



Vincotech

# 10-FS12NMA080SH08-M260F98

datasheet

flowMNPC 0

1200 V / 80 A

## Features

- Three-level MNPC topology
- High reactive power capability
- Low inductive layout
- Improved LVRT capability
- Enhanced thermal performance

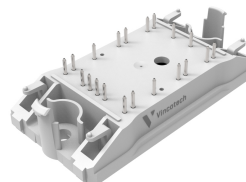
## Target applications

- Industrial Drives
- Solar Inverters
- UPS

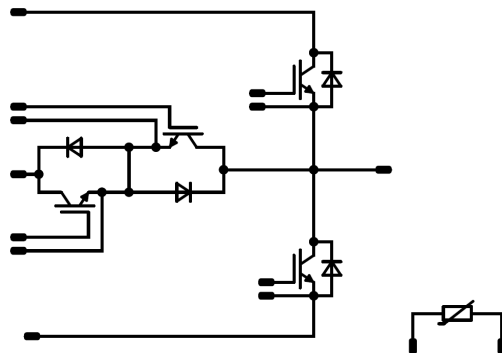
## Types

- 10-FS12NMA080SH08-M260F98

## flow 0 12 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)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	85	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	240	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	223	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	$V_{RRM}$		650	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	59	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	320	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	84	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Boost Switch

Collector-emitter voltage	$V_{CES}$		650	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	65	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	320	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	109	W
Gate-emitter voltage	$V_{GES}$		$\pm 30$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 360\text{ V}$ $T_j = 25\text{ °C}$	2	$\mu s$
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)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	51	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	100	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	92	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			min. 12,7	mm
Clearance			8,72	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>	$R_{th(j-s)}$	$\lambda_{paste} = 4,4 \text{ W/mK}$ (PTM)						0,43		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	55	25 125 150		78 78 78		ns
Rise time	$t_r$					25 125 150		12 15 15		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		179 235 248		ns
Fall time	$t_f$					25 125 150		53,79 89,18 106,61		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD}=2,04 \text{ } \mu\text{C}$ $Q_{tFWD}=3,64 \text{ } \mu\text{C}$ $Q_{tFWD}=4,16 \text{ } \mu\text{C}$				25 125 150		0,806 1,34 1,38		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		1,47 2,7 2,73		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	$V_F$				80	25 125 150		1,55 1,62 1,62	1,9 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 650$ V				25			10	µA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						1,13		K/W
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#### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt=3491$ A/µs $di/dt=3563$ A/µs $di/dt=3610$ A/µs	$\pm 15$	350	55	25 125 150		81,73 84,5 86,06		A
Reverse recovery time	$t_{rr}$					25 125 150		41,83 108,58 124,52		ns
Recovered charge	$Q_r$					25 125 150		2,04 3,64 4,16		µC
Reverse recovered energy	$E_{rec}$					25 125 150		0,314 0,665 0,771		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		6568 4238 3040		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	$V_{GE(th)}$			5	0,0571	25	5	6	7	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		80	25 125 150		1,64 1,69 1,75	1,9 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	650		25			10	µA
Gate-emitter leakage current	$I_{GES}$		30	0		25			200	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	30	25			4810		pF
Output capacitance	$C_{oes}$							184		pF
Reverse transfer capacitance	$C_{res}$							79		pF
Gate charge	$Q_g$		15	400	80	25		171		nC

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 4,4 \text{ W/mK}$ (PTM)						0,87		K/W
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#### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	$\pm 15$	350	55	25 125 150		56 58 58		ns
Rise time	$t_r$					25 125 150		5 5 6		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		76 89 92		ns
Fall time	$t_f$					25 125 150		47,06 44,09 54,14		ns
Turn-on energy (per pulse)	$E_{on}$					25 125 150		0,263 0,368 0,42		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		0,758 1,22 1,33		mWs



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datasheet

## 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		1,66 1,78 1,79	2,1 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 1200$ V				25			40	µA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						1,04		K/W
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#### Dynamic

Peak recovery current	$I_{RRM}$	$di/dt=15050$ A/µs $di/dt=12587$ A/µs $di/dt=12212$ A/µs	$\pm 15$	350	55	25 125 150		150,46 149,24 153,71		A
Reverse recovery time	$t_{rr}$					25 125 150		33,78 112,37 115,38		ns
Recovered charge	$Q_r$					25 125 150		5,62 7,56 8,39		µC
Reverse recovered energy	$E_{rec}$					25 125 150		1,51 2,08 2,31		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		10000 9986 9495		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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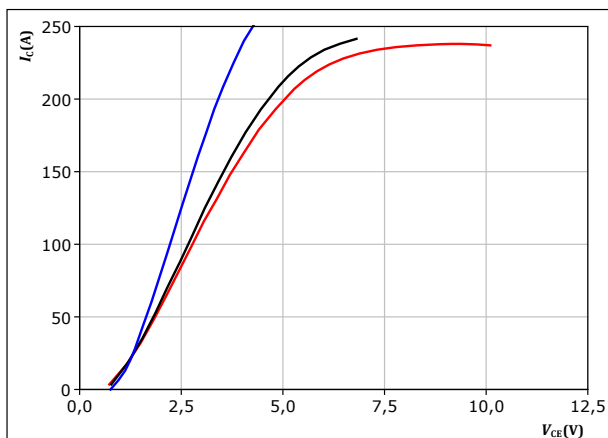
## Buck Switch Characteristics

figure 1.

IGBT

Typical output characteristics

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



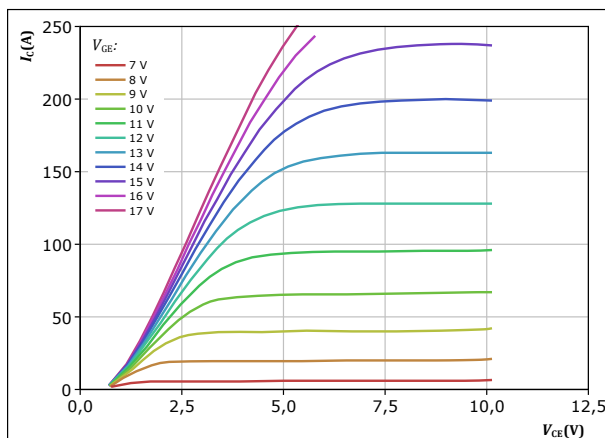
$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j:$  25 °C, 125 °C, 150 °C

figure 2.

IGBT

Typical output characteristics

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



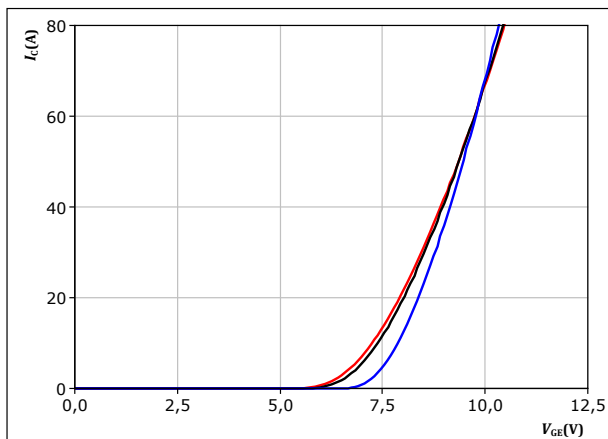
$t_p = 250 \mu s$   
 $T_j = 150 \text{ °C}$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 3.

