



Vincotech

70-W224NIA400M703-L400F70

datasheet

VINcoNPC X4

1200 V / 400 A

Features

- 2400 V NPC-topology
- High power screw interface
- Low inductive interface for external DC-capacitors and paralleling on component level
- High speed buck IGBTs
- Integrated Temperature sensor
- IGBT Mitsubishi Gen 7 technology with low VCEsat and improved EMC behavior
- Low inductance packaging

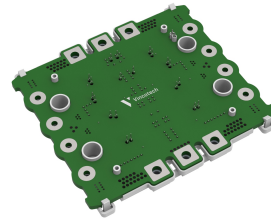
Target applications

- Solar Inverters
- UPS

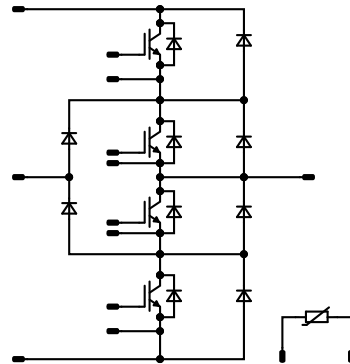
Types

- 70-W224NIA400M703-L400F70

VINco X4 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	372	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	$^{\circ}\text{C}$

Buck Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	266	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	434	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Buck Sw. Protection Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	42	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	130	A
Surge current capability	I^2t		84	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	126	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$



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Maximum Ratings

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

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Boost Switch				
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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
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Boost Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	266	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	434	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Boost Sw. Inv. Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	266	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	434	W
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$



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Surge current capability	I^2t		84	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	126	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

Isolation Properties

Isolation voltage	V_{isol}	DC Test Voltage* $t_p = 2\text{ s}$	4000	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					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Buck Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,04	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		400	25 125 150		1,53 1,71 1,75	1,85 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			400	μA
Gate-emitter leakage current	I_{GES}		20	0		25			2	μA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	0	10	25				84000		pF
Output capacitance	C_{oes}							2800		pF
Reverse transfer capacitance	C_{res}							1120		pF
Gate charge	Q_g	$V_{CC} = 600$ V	15		400	25		2800		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,15		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 1,25$ Ω $R_{goff} = 1,25$ Ω	-8/16	600	400	25 125 150		2384 2385 2403		ns
Rise time	t_r					25 125 150		40,96 41,92 42,56		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		1748 1743 1739		ns
Fall time	t_f					25 125 150		70,06 88,46 98,28		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD}=40,32$ μC $Q_{tFWD}=58,26$ μC $Q_{tFWD}=66,03$ μC				25 125 150		27,16 34,71 36,64		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		33,32 42,91 46,63		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Buck Diode

Static

Forward voltage	V_F				400	25 125 150		1,82 1,96 1,97	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25			160	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,22		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=8938$ A/µs $di/dt=9411$ A/µs $di/dt=9083$ A/µs	-8/16	600	400	25 125 150		387,14 428,67 454,49		A
Reverse recovery time	t_{rr}					25 125 150		264,31 376,56 408,71		ns
Recovered charge	Q_r					25 125 150		40,32 58,26 66,03		µC
Reverse recovered energy	E_{rec}					25 125 150		16,58 24,63 28,55		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		5837 5294 5428		A/µs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Buck Sw. Protection Diode

Static

Forward voltage	V_F				30	25 125 150		2,37 2,47	2,71 ⁽¹⁾ 2,77 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25 150		1800	120 3600	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,76		K/W
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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Boost Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,04	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		400	25 125 150		1,53 1,71 1,75	1,85 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			400	µA
Gate-emitter leakage current	I_{GES}		20	0		25			2	µA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	0	10	25				84000		pF
Output capacitance	C_{oes}							2800		pF
Reverse transfer capacitance	C_{res}							1120		pF
Gate charge	Q_g	$V_{CC} = 600$ V	15		400	25		2800		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,15		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 1,25$ Ω $R_{goff} = 1,25$ Ω	-8/16	600	400	25 125 150		235,84 237,12 237,76		ns
Rise time	t_r					25 125 150		39,04 40,64 40,32		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		1865 1920 1806		ns
Fall time	t_f					25 125 150		72,44 92,66 100,06		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD}=40,25$ µC $Q_{tFWD}=59,4$ µC $Q_{tFWD}=64,76$ µC				25 125 150		22,05 27,91 28,75		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		30,68 39,99 43,12		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Boost Diode

Static

Forward voltage	V_F				400	25 125 150		1,82 1,96 1,97	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25			160	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,22		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=9501$ A/µs $di/dt=9488$ A/µs $di/dt=9046$ A/µs	-8/16	600	400	25 125 150		383,25 417,6 426,7		A
Reverse recovery time	t_{rr}					25 125 150		259,02 377,84 402,91		ns
Recovered charge	Q_r					25 125 150		40,25 59,4 64,76		µC
Reverse recovered energy	E_{rec}					25 125 150		16,36 24,55 26,91		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		4770 3973 3754		A/µs



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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Boost Sw. Inv. Diode

Static

Forward voltage	V_F				400	25 125 150		1,82 1,96 1,97	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25			160	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,22		K/W
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Boost Sw. Protection Diode

Static

Forward voltage	V_F				30	25 125 150		2,37 2,47	2,71 ⁽¹⁾ 2,77 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 1200$ V				25 150			120 3600	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						0,76		K/W
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Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P							5		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.



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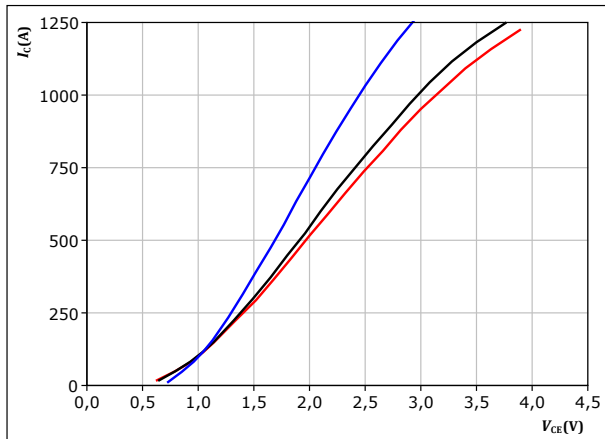
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Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

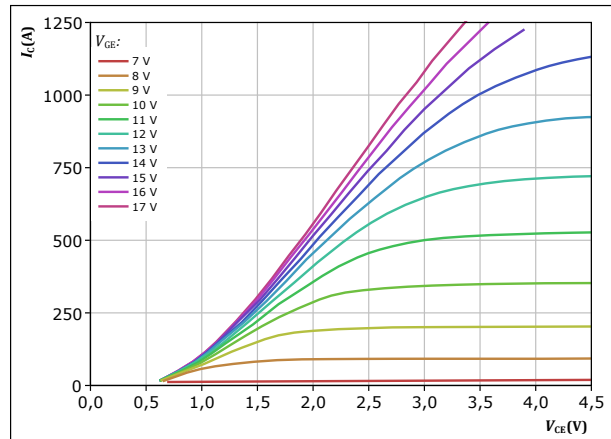


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$
 $125 \text{ } ^\circ C$
 $150 \text{ } ^\circ C$

figure 2. IGBT

Typical output characteristics

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

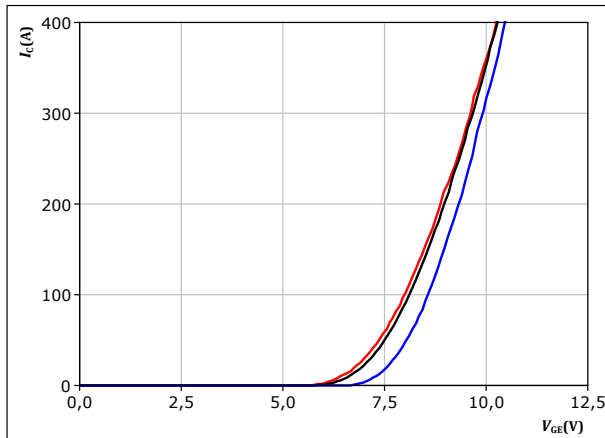


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

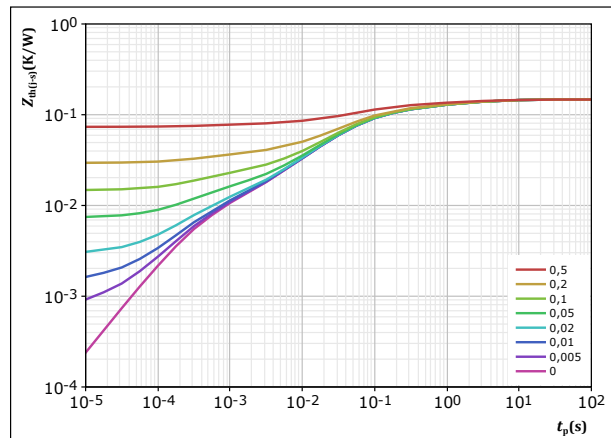


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$
 $125 \text{ } ^\circ C$
 $150 \text{ } ^\circ C$

