



Vincotech

# 10-P012NME080SH-M910F09Y

datasheet

flowMNPC 0

1200 V / 80 A

## Features

- Mixed voltage component topology
- Neutral point clamped inverter
- Pin compatibility to P96x NPC family
- LVRT and reactive power capability

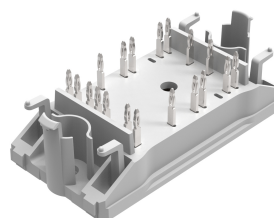
## Target applications

- Solar inverter
- UPS

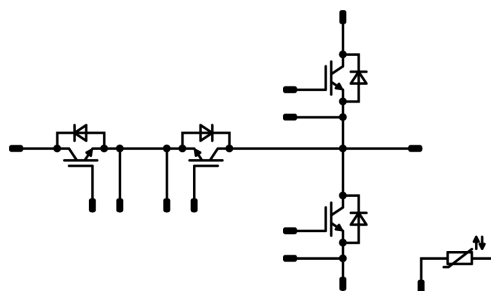
## Types

- 10-P012NME080SH-M910F09Y

## flow 0 17 mm housing



## Schematic





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## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Buck Switch</b>				
Collector-emitter voltage	$V_{CES}$		1200	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	76	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	240	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	186	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	$\mu s$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Buck Diode

Peak repetitive reverse voltage	$V_{RRM}$		600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	51	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	69	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Boost Switch

Collector-emitter voltage	$V_{CES}$		600	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	65	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	225	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	101	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	$\mu s$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$



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## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Boost Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	31	A
Surge (non-repetitive) forward current	$I_{FSM}$	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	170	A
Surge current capability	$I^2t$		145	A <sup>2</sup> s
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	71	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			>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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,003	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		80	25 125 150	1,78	1,99 2,33 2,41	2,42 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	1200		25			10	µA
Gate-emitter leakage current	$I_{GES}$		20	0		25			240	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	25		25		4660		pF
Output capacitance	$C_{oes}$							300		pF
Reverse transfer capacitance	$C_{res}$							260		pF
Gate charge	$Q_g$	$V_{CC} = 960 \text{ V}$	15		80	25		370		nC

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,51		K/W
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#### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \text{ } \Omega$ $R_{goff} = 4 \text{ } \Omega$	$\pm 15$	350	56	25 125		77,6 78,8		ns
Rise time	$t_r$					25 125		13 15,4		ns
Turn-off delay time	$t_{d(off)}$					25 125		170,4 220,8		ns
Fall time	$t_f$					25 125		43,2 68,24		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{iFWD}=1,01 \text{ } \mu\text{C}$ $Q_{iFWD}=2,74 \text{ } \mu\text{C}$				25 125		0,473 0,972		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125		1,28 2,17		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	$V_F$				60	25 125 150		2,27 1,68 1,58	2,8 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 600$ V				25			10	µA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,38		K/W
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#### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt=4710$ A/µs $di/dt=4651$ A/µs	±15	350	56	25 125		64,27 83,05		A
Reverse recovery time	$t_{rr}$					25 125		28,7 73,13		ns
Recovered charge	$Q_r$					25 125		1,01 2,74		µC
Reverse recovered energy	$E_{rec}$					25 125		0,172 0,521		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125		9597 3522		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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0012	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	25 125 150	1,05	1,45 1,59 1,64	1,85 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	600		25			3,8	µA
Gate-emitter leakage current	$I_{GES}$		20	0		25			600	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	25		25		4620		pF
Output capacitance	$C_{oes}$							288		pF
Reverse transfer capacitance	$C_{res}$							137		pF
Gate charge	$Q_g$	$V_{CC} = 480 \text{ V}$	15		75	25		470		nC

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						0,94		K/W
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#### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \text{ } \Omega$ $R_{goff} = 4 \text{ } \Omega$	$\pm 15$	350	56	25 125 150		86 87 86,6		ns
Rise time	$t_r$					25 125 150		12,2 13,2 13,4		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		172,8 200,2 206,4		ns
Fall time	$t_f$					25 125 150		72,92 95,63 96		ns
Turn-on energy (per pulse)	$E_{on}$					25 125 150		0,435 0,681 0,75		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		1,75 2,34 2,46		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	$V_F$				35	25 125 150		2,28 2,41 2,37	2,62 <sup>(1)</sup> 2,62 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 1200$ V				25 150		2700	60 5500	µA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,34		K/W
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#### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt=5389$ A/µs $di/dt=3855$ A/µs $di/dt=3963$ A/µs	$\pm 15$	350	56	25 125 150		85,75 97,34 104,63		A
Reverse recovery time	$t_{rr}$					25 125 150		32,33 89,76 99,07		ns
Recovered charge	$Q_r$					25 125 150		2,96 5,5 6,87		µC
Reverse recovered energy	$E_{rec}$					25 125 150		0,804 1,55 1,96		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		6668 5971 5963		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	

## 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	

<sup>(1)</sup> Value at chip level

<sup>(2)</sup> Only valid with pre-applied Vincotech thermal interface material.



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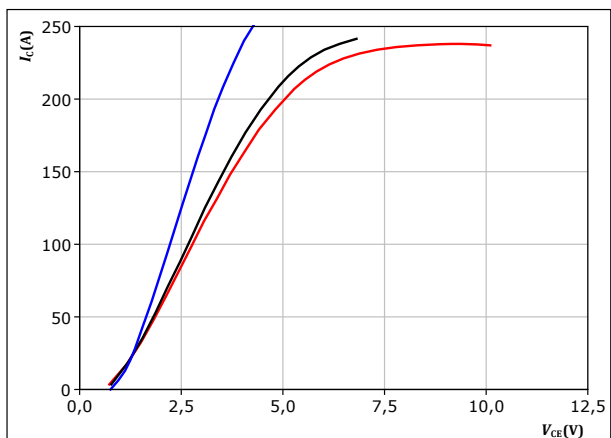
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## Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

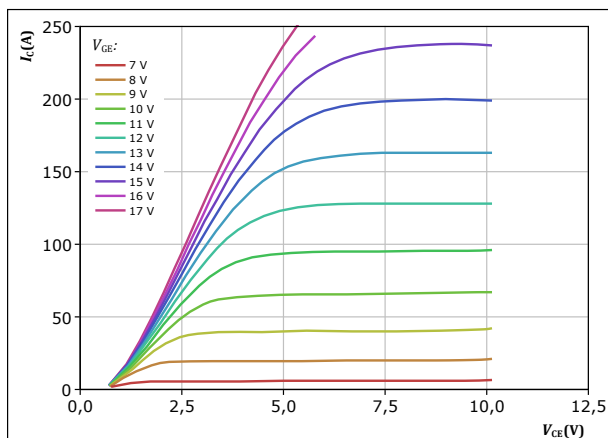


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j:$  25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

