



Vincotech

10-PG07N3A050S5-M896F96T

datasheet

flow3xNPC 1

650 V / 50 A

Features

- Four quadrant operation
- Enhanced thermal performance
- Fast switching IGBTs

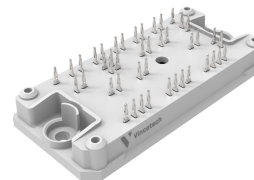
Target applications

- Solar Inverters
- UPS

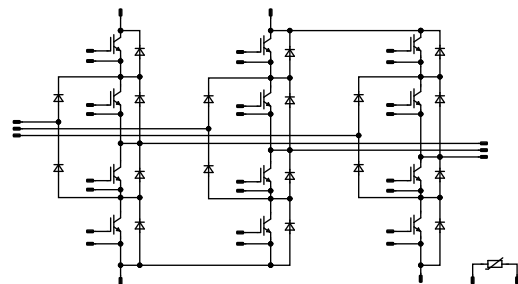
Types

- 10-PG07N3A050S5-M896F96T

flow 1 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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Buck Switch

Collector-emitter voltage	V_{CES}		650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	48	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	68	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C

Buck Diode

Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	45	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	60	W
Maximum junction temperature	T_{jmax}		175	°C

Boost Switch

Collector-emitter voltage	V_{CES}		650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	48	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	68	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C



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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	45	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	60	W
Maximum junction temperature	T_{jmax}		175	°C

Boost Sw. Inv. Diode

Peak repetitive reverse voltage	V_{RRM}		650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	45	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	60	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* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			9,56	mm
Comparative Tracking Index	CTI		≥ 600	

*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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0005	25	3,2	4	4,8	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	25 125 150		1,35 1,41 1,44	1,75 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		3100		pF
Output capacitance	C_{oes}							88		pF
Reverse transfer capacitance	C_{res}							12		pF
Gate charge	Q_g	$V_{CC} = 520 \text{ V}$	15		50	25		120		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,39		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	± 15	350	50	25 125 150		65 67 70		ns
Rise time	t_r					25 125 150		8 8 9		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		85 100 104		ns
Fall time	t_f					25 125 150		11,92 14,56 17,26		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		0,426 0,578 0,522		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,393 0,645 0,785		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				50	25 125 150		1,5 1,44 1,42	1,92 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 650$ V				25			2,65	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,58		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=8774$ A/µs $di/dt=8156$ A/µs $di/dt=7634$ A/µs	± 15	350	50	25 125 150		94,77 114,24 112,38		A
Reverse recovery time	t_{rr}					25 125 150		28,1 65,75 72,89		ns
Recovered charge	Q_r					25 125 150		1,82 3,26 3,59		µC
Reverse recovered energy	E_{rec}					25 125 150		0,476 0,865 1,06		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		8284 7934 6988		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 Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0005	25	3,2	4	4,8	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	25 125 150		1,35 1,41 1,44	1,75 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	650		25			50	μA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		3100		pF
Output capacitance	C_{oes}							88		pF
Reverse transfer capacitance	C_{res}							12		pF
Gate charge	Q_g	$V_{CC} = 520 \text{ V}$	15		50	25		120		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,39		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	± 15	350	50	25 125 150		58,6 59,78 60,21		ns
Rise time	t_r					25 125 150		11,82 13,1 13,24		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		68,84 85,65 89,27		ns
Fall time	t_f					25 125 150		14,71 28,24 33,09		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		0,329 0,524 0,522		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,615 0,918 1,01		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				50	25 125 150		1,5 1,44 1,42	1,92 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 650$ V				25			2,65	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,58		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=4018$ A/µs $di/dt=3358$ A/µs $di/dt=3518$ A/µs	± 15	350	50	25 125 150		47,06 60,23 64,18		A
Reverse recovery time	t_{rr}					25 125 150		57,37 94,16 106,27		ns
Recovered charge	Q_r					25 125 150		1,39 2,88 3,34		µC
Reverse recovered energy	E_{rec}					25 125 150		0,365 0,722 0,837		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		1038,73 797,08 824,8		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			50	25 125 150			1,5 1,44 1,42	1,92 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 650$ V			25				2,65	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,58		K/W
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Thermistor

Static

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

⁽¹⁾ Value at chip level

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



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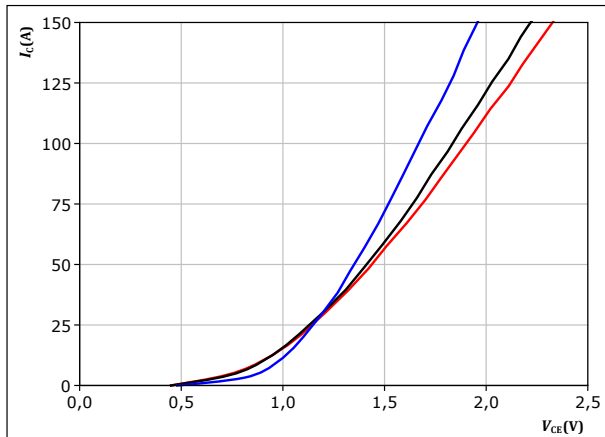
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Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

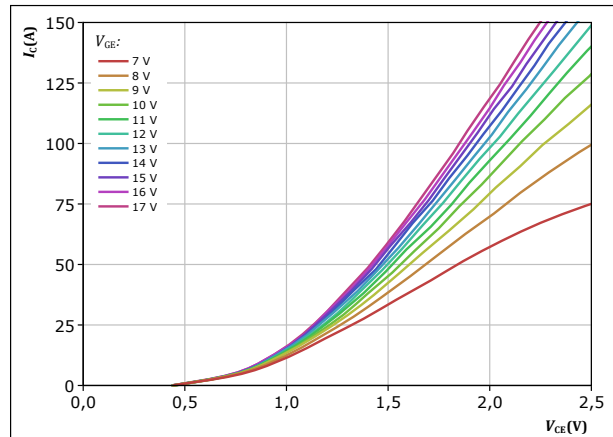


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

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

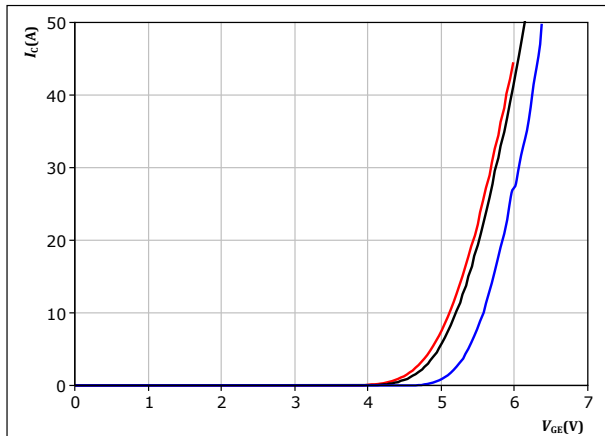


$t_p = 250 \mu s$
 $T_j = 150 \text{ °C}$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