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



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

R (K/W)	τ (s)
1,21E-02	5,43E+00
2,13E-02	9,81E-01
3,11E-02	1,80E-01
5,30E-02	4,67E-02
1,72E-02	1,41E-02
5,27E-03	2,87E-03
7,06E-03	3,56E-04



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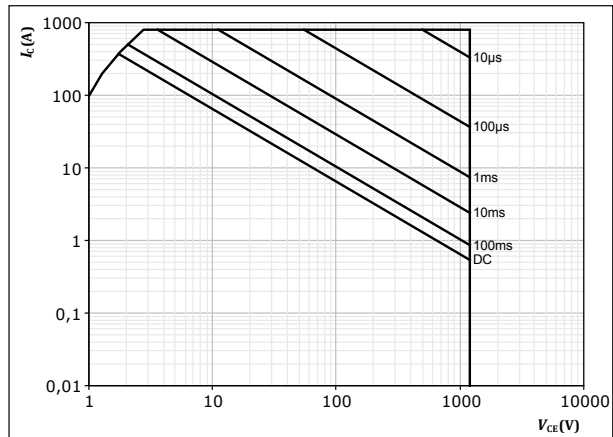
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Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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

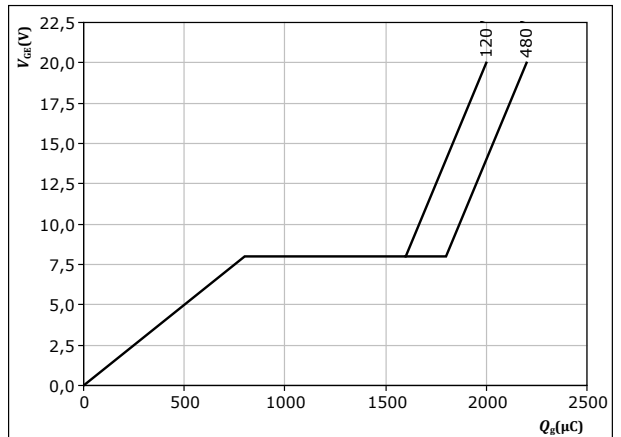


$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 6. IGBT

Gate voltage vs gate charge

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



$I_C = 100$ A
 $T_j = 25$ °C



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Buck Diode Characteristics

figure 7.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

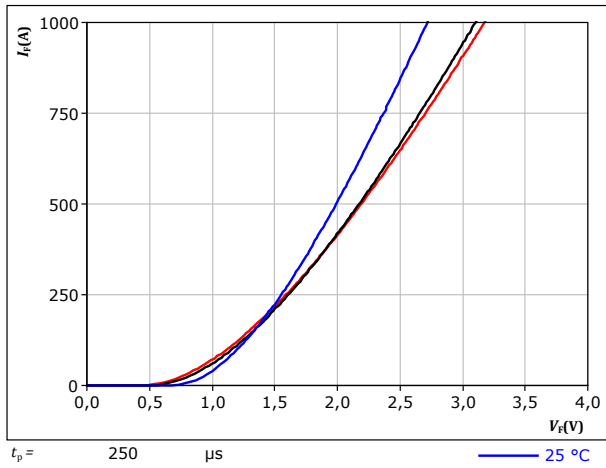
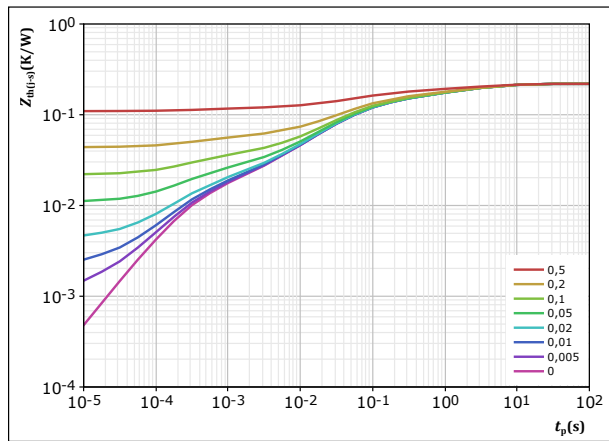


figure 8.

FWD

Transient thermal impedance as a function of pulse width

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





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Buck Sw. Protection Diode Characteristics

figure 9.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

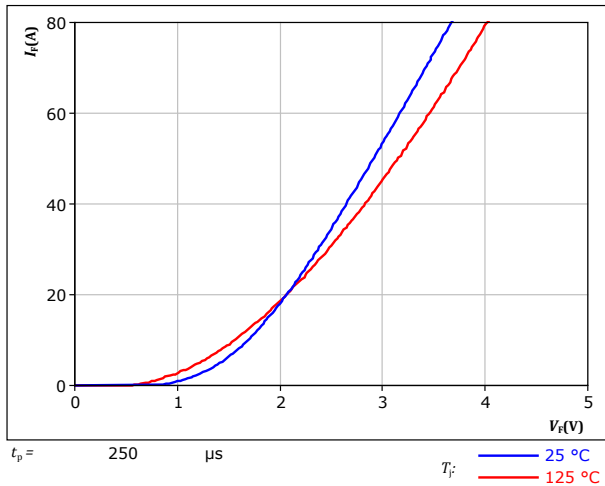
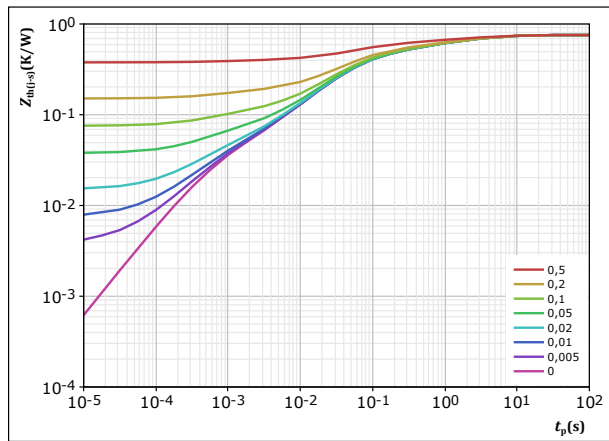


figure 10.

FWD

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$
$$R_{th(j-s)} = 0,755 \text{ K/W}$$

FWD thermal model values

R (K/W)	τ (s)
9,01E-02	5,64E+00
1,41E-01	1,21E+00
1,39E-01	2,33E-01
2,74E-01	4,98E-02
7,19E-02	1,55E-02
1,59E-02	2,19E-03
2,29E-02	5,19E-04



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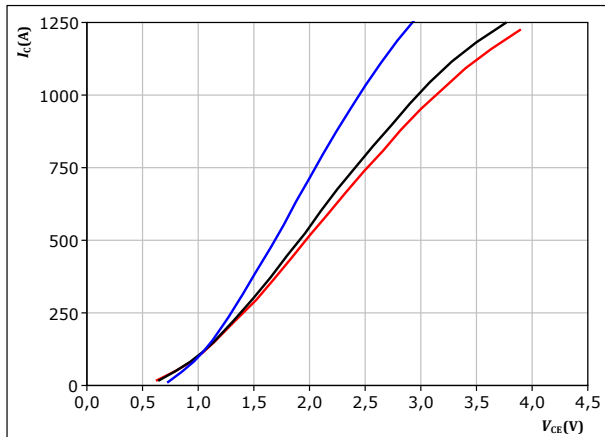
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Boost Switch Characteristics