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

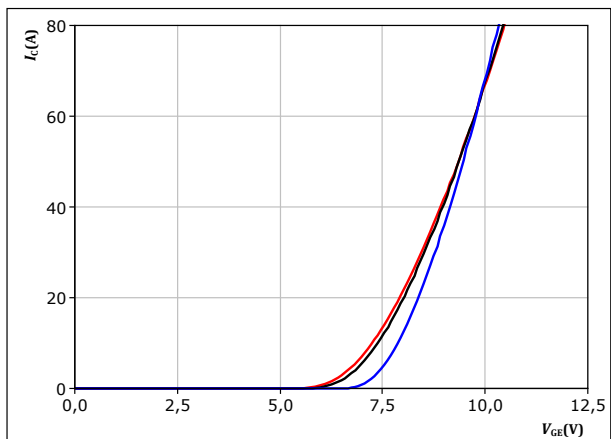


$t_p = 250 \mu s$   
 $T_j = 150 ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

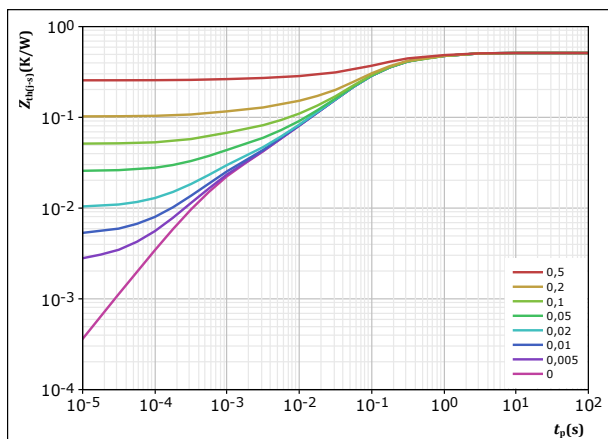


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j:$  25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,512 K/W$   
 IGBT thermal model values  

$R (K/W)$	$\tau (s)$
9,50E-02	1,05E+00
1,84E-01	1,66E-01
1,81E-01	6,37E-02
3,37E-02	7,18E-03
1,79E-02	6,47E-04



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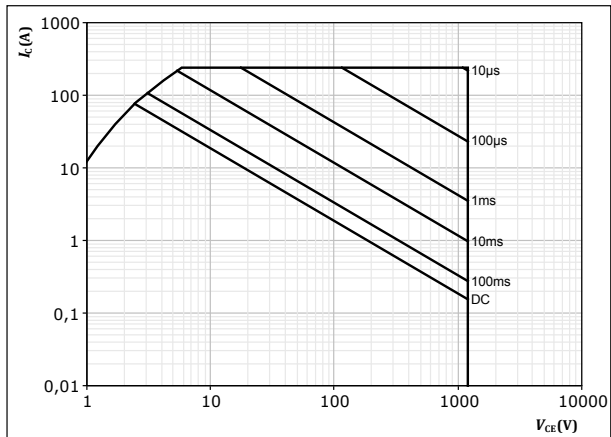
## Buck Switch Characteristics

figure 5.

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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datasheet

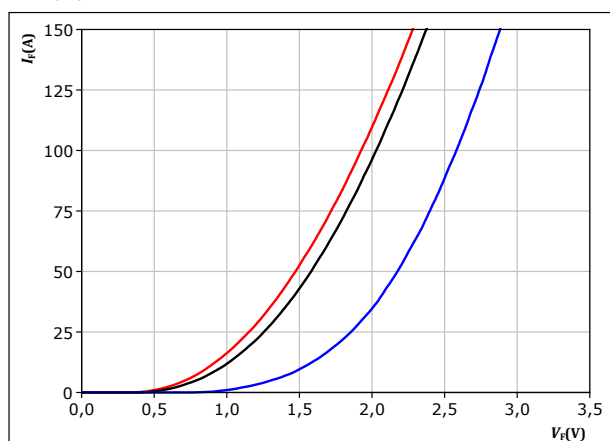
## Buck Diode Characteristics

figure 6.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

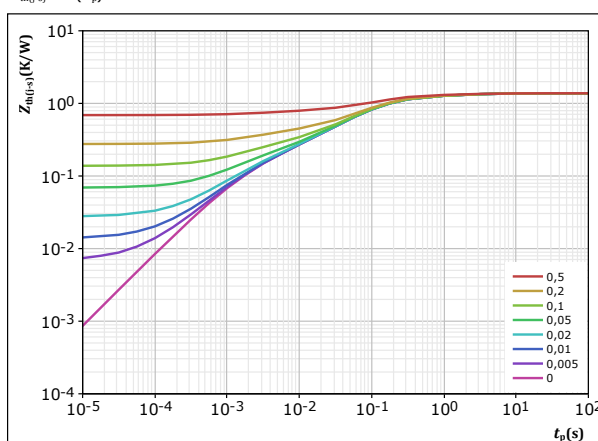
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 7.

FWD

Transient thermal impedance as a function of pulse width

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



$D =$	$t_p / T$	
$R_{th(j-s)} =$	1,379	K/W
FWD thermal model values		
$R$ (K/W)	$\tau$ (s)	
8,16E-02	3,99E+00	
2,02E-01	6,32E-01	
7,09E-01	1,11E-01	
2,16E-01	3,68E-02	
9,74E-02	5,31E-03	
7,28E-02	1,31E-03	



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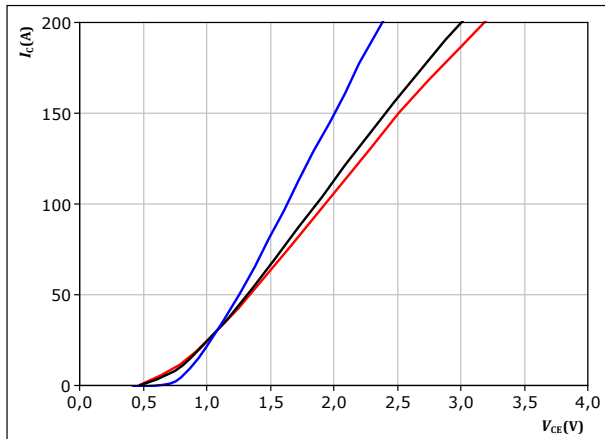
datasheet

## Boost Switch Characteristics

figure 8. IGBT

Typical output characteristics

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

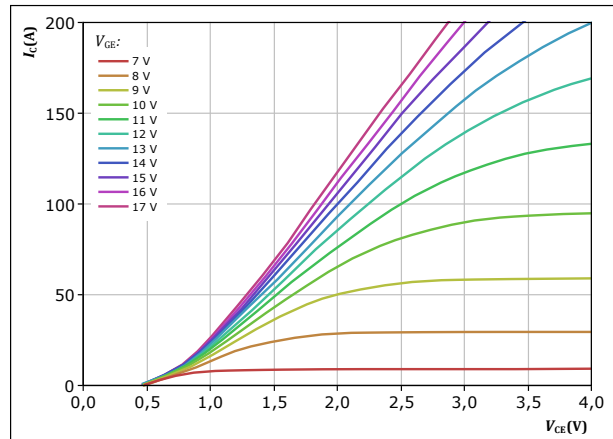


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25 ^\circ C$   
 $125 ^\circ C$   
 $150 ^\circ C$

figure 9. IGBT

Typical output characteristics

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

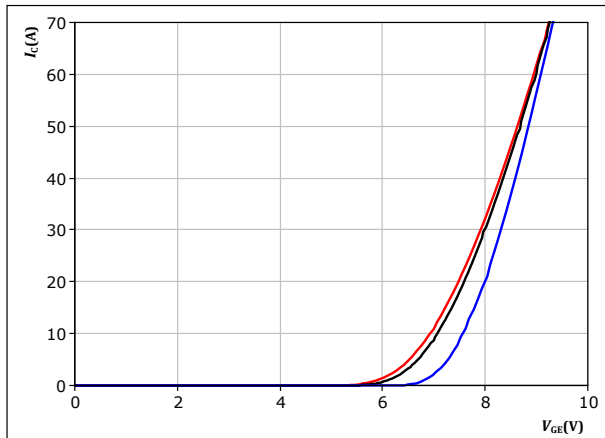


$t_p = 250 \mu s$   
 $T_j = 150 ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 10. IGBT