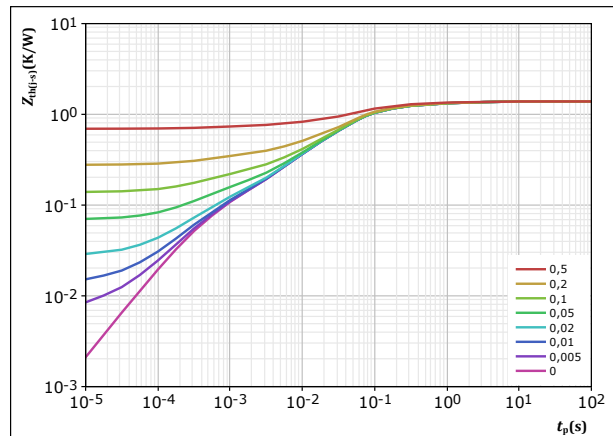


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,387 \text{ K/W}$
IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
8,70E-02	2,39E+00
2,35E-01	2,56E-01
8,38E-01	4,81E-02
1,53E-01	6,04E-03
7,46E-02	4,42E-04



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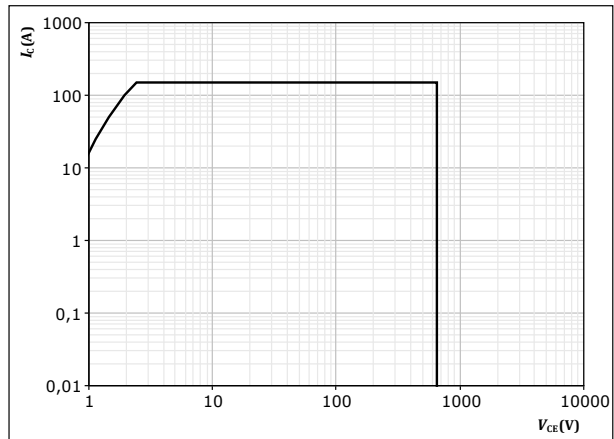
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datasheet

Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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



$D =$ single pulse

$T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



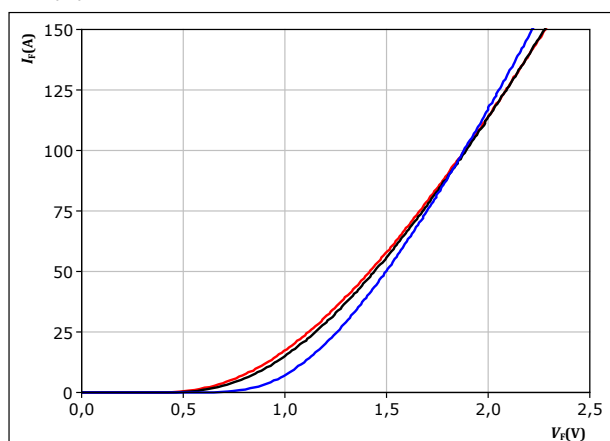
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Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

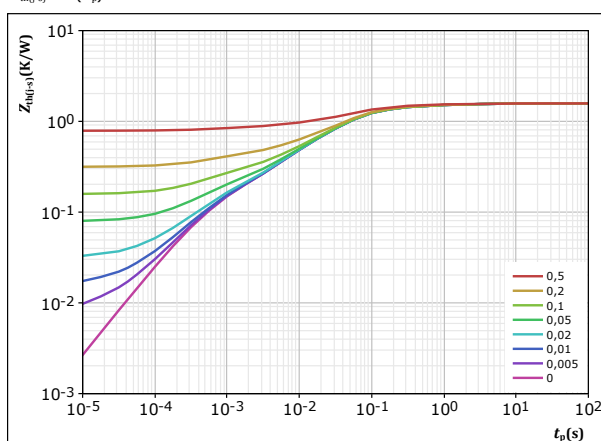
$T_j:$

- 25 °C
- 125 °C
- 150 °C

figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 1,576 \text{ K/W}$

FWD thermal model values

R (K/W)	τ (s)
8,98E-02	2,45E+00
2,77E-01	2,04E-01
8,69E-01	4,27E-02
2,26E-01	6,63E-03
1,14E-01	5,39E-04



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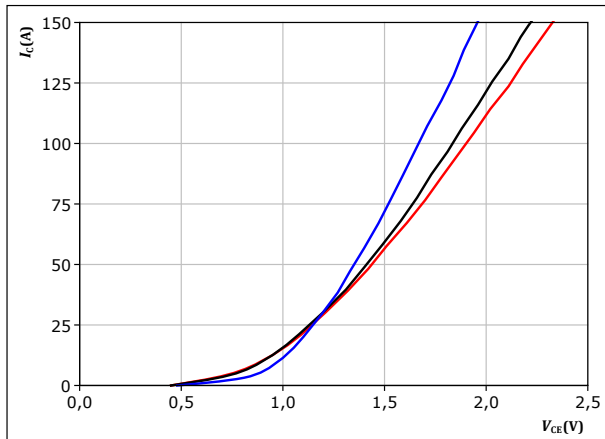
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Boost Switch Characteristics

figure 8. IGBT

Typical output characteristics

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



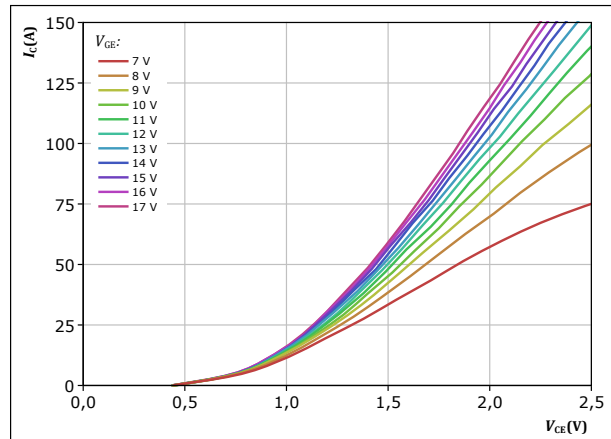
$t_p = 250 \mu s$
 $V_{GE} = 15 V$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 9. IGBT

Typical output characteristics

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

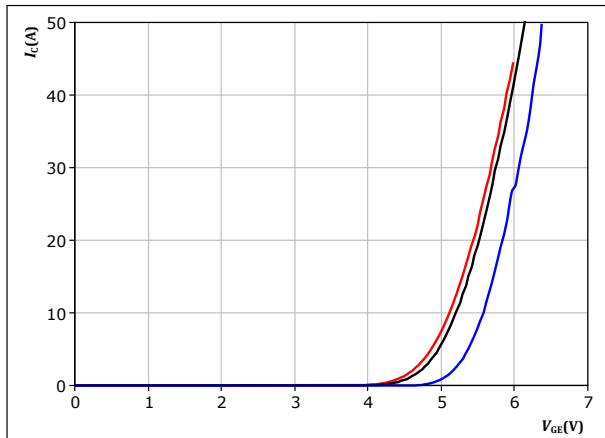


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 10. IGBT

Typical transfer characteristics

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



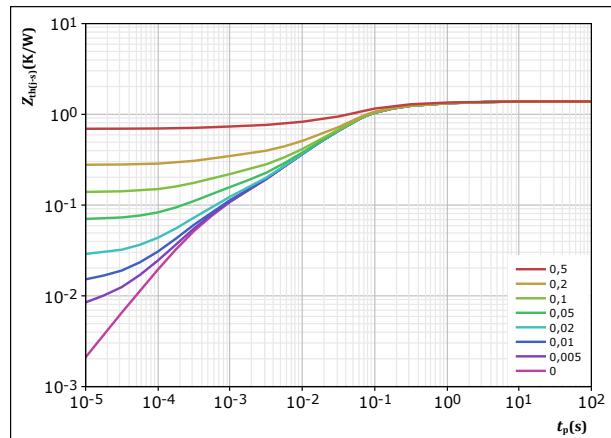
$t_p = 250 \mu s$
 $V_{CE} = 10 V$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,387 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
8,70E-02	2,39E+00
2,35E-01	2,56E-01
8,38E-01	4,81E-02
1,53E-01	6,04E-03
7,46E-02	4,42E-04



