,05	DC+desat				
1.50	226,55	93,05	DC+desat				
1.51	194,35	70,05	G13-5				
1.52	194,35	67,15	S13-5				
1.53	253,65	70,05	G13-6				
1.54	253,65	67,15	S13-6				
1.55	218,75	75,35	GND desat				
1.56	229,25	75,35	GND desat				
1.57	199,45	28	G14-5				
1.58	196,55	28	S14-5				
1.59	248,55	28	G14-6				
1.60	251,45	28	S14-6				
1.61	197,2	50,85	G12-5				
1.62	200,4	49,05	S12-5				
1.63	250,8	50,85	G12-6				
1.64	247,6	49,05	S12-6				
1.65	269,65	89,8	Therm1-3				
1.66	269,65	86,7	Therm2-3				



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	1200 A	Buck Switch	
D11, D12	FWD	1200 V	1200 A	Buck Diode	
D41, D42	FWD	1200 V	90 A	Buck Sw. Protection Diode	
T13, T14	IGBT	1200 V	1200 A	Boost Switch	
D13, D14	FWD	1200 V	1200 A	Boost Diode	
D16, D15	FWD	1200 V	1200 A	Boost Sw.Inv.Diode	
D43, D44	FWD	1200 V	90 A	Boost Sw. Protection Diode	
Rt	Thermistor			Thermistor	

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.

Document No.:	Date:	Modification:	Pages
70-W624NIA1K2M702-L400FP70-D3-14	08 July 2021	Pin coordinates corrected	33