figure 11. IGBT

Typical output characteristics

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

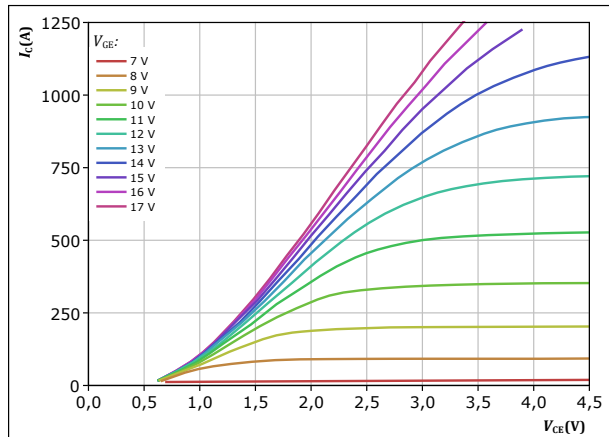


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 12. IGBT

Typical output characteristics

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

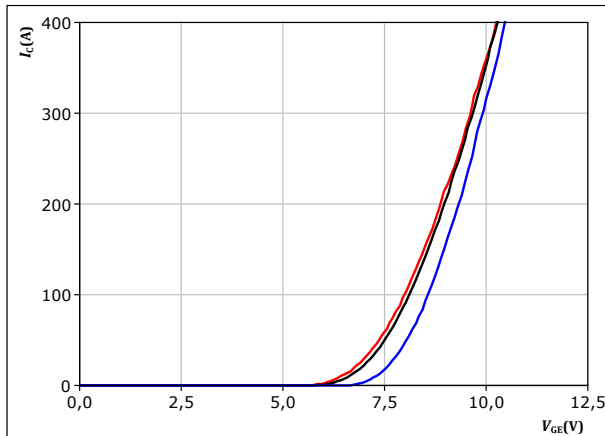


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 13. IGBT

Typical transfer characteristics

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

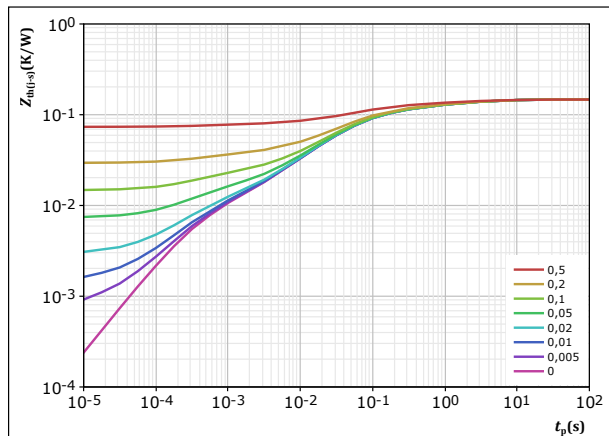


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 14. IGBT

Transient thermal impedance as a function of pulse width

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



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

R (K/W)	τ (s)
1,21E-02	5,43E+00
2,13E-02	9,81E-01
3,11E-02	1,80E-01
5,30E-02	4,67E-02
1,72E-02	1,41E-02
5,27E-03	2,87E-03
7,06E-03	3,56E-04



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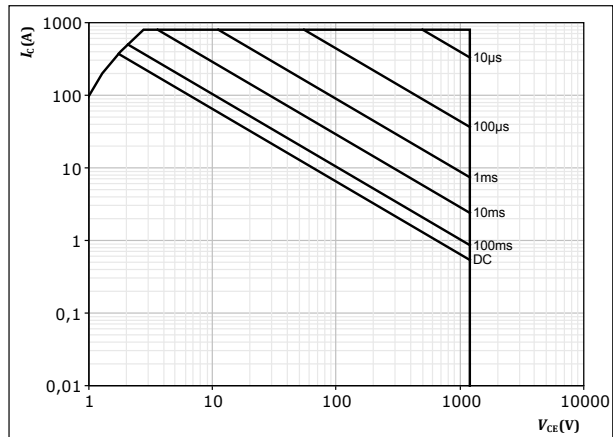
Boost Switch Characteristics

figure 15.

IGBT

Safe operating area

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



D = single pulse

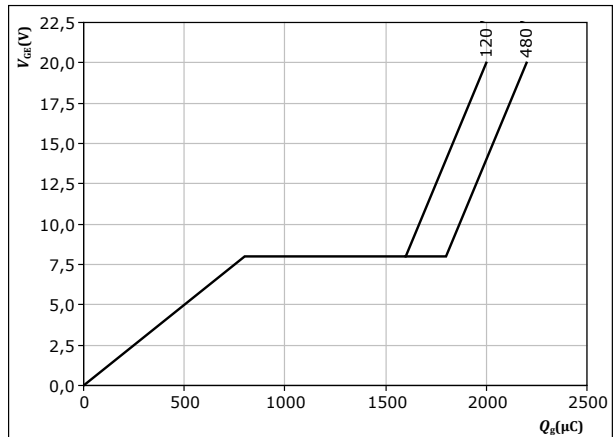
$T_s = 80$ °C
 $V_{GE} = 15$ V
 $T_j = T_{jmax}$

figure 16.

IGBT

Gate voltage vs gate charge

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



$I_C = 100$ A
 $T_j = 25$ °C



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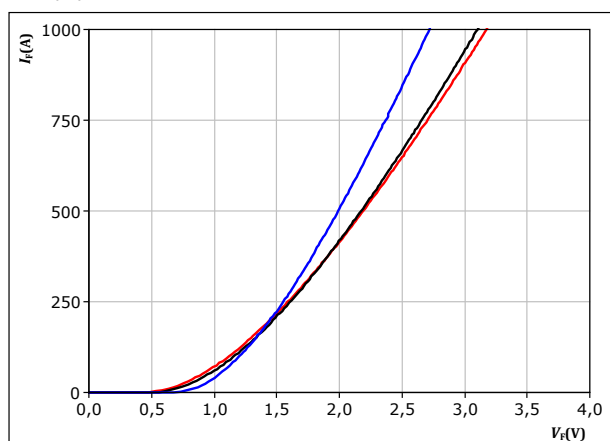
Boost Diode Characteristics

figure 17.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

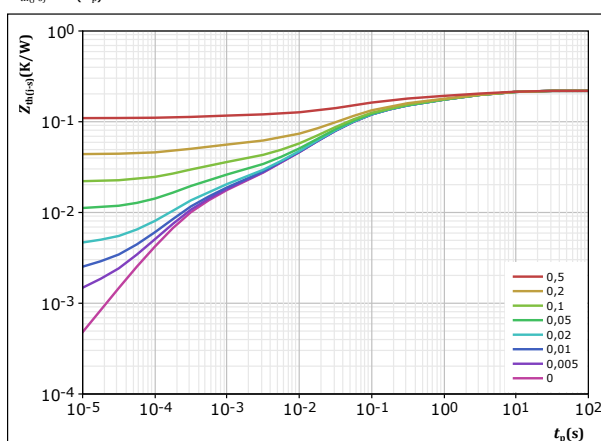
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 18.

FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,219 \text{ K/W}$

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
2,89E-02	6,07E+00
3,84E-02	1,43E+00
4,30E-02	2,09E-01
6,86E-02	4,64E-02
2,18E-02	1,22E-02
6,57E-03	1,76E-03
1,18E-02	2,85E-04



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Boost Sw. Inv. Diode Characteristics

figure 19.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

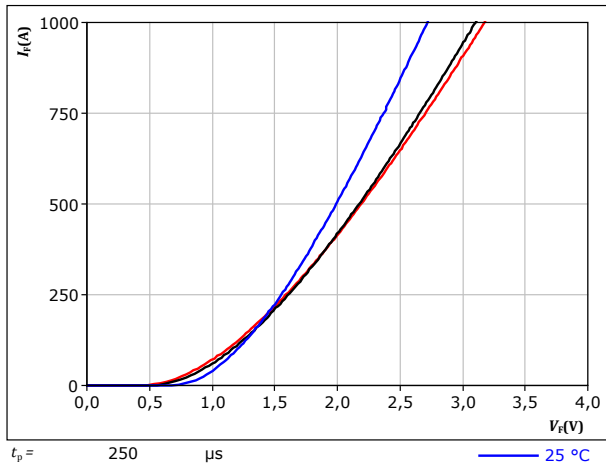
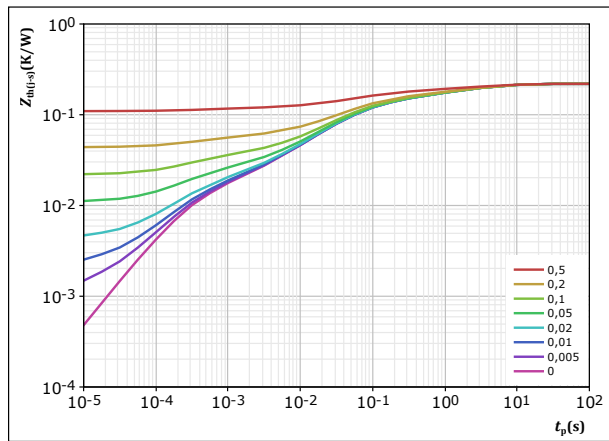


figure 20.