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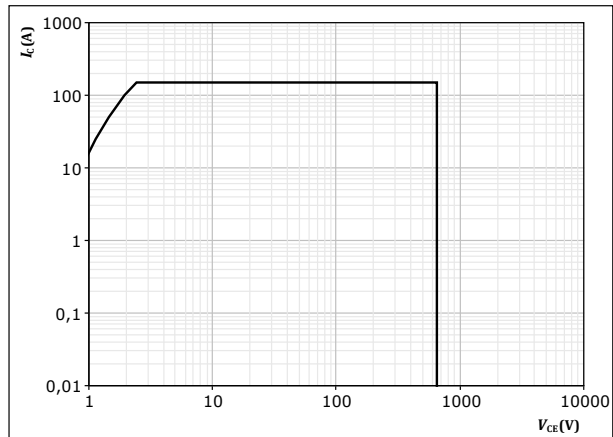
Boost Switch Characteristics

figure 12.

IGBT

Safe operating area

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



$D = \text{single pulse}$

$T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



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Boost Diode Characteristics

figure 13.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

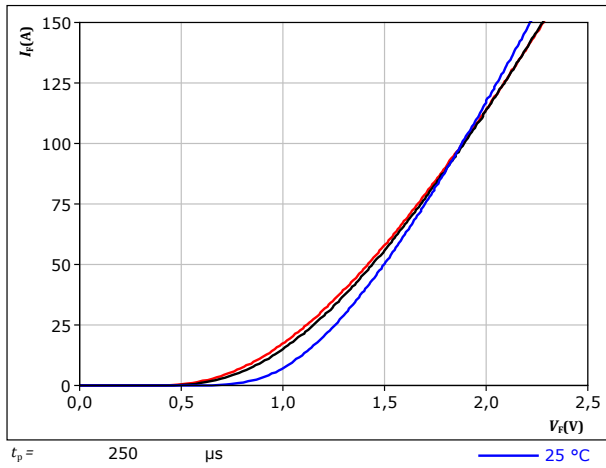
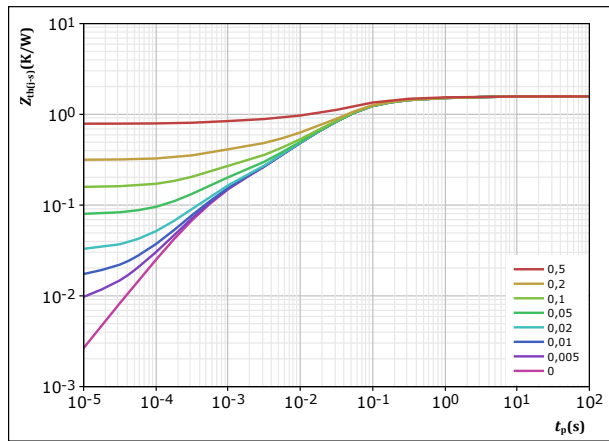


figure 14.

FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	1,576	K/W
FWD thermal model values		
R (K/W)	τ (s)	
8,98E-02	2,45E+00	
2,77E-01	2,04E-01	
8,69E-01	4,27E-02	
2,26E-01	6,63E-03	
1,14E-01	5,39E-04	



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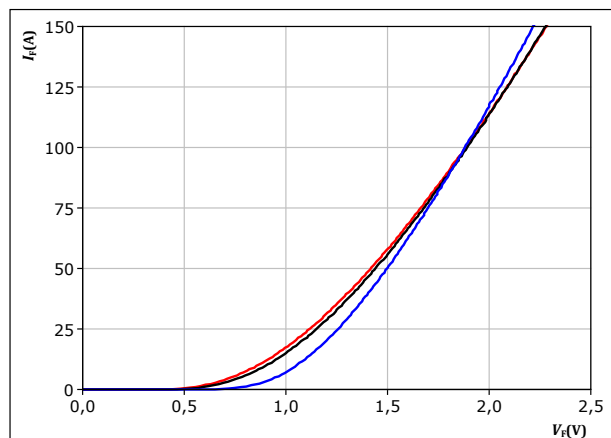
datasheet

Boost Sw. Inv. Diode Characteristics

figure 15. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



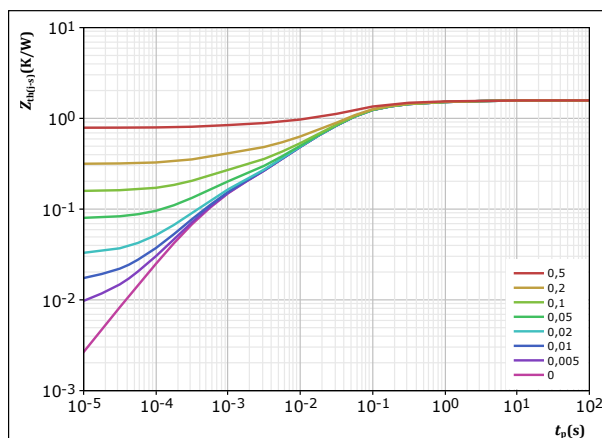
$t_p = 250 \mu s$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 16. FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T	
$R_{th(j-s)} =$	1,576	K/W
FWD thermal model values		
R (K/W)	τ (s)	
8,98E-02	2,45E+00	
2,77E-01	2,04E-01	
8,69E-01	4,27E-02	
2,26E-01	6,63E-03	
1,14E-01	5,39E-04	



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Thermistor Characteristics

figure 17.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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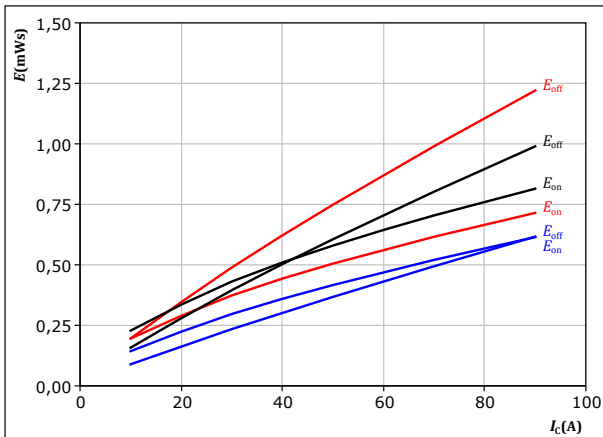
Buck Switching Characteristics

figure 18.