Typical transfer characteristics

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

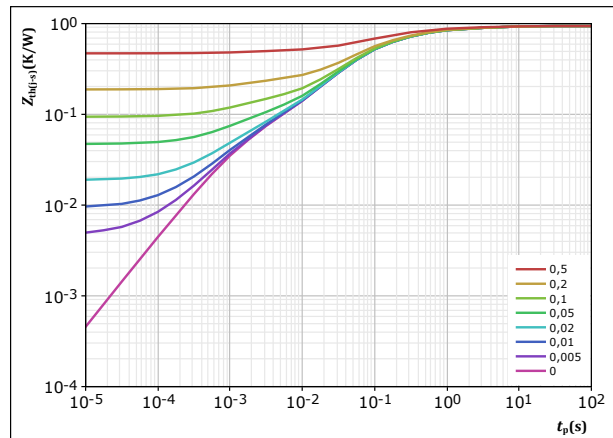


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25 ^\circ C$   
 $125 ^\circ C$   
 $150 ^\circ C$

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,94 K/W$   
IGBT thermal model values  

$R (K/W)$	$\tau (s)$
8,42E-02	4,56E+00
2,89E-01	4,19E-01
4,35E-01	7,20E-02
8,50E-02	2,19E-02
4,67E-02	1,33E-03





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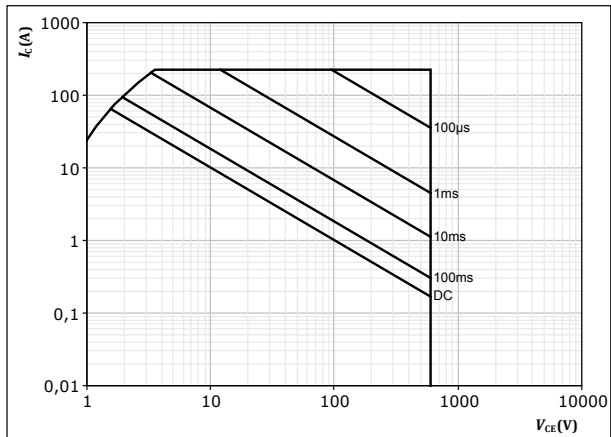
## Boost Switch Characteristics

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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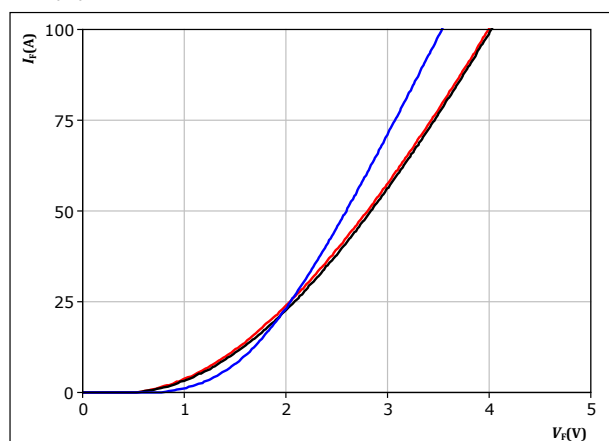
## Boost Diode Characteristics

figure 13.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

$T_j$ :

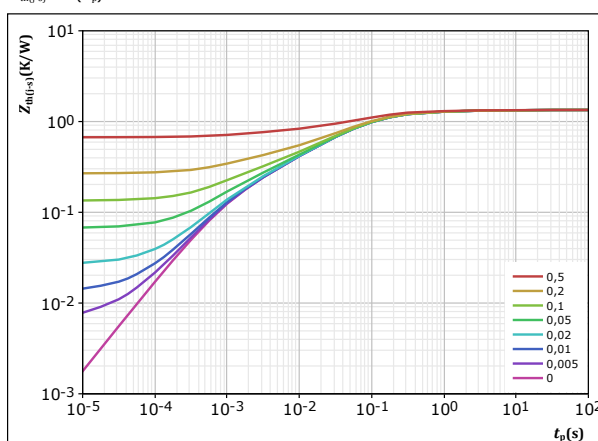
- 25 °C
- 125 °C
- 150 °C

figure 14.

FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 1,342 \text{ K/W}$

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
$3,06E-02$	$9,16E+00$
$1,47E-01$	$6,10E-01$
$6,10E-01$	$8,89E-02$
$2,96E-01$	$2,14E-02$
$1,39E-01$	$5,05E-03$
$1,19E-01$	$9,19E-04$



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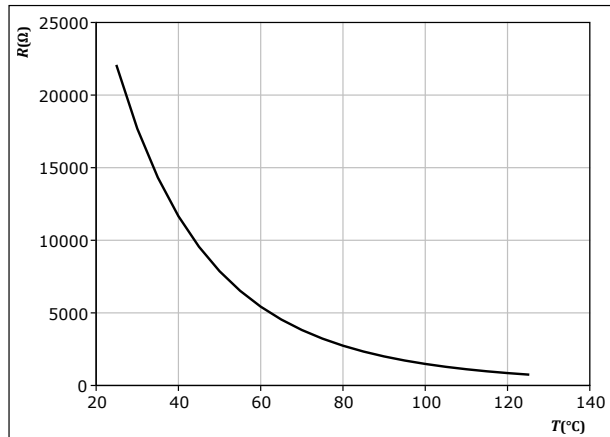
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datasheet

## Thermistor Characteristics

**figure 15.** Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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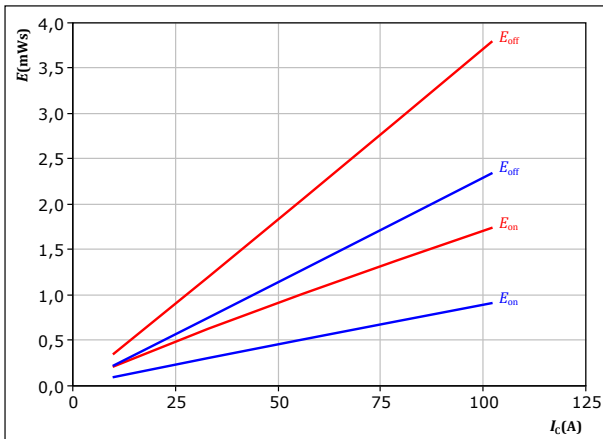
## Buck Switching Characteristics

figure 16.