FWD

Transient thermal impedance as a function of pulse width

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





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Boost Sw. Protection Diode Characteristics

figure 21. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

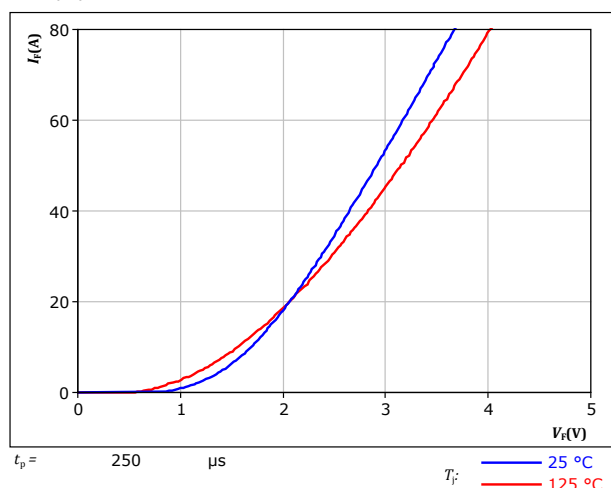
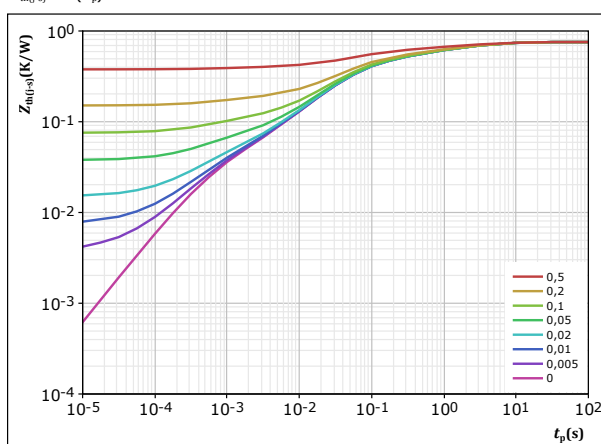


figure 22. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	0,755	K/W
FWD thermal model values		
R (K/W)	τ (s)	
9,01E-02	5,64E+00	
1,41E-01	1,21E+00	
1,39E-01	2,33E-01	
2,74E-01	4,98E-02	
7,19E-02	1,55E-02	
1,59E-02	2,19E-03	
2,29E-02	5,19E-04	



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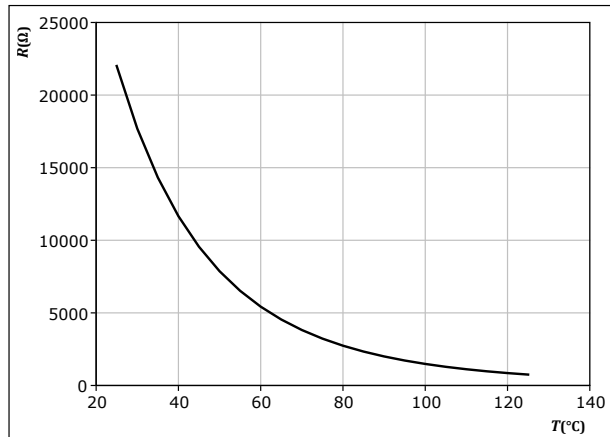
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datasheet

Thermistor Characteristics

figure 23. Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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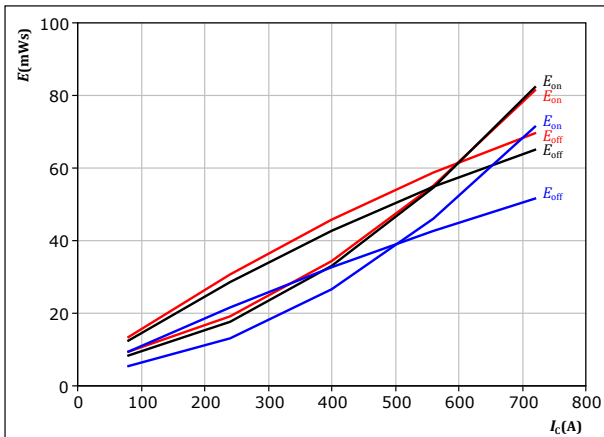
70-W224NIA400M703-L400F70 datasheet

Buck Switching Characteristics

figure 24. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$$V_{CE} = 600 \text{ V}$$

$$V_{GE} = -8/16 \text{ V}$$

$$R_{gon} = 1,25 \text{ } \Omega$$

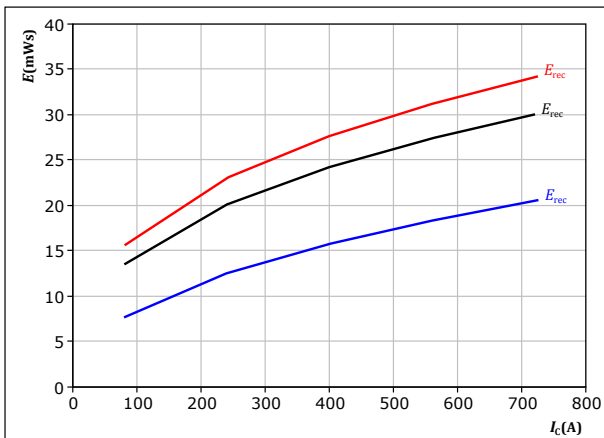
$$R_{goff} = 1,25 \text{ } \Omega$$

$$T_j: \begin{array}{l} \text{---} 25 \text{ } ^\circ\text{C} \\ \text{---} 125 \text{ } ^\circ\text{C} \\ \text{---} 150 \text{ } ^\circ\text{C} \end{array}$$

figure 26. FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$$V_{CE} = 600 \text{ V}$$

$$V_{GE} = -8/16 \text{ V}$$

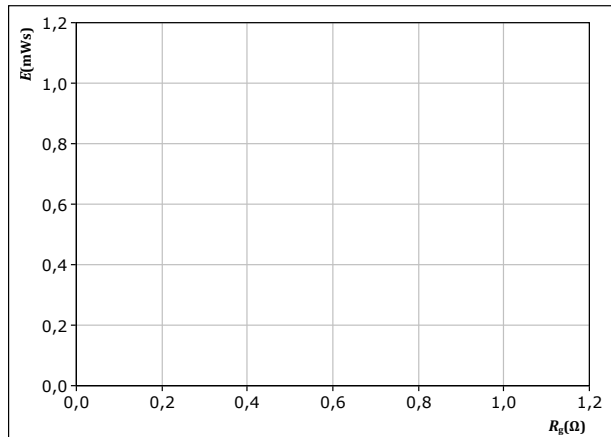
$$R_{gon} = 1,25 \text{ } \Omega$$

$$T_j: \begin{array}{l} \text{---} 25 \text{ } ^\circ\text{C} \\ \text{---} 125 \text{ } ^\circ\text{C} \\ \text{---} 150 \text{ } ^\circ\text{C} \end{array}$$

figure 25. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$$V_{CE} = 600 \text{ V}$$

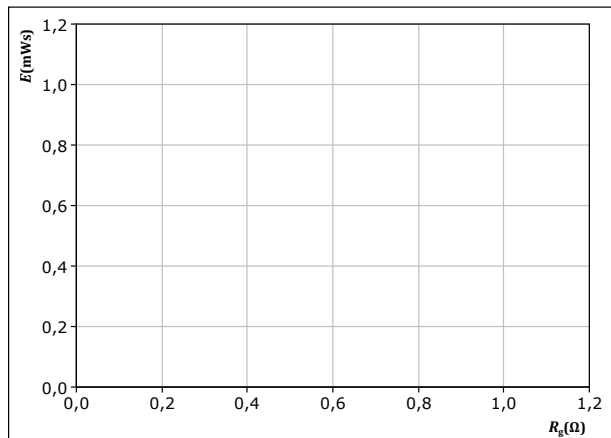
$$V_{GE} = -8/16 \text{ V}$$

$$I_C = 400 \text{ A}$$

figure 27. FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$$V_{CE} = 600 \text{ V}$$

$$V_{GE} = -8/16 \text{ V}$$

$$I_C = 400 \text{ A}$$



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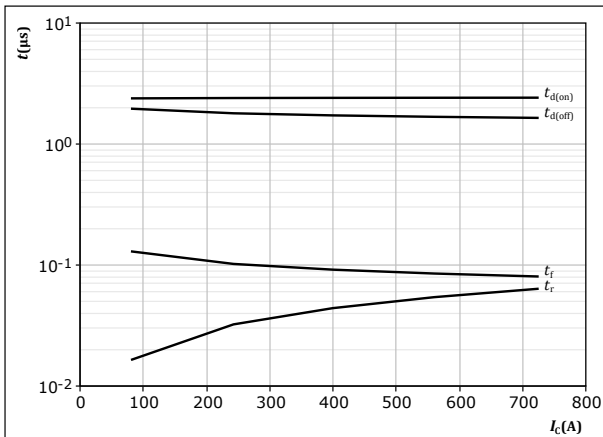
70-W224NIA400M703-L400F70 datasheet

Buck Switching Characteristics

figure 28.

IGBT

Typical switching times as a function of collector current
 $t = f(I_C)$



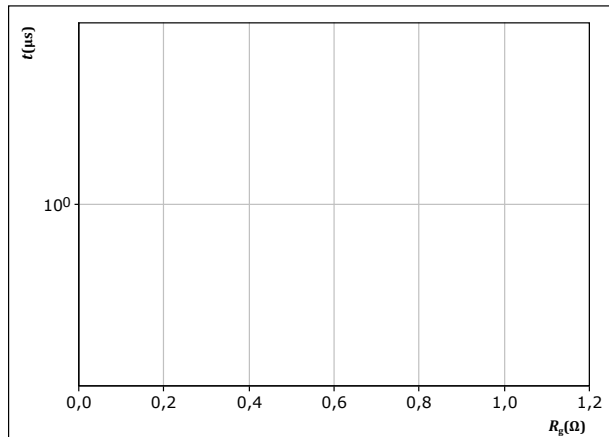
With an inductive load at

$T_j = 150$ °C
 $V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω
 $R_{goff} = 1,25$ Ω

figure 29.