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
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω

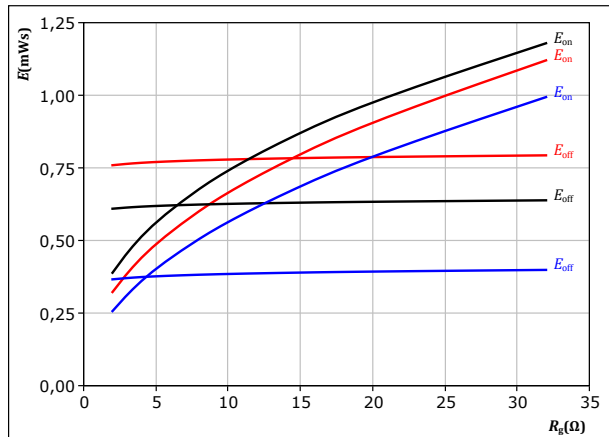
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 19.

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
 $I_C = 50$ A

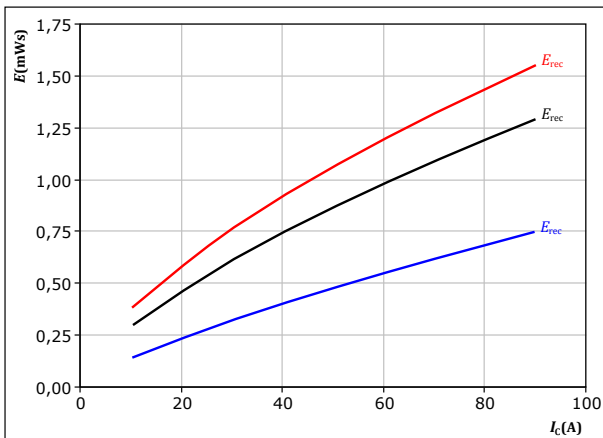
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 20.

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
 $R_{gon} = 8$ Ω

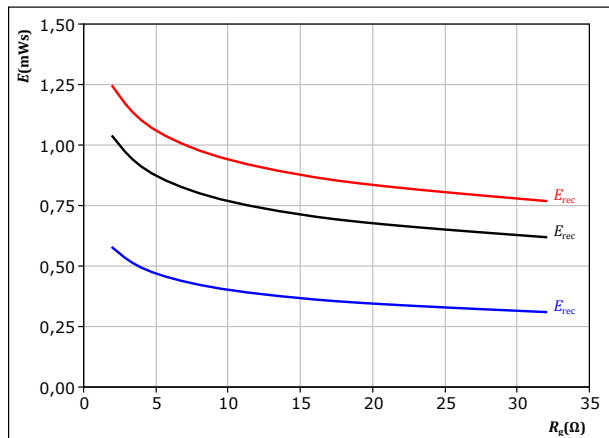
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 21.

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
 $I_C = 50$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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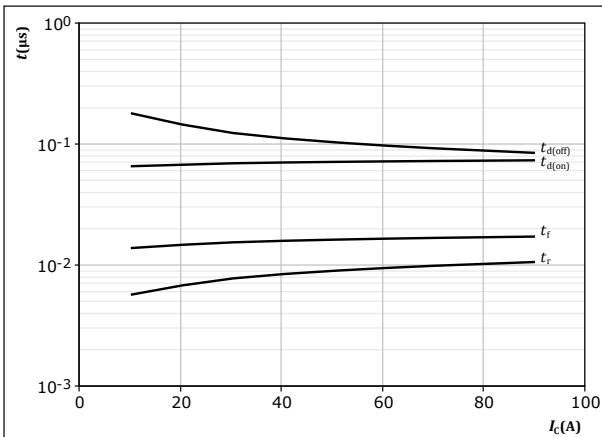
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datasheet

Buck Switching Characteristics

figure 22.

IGBT

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



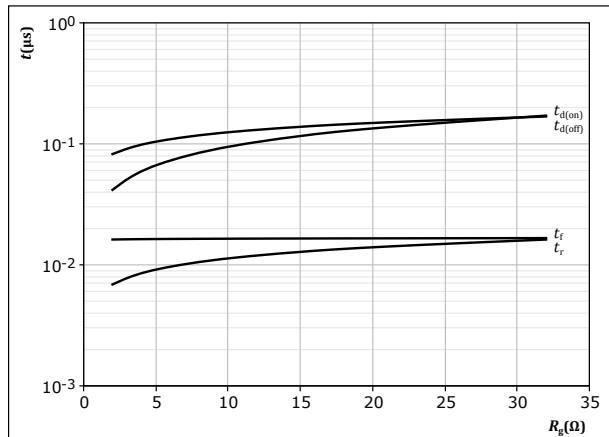
With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$

figure 23.

IGBT

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



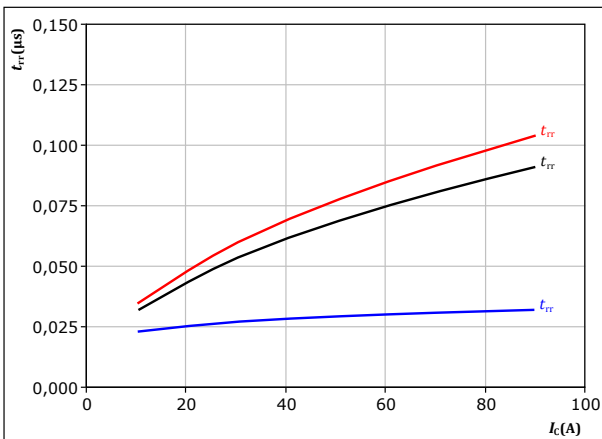
With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

figure 24.

FWD

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



With an inductive load at

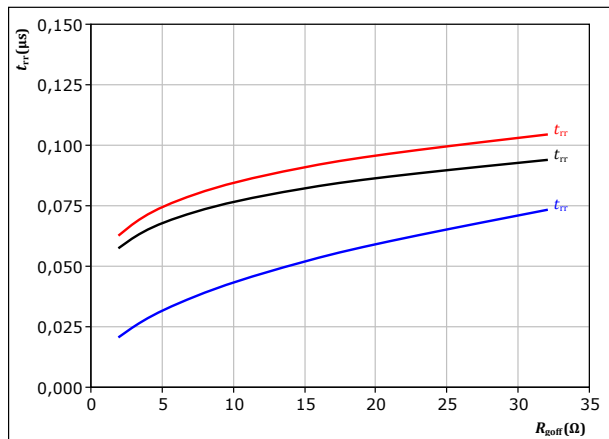
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

T_j : — 25 °C
— 125 °C
— 150 °C

figure 25.

FWD

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



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

T_j : — 25 °C
— 125 °C
— 150 °C



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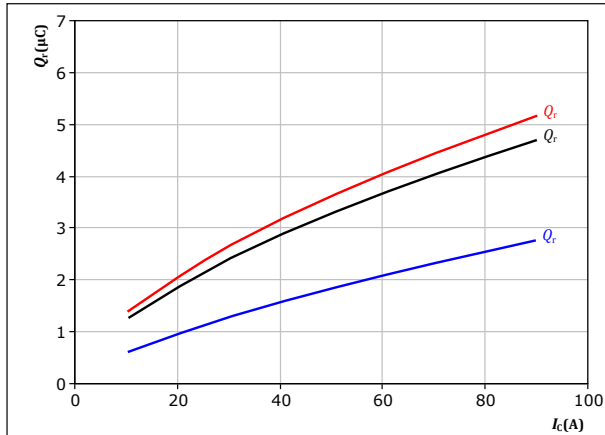
Buck Switching Characteristics

figure 26.

