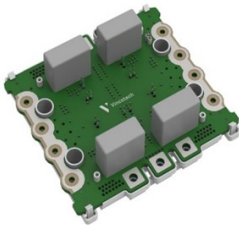
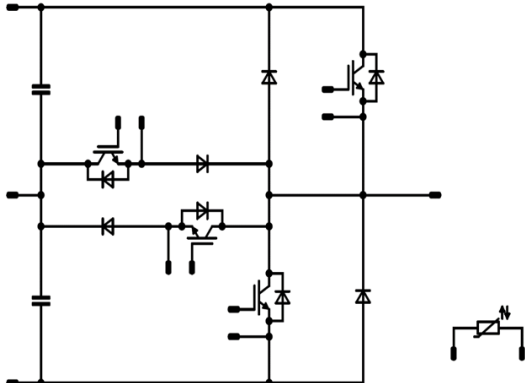




Vincotech

70-W212NMA400M7-LC08F71

datasheet

VINcoMNPC X4		1200 V / 400 A
Features <ul style="list-style-type: none">• IGBT M7 technology with low V_{CEsat} and improved EMC behavior• Low inductive package• High efficiency• Integrated snubber capacitors		VINco X4 housing 
Target applications <ul style="list-style-type: none">• Solar Inverters• UPS		Schematic 
Types <ul style="list-style-type: none">• 70-W212NMA400M7-LC08F71		

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	370	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	646	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	9,5	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}C$



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	267	A
Repetitive peak forward current	I_{FRM}		800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	361	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	22	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	39	W
Maximum junction temperature	T_{jmax}		175	°C
Boost Switch				
Collector-emitter voltage	V_{CES}	Relative moisture level $\leq 50\%$ $> 50\%$	650 500	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	342	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	495	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CC} = 400\text{ V}$ $T_j = 150\text{ °C}$	9	μs
Maximum junction temperature	T_{jmax}		175	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	236	A
Repetitive peak forward current	I_{FRM}		800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	361	W
Maximum junction temperature	T_{jmax}		175	°C



Vincotech

Maximum Ratings

$T_j = 25\text{ °C}$, 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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	49	A
Repetitive peak forward current	I_{FRM}		80	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	84	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	TPCB		125	°C

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	4000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			min. 12,7	mm
Clearance			min. 12,7	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



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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	$V_{GE(th)}$			10	0,04	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,53 1,70 1,75	1,85	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			400	µA
Gate-emitter leakage current	I_{GES}		20	0		25			2000	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}		0	10	25			84000		pF
Output capacitance	C_{oes}							2800		
Reverse transfer capacitance	C_{res}							1120		
Gate charge	Q_g		15	600	400	25		2800		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK (PSX)}$						0,147		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	±15	350	400	25 125		614 604		ns
Rise time	t_r					25 125		132 150		
Turn-off delay time	$t_{d(off)}$					25 125		373 399		
Fall time	t_f					25 125		55 75		
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 32,9 \mu\text{C}$ $Q_{tFWD} = 66,9 \mu\text{C}$				25 125		34,61 44,42		mWs
Turn-off energy (per pulse)	E_{off}					25 125		15,44 20,24		



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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				400	25 125 150		1,57 1,60 1,60	1,85	V
Reverse leakage current	I_R			650		25			200	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,263		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt = 2993 \text{ A/}\mu\text{s}$ $di/dt = 2752 \text{ A/}\mu\text{s}$	± 15	350	400	25 125		143 172		A
Reverse recovery time	t_{rr}					25 125		561 960		ns
Recovered charge	Q_r					25 125		32,94 66,92		μC
Reverse recovered energy	E_{rec}					25 125		6,60 15,31		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		912 602		A/μs

Buck Sw. Protection Diode

Static

Forward voltage	V_F				20	25 125 150		1,61 1,69 1,69	2,1	V
Reverse leakage current	I_R			1200		25			50	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						2,444		K/W
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Vincotech

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	$V_{GE(th)}$			10	0,04	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,41 1,51 1,54	1,6	V
Collector-emitter cut-off current	I_{CES}		0	650		25			200	µA
Gate-emitter leakage current	I_{GES}		20	0		25			2000	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	0	10		25			48000		pF
Output capacitance	C_{oes}							2280		
Reverse transfer capacitance	C_{res}							960		
Gate charge	Q_g		15	300	400	25		1640		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK (PSX)}$						0,192		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	±15	350	400	25 125		351 343		ns
Rise time	t_r					25 125		105 110		
Turn-off delay time	$t_{d(off)}$					25 125		252 275		
Fall time	t_f					25 125		61 73		
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 30,4 \mu\text{C}$ $Q_{rFWD} = 48,1 \mu\text{C}$				25 125		22,55 26,83		mWs
Turn-off energy (per pulse)	E_{off}					25 125		13,64 19,16		



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70-W212NMA400M7-LC08F71

datasheet

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				400	25 125 150		1,82 1,96 1,97	2,1	V
Reverse leakage current	I_R			1200		25			160	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK (PSX)}$						0,26		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt = 4200 \text{ A/}\mu\text{s}$ $di/dt = 3250 \text{ A/}\mu\text{s}$	± 15	350	400	25 125		184 204		A
Reverse recovery time	t_{rr}					25 125		397 541		ns
Recovered charge	Q_r					25 125		30,43 48,07		μC
Reverse recovered energy	E_{rec}					25 125		5,82 10,13		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		750 639		A/μs

Boost Sw. Protection Diode

Static

Forward voltage	V_F				40	25 125 150		1,74 1,66 1,61	1,87	V
Reverse leakage current	I_R			650		25			0,48	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK (PSX)}$						1,13		K/W
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Capacitor (DC)

Capacitance	C							1360		nF
Tolerance							-10		+10	%
Dissipation factor		$f = 1 \text{ kHz}$				20			0,04	%
Climatic category							40/105/56			



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70-W212NMA400M7-LC08F71

datasheet

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	

Thermistor

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				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	



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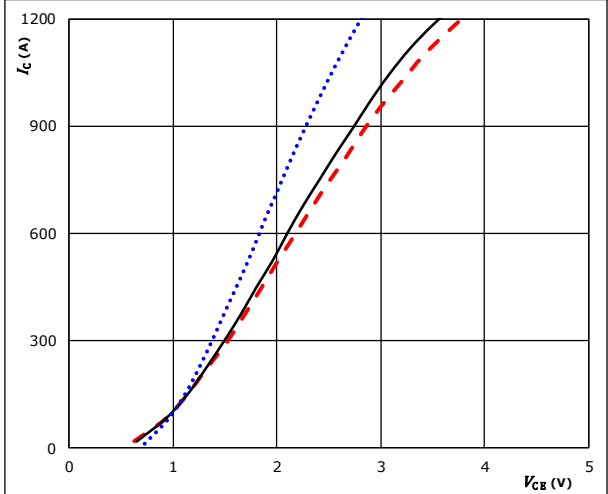
datasheet

Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

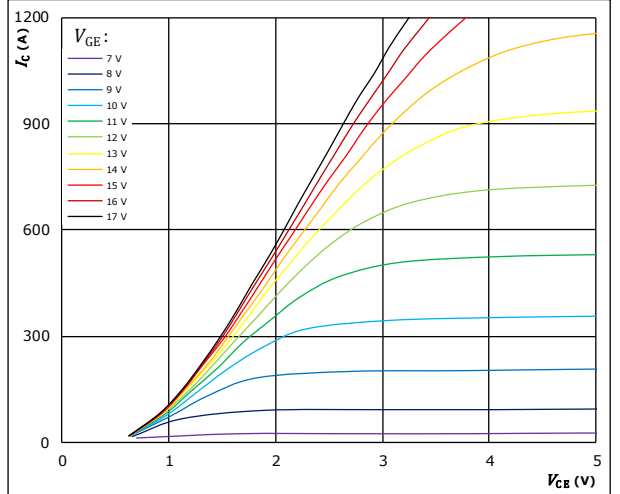


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

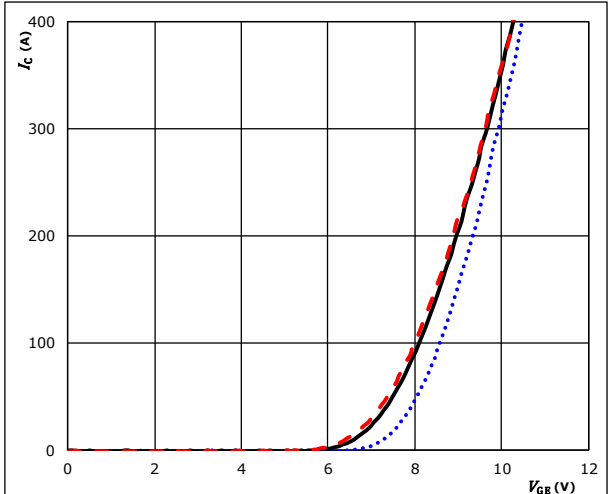


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

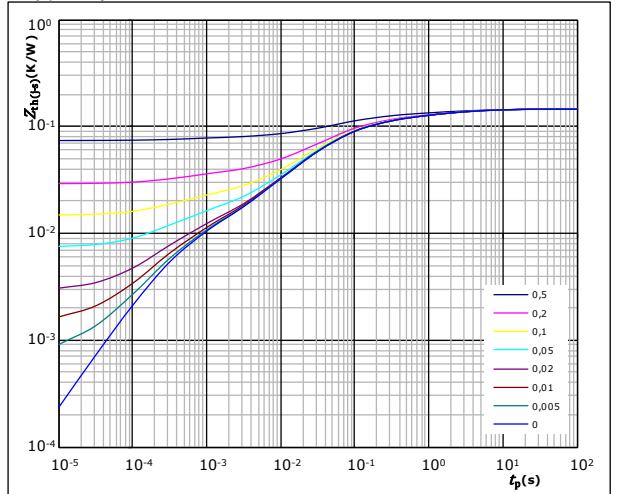


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,147 \text{ K/W}$
 IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
1,21E-02	2,29E+00
2,13E-02	4,14E-01
3,11E-02	7,62E-02
5,30E-02	1,97E-02
1,72E-02	5,97E-03
5,27E-03	1,21E-03
7,06E-03	1,51E-04