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  
 $R_{gon} = 4$   $\Omega$   
 $R_{goff} = 4$   $\Omega$

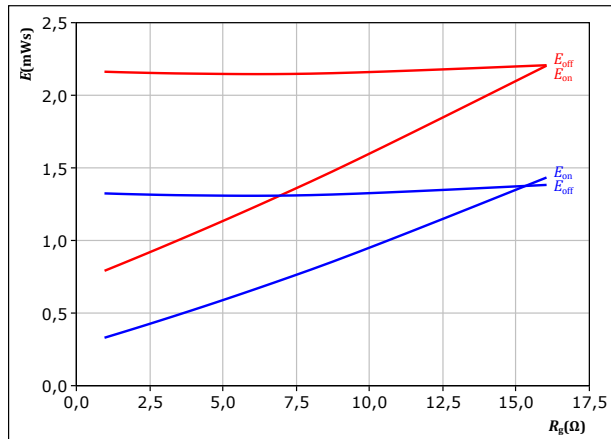
$T_j$ : — 25 °C  
— 125 °C

figure 17.

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  
 $I_C = 56$  A

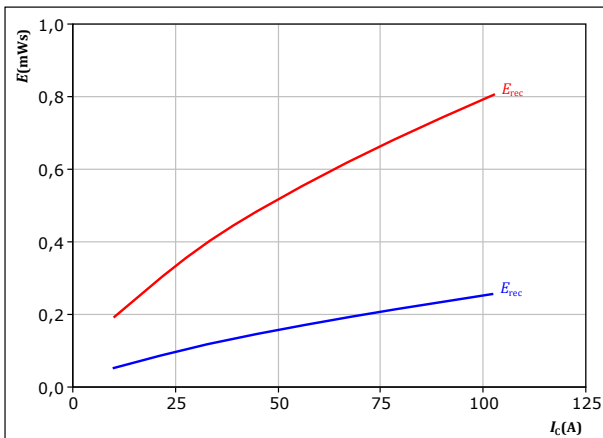
$T_j$ : — 25 °C  
— 125 °C

figure 18.

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  
 $R_{gon} = 4$   $\Omega$

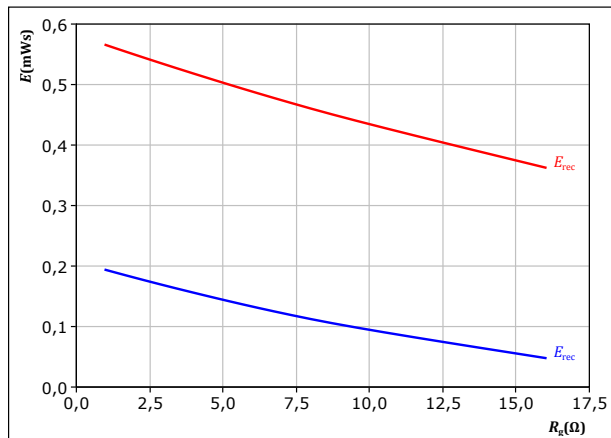
$T_j$ : — 25 °C  
— 125 °C

figure 19.

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  
 $I_C = 56$  A

$T_j$ : — 25 °C  
— 125 °C



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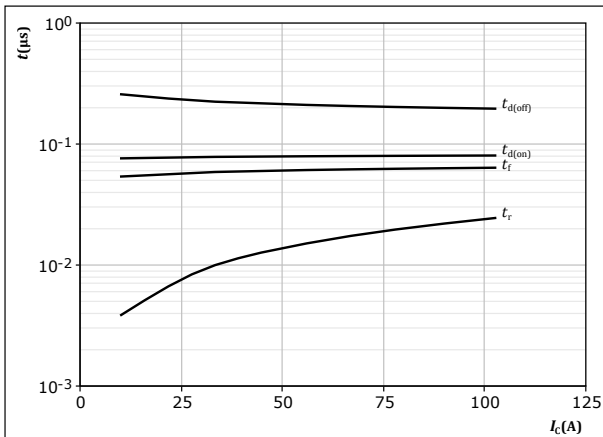
## Buck Switching Characteristics

figure 20.

IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



With an inductive load at

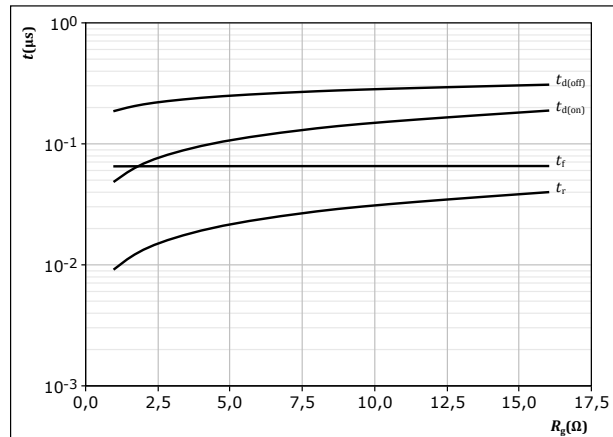
$T_j =$	125	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	4	Ω
$R_{goff} =$	4	Ω

figure 21.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

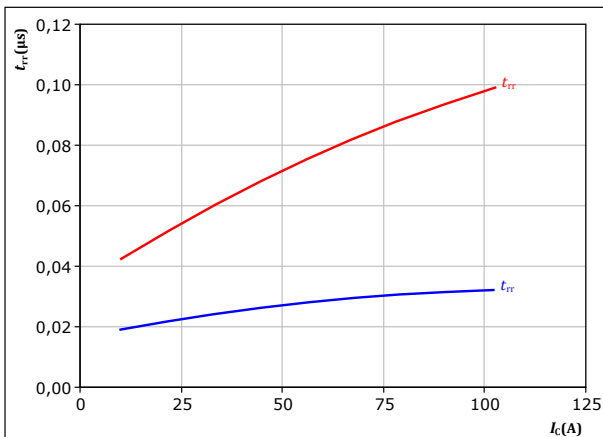
$T_j =$	125	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$I_C =$	56	A

figure 22.

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
$R_{gon} =$	4	Ω

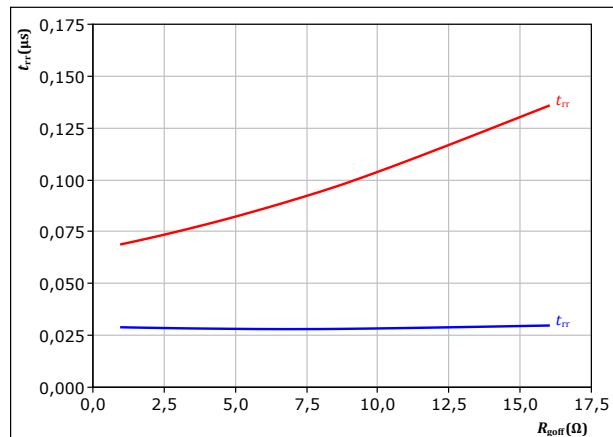
$T_j$ : — 25 °C  
— 125 °C

figure 23.