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
 $R_{gon} = 8$ Ω

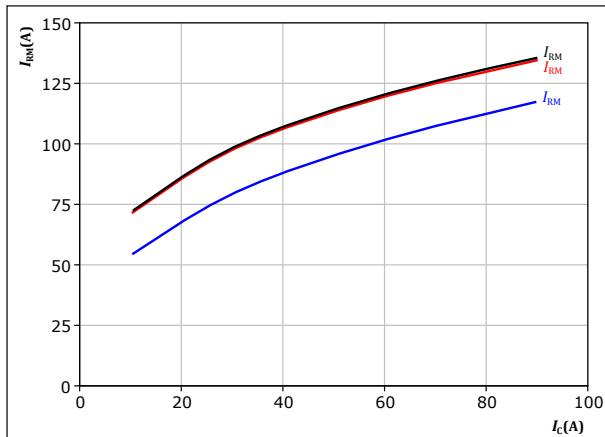
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 28.

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
 $R_{gon} = 8$ Ω

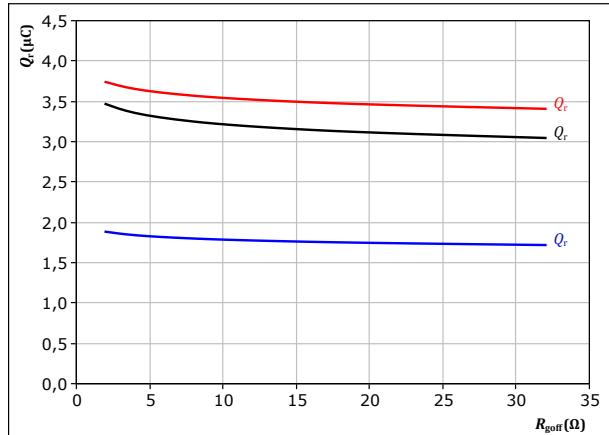
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 27.

FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

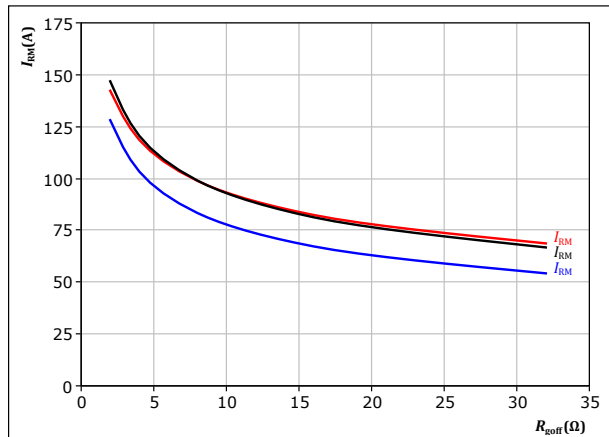
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 29.

FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



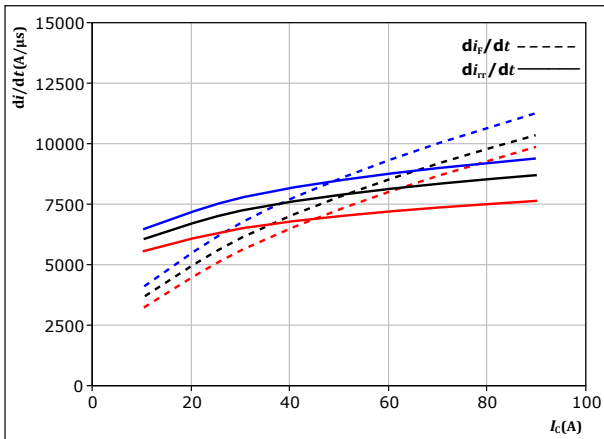
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datasheet

Buck Switching Characteristics

figure 30. 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

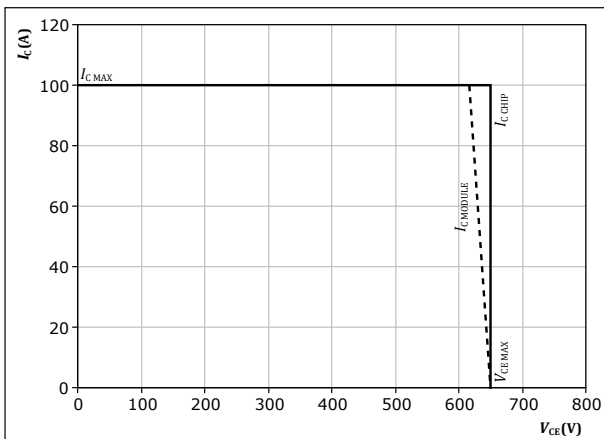
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 32. IGBT

Reverse bias safe operating area

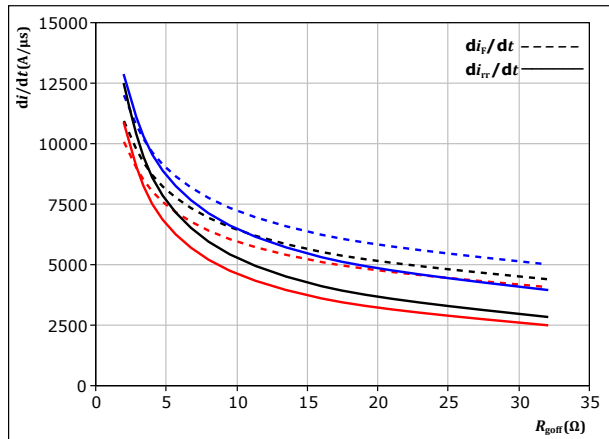
$I_C = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω

figure 31. FWD

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 50$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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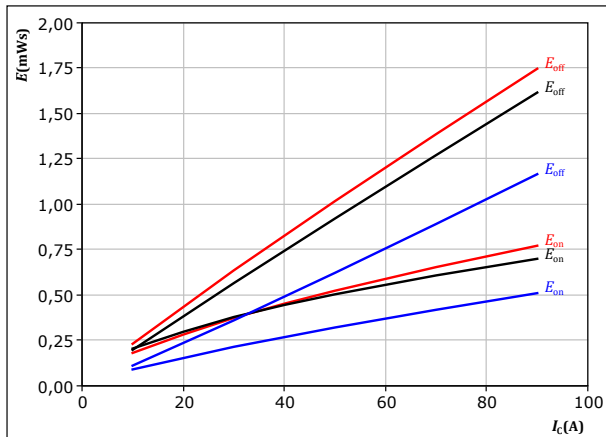
Boost Switching Characteristics