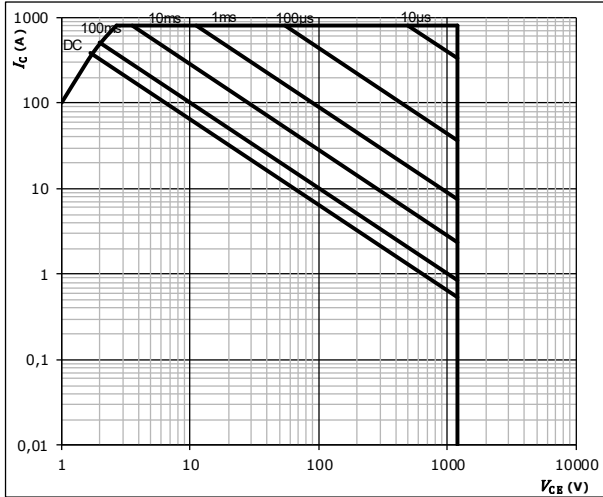
Vincotech

Buck Switch Characteristics

figure 6. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



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



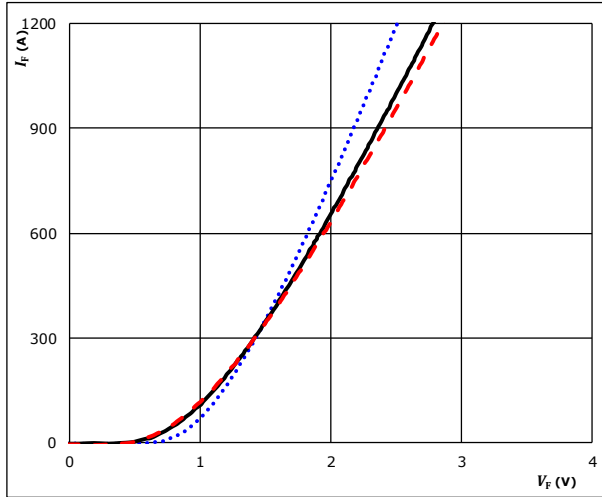
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Buck Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

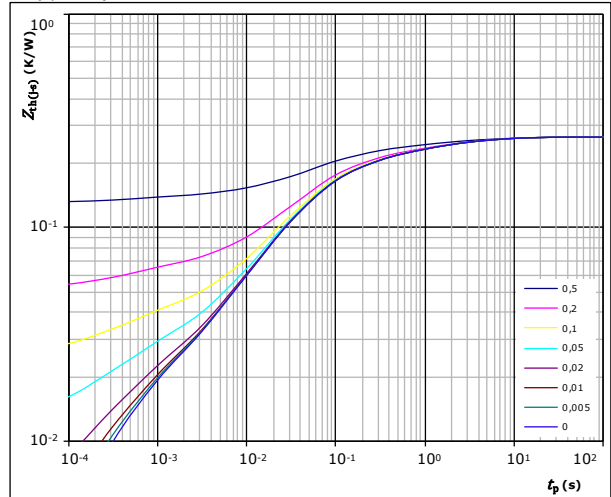


$t_p =$ 250 μ s
 T_j : 25 °C
125 °C ———
150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



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

FWD thermal model values

R (K/W)	τ (s)
2,16E-02	4,10E+00
3,81E-02	7,41E-01
5,56E-02	1,36E-01
9,48E-02	3,53E-02
3,07E-02	1,07E-02
9,42E-03	2,17E-03
1,26E-02	2,69E-04



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Buck Sw. Protection Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

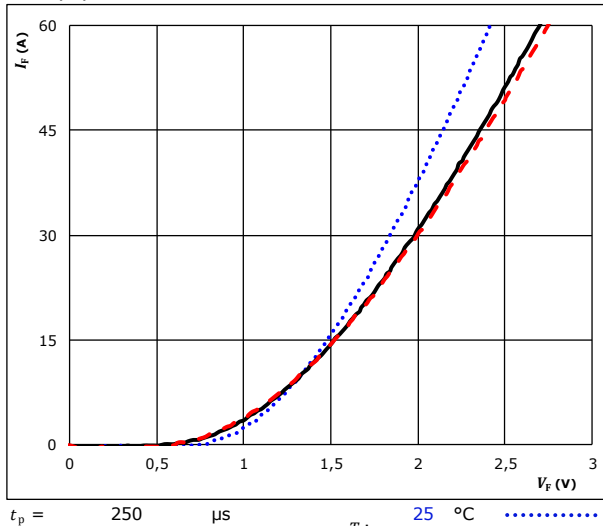
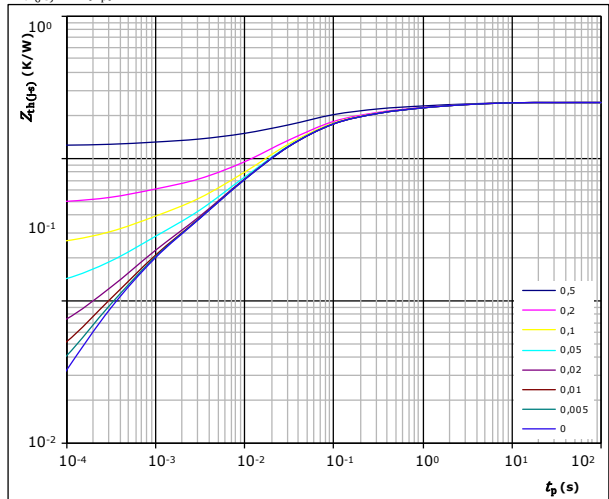


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-s)} = 2,444 \text{ K/W}$$

FWD thermal model values

R (K/W)	τ (s)
1,91E-01	1,38E+01
3,28E-01	2,37E+00
5,94E-01	4,22E-01
9,46E-01	1,13E-01
2,58E-01	1,90E-02
1,27E-01	2,09E-03



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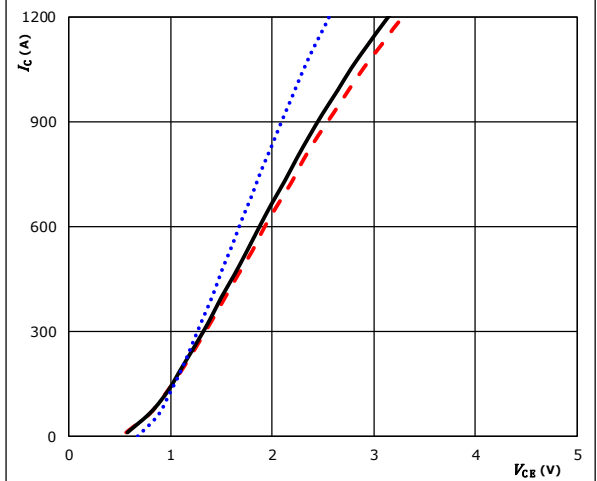
70-W212NMA400M7-LC08F71 datasheet

Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

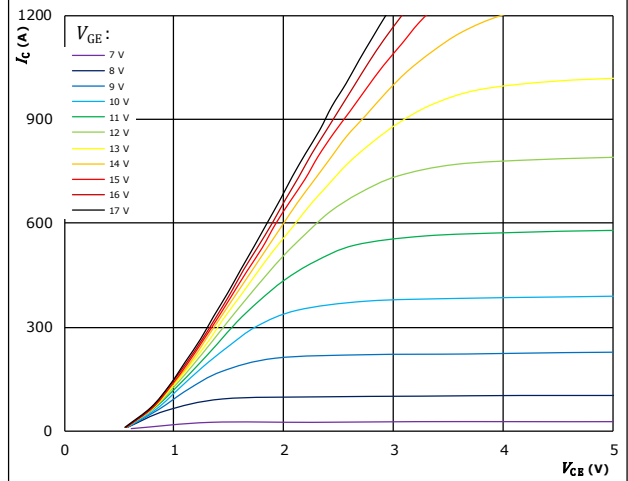


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $125 \text{ } ^\circ C$ (solid black line)
 $150 \text{ } ^\circ C$ (dashed red line)

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

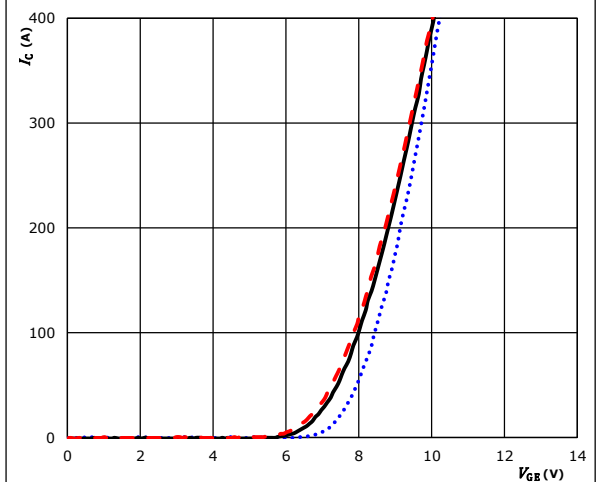


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

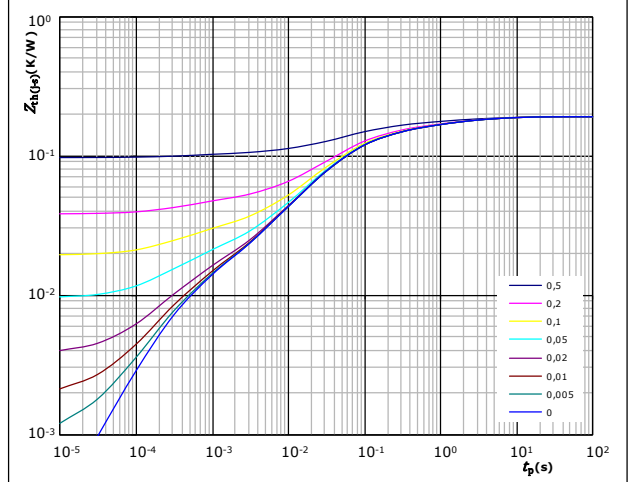


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue line)
 $125 \text{ } ^\circ C$ (solid black line)
 $150 \text{ } ^\circ C$ (dashed red line)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,192 \text{ K/W}$
 IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
1,58E-02	3,00E+00
2,78E-02	5,41E-01
4,06E-02	9,95E-02
6,92E-02	2,58E-02
2,24E-02	7,80E-03
6,88E-03	1,58E-03
9,22E-03	1,97E-04