IGBT

Typical switching times as a function of gate resistor
 $t = f(R_g)$



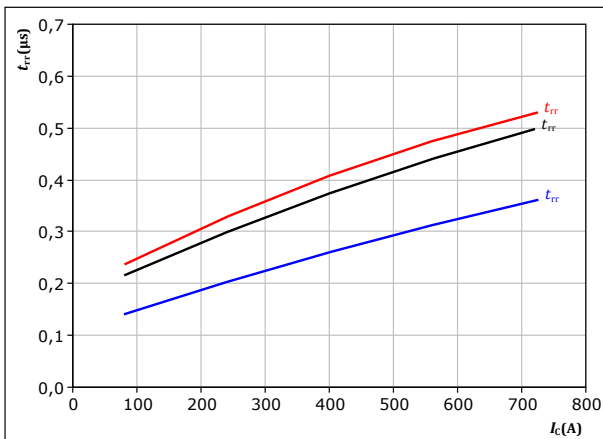
With an inductive load at

$T_j =$ °C
 $V_{CE} =$ V
 $V_{GE} =$ V
 $I_C =$ A

figure 30.

FWD

Typical reverse recovery time as a function of collector current
 $t_{rr} = f(I_C)$



With an inductive load at

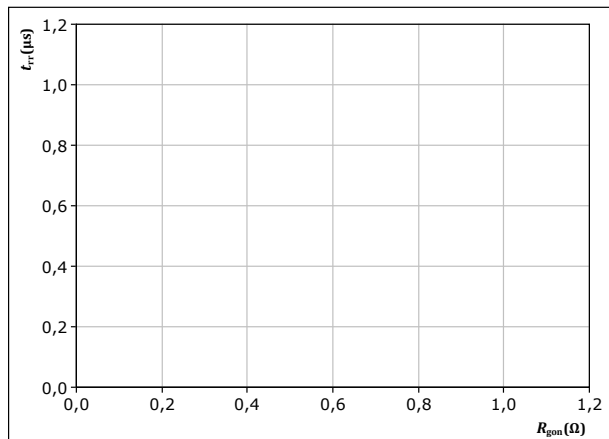
$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 31.

FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor
 $t_{rr} = f(R_{gon})$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_C = 400$ A



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datasheet

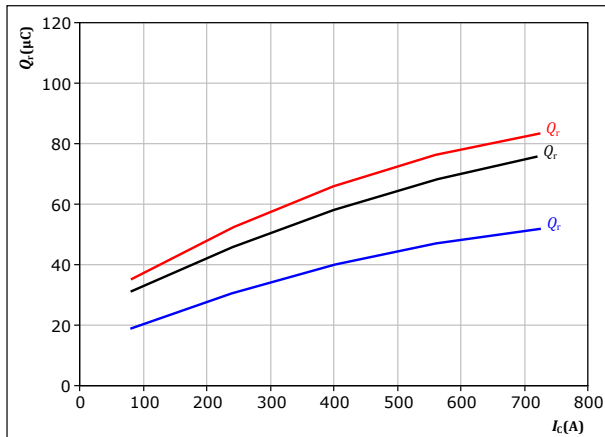
Buck Switching Characteristics

figure 32.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

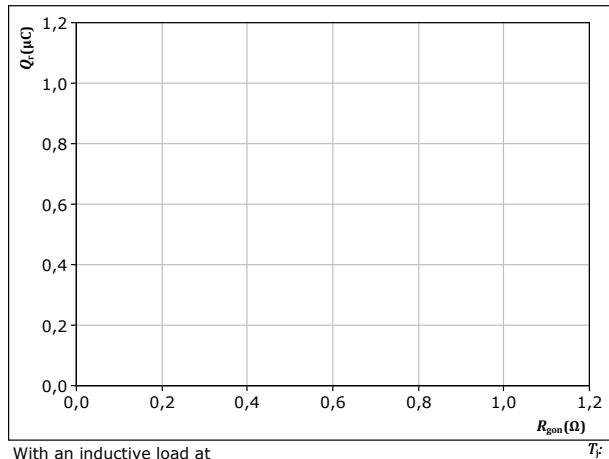
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 33.

FWD

Typical recovered charge as a function of turn on gate resistor

$$Q_r = f(R_{gon})$$



With an inductive load at

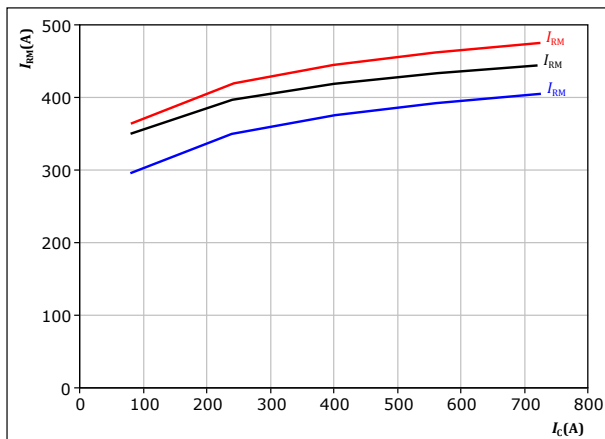
$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_C = 400$ A

figure 34.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

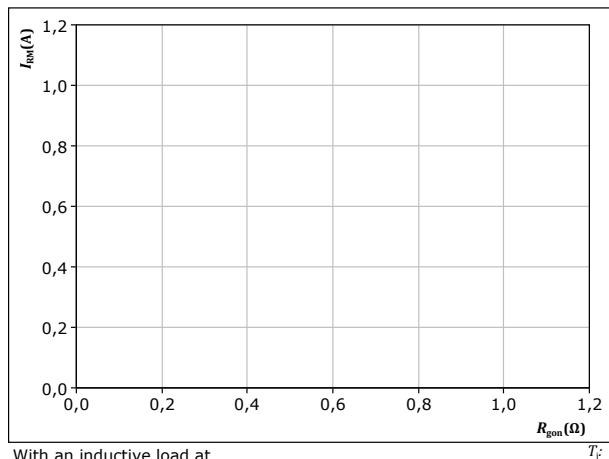
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 35.

FWD

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

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_C = 400$ A



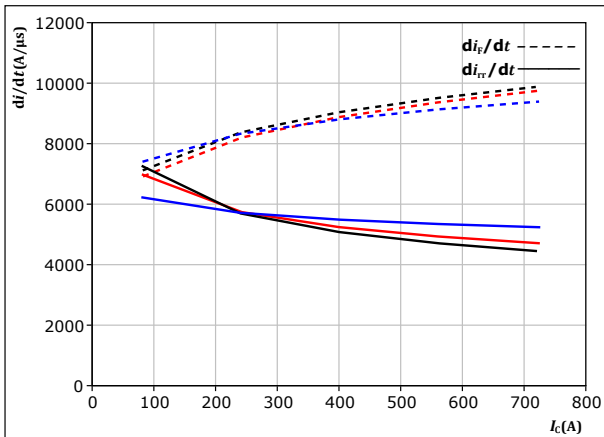
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datasheet

Buck Switching Characteristics

figure 36. FWD

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



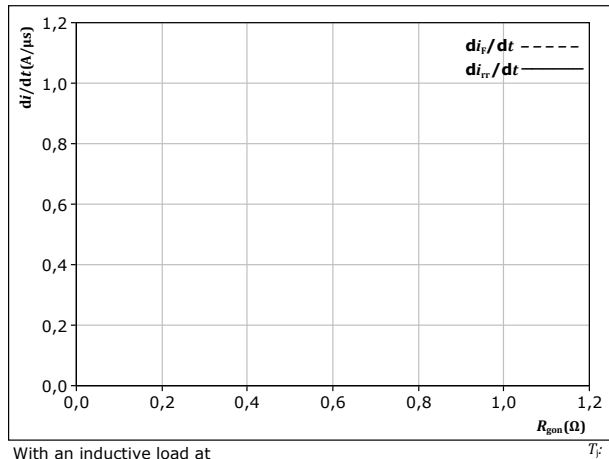
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = -8/16 \text{ V}$
 $R_{gon} = 1,25 \text{ } \Omega$

$T_j:$
 — 25 °C
 — 125 °C
 — 150 °C

figure 37. FWD

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



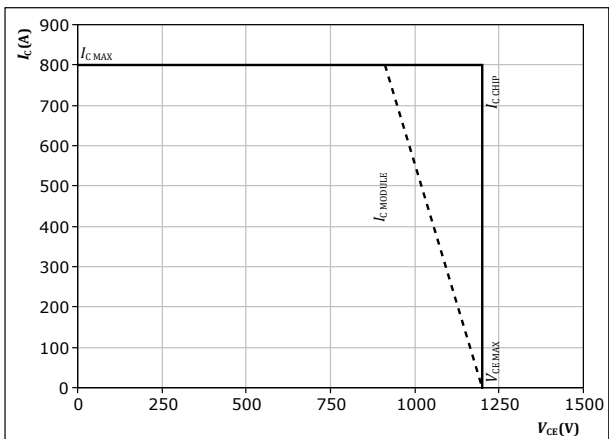
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = -8/16 \text{ V}$
 $I_C = 400 \text{ A}$

figure 38. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 1,25 \text{ } \Omega$
 $R_{goff} = 1,25 \text{ } \Omega$