figure 33.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$

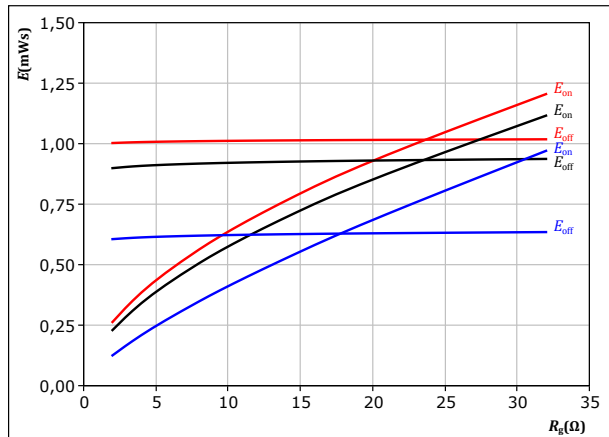
T_j : — 25 °C
— 125 °C
— 150 °C

figure 34.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

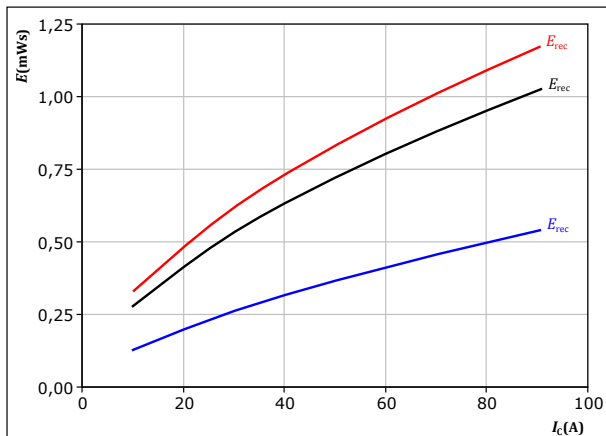
T_j : — 25 °C
— 125 °C
— 150 °C

figure 35.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

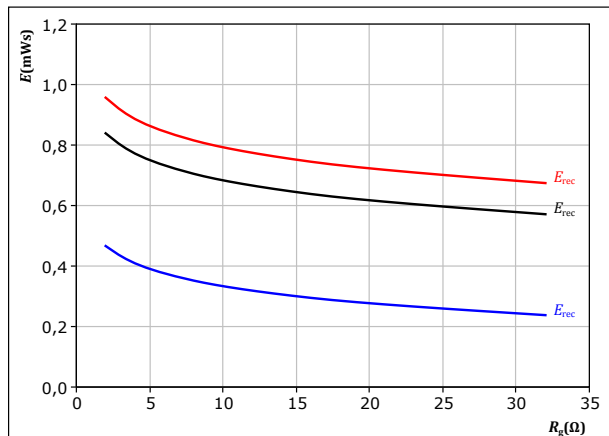
T_j : — 25 °C
— 125 °C
— 150 °C

figure 36.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

T_j : — 25 °C
— 125 °C
— 150 °C



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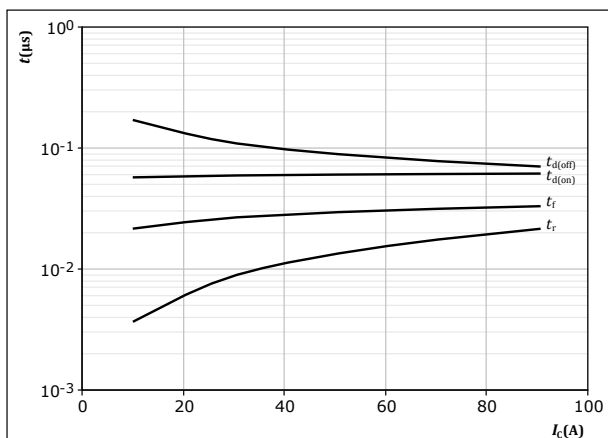
Boost Switching Characteristics

figure 37.

IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



With an inductive load at

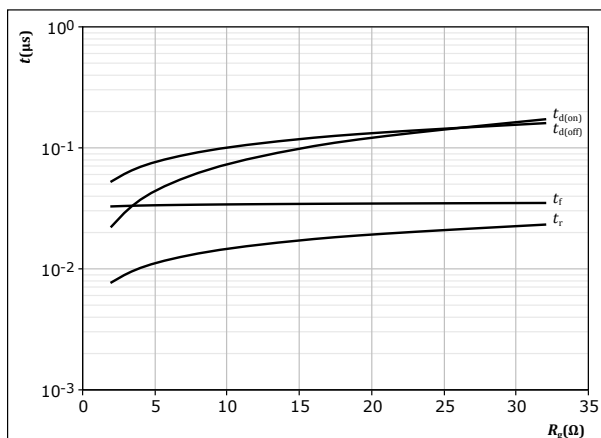
$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω

figure 38.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

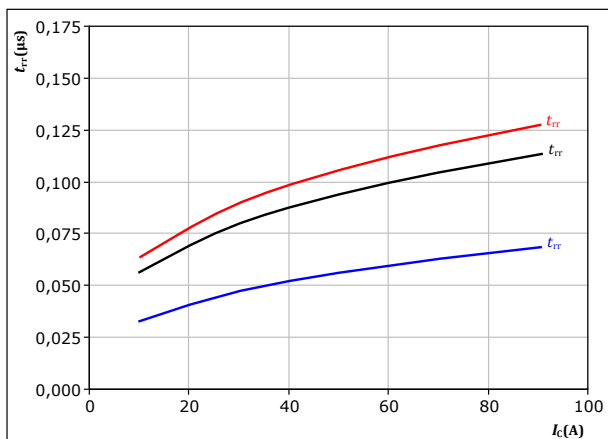
$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

figure 39.

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
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω

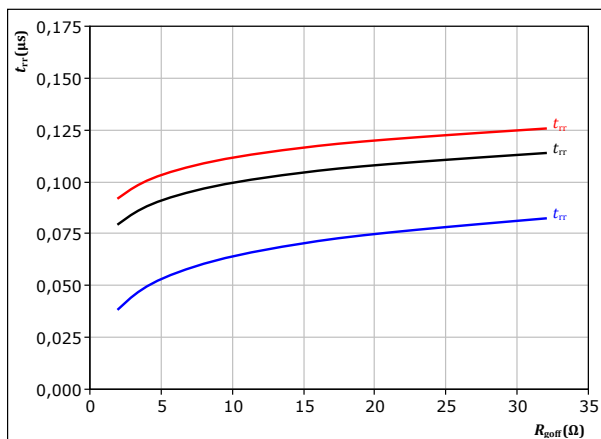
T_j : 25 °C
125 °C
150 °C

figure 40.

FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

T_j : 25 °C
125 °C
150 °C



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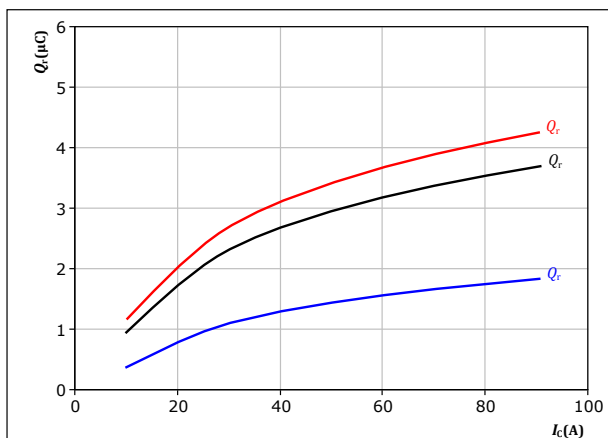
Boost Switching Characteristics

figure 41.