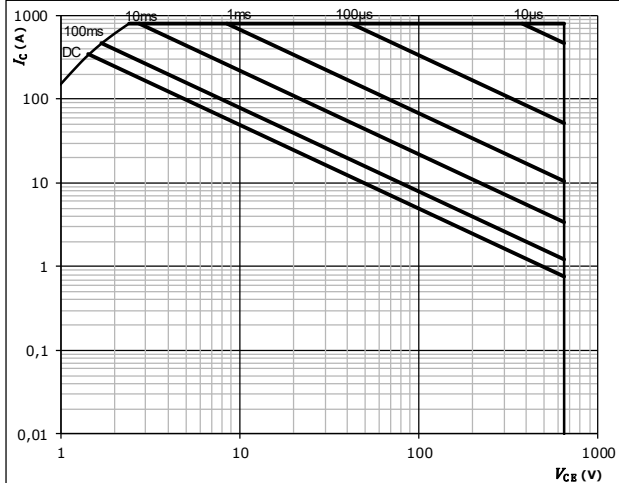
Vincotech

Boost Switch Characteristics

figure 6. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



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



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Boost Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

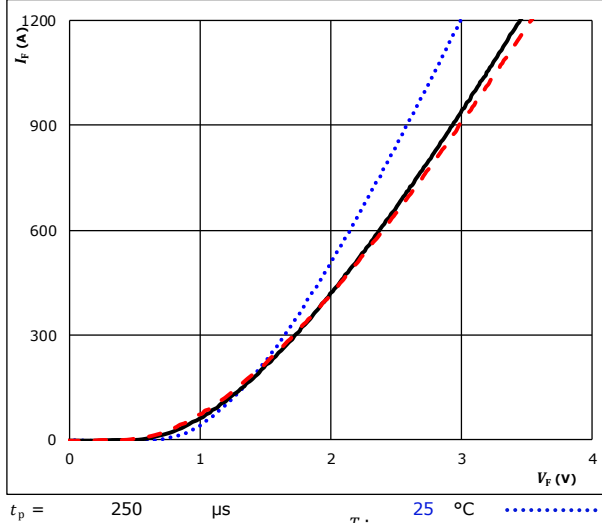
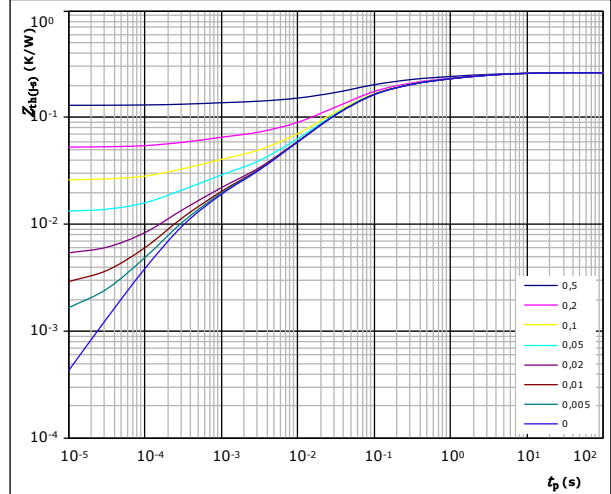


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-s)} = 0,26 \text{ K/W}$$

FWD thermal model values

R (K/W)	τ (s)
2,16E-02	4,10E+00
3,81E-02	7,41E-01
5,56E-02	1,36E-01
9,48E-02	3,53E-02
3,07E-02	1,07E-02
9,42E-03	2,17E-03
1,26E-02	2,69E-04



Boost Sw. Protection Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

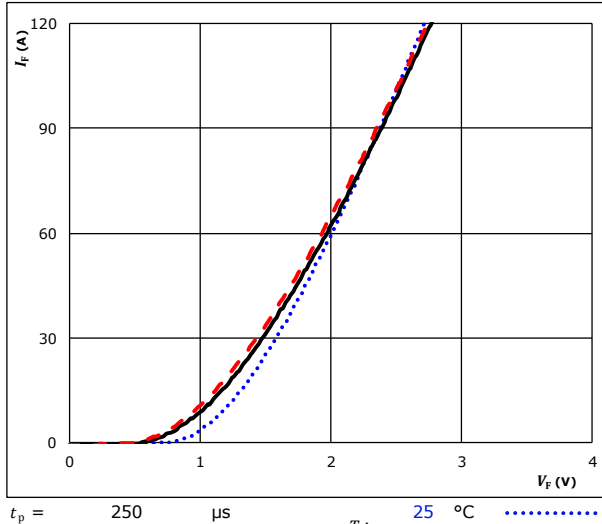
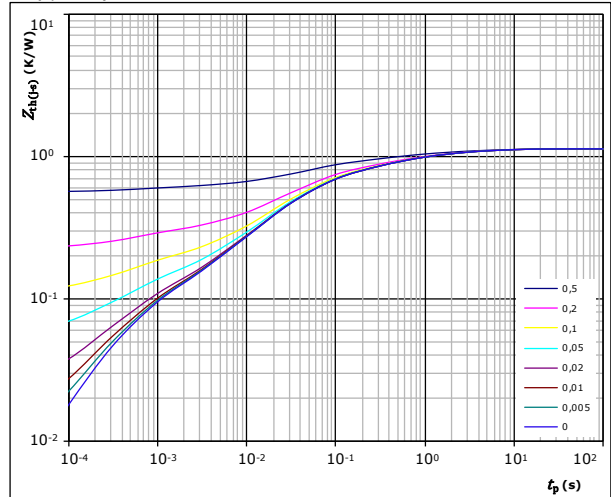


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$$D = t_p / T$$

$$R_{th(j-s)} = 1,13 \text{ K/W}$$

FWD thermal model values

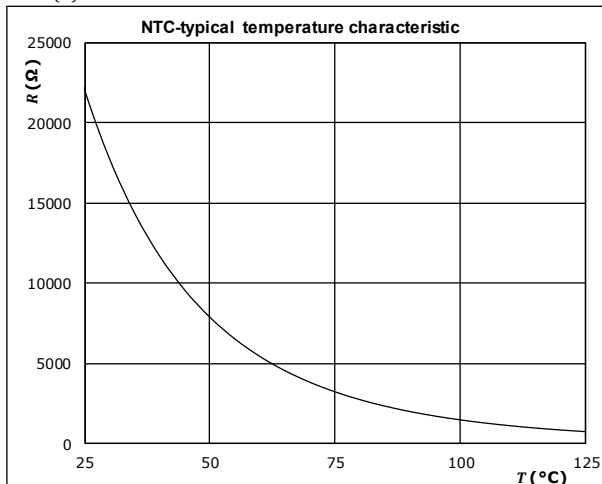
R (K/W)	τ (s)
7,96E-02	1,68E+01
1,66E-01	3,48E+00
2,55E-01	7,36E-01
3,92E-01	1,27E-01
1,41E-01	3,52E-02
3,48E-02	5,62E-03
6,52E-02	1,24E-03

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

$$R = f(T)$$





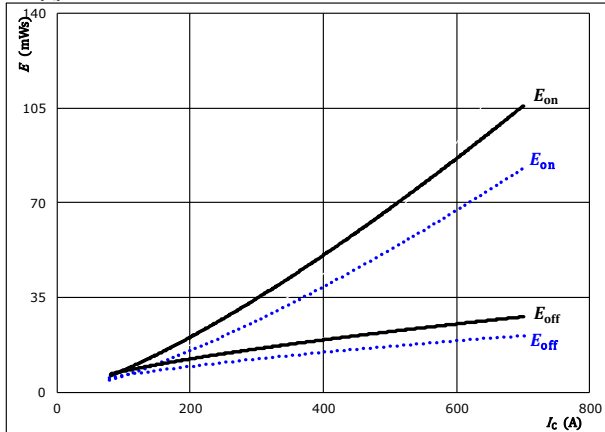
Vincotech

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

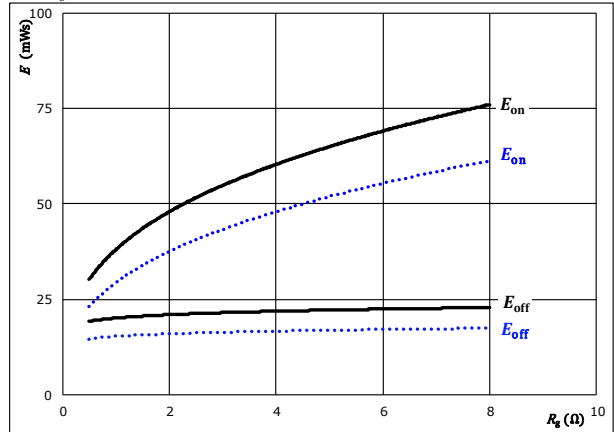
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω

T_j : 25 °C
125 °C

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

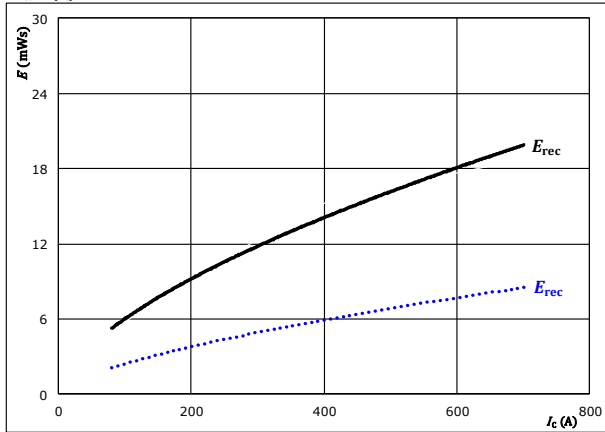
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 400$ A