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
$V_{GE} =$	±15	V
$I_C =$	56	A

$T_j$ : — 25 °C  
— 125 °C



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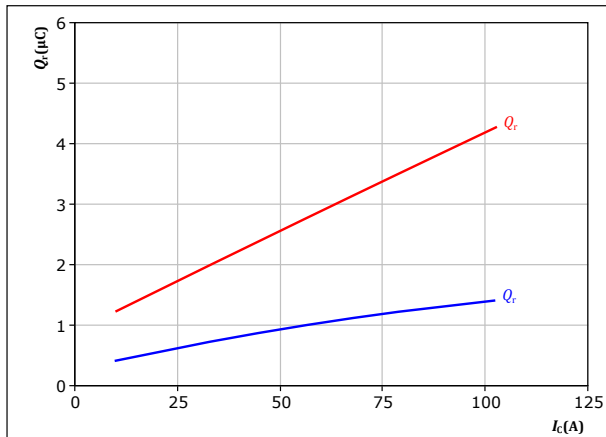
## Buck Switching Characteristics

figure 24.

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  
 $R_{gon} = 4$  Ω

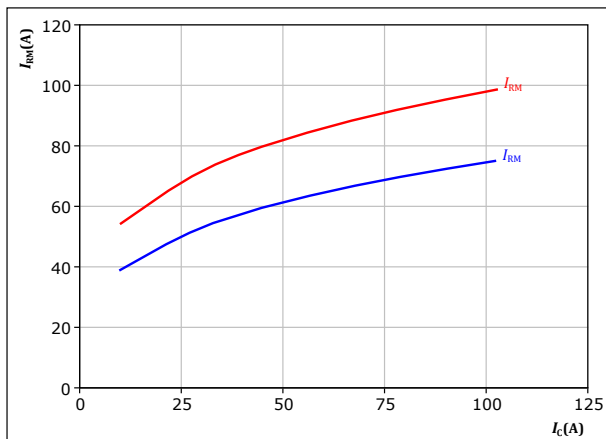
$T_j$ : — 25 °C  
— 125 °C

figure 26.

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  
 $R_{gon} = 4$  Ω

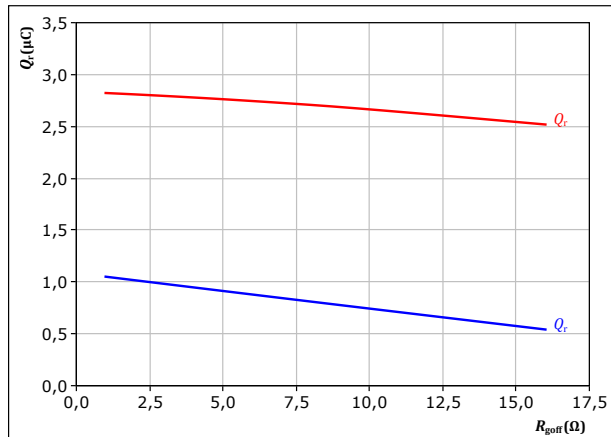
$T_j$ : — 25 °C  
— 125 °C

figure 25.

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  
 $I_c = 56$  A

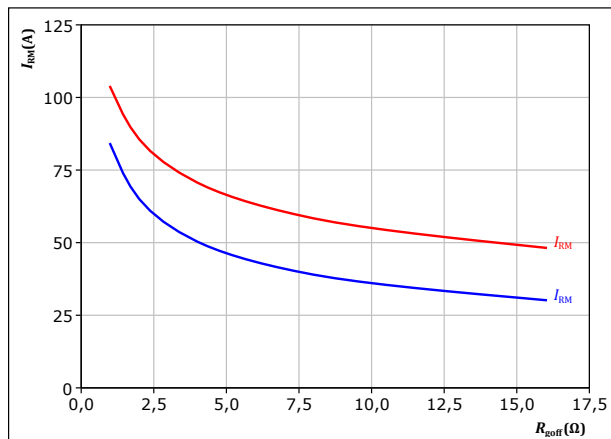
$T_j$ : — 25 °C  
— 125 °C

figure 27.

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  
 $I_c = 56$  A

$T_j$ : — 25 °C  
— 125 °C



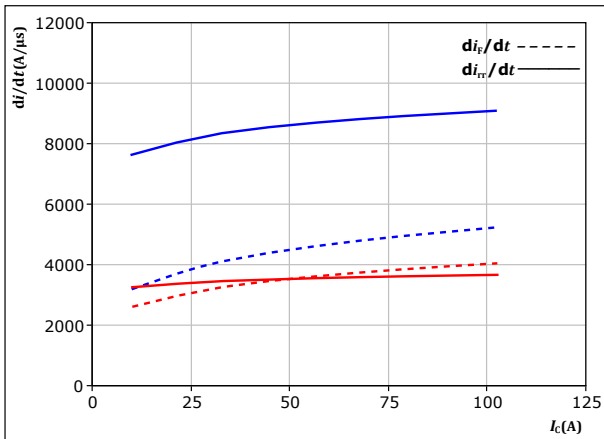
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datasheet

## Buck Switching Characteristics

figure 28. FWD

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



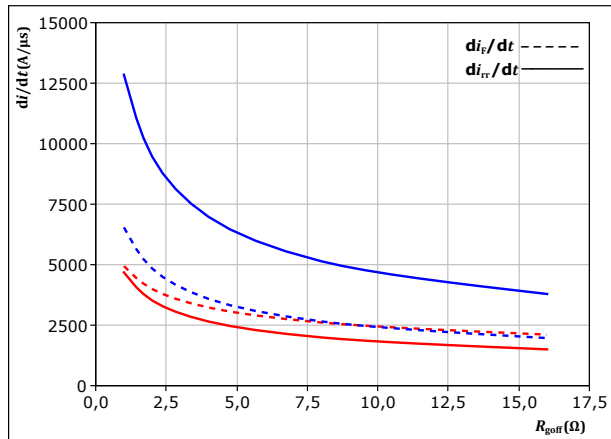
With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$

$T_j$ : — 25 °C  
— 125 °C

figure 29. 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

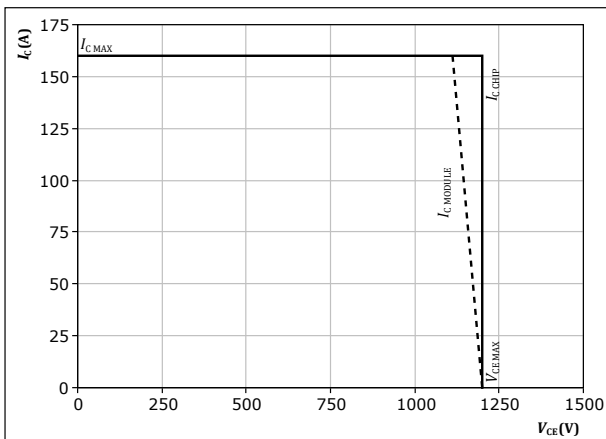
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 56 \text{ A}$

$T_j$ : — 25 °C  
— 125 °C

figure 30. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At  $T_j = 125 \text{ } ^\circ\text{C}$   
 $R_{gon} = 4 \text{ } \Omega$   
 $R_{goff} = 4 \text{ } \Omega$