IGBT

Typical transfer characteristics

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



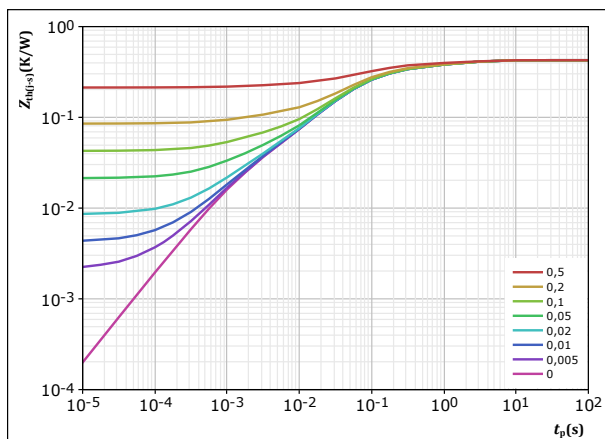
$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j:$  25 °C, 125 °C, 150 °C

figure 4.

IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,426 \text{ K/W}$   
IGBT thermal model values  

$R \text{ (K/W)}$	$\tau \text{ (s)}$
6,34E-02	2,17E+00
6,80E-02	3,73E-01
2,18E-01	7,13E-02
5,76E-02	1,82E-02
1,95E-02	1,44E-03



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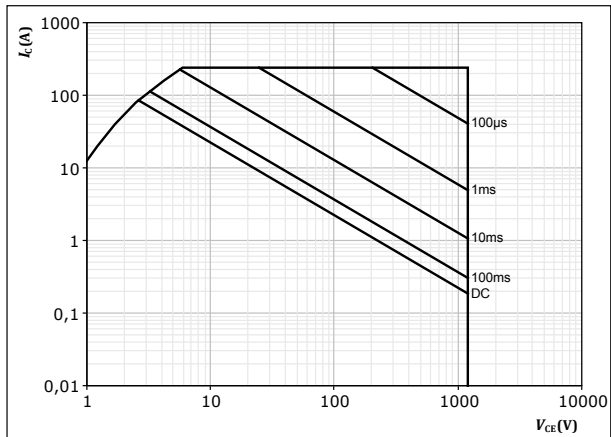
**10-FS12NMA080SH08-M260F98**  
datasheet

## Buck Switch Characteristics

figure 5. IGBT

Safe operating area

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



D = single pulse

T<sub>s</sub> = 80 °C

V<sub>GE</sub> = 15 V

T<sub>j</sub> = T<sub>jmax</sub>



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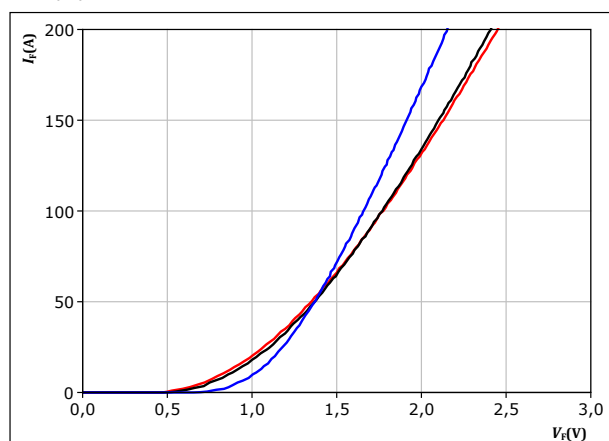
# 10-FS12NMA080SH08-M260F98 datasheet

## Buck Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



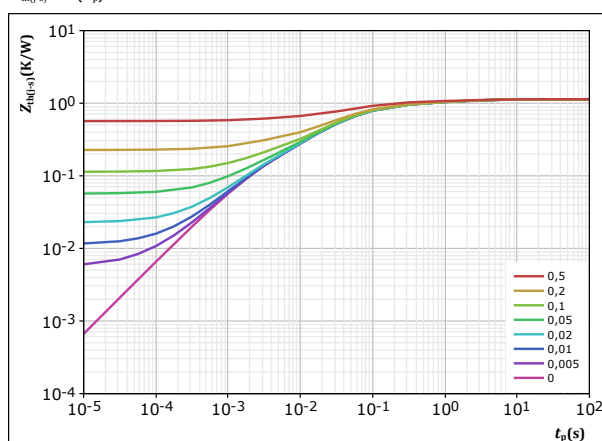
$t_p = 250 \mu s$

$T_j$ : 25 °C, 125 °C, 150 °C

figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 1,134 \text{ K/W}$

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
8,81E-02	3,39E+00
1,55E-01	5,93E-01
4,48E-01	7,76E-02
3,52E-01	2,14E-02
9,01E-02	2,05E-03



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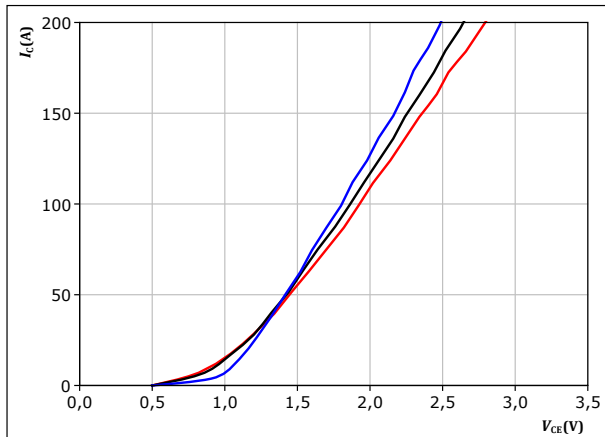
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## Boost Switch Characteristics

figure 8. IGBT

Typical output characteristics

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

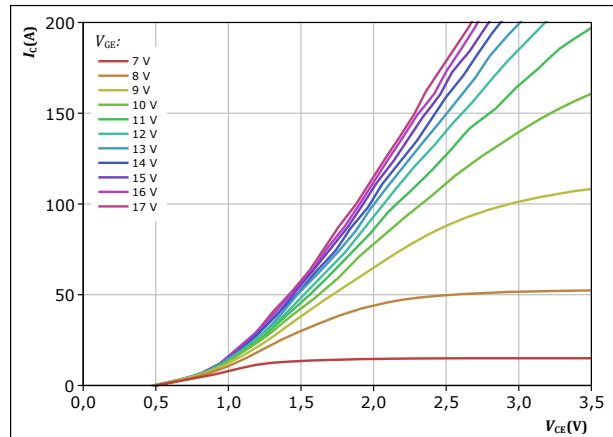


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j: 25^\circ C, 125^\circ C, 150^\circ C$