T_j : 25 °C
125 °C

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_C)$$



With an inductive load at

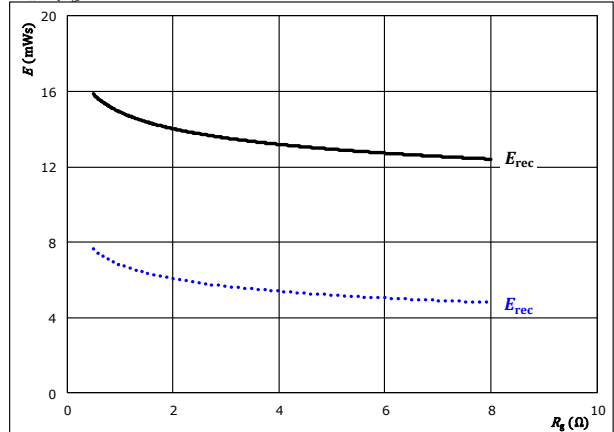
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

T_j : 25 °C
125 °C

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 400$ A

T_j : 25 °C
125 °C



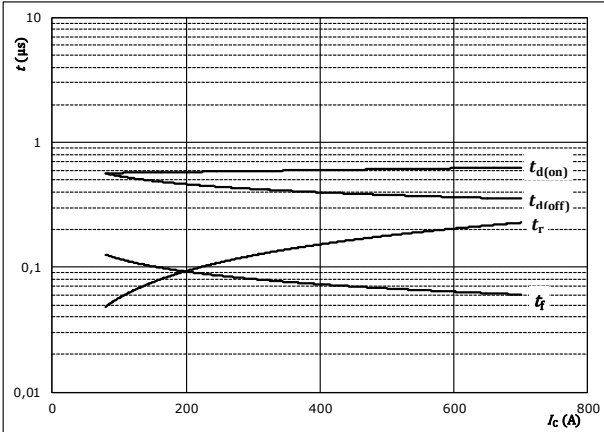
Vincotech

Buck Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



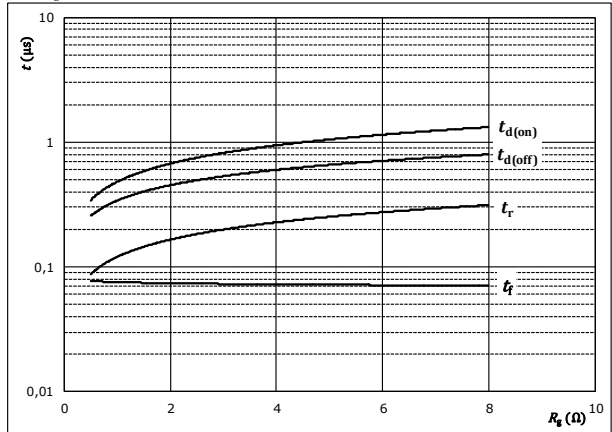
With an inductive load at

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

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



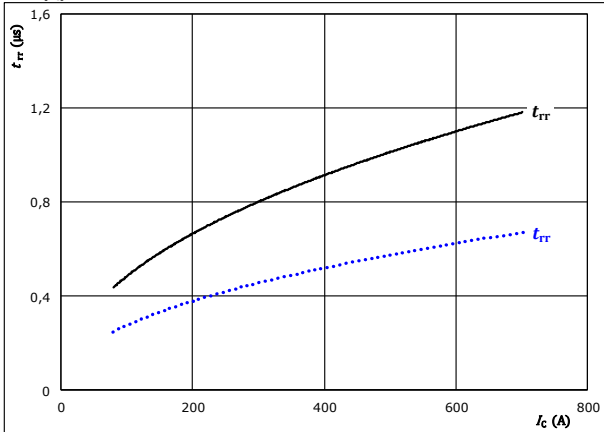
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$



With an inductive load at

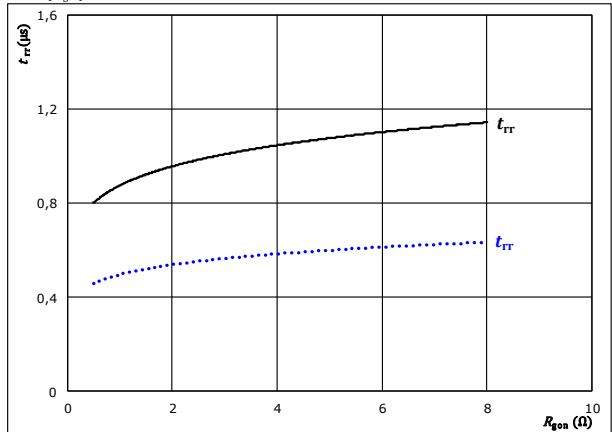
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	2	Ω

$T_j:$ 25 °C
125 °C

figure 8. 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



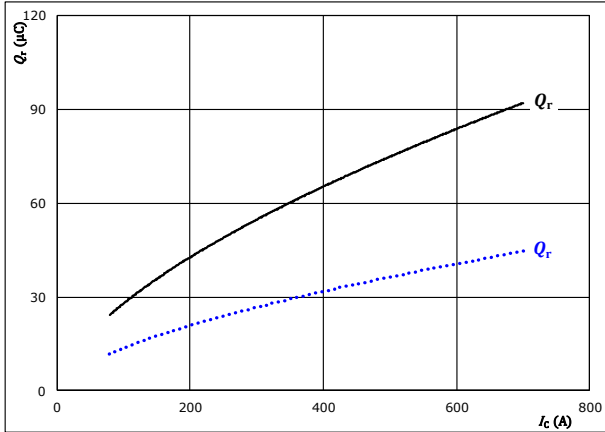
Vincotech

Buck Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

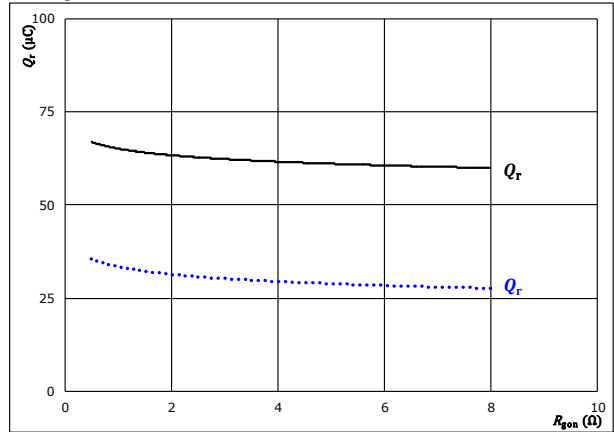
$T_j: 25$ °C

$T_j: 125$ °C

figure 10. 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
 $V_{GE} = \pm 15$ V
 $I_C = 400$ A

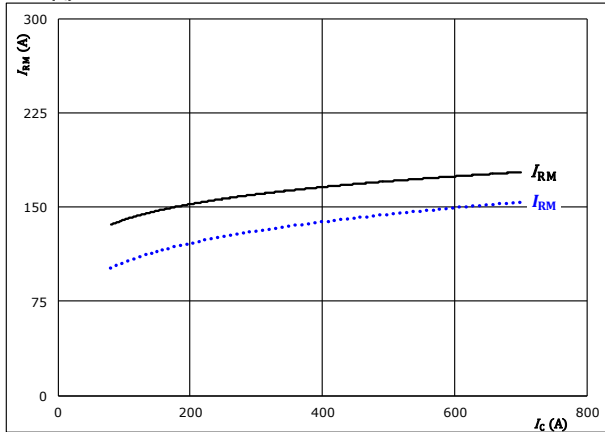
$T_j: 25$ °C

$T_j: 125$ °C

figure 11. 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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω

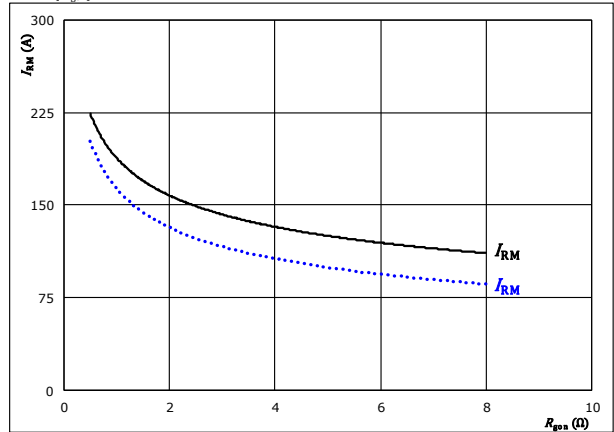
$T_j: 25$ °C

$T_j: 125$ °C

figure 12. 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
 $V_{GE} = \pm 15$ V
 $I_C = 400$ A

$T_j: 25$ °C

$T_j: 125$ °C

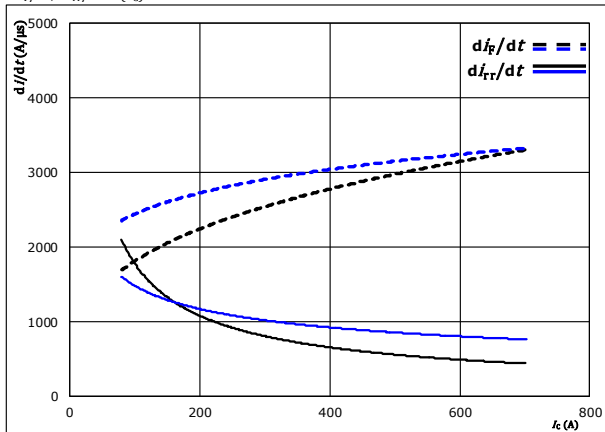


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Buck Switching Characteristics

figure 13. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_C)$

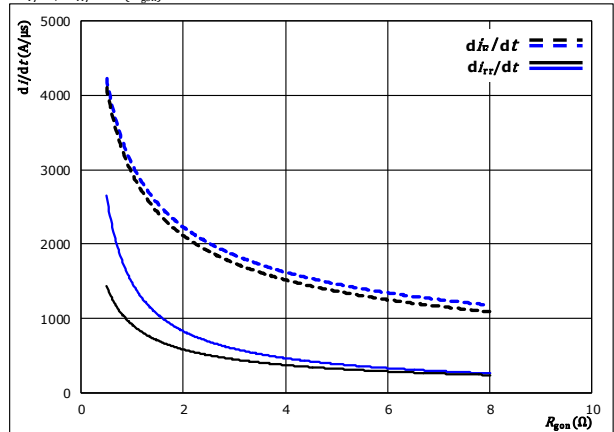


With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j = 25$ °C
 $T_j = 125$ °C