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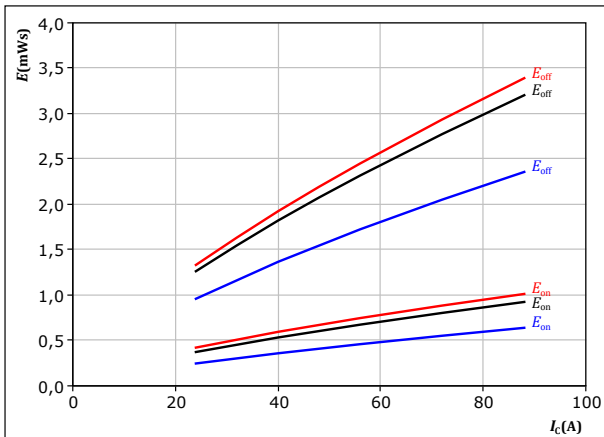
datasheet

## Boost Switching Characteristics

figure 31. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



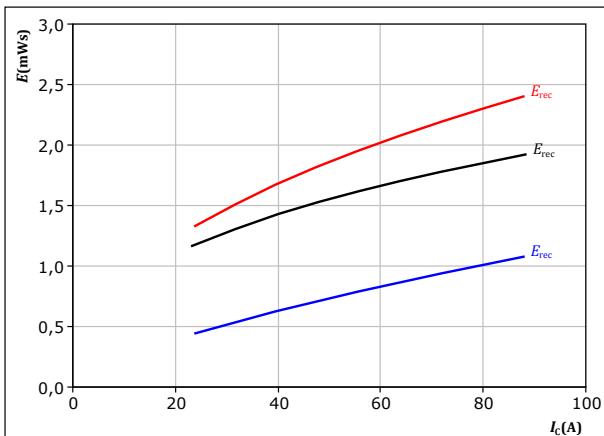
With an inductive load at

$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	4	Ω		150 °C
$R_{goff} =$	4	Ω		

figure 33. FWD

Typical reverse recovered energy loss as a function of collector current

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



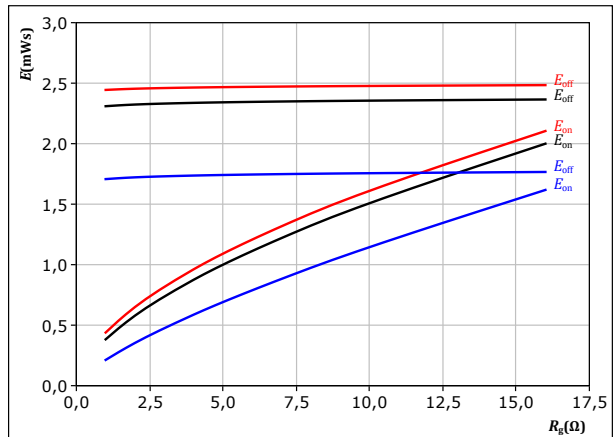
With an inductive load at

$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	4	Ω		150 °C

figure 32. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



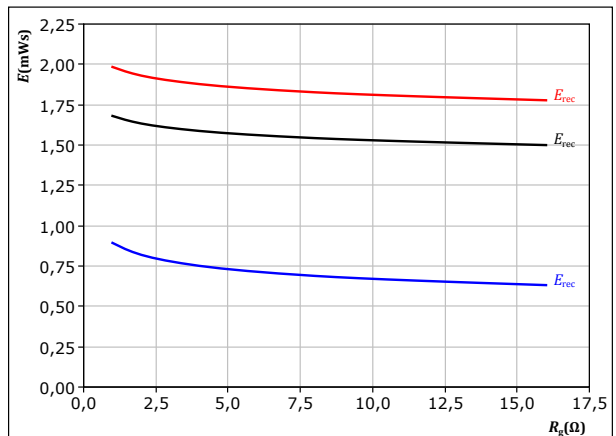
With an inductive load at

$V_{CE} =$	350	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_C =$	56	A		150 °C

figure 34. 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	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_C =$	56	A		150 °C





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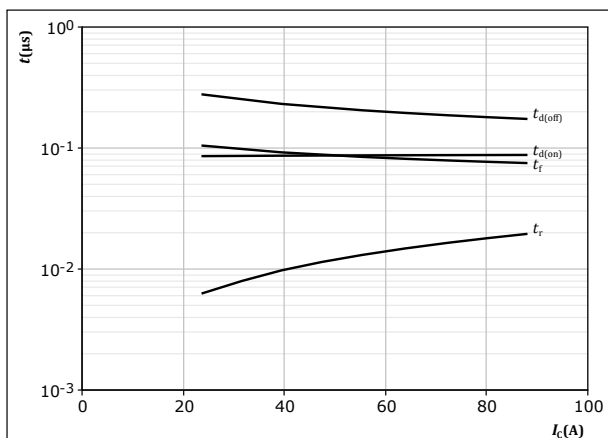
## Boost Switching Characteristics

figure 35.

IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



With an inductive load at

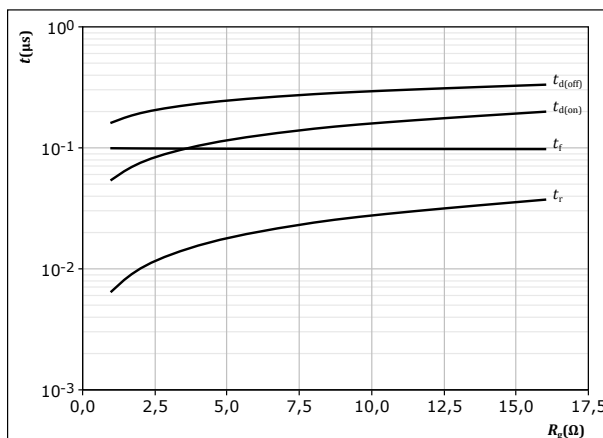
$T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$  Ω  
 $R_{goff} = 4$  Ω

figure 36.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

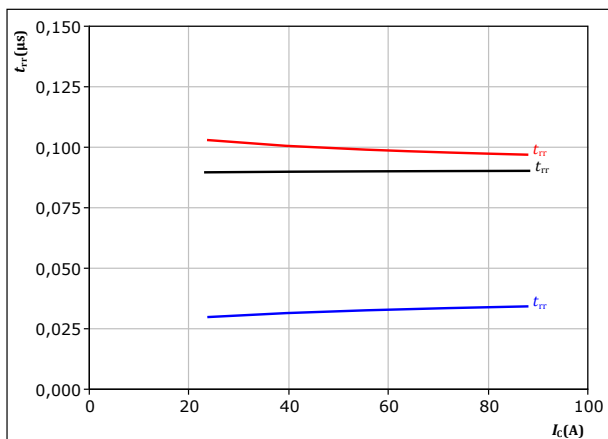
$T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 56$  A

figure 37.

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  
 $R_{gon} = 4$  Ω

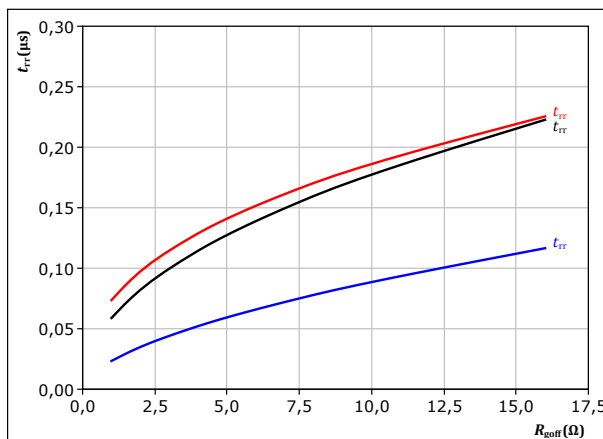
$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

figure 38.