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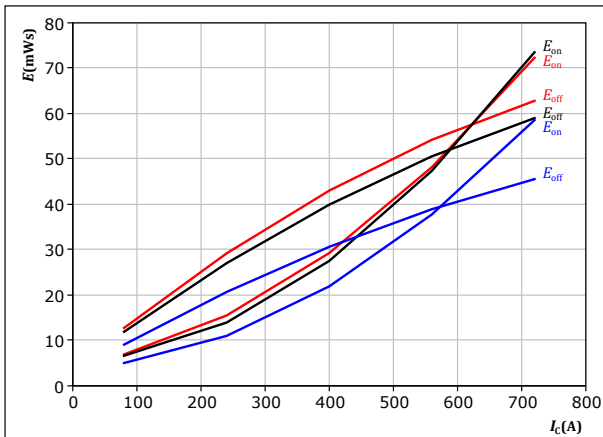
Boost Switching Characteristics

figure 39.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω
 $R_{goff} = 1,25$ Ω

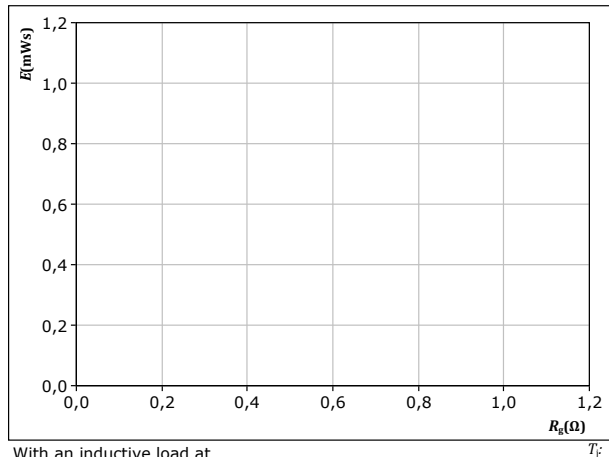
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 40.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

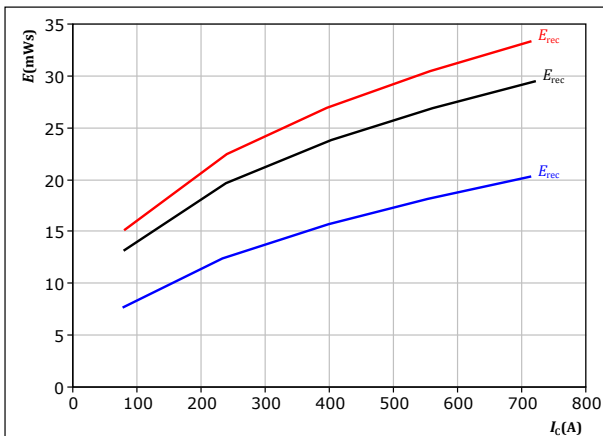
$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_C = 400$ A

figure 41.

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
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

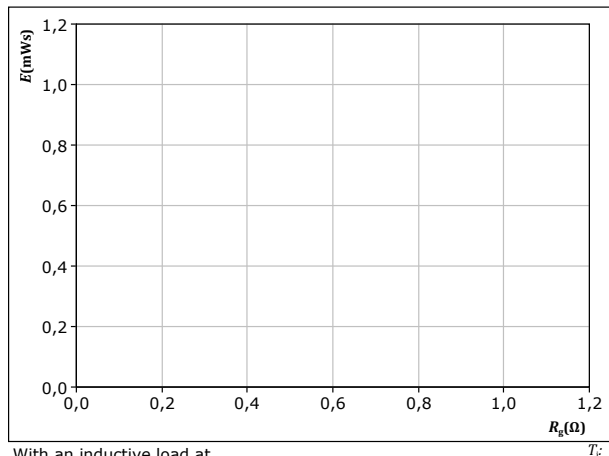
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 42.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_C = 400$ A



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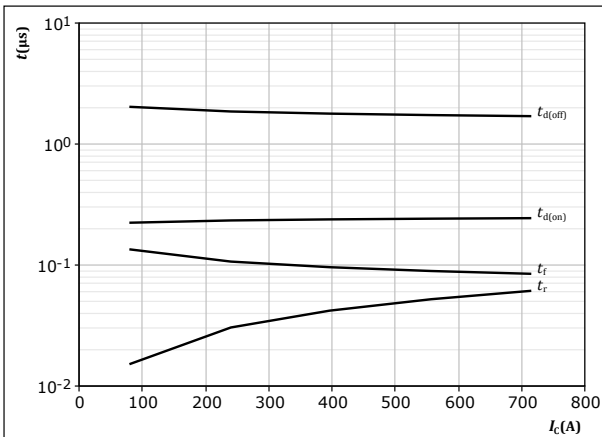
Boost Switching Characteristics

figure 43.

IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



With an inductive load at

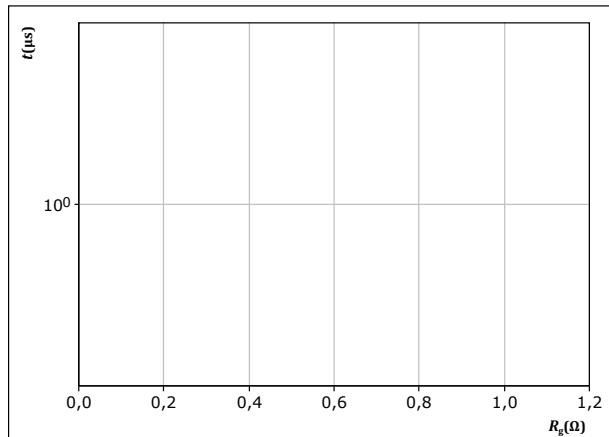
$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = -8/16 \text{ V}$
 $R_{gon} = 1,25 \text{ } \Omega$
 $R_{goff} = 1,25 \text{ } \Omega$

figure 44.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

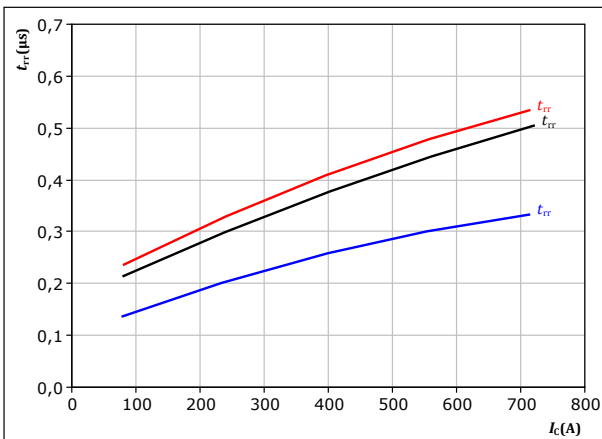
$T_j = \text{ } ^\circ\text{C}$
 $V_{CE} = \text{ V}$
 $V_{GE} = \text{ V}$
 $I_c = \text{ A}$

figure 45.

FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = -8/16 \text{ V}$
 $R_{gon} = 1,25 \text{ } \Omega$

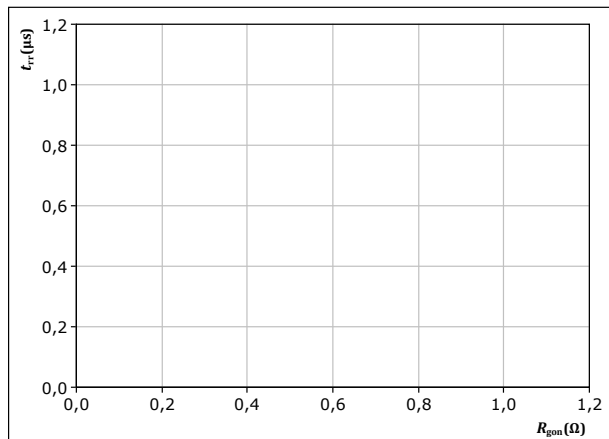
$T_j:$
— 25 °C
— 125 °C
— 150 °C

figure 46.