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



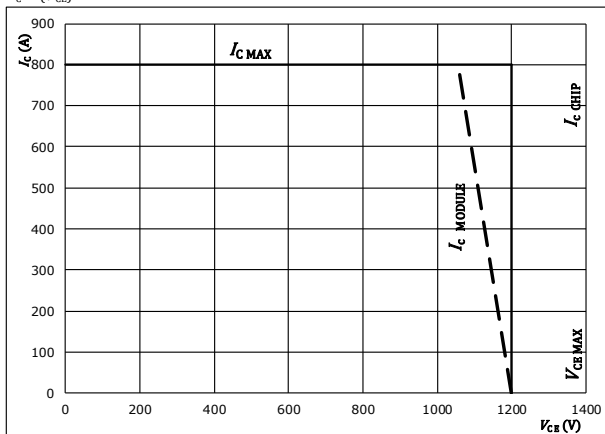
With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 400$ A
 $T_j = 25$ °C
 $T_j = 125$ °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$T_j = 125$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



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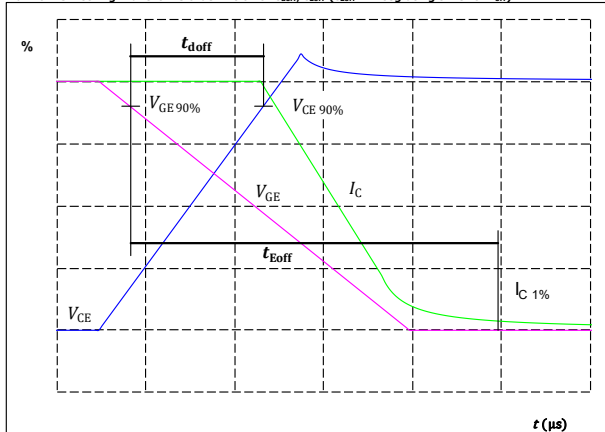
Buck Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

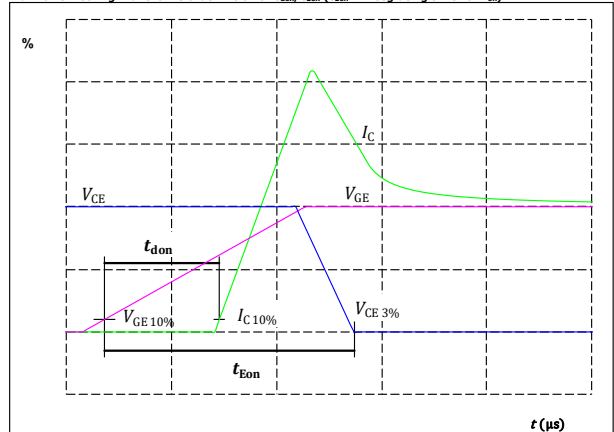
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	400	A
$t_{doff} =$	399	ns

figure 2. IGBT

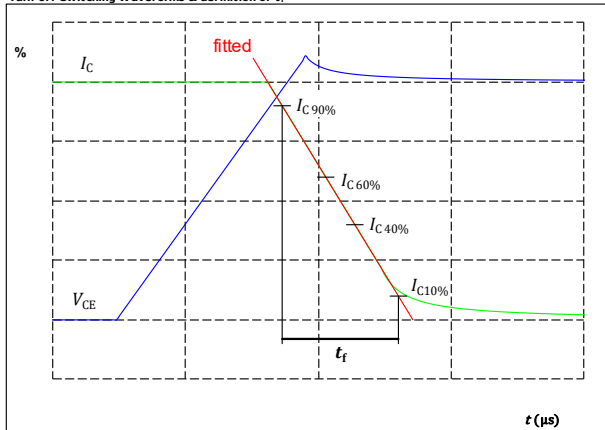
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	400	A
$t_{don} =$	604	ns

figure 3. IGBT

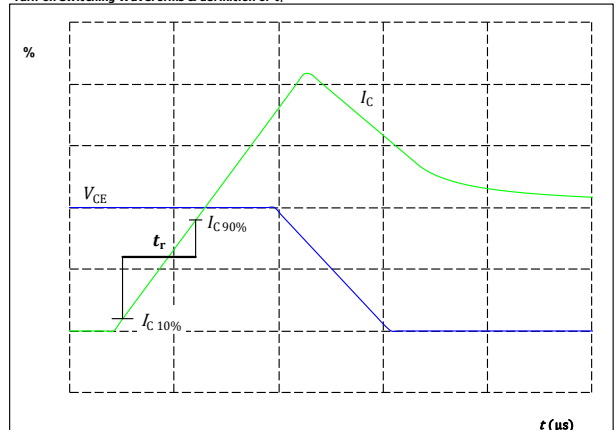
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	350	V
$I_C(100\%) =$	400	A
$t_f =$	75	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	350	V
$I_C(100\%) =$	400	A
$t_r =$	150	ns

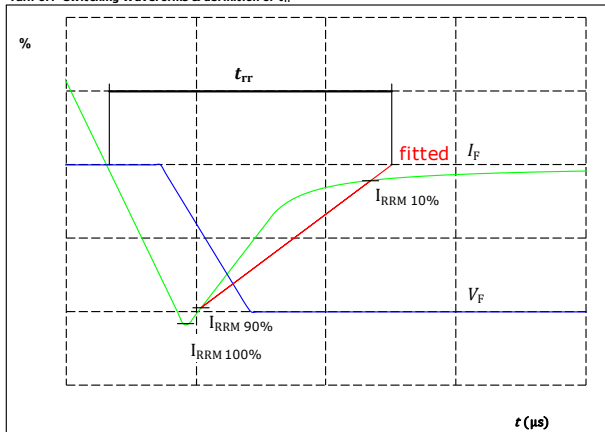


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Buck Switching Characteristics

figure 5. FWD

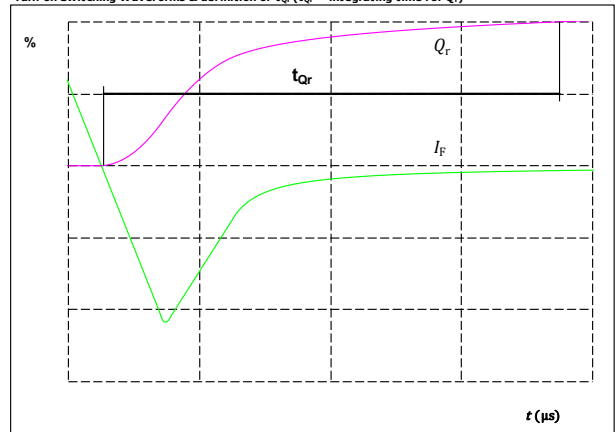
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	350	V
$I_F(100\%) =$	400	A
$I_{RRM}(100\%) =$	172	A
$t_{rr} =$	960	ns