figure 9. IGBT

Typical output characteristics

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

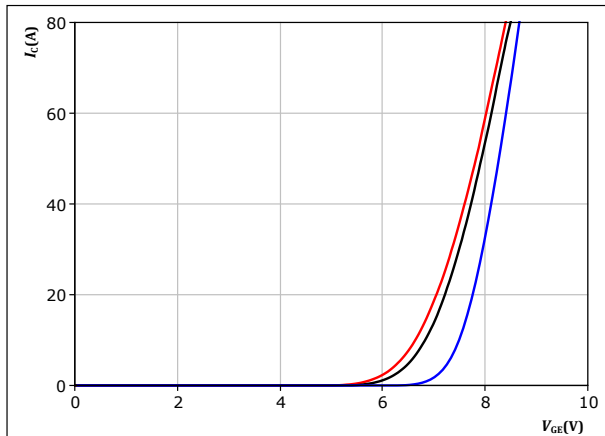


$t_p = 250 \mu s$   
 $T_j = 150^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 10. IGBT

Typical transfer characteristics

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

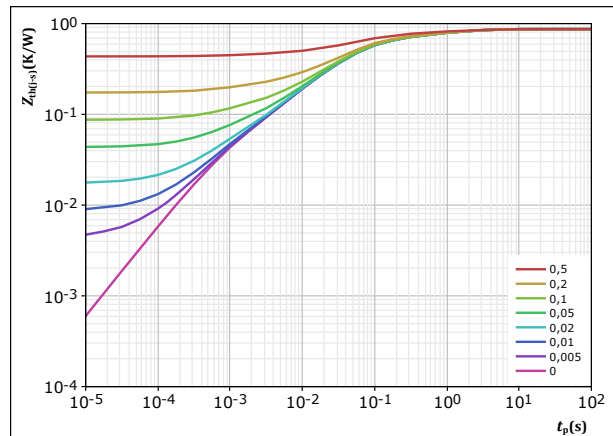


$t_p = 250 \mu s$   
 $V_{CE} = 10 V$   
 $T_j: 25^\circ C, 125^\circ C, 150^\circ C$

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0.869 K/W$   
IGBT thermal model values  

$R (K/W)$	$\tau (s)$
1,24E-01	1,83E+00
1,61E-01	2,81E-01
4,39E-01	5,07E-02
1,13E-01	9,54E-03
3,33E-02	8,57E-04



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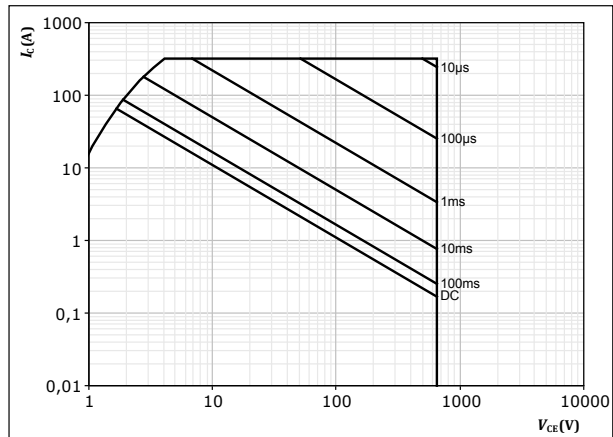
## Boost Switch Characteristics

figure 12.

IGBT

Safe operating area

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



$D =$  single pulse

$T_s = 80$  °C

$V_{GE} = 15$  V

$T_j = T_{jmax}$



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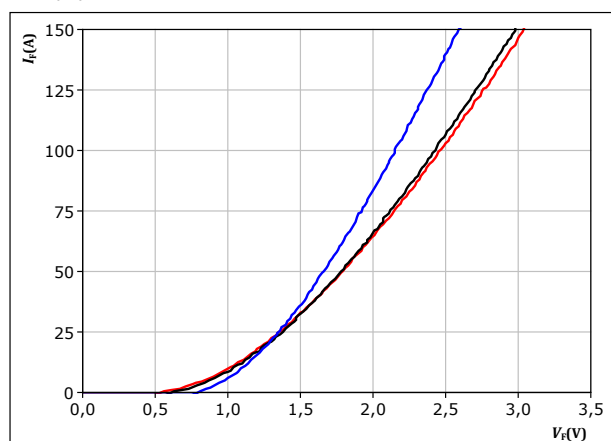
## Boost Diode Characteristics

figure 13.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

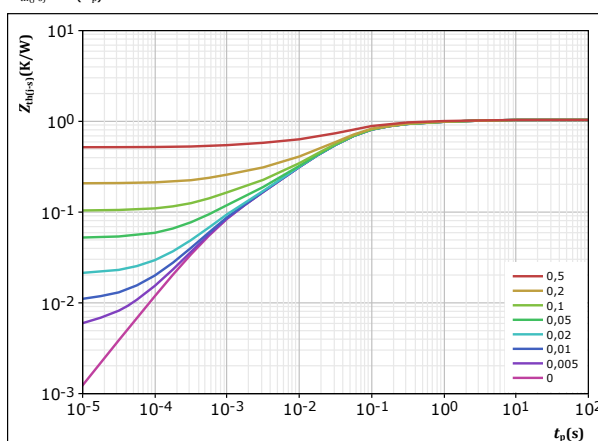
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 14.

FWD

Transient thermal impedance as a function of pulse width

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



$D =$	$t_p / T$	
$R_{th(j-s)} =$	1,037	K/W
FWD thermal model values		
$R$ (K/W)	$\tau$ (s)	
6,88E-02	2,36E+00	
1,35E-01	2,56E-01	
5,81E-01	4,67E-02	
1,79E-01	8,60E-03	
7,33E-02	8,11E-04	



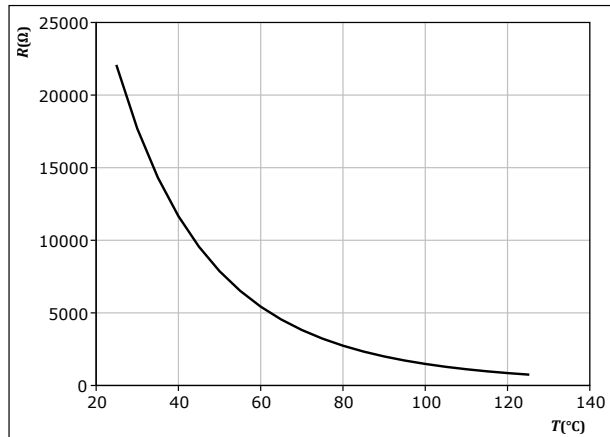
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## Thermistor Characteristics