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
 $R_{gon} = 8$ Ω

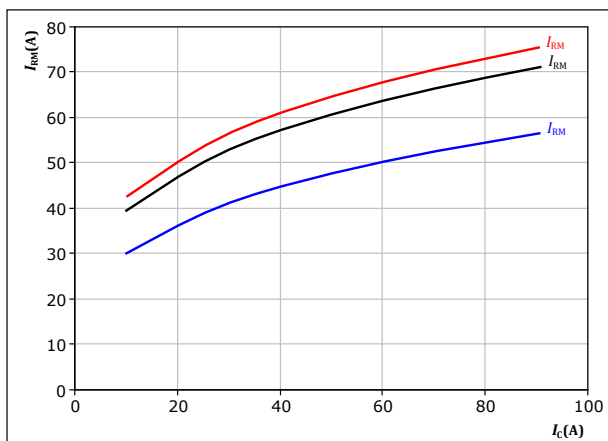
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 43.

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
 $R_{gon} = 8$ Ω

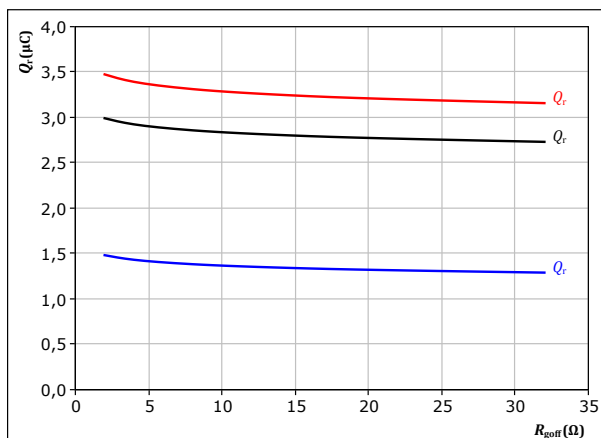
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 42.

FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

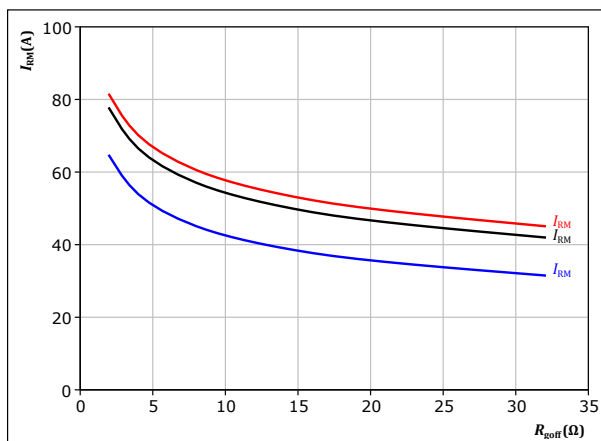
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 44.

FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 50$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



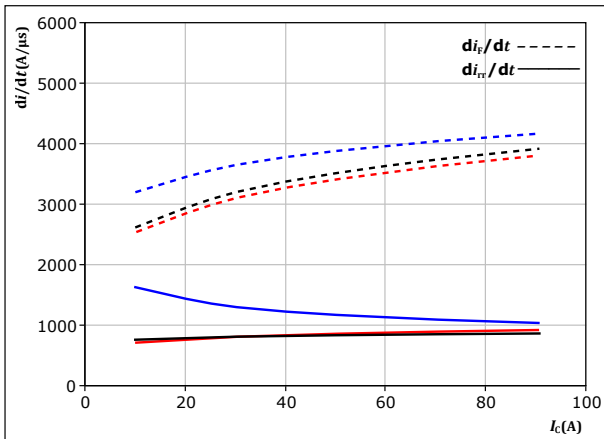
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datasheet

Boost Switching Characteristics

figure 45. FWD

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



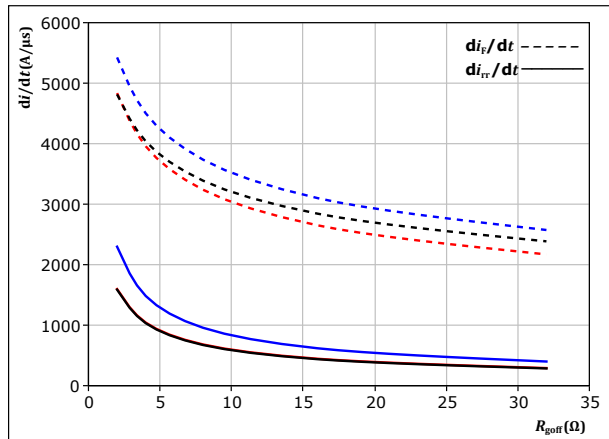
With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 8 \text{ } \Omega$

T_j : 25 °C (blue line), 125 °C (black line), 150 °C (red line)

figure 46. FWD

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



With an inductive load at

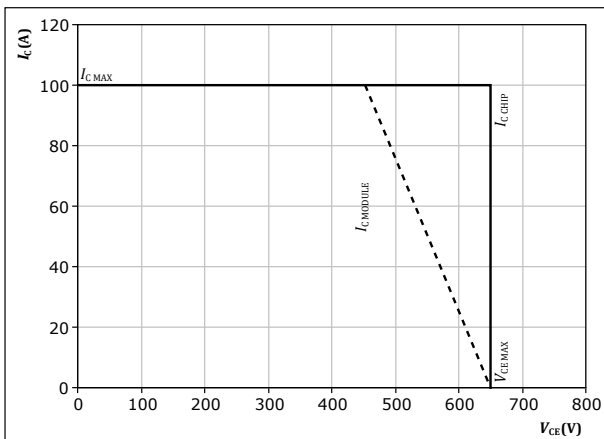
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 50 \text{ A}$

T_j : 25 °C (blue line), 125 °C (black line), 150 °C (red line)

figure 47. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 8 \text{ } \Omega$
 $R_{goff} = 8 \text{ } \Omega$



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Switching Definitions

figure 48. IGBT

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



figure 49. IGBT

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



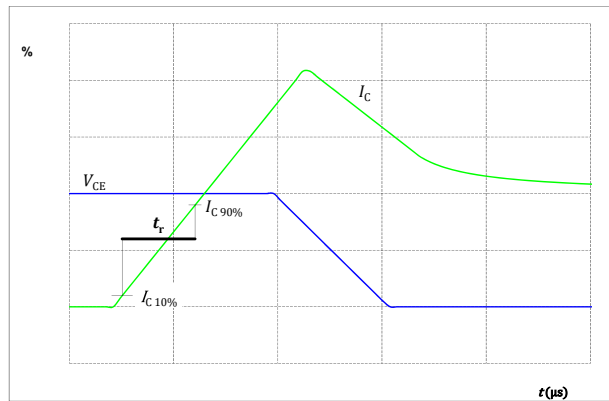
figure 50. IGBT

Turn-off Switching Waveforms & definition of t_f



figure 51. IGBT

Turn-on Switching Waveforms & definition of t_r





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Switching Definitions

figure 52.