figure 6. FWD

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



$I_F(100\%) =$	400	A
$Q_r(100\%) =$	67	μC



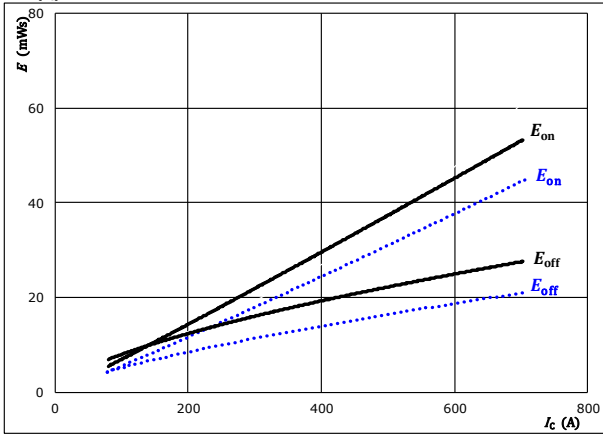
Vincotech

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

$V_{GE} = \pm 15$ V

$R_{gon} = 2$ Ω

$R_{goff} = 2$ Ω

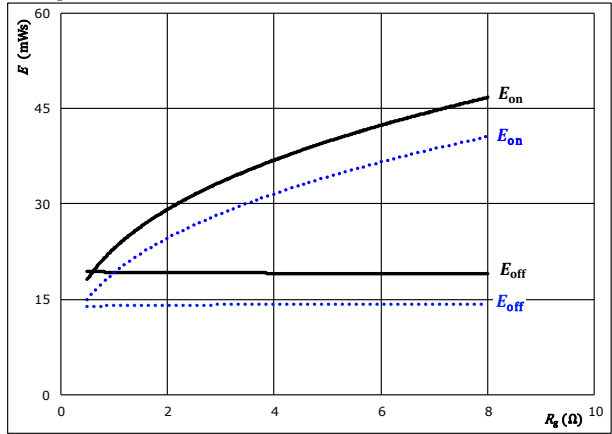
$T_j: 25$ °C

$T_j: 125$ °C

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350$ V

$V_{GE} = \pm 15$ V

$I_C = 400$ A

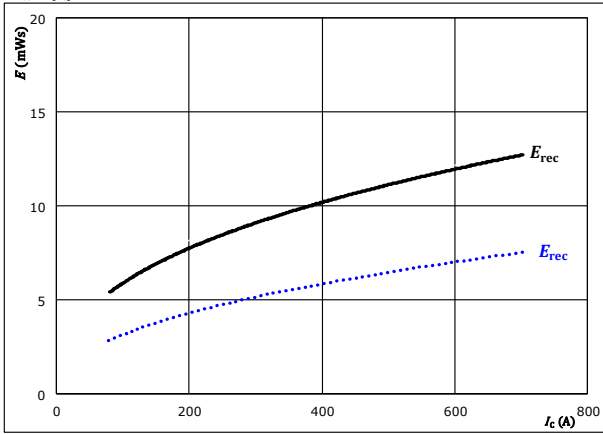
$T_j: 25$ °C

$T_j: 125$ °C

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_C)$$



With an inductive load at

$V_{CE} = 350$ V

$V_{GE} = \pm 15$ V

$R_{gon} = 2$ Ω

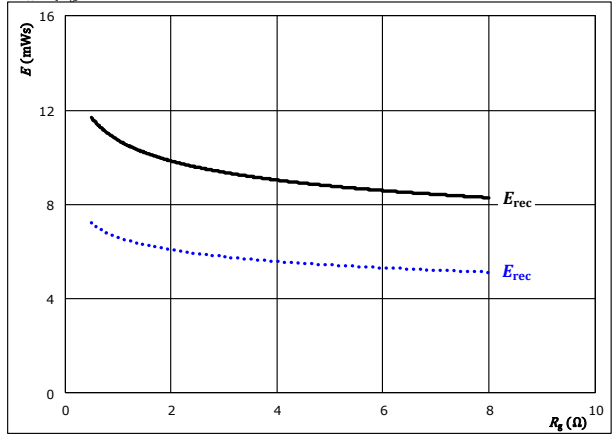
$T_j: 25$ °C

$T_j: 125$ °C

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{CE} = 350$ V

$V_{GE} = \pm 15$ V

$I_C = 400$ A

$T_j: 25$ °C

$T_j: 125$ °C



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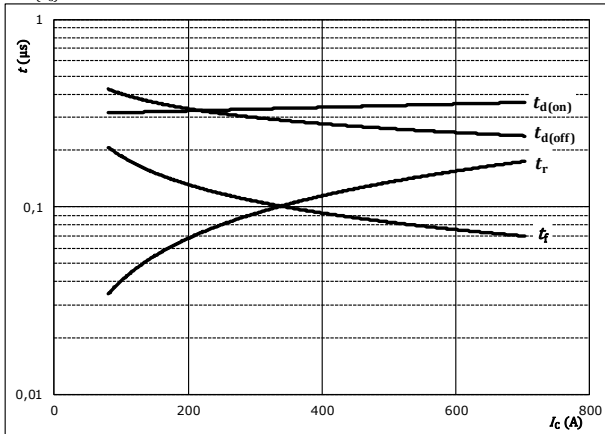
70-W212NMA400M7-LC08F71 datasheet

Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



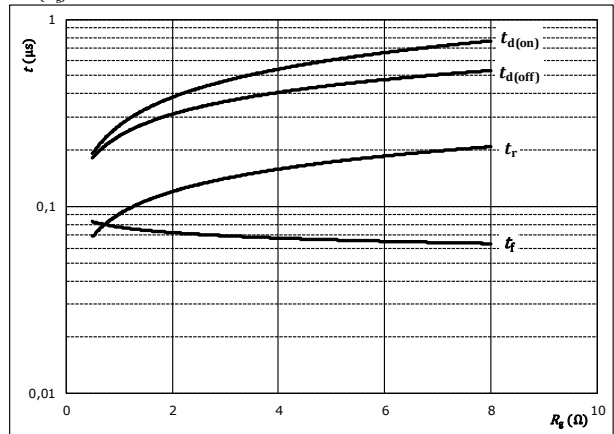
With an inductive load at

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

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



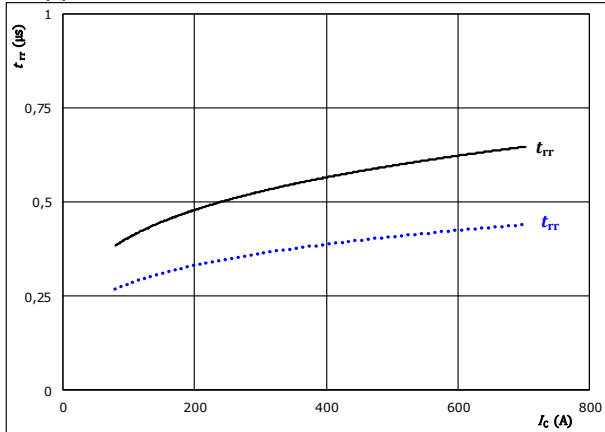
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_C)$$



With an inductive load at

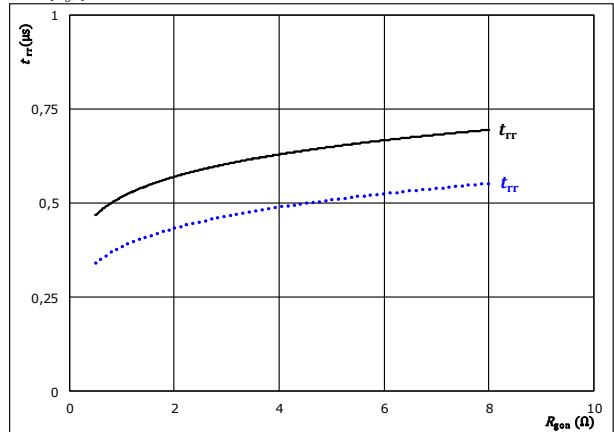
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	2	Ω

$T_j:$ 25 °C
125 °C

figure 8. 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



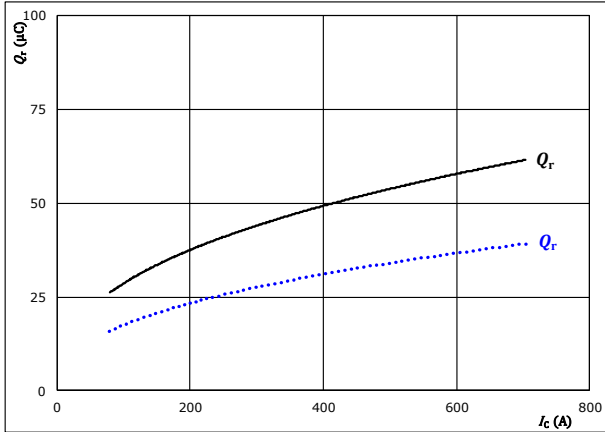
Vincotech

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$



With an inductive load at

$V_{CE} = 350$ V

$V_{GE} = \pm 15$ V

$R_{gon} = 2$ Ω

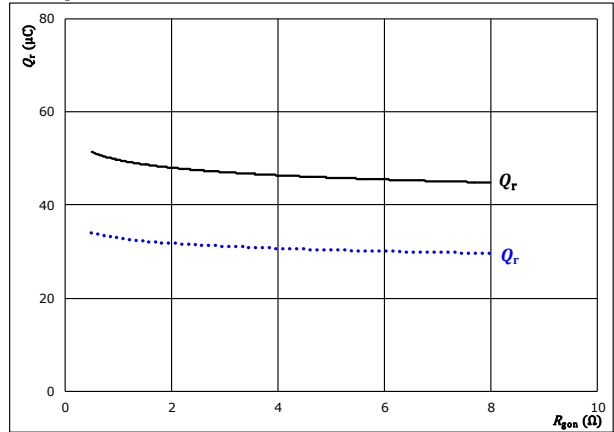
$T_j: 25$ °C

$T_j: 125$ °C

figure 10. 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

$V_{GE} = \pm 15$ V

$I_C = 400$ A

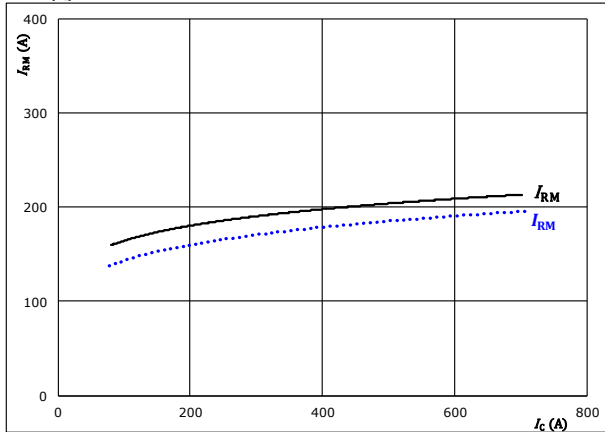
$T_j: 25$ °C

$T_j: 125$ °C

figure 11. FWD

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

$$I_{RM} = f(I_C)$$



With an inductive load at

$V_{CE} = 350$ V

$V_{GE} = \pm 15$ V

$R_{gon} = 2$ Ω

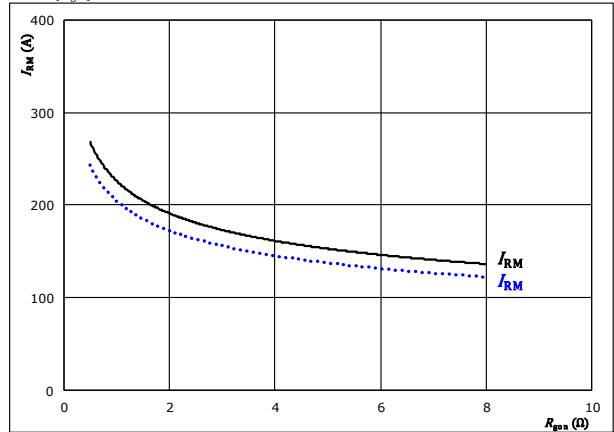
$T_j: 25$ °C

$T_j: 125$ °C

figure 12. FWD

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

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



With an inductive load at

$V_{CE} = 350$ V

$V_{GE} = \pm 15$ V

$I_C = 400$ A

$T_j: 25$ °C

$T_j: 125$ °C



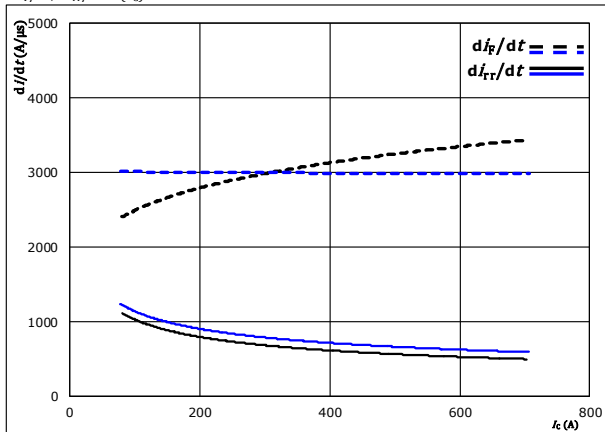
Vincotech

70-W212NMA400M7-LC08F71
datasheet

Boost Switching Characteristics

figure 13. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$

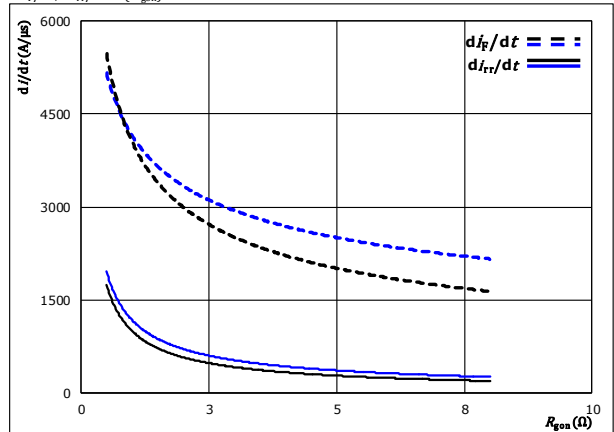


With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j = 25$ °C
 $T_j = 125$ °C

figure 14. FWD

Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_F/dt, di_{rr}/dt = f(R_{gon})$