**figure 15.** Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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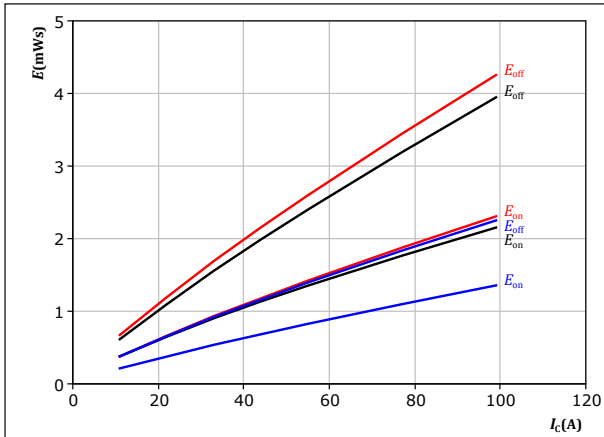
## Buck Switching Characteristics

figure 16.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

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

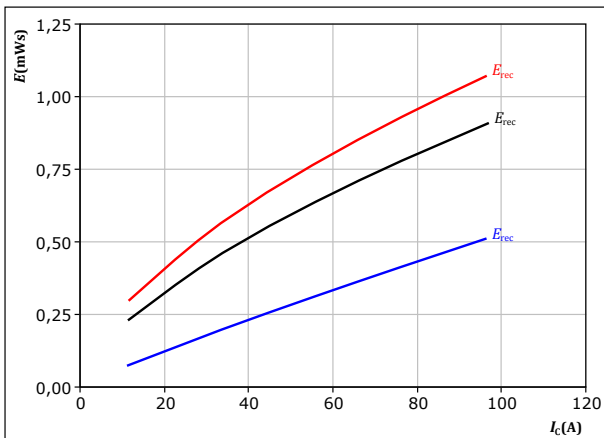
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 18.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

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

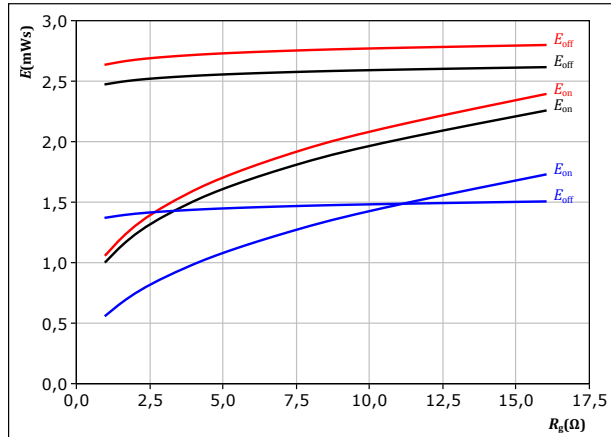
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 17.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 55 \text{ A}$

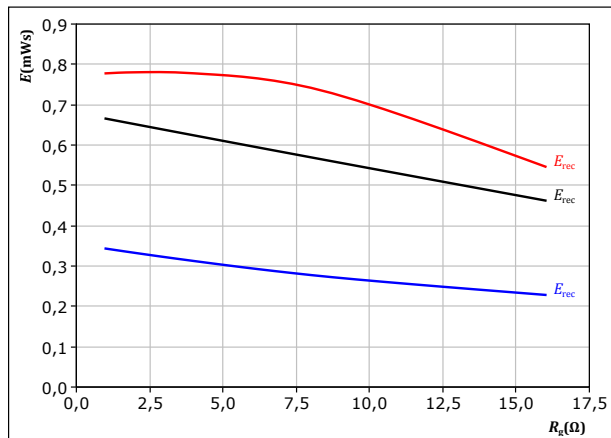
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 19.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 55 \text{ A}$

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





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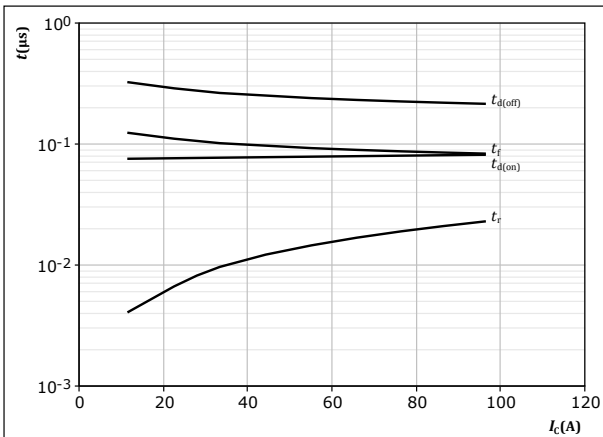
# 10-FS12NMA080SH08-M260F98 datasheet

## Buck Switching Characteristics

figure 20.

IGBT

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



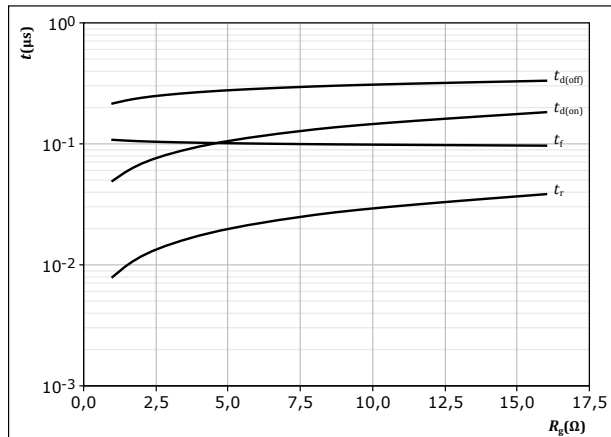
With an inductive load at

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

figure 21.

IGBT

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



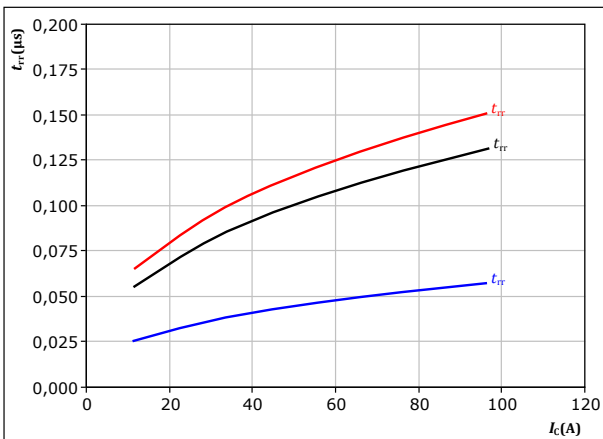
With an inductive load at

$T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 55$  A

figure 22.

FWD

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



With an inductive load at

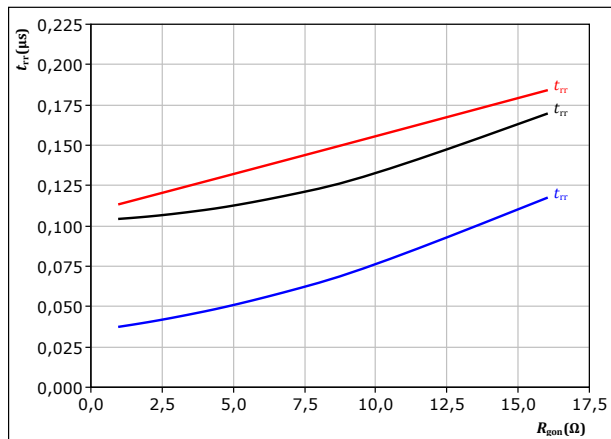
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : 25 °C  
125 °C  
150 °C

figure 23.