FWD

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

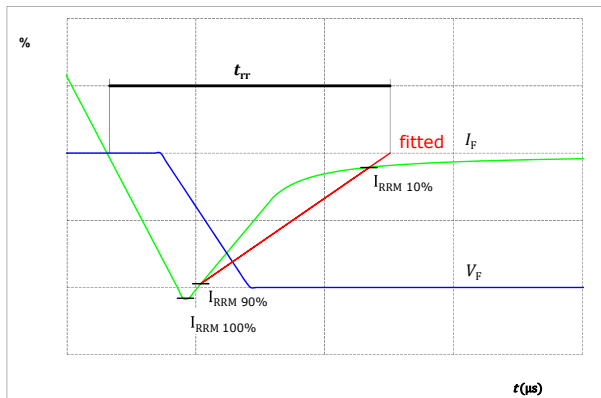
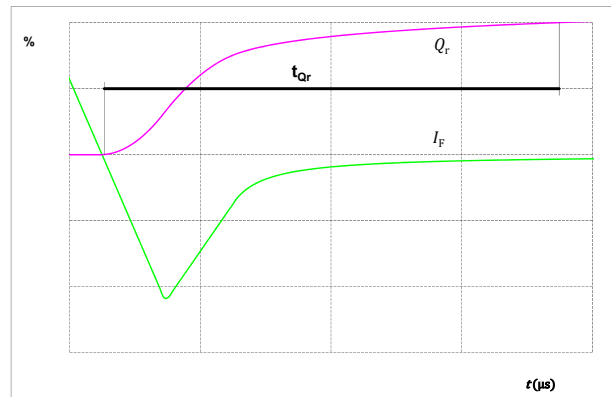


figure 53.

FWD

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









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datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-PG07N3A050S5-M896F96T
With thermal paste (5,2 W/mK, PTM6000HV)	10-PG07N3A050S5-M896F96T-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PG07N3A050S5-M896F96T-/3/

Marking							
<div><div>NN-NNNNNNNNNNNN TTTTTVVWYY UL VIN LLLL SSSS</div><div></div><div></div></div>	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNN- TTTTTVV		WWYY	UL VIN	LLLL	SSSS
	<div><div></div><div></div><div></div></div>	Datamatrix	Type&Ver	Lot number	Serial	Date code	
TTTTTVV			LLLL	SSSS	WWYY		

Outline				
Pin table [mm]				
Pin	X	Y	Function	
1	0	28,2	DC+1	
2	6	28,2	GND1	
3	9,7	28,2	GND1	
4	15,7	28,2	DC-1	
5	18,7	28,2	DC-1	
6	24,7	28,2	GND2	
7	27,7	28,2	GND2	
8	33,8	28,2	DC+2	
9	36,8	28,2	DC+2	
10	42,8	28,2	GND3	
11	46,2	28,2	GND3	
12	52,2	28,2	DC-2	
13	52,2	23,7	G32	
14	52,2	20,7	S32	
15	41,25	20,6	G31	
16	38,25	20,6	S31	
17	32,55	20,6	S21	
18	29,55	20,6	G21	
19	18,7	20,7	S22	
20	18,7	23,7	G22	
21	15,7	23,7	G12	
22	15,7	20,7	S12	
23	4,75	20,6	G11	
24	1,75	20,6	S11	
25	8,35	12,2	G14	
26	11,35	12,2	S14	
27	19,95	12,2	S24	
28	22,95	12,2	G24	
29	44,35	12,2	G34	
30	47,35	12,2	S34	
31	52,2	8,9	Therm1	
32	52,2	5,9	Therm2	
33	46,75	0	Ph3	
34	43,95	0	Ph3	
35	40,95	0	S33	
36	37,95	0	G33	
37	29,2	0	G23	
38	26,2	0	S23	
39	23,2	0	Ph2	
40	20,4	0	Ph2	
41	11,8	0	Ph1	
42	9	0	Ph1	
43	6	0	S13	
44	3	0	G13	

Tolerance of pin positions: ± 0.4 mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

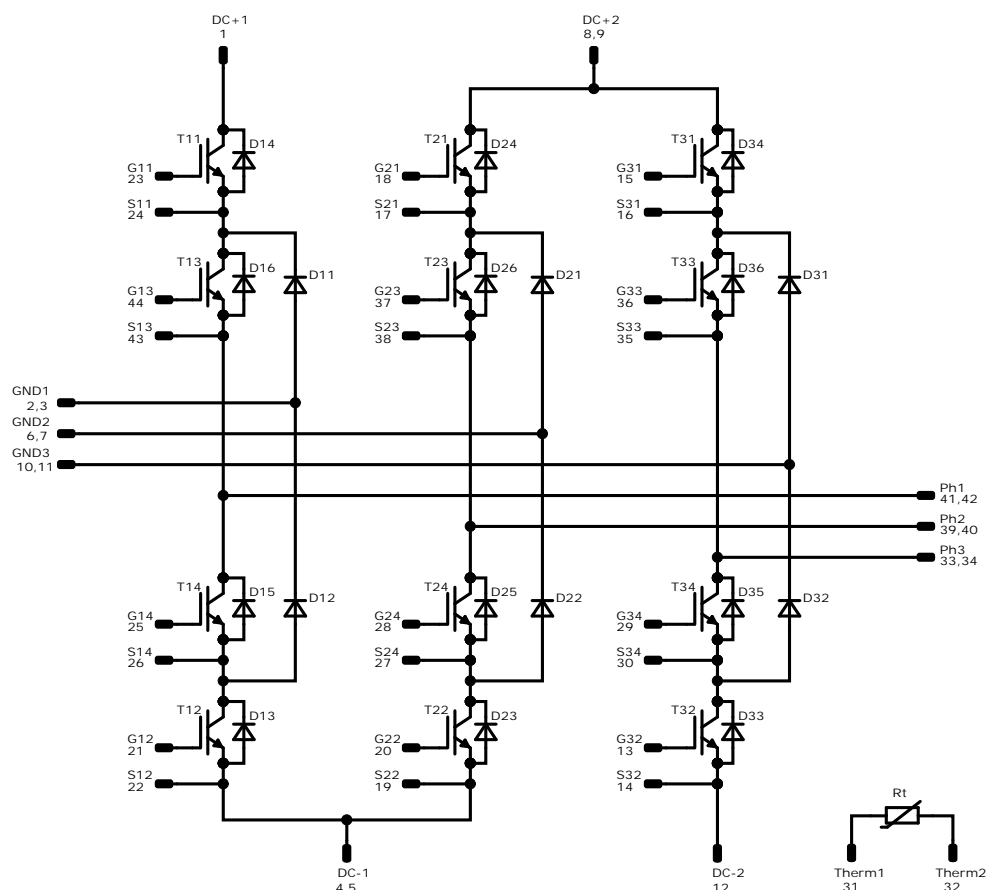


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datasheet

Pinout




Identification

ID	Component	Voltage	Current	Function	Comment
T11, T21, T31, T12, T22, T32	IGBT	650 V	50 A	Buck Switch	
D11, D21, D31, D12, D22, D32	FWD	650 V	50 A	Buck Diode	
T13, T23, T33, T14, T24, T34	IGBT	650 V	50 A	Boost Switch	
D13, D23, D33, D14, D24, D34	FWD	650 V	50 A	Boost Diode	
D15, D16, D25, D26, D35, D36	FWD	650 V	50 A	Boost Sw. Inv. Diode	
Rt	NTC			Thermistor	



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datasheet

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample
Handling instruction				
Handling instructions for <i>flow</i> 1 packages see vincotech.com website.				
Package data				
Package data for <i>flow</i> 1 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
10-PG07N3A050S5-M896F96T-D2-14	5 Sep. 2021	- New Datasheet format, module is unchanged - Correct Rth of all position - Change Boost Switching Dynamic measurement - Clearance value	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.