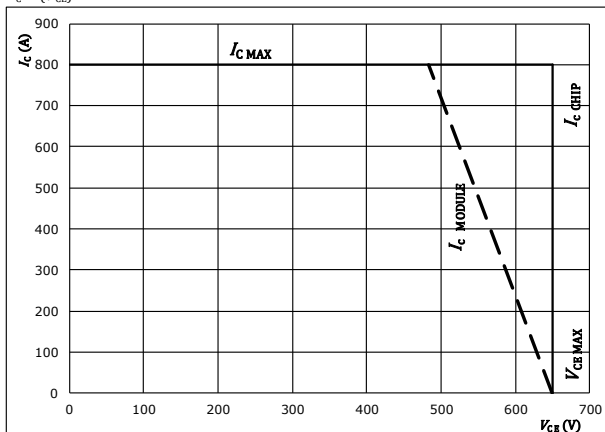
With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 400$ A
 $T_j = 25$ °C
 $T_j = 125$ °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

$T_j = 125$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



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Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

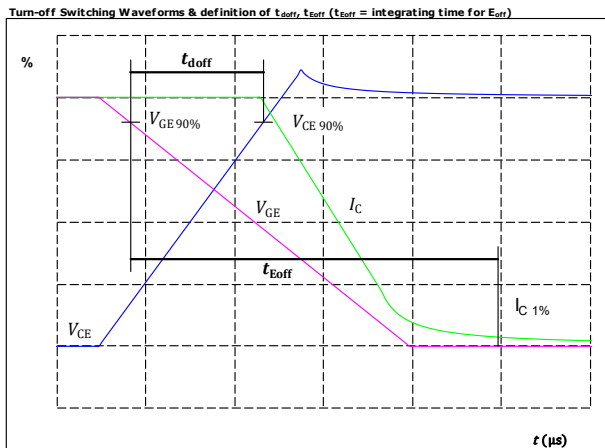


figure 2. IGBT

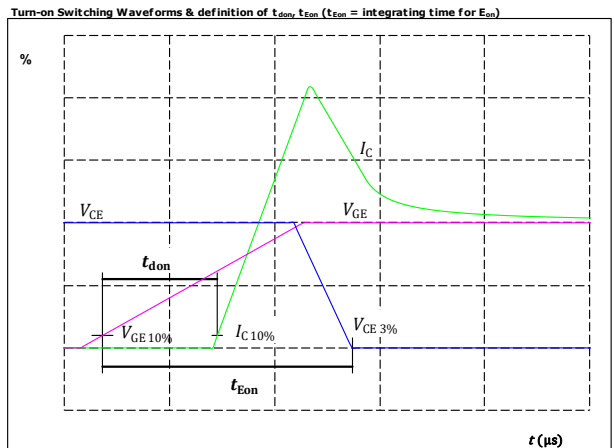


figure 3. IGBT

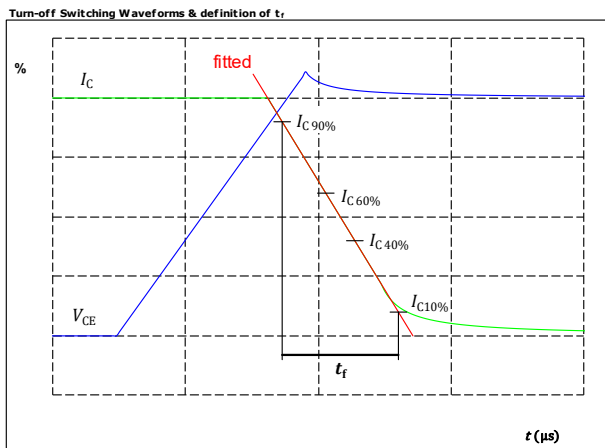
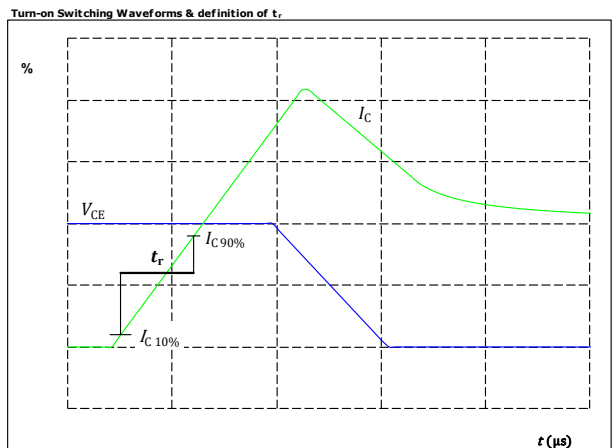


figure 4. IGBT



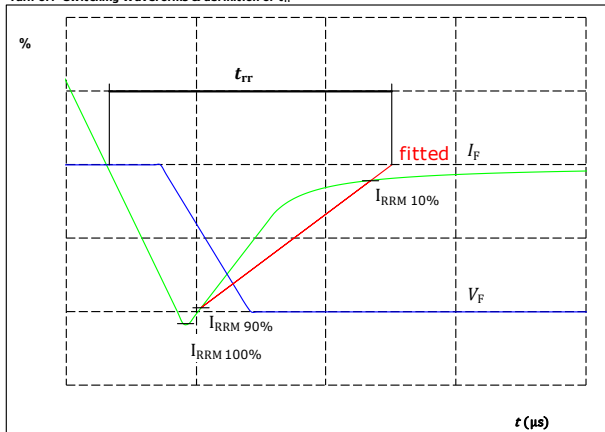


Vincotech

Boost Switching Characteristics

figure 5. FWD

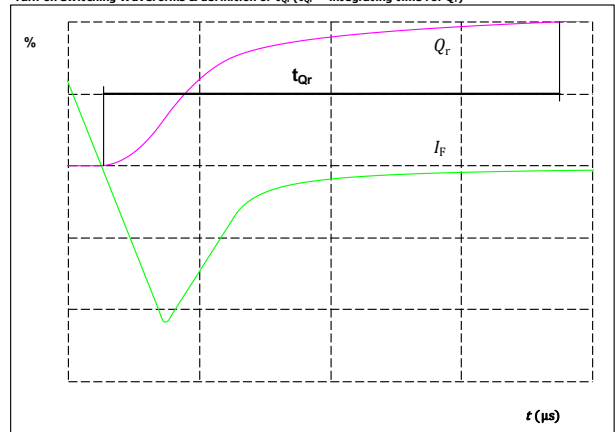
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	350	V
$I_F(100\%) =$	400	A
$I_{RRM}(100\%) =$	204	A
$t_{rr} =$	541	ns

figure 6. FWD

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




$I_F(100\%) =$	400	A
$Q_r(100\%) =$	48	μC



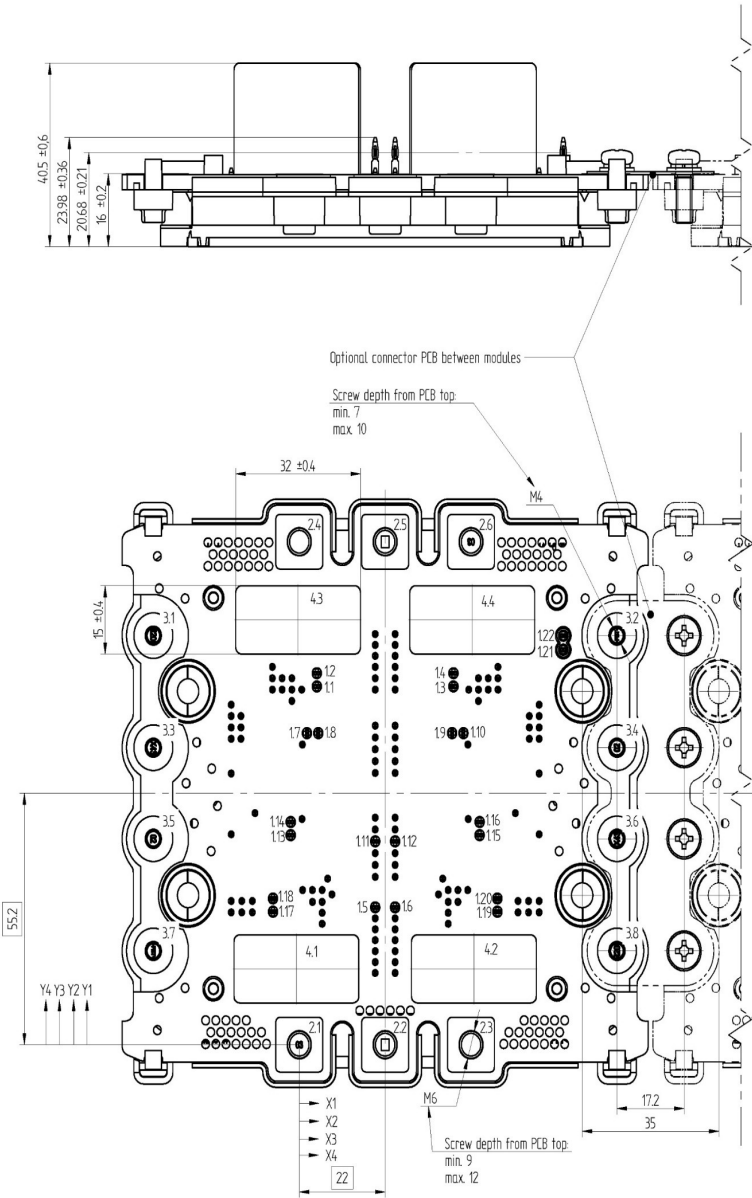
Vincotech

70-W212NMA400M7-LC08F71

datasheet

Ordering Code & Marking								
Version			Ordering Code					
without thermal paste			70-W212NMA400M7-LC08F71					
with thermal paste			70-W212NMA400M7-LC08F71-/3/					
<div><div><div>Name</div><div></div><div>YK/Date code</div><div>Lot</div><div>Serial</div><div>Vincotech</div><div>UL</div></div></div>	Text	Name		Date code	UL & VIN	Lot	Serial	
		NN-NNNNNNNNNNNN-TTTTTTV		WWYY	UL VIN	LLLLL	SSSS	
	Datamatrix	Type&Ver	Lot number	Serial	Date code			
		TTTTTTTV	LLLLL	SSSS	WWYY			