FWD

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 55$  A

$T_j$ : 25 °C  
125 °C  
150 °C



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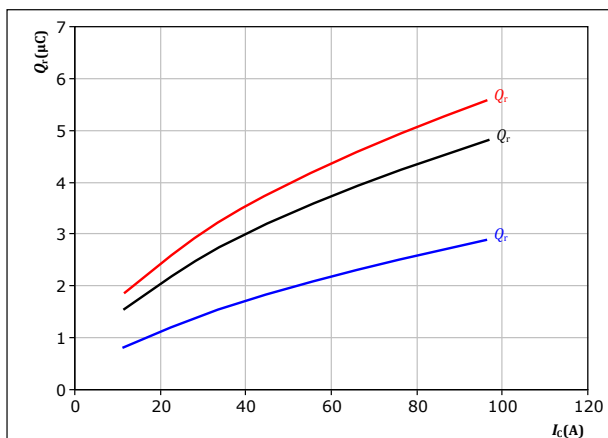
## Buck Switching Characteristics

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

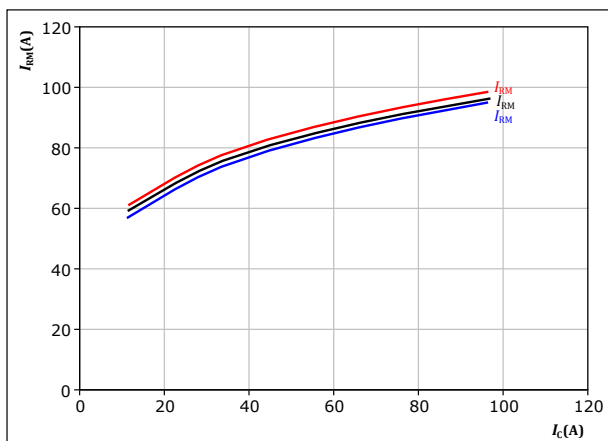
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

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

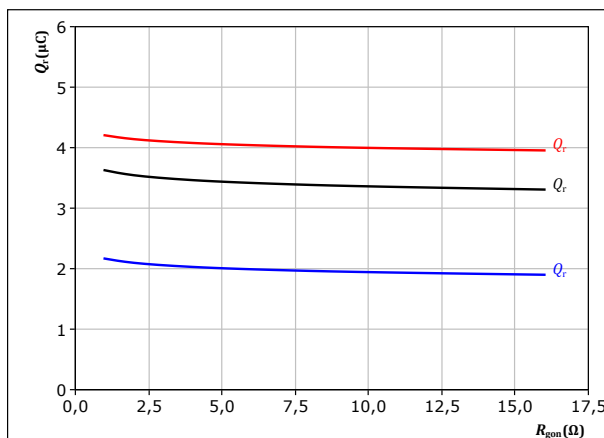
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 25.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 55$  A

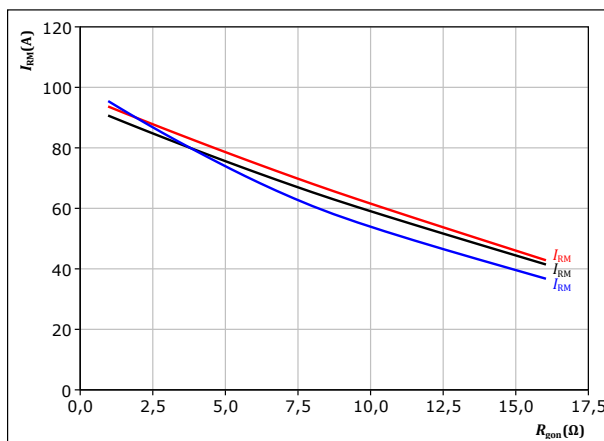
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 27.

FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 55$  A

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



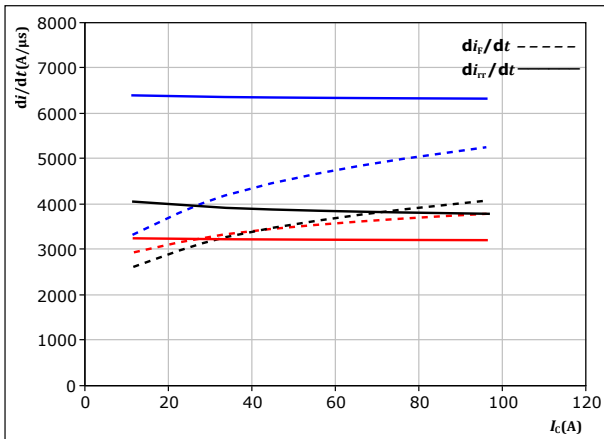
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## Buck Switching Characteristics

**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

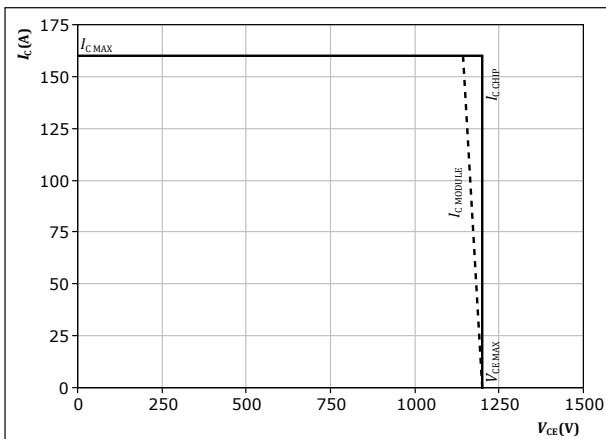
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$