FWD

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

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = -8/16 \text{ V}$
 $I_c = 400 \text{ A}$



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datasheet

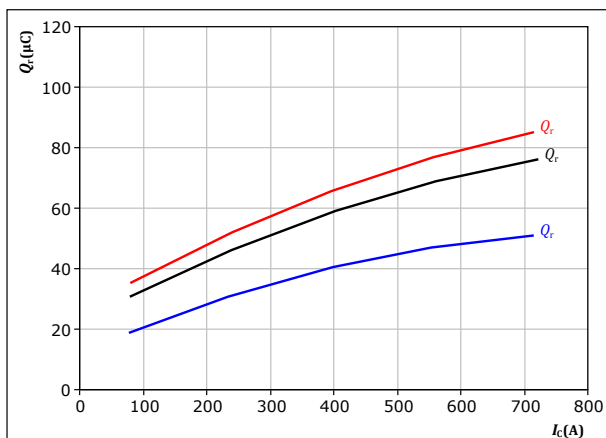
Boost Switching Characteristics

figure 47.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

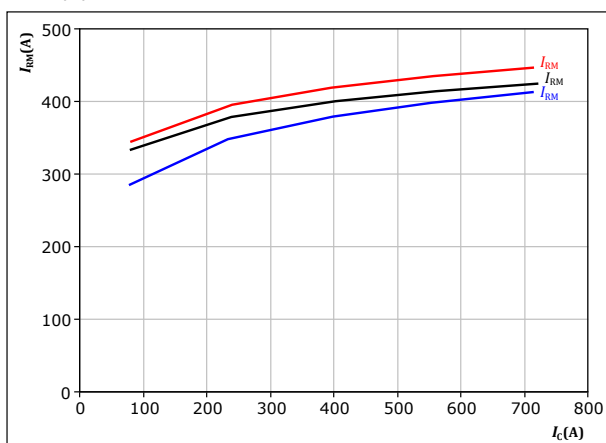
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 49.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

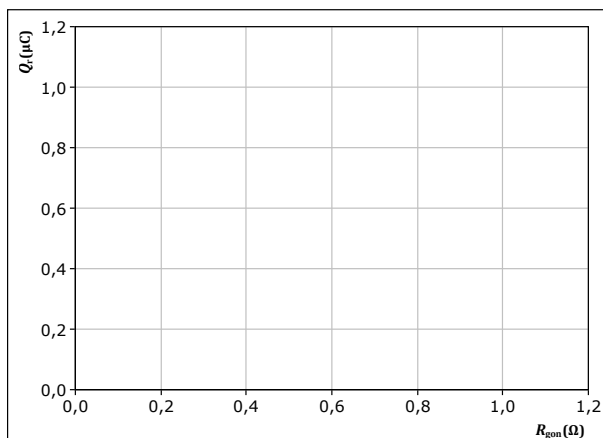
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 48.

FWD

Typical recovered charge as a function of turn on gate resistor

$$Q_r = f(R_{gon})$$



With an inductive load at

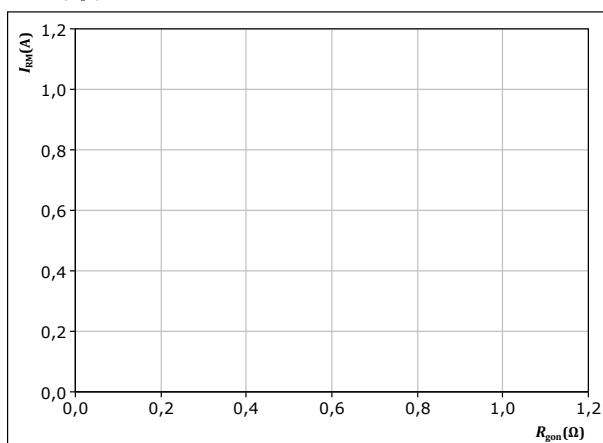
$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_c = 400$ A

figure 50.

FWD

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

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_c = 400$ A



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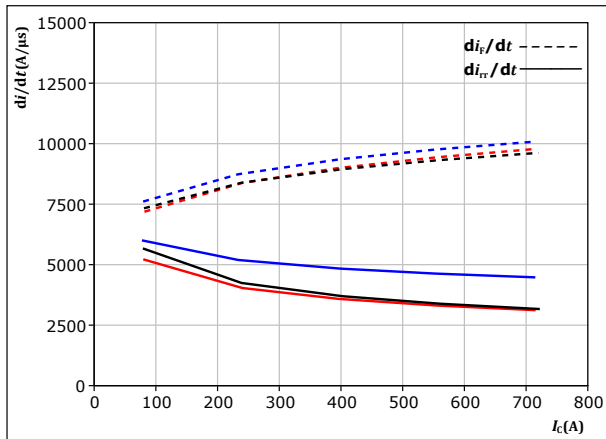
70-W224NIA400M703-L400F70

datasheet

Boost Switching Characteristics

figure 51. FWD

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



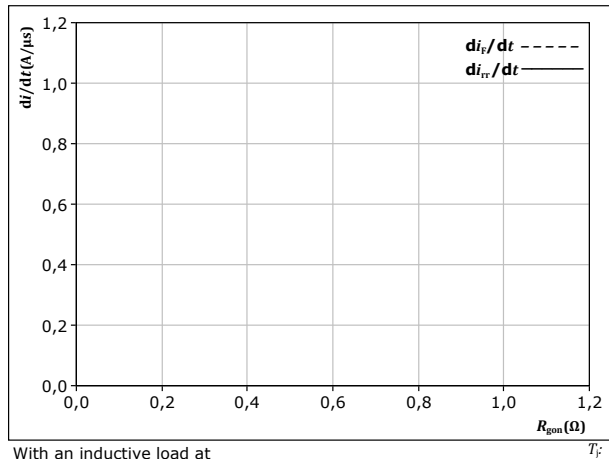
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $R_{gon} = 1,25$ Ω

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 52. FWD

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



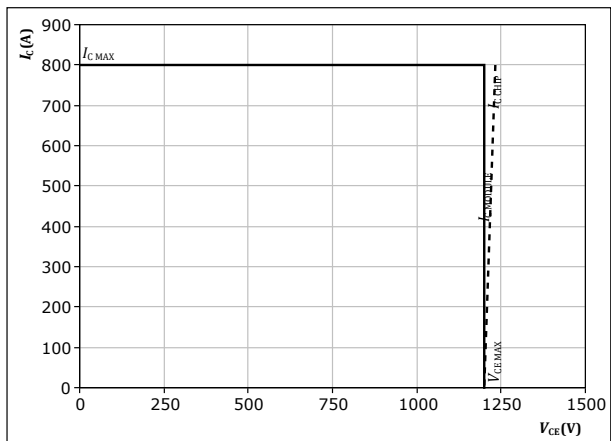
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = -8/16$ V
 $I_C = 400$ A

figure 53. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 1,25$ Ω
 $R_{goff} = 1,25$ Ω



Vincotech

70-W224NIA400M703-L400F70 datasheet

Switching Definitions

figure 54. IGBT

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

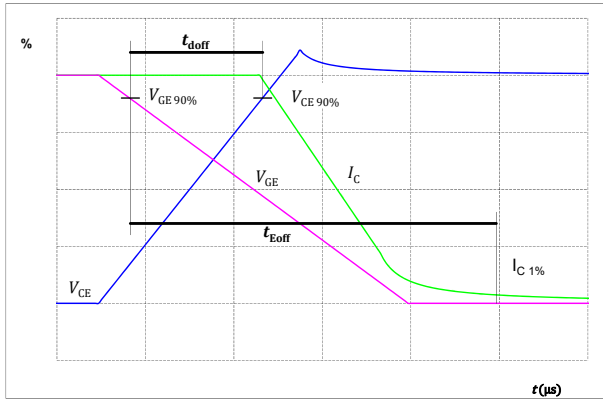


figure 55. IGBT

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

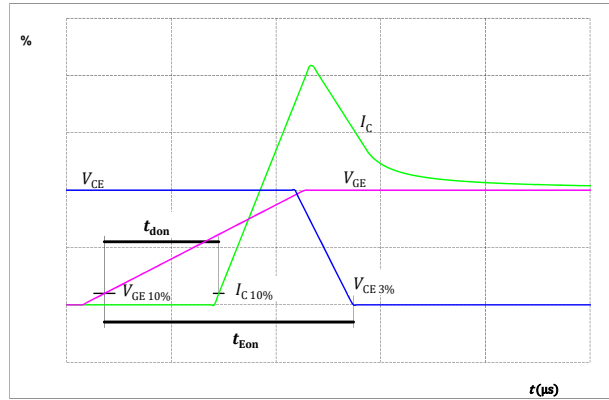


figure 56. IGBT

Turn-off Switching Waveforms & definition of t_f

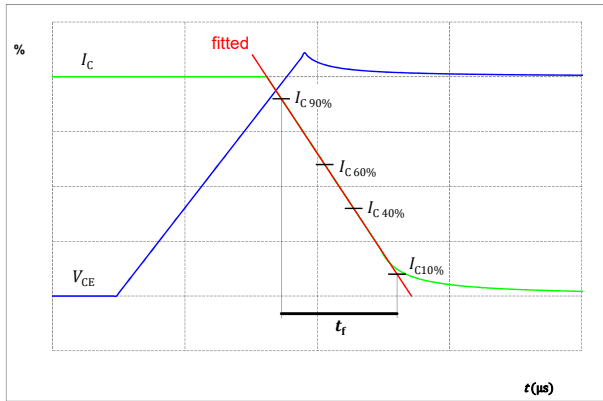
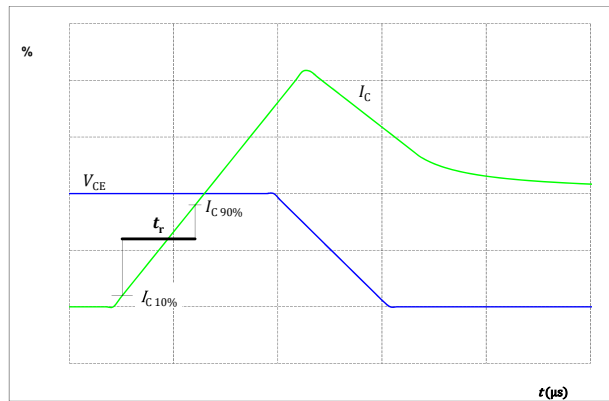


figure 57. IGBT

Turn-on Switching Waveforms & definition of t_r





Vincotech

Switching Definitions

figure 58.