Outline



Technical drawing of the 70-W212NMA400M7-LC08F71 module showing top and side views with dimensions and pin locations.

Dimensions (mm):

- Overall width: 405 ±0.6
- Overall height: 23.98 ±0.36
- Module height: 20.68 ±0.21
- Pin pitch: 16 ±0.2
- Pin 1 offset: 15 ±0.4
- Pin 2 offset: 32 ±0.4
- Pin 3 offset: 17.2
- Pin 4 offset: 35
- Pin 5 offset: 17.2
- Pin 6 offset: 35
- Pin 7 offset: 17.2
- Pin 8 offset: 35
- Pin 9 offset: 17.2
- Pin 10 offset: 35
- Pin 11 offset: 17.2
- Pin 12 offset: 35
- Pin 13 offset: 17.2
- Pin 14 offset: 35
- Pin 15 offset: 17.2
- Pin 16 offset: 35
- Pin 17 offset: 17.2
- Pin 18 offset: 35
- Pin 19 offset: 17.2
- Pin 20 offset: 35
- Pin 21 offset: 17.2
- Pin 22 offset: 35
- Pin 23 offset: 17.2
- Pin 24 offset: 35
- Pin 25 offset: 17.2
- Pin 26 offset: 35
- Pin 27 offset: 17.2
- Pin 28 offset: 35
- Pin 29 offset: 17.2
- Pin 30 offset: 35
- Pin 31 offset: 17.2
- Pin 32 offset: 35
- Pin 33 offset: 17.2
- Pin 34 offset: 35
- Pin 35 offset: 17.2
- Pin 36 offset: 35
- Pin 37 offset: 17.2
- Pin 38 offset: 35
- Pin 39 offset: 17.2
- Pin 40 offset: 35
- Pin 41 offset: 17.2
- Pin 42 offset: 35
- Pin 43 offset: 17.2
- Pin 44 offset: 35
- Pin 45 offset: 17.2
- Pin 46 offset: 35
- Pin 47 offset: 17.2
- Pin 48 offset: 35
- Pin 49 offset: 17.2
- Pin 50 offset: 35
- Pin 51 offset: 17.2
- Pin 52 offset: 35
- Pin 53 offset: 17.2
- Pin 54 offset: 35
- Pin 55 offset: 17.2
- Pin 56 offset: 35
- Pin 57 offset: 17.2
- Pin 58 offset: 35
- Pin 59 offset: 17.2
- Pin 60 offset: 35
- Pin 61 offset: 17.2
- Pin 62 offset: 35
- Pin 63 offset: 17.2
- Pin 64 offset: 35
- Pin 65 offset: 17.2
- Pin 66 offset: 35
- Pin 67 offset: 17.2
- Pin 68 offset: 35
- Pin 69 offset: 17.2
- Pin 70 offset: 35

Optional connector PCB between modules

Screw depth from PCB top:

- min. 7
- max. 10

Screw depth from PCB top:

- min. 9
- max. 12

Dimension of coordinate axis is only offset without tolerance

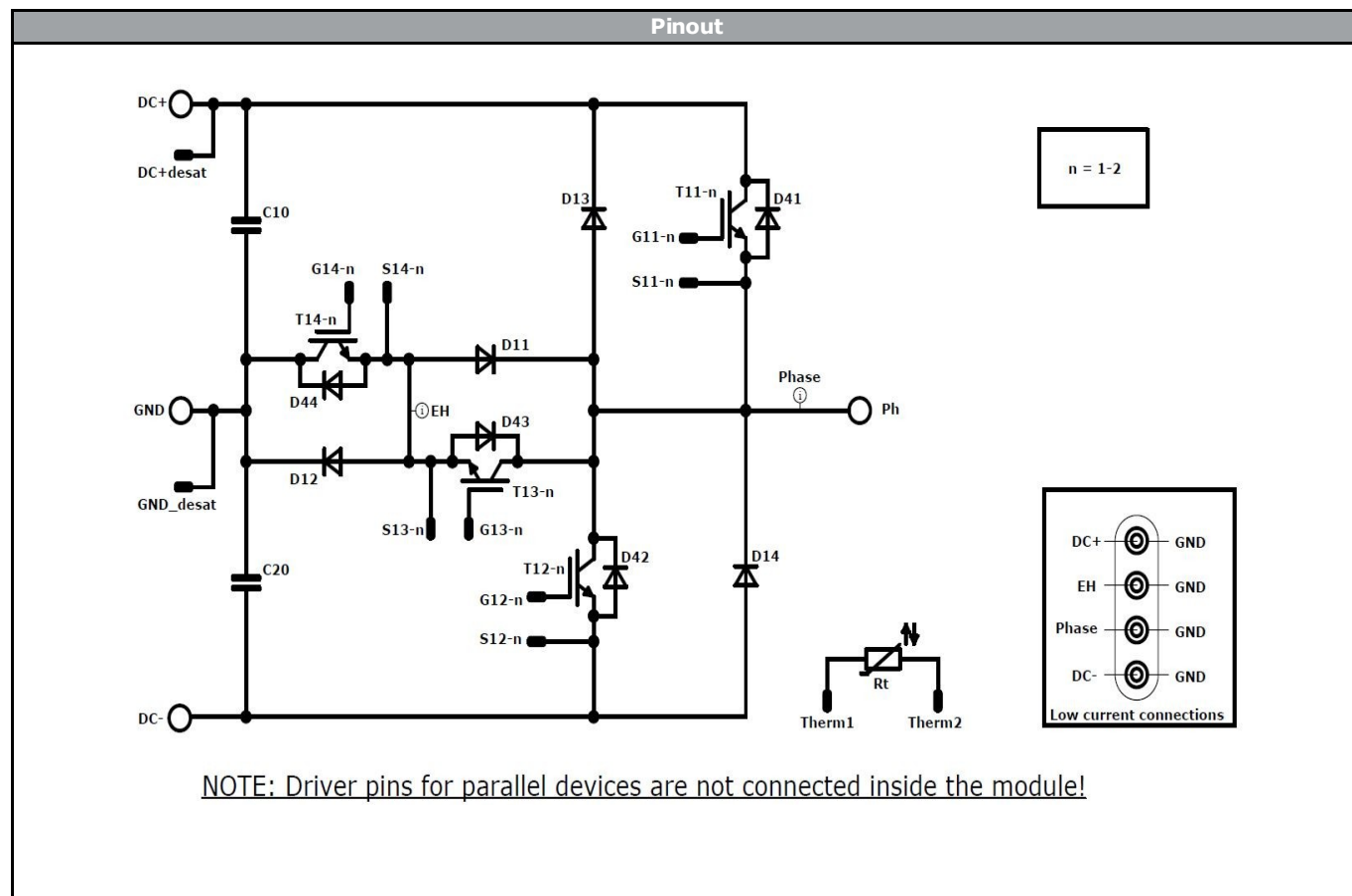
Driver pins			
Pin	X1	Y1	Function
1.1	4,5	78,65	G11-1
1.2	4,5	81,55	S11-1
1.3	39,5	78,65	G11-2
1.4	39,5	81,55	S11-2
1.5	19,45	30,15	DC+desat
1.6	24,55	30,15	DC+desat
1.7	1,95	68,4	S14-1
1.8	4,85	68,4	G14-1
1.9	39,15	68,4	G14-2
1.10	42,05	68,4	S14-2
1.11	19,45	44,65	GND_desat
1.12	24,55	44,65	GND_desat
1.13	-2,2	46	G13-1
1.14	-2,2	48,9	S13-1
1.15	46,2	46	G13-2
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
1.22	67,65	89,8	Therm1

Power interconnections			
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	GND
2.6	44	110,4	DC-

Low current connections			
M4 screw	X3	Y3	Function
3.1	-37,4	89,8	DC+
3.2	81,4	89,8	DC+
3.3	-37,4	65,2	EH
3.4	81,4	65,2	EH
3.5	-37,4	45,2	Phase
3.6	81,4	45,2	Phase
3.7	-37,4	20,6	DC-
3.8	81,4	20,6	DC-



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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	20 A	Buck Sw. Protection Diode	
T13, T14	IGBT	650 V	400 A	Boost Switch	
D13, D14	FWD	1200 V	400 A	Boost Diode	
D43, D44	FWD	650 V	40 A	Boost Sw. Protection Diode	
C10, C20	Capacitor	630V		Capacitor (DC)	
Rt	NTC			Thermistor	




Vincotech

70-W212NMA400M7-LC08F71
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 8	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for VINco X4 packages see vincotech.com website.

Package data
Package data for VINco X4 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-W212NMA400M7-LC08F71-D2-14	27 Nov. 2019	SPQ, Handling instruction, Package data	31

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