$T_j$ : 25 °C  
125 °C  
150 °C

**figure 30.** IGBT

Reverse bias safe operating area

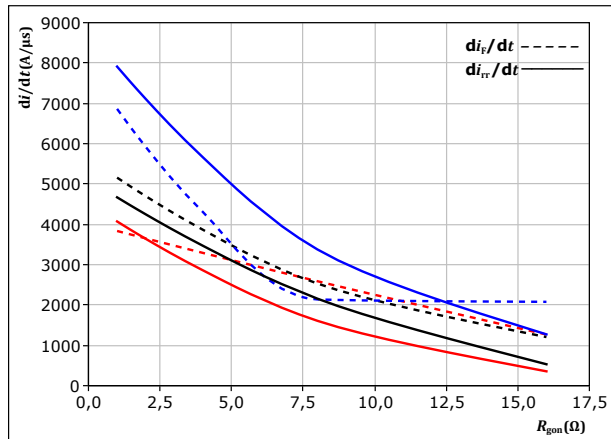
$I_C = f(V_{CE})$



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

**figure 29.** 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

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 55 \text{ A}$

$T_j$ : 25 °C  
125 °C  
150 °C



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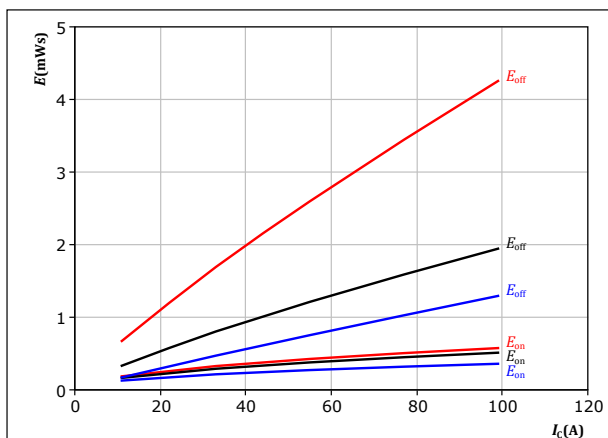
## Boost Switching Characteristics

figure 31.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

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

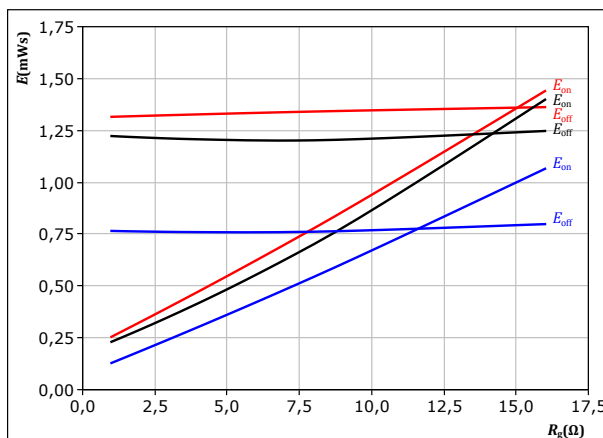
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 32.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 55 \text{ A}$

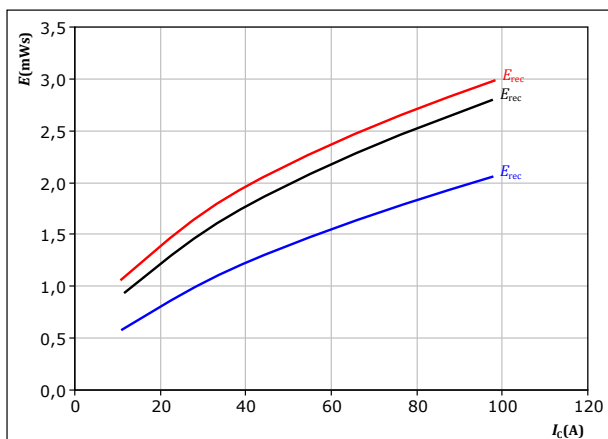
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 33.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

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

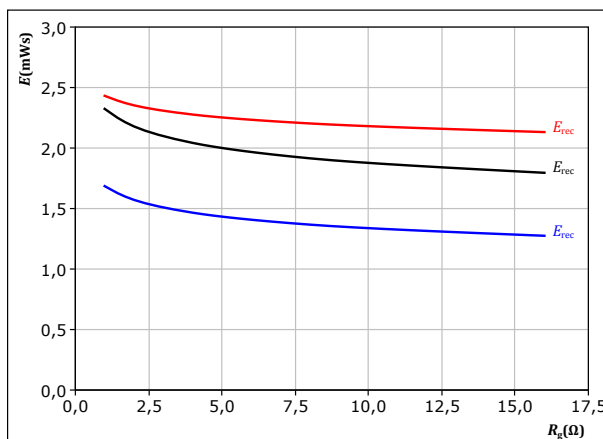
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 34.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 55 \text{ A}$

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



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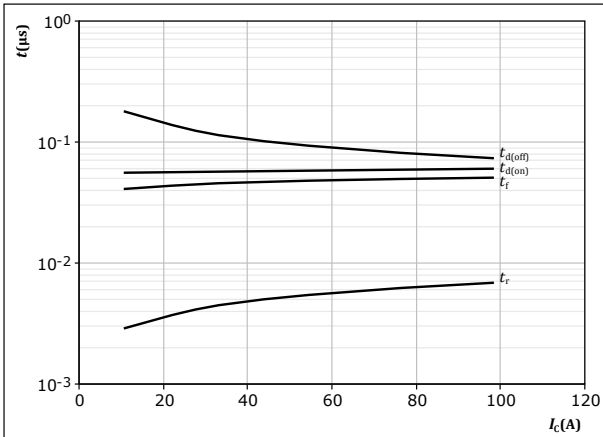
# 10-FS12NMA080SH08-M260F98 datasheet

## Boost Switching Characteristics

figure 35.

IGBT

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



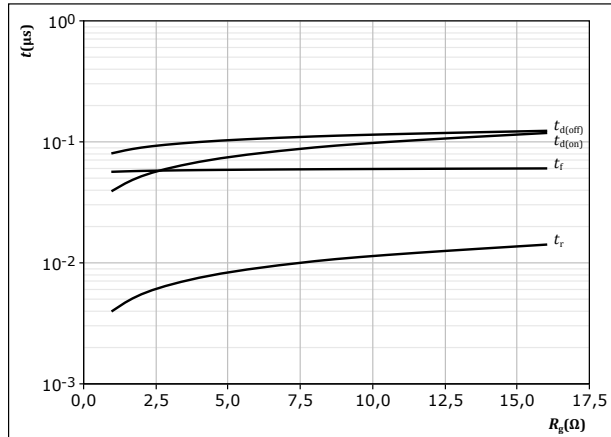
With an inductive load at

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

figure 36.

IGBT

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



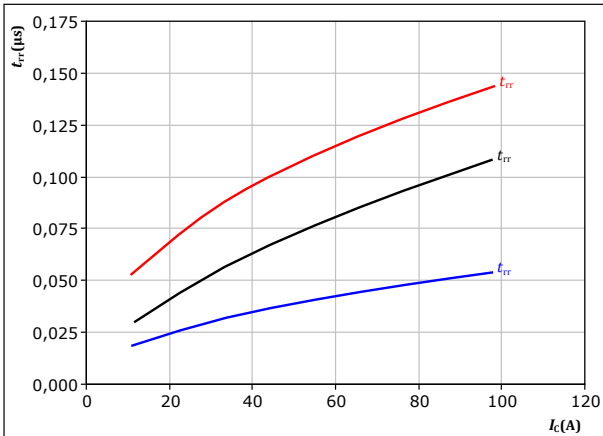
With an inductive load at

$T_j = 150$  °C  
 $V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 55$  A

figure 37.