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  
 $I_C = 56$  A

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C



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datasheet

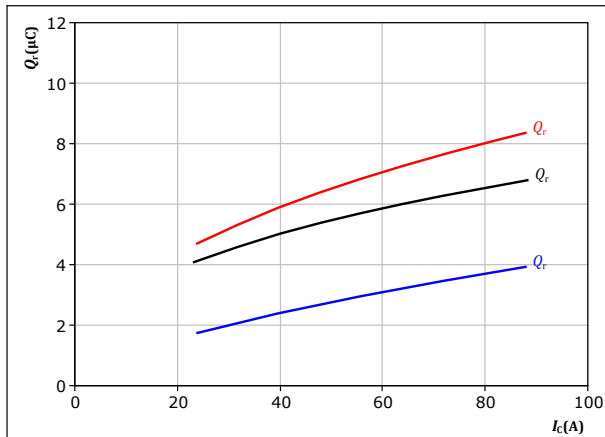
## Boost Switching Characteristics

figure 39.

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  
 $R_{gon} = 4$  Ω

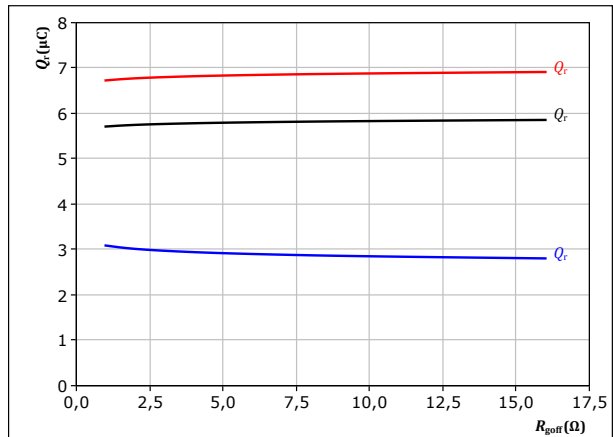
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 40.

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  
 $I_c = 56$  A

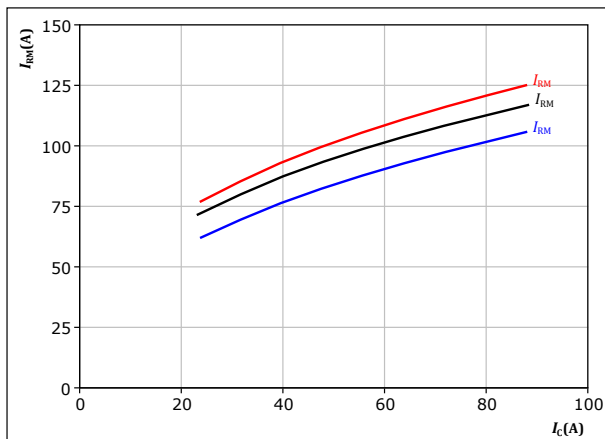
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 41.

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  
 $R_{gon} = 4$  Ω

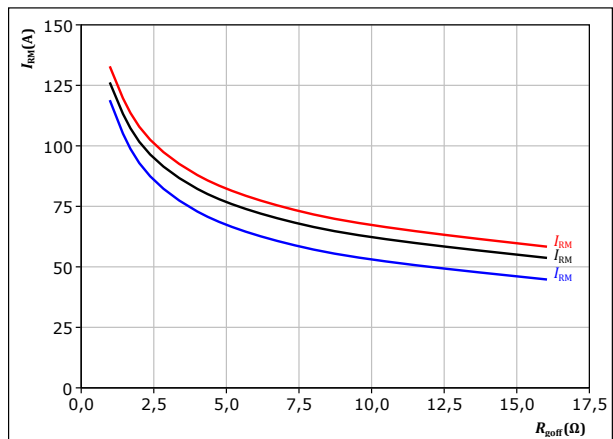
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 42.

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  
 $I_c = 56$  A

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C



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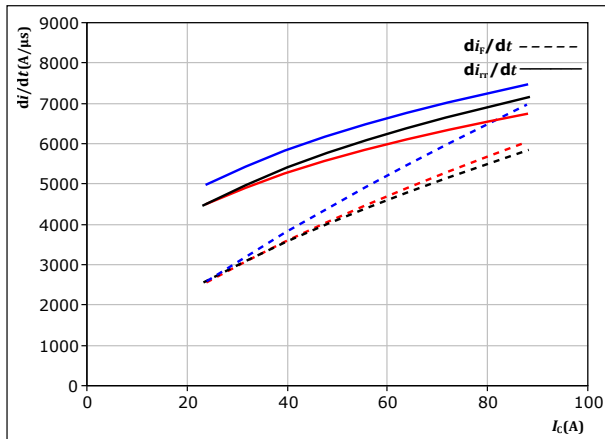
# 10-P012NME080SH-M910F09Y

datasheet

## Boost Switching Characteristics

figure 43. FWD

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



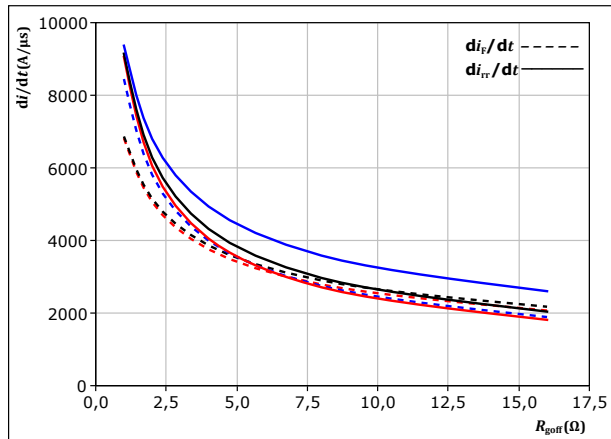
With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{goff} = 4 \text{ } \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 44. 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

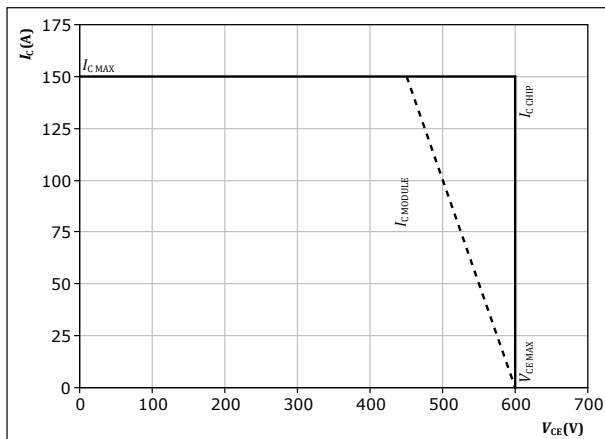
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 56 \text{ A}$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 45. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At  $T_j = 150 \text{ } ^\circ\text{C}$   
 $R_{goff} = 4 \text{ } \Omega$   
 $R_{goff} = 4 \text{ } \Omega$