FWD

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

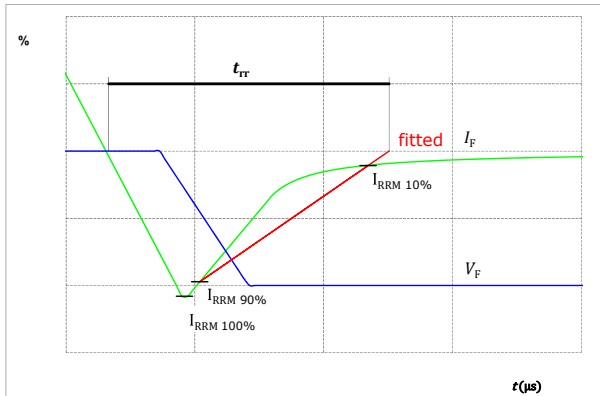
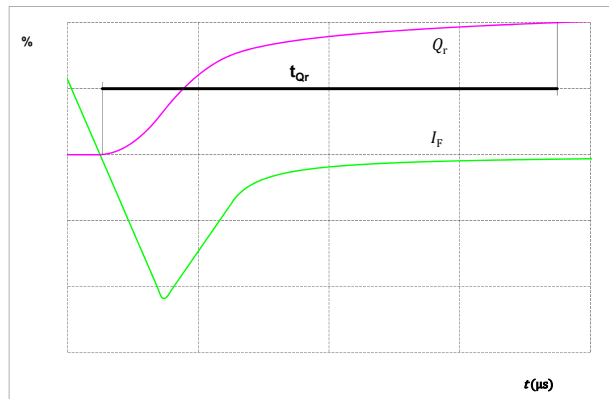


figure 59.

FWD

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





Vincotech

70-W224NIA400M703-L400F70

datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	70-W224NIA400M703-L400F70
With thermal paste	70-W224NIA400M703-L400F70-/3/

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

Outline

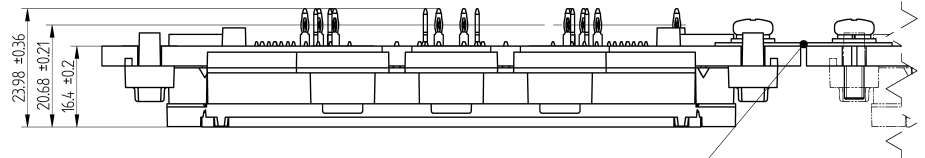


Vincotech

70-W224NIA400M703-L400F70

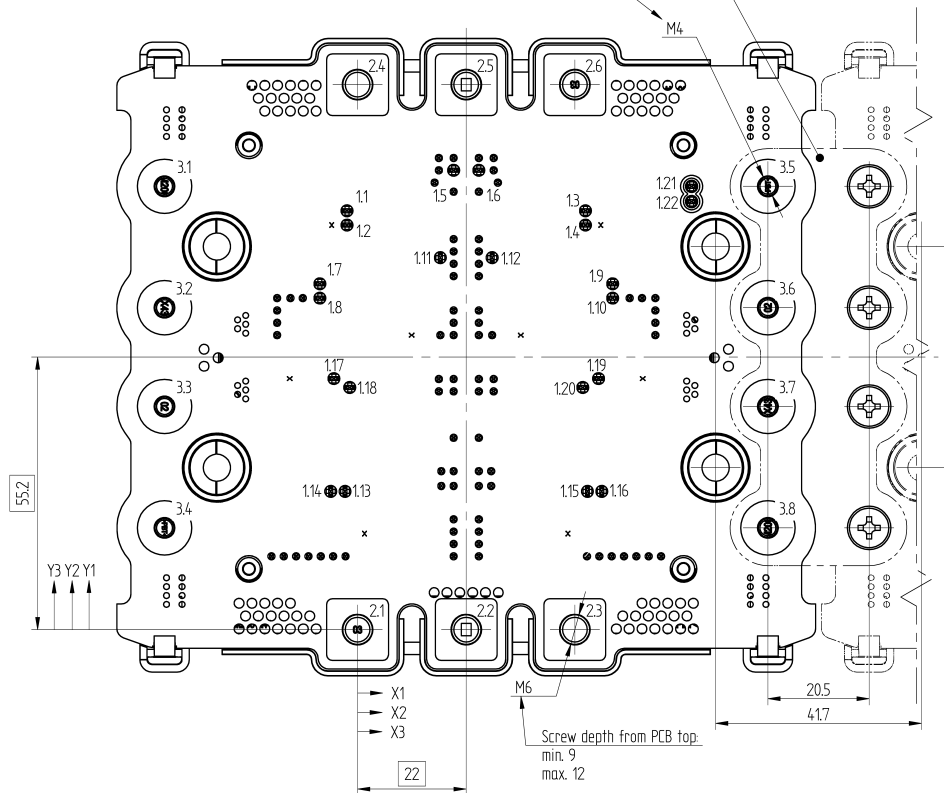
datasheet

Pin table [mm]			
Pin	X	Y	Function
1	-2,15	84,85	G11-1
2	-2,15	81,95	E11-1
3	46,15	84,85	G13-2
4	46,15	81,95	E13-2
5	19,45	93,05	DC+desat
6	24,55	93,05	DC+desat
7	-7,65	70,05	G13-1
8	-7,65	67,15	E13-1
9	51,65	70,05	G13-2
10	51,65	67,15	E13-2
11	16,75	75,35	GND desat
12	27,25	75,35	GND desat
13	-2,55	28	G14-1
14	-5,45	28	E14-1
15	46,55	28	G14-2
16	49,45	28	E14-2
17	-4,8	50,85	G12-1
18	-1,6	49,05	E12-1
19	48,8	50,85	G12-2
20	45,6	49,05	E12-2
21	67,65	89,8	Therm1-1
22	67,65	86,7	Therm2-1



Optional connector PCB between modules

Screw depth from PCB top:
min. 7
max. 10

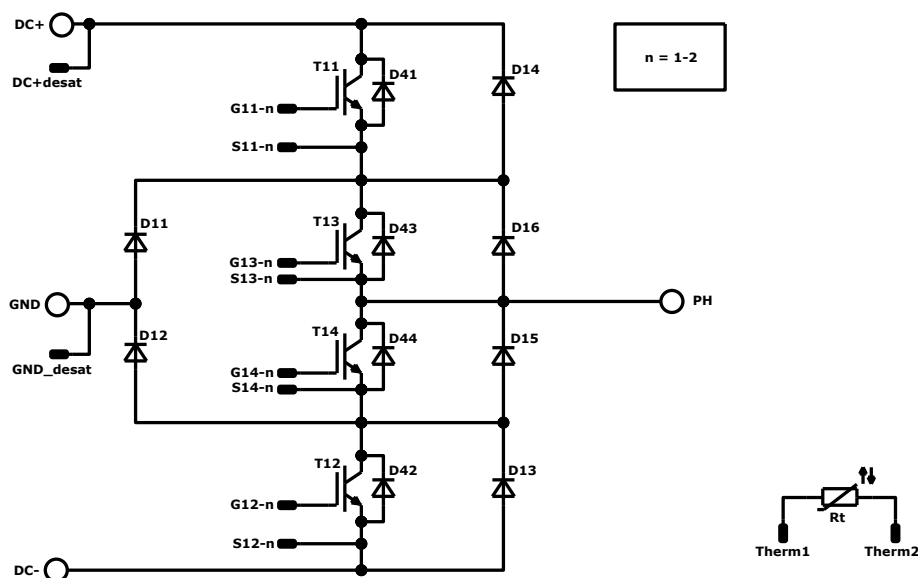


Dimension of coordinate axis is only offset without tolerance



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	400 A	Buck Switch	
D11, D12	FWD	1200 V	400 A	Buck Diode	
D41, D42	FWD	1200 V	30 A	Buck Sw. Protection Diode	
T13, T14	IGBT	1200 V	400 A	Boost Switch	
D13, D14	FWD	1200 V	400 A	Boost Diode	
D15, D16	FWD	1200 V	400 A	Boost Sw. Inv. Diode	
D43, D44	FWD	1200 V	30 A	Boost Sw. Protection Diode	
Rt	NTC			Thermistor	



Vincotech

70-W224NIA400M703-L400F70
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.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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-W224NIA400M703-L400F70-D1-14	24 Jul. 2020		

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