FWD

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



With an inductive load at

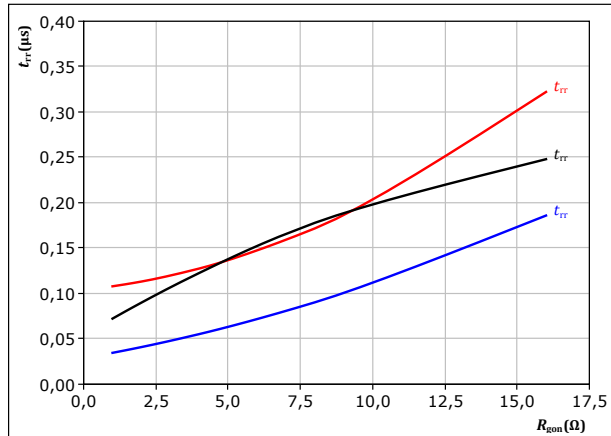
$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 4$   $\Omega$

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

figure 38.

FWD

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 55$  A

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C



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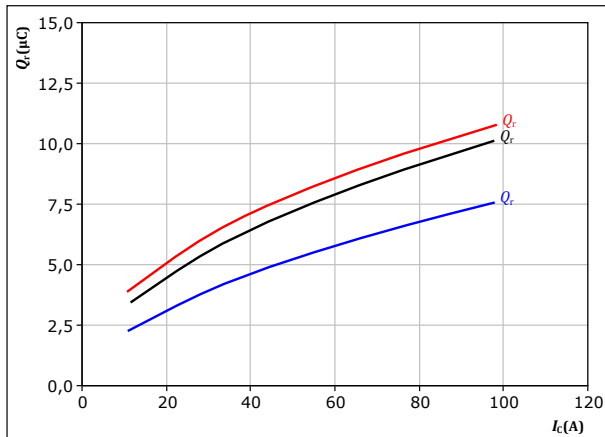
## Boost Switching Characteristics

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

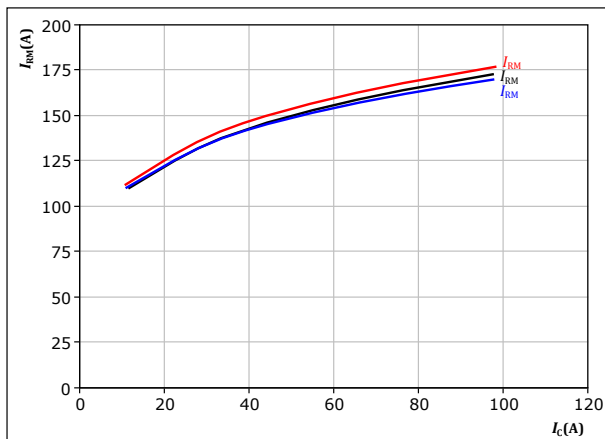
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 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

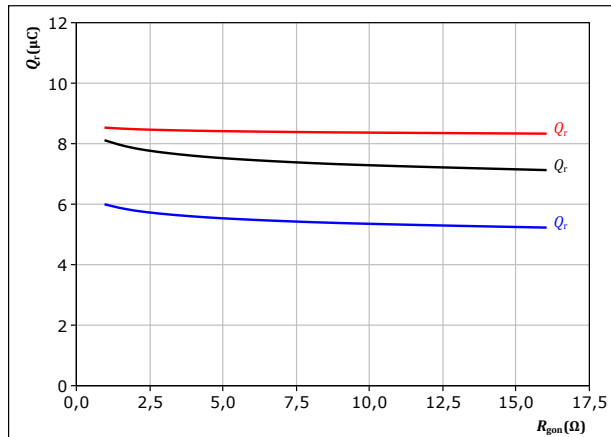
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 40.

FWD

Typical recovered charge as a function of turn on gate resistor

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 55$  A

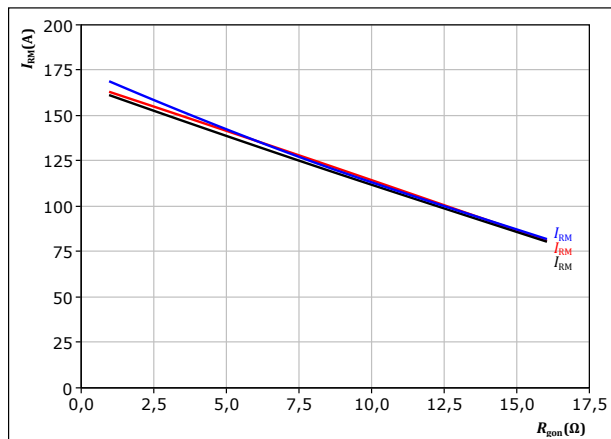
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 42.

FWD

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

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



With an inductive load at

$V_{CE} = 350$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 55$  A

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



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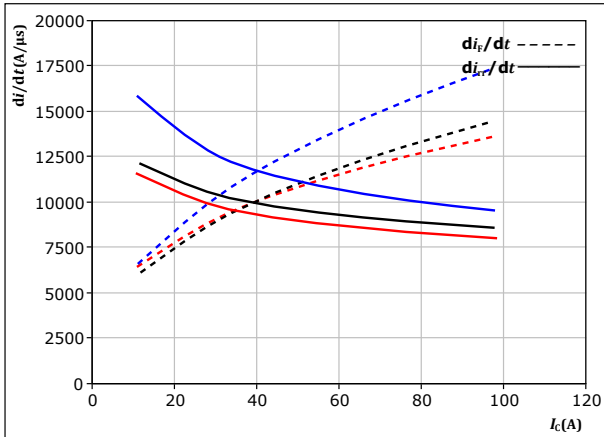
# 10-FS12NMA080SH08-M260F98

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

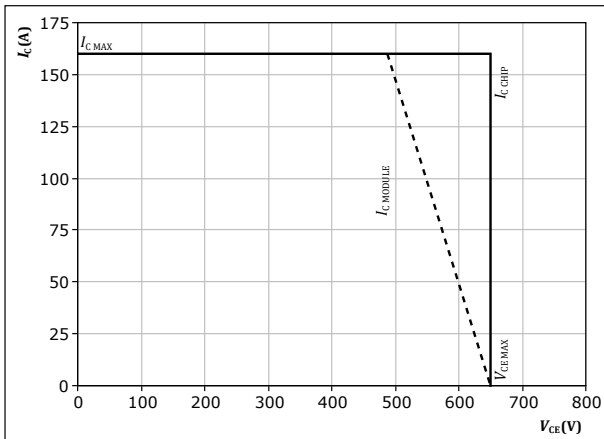
$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 4 \text{ } \Omega$