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## Switching Definitions

figure 46. IGBT

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

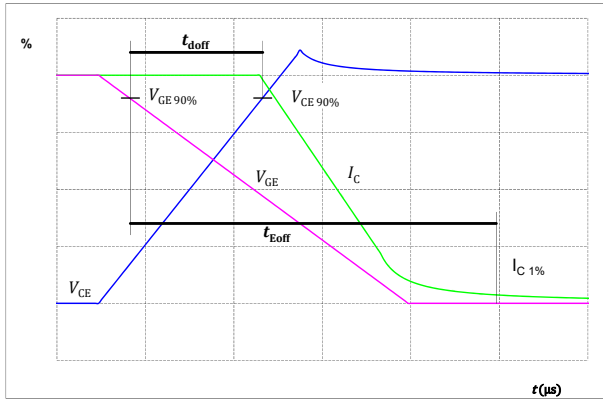


figure 47. IGBT

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

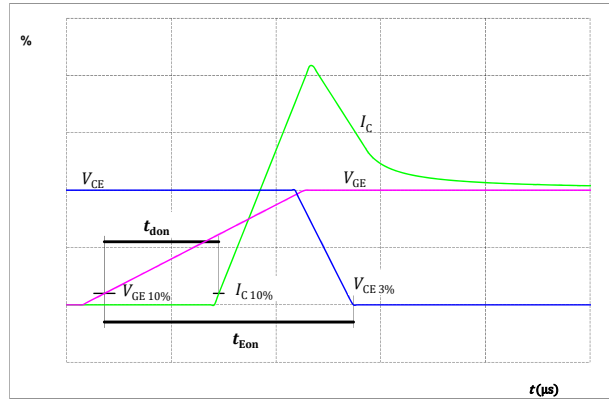


figure 48. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

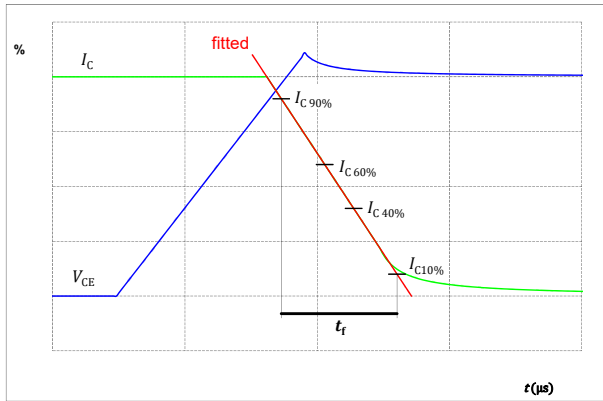
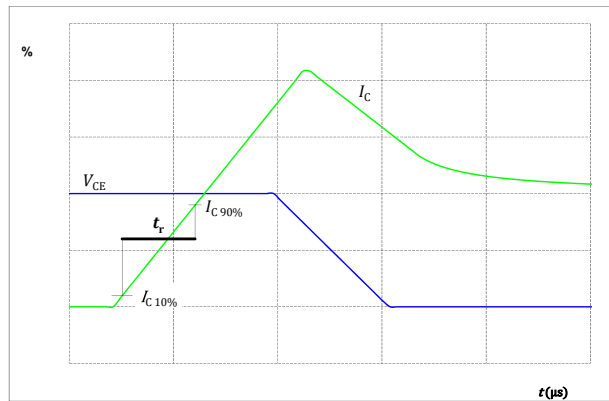


figure 49. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





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## Switching Definitions

figure 50.

FWD

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

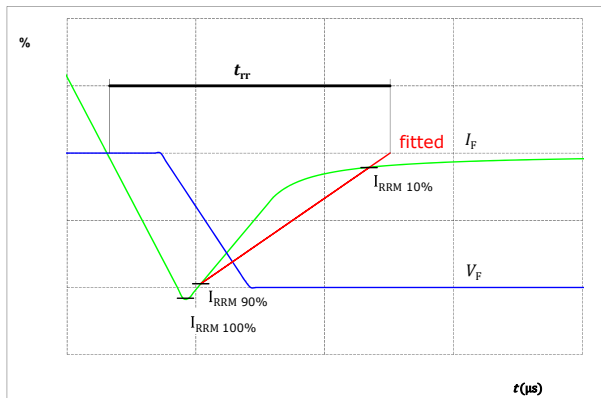
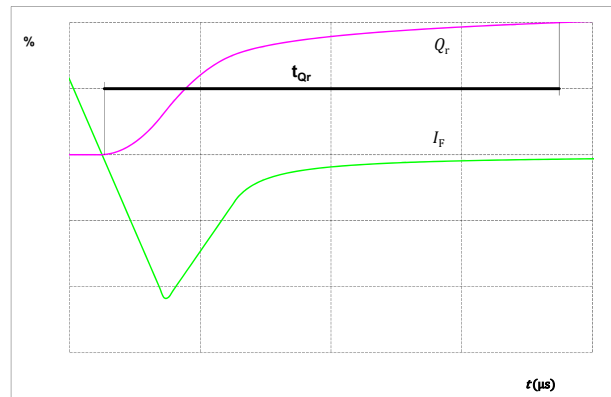


figure 51.

FWD


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





**10-P012NME080SH-M910F09Y**  
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-P012NME080SH-M910F09Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-P012NME080SH-M910F09Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-P012NME080SH-M910F09Y-/3/

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

Outline
1

Pin table [mm]			
Pin	X	Y	Function
1	33,6	0	G2
2	30,7	0	S2
3	not assembled		
4	22	0	-DC
5	19,2	0	-DC
6	11,4	0	GND
7	0	0	S3
8	0	2,9	G3
9	0	9,9	Line
10	0	12,7	Line
11	0	15,5	Line
12	0	19,7	G4
13	0	22,6	S4
14	10,1	22,6	GND
15	17,9	22,6	+DC
16	20,8	22,6	+DC
17	not assembled		
18	30,7	22,6	S1
19	33,6	22,6	G1
20	33,6	14,8	NTC1
21	33,6	8,2	NTC2


The technical drawing consists of two views of the sensor module. The top view shows the rectangular footprint of the module with dimensions 113 mm in height and 168 mm in width. It features two circular mounting holes on the left and right sides. Pin locations are indicated by numbers 1 through 21, corresponding to the pin table. The bottom view shows the underside of the module, highlighting the press-fit pinhead locations. A dimension of 179 ±0.1 mm is shown for the distance between the mounting holes, and a total height of 212 ±0.5 mm is indicated. A note points to the center of the press-fit pinhead, stating: 'center of press-fit pinhead for connection parameter see the handling instruction'.

Tolerance of pinpositions: ±0.5mm at the end of pins  
 Dimension of coordinate axis is only offset without tolerance

12 Sep. 2021 / Revision 3



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Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample
Handling instruction				
Handling instructions for <i>flow 0</i> packages see vincotech.com website.				
Package data				
Package data for <i>flow 0</i> 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-P012NME080SH-M910F09Y-D3-14	12 Sep. 2021	New Datasheet format, module is unchanged Correct Thermal values Separate datasheet for pressfit pin version	

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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.