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

figure 45. IGBT

Reverse bias safe operating area

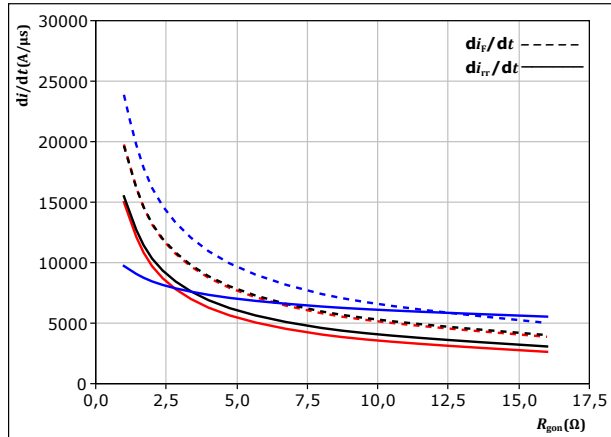
$I_C = f(V_{CE})$



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

figure 44. 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

$V_{CE} = 350 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 55 \text{ A}$

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



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## Switching Definitions

figure 46. IGBT

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

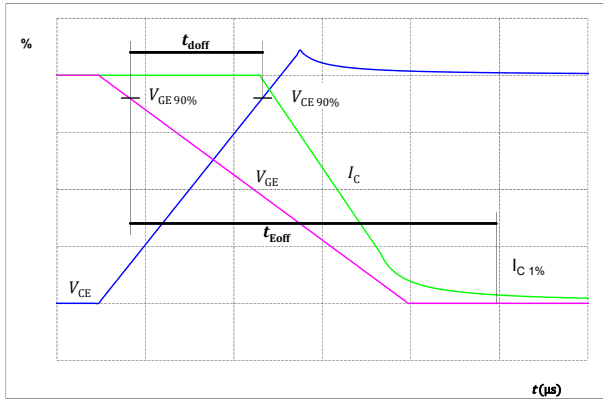


figure 47. IGBT

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

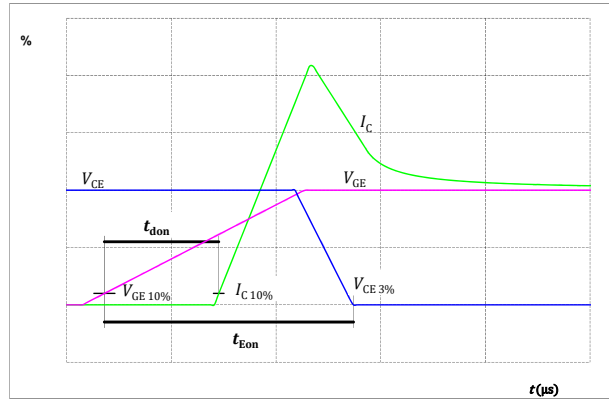


figure 48. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

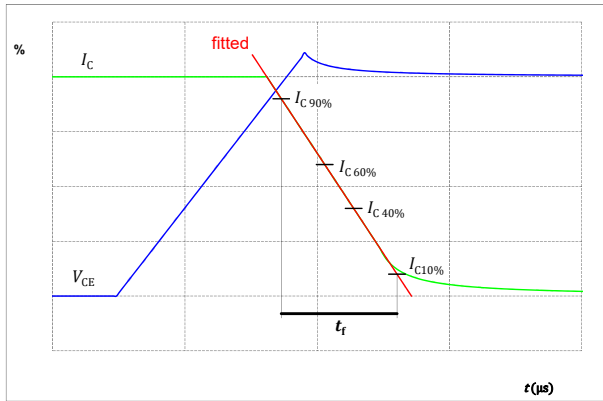
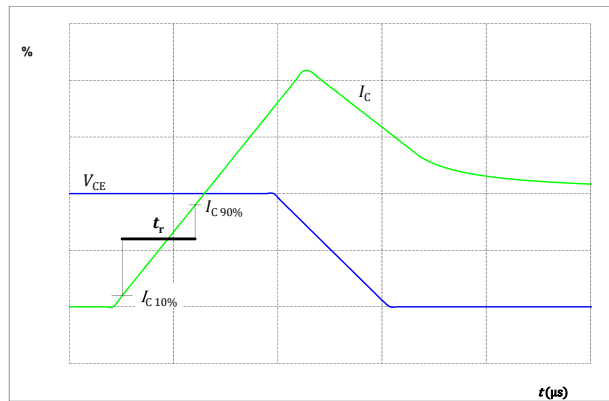


figure 49. IGBT

Turn-on Switching Waveforms & definition of  $t_r$







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## Switching Definitions

figure 50.

FWD

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

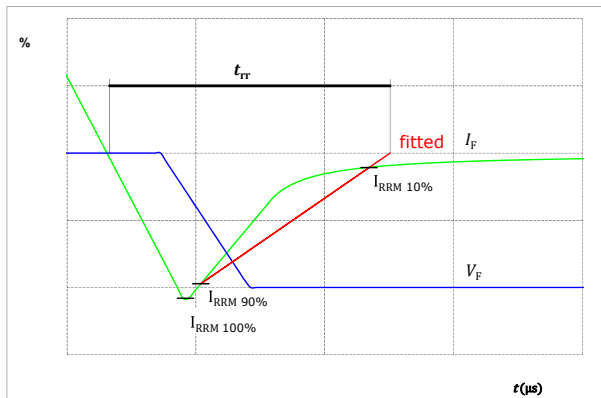
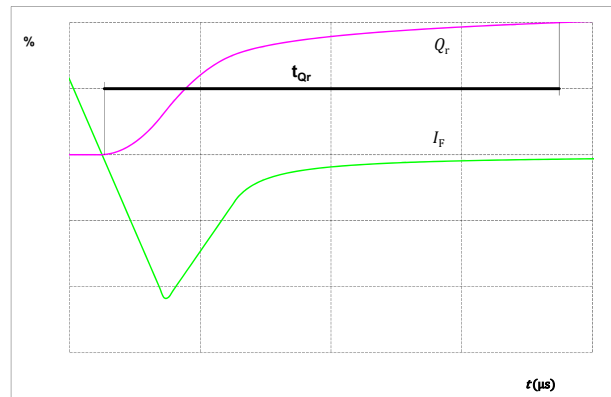


figure 51.

FWD

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






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# 10-FS12NMA080SH08-M260F98

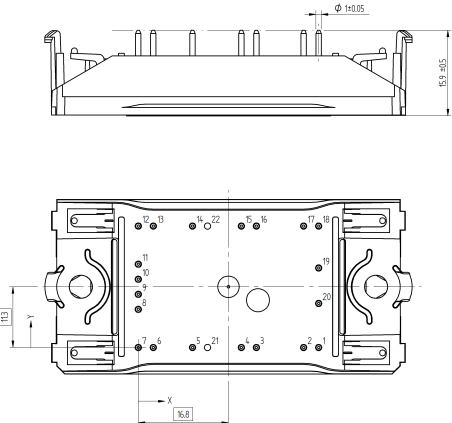
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-FS12NMA080SH08-M260F98
With thermal paste	10-FS12NMA080SH08-M260F98-/7/

Marking						
	Text	Name	Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNNNN- TTTTIV	WWYY	UL VIN	LLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTIV	LLLL	SSSS	WWYY	

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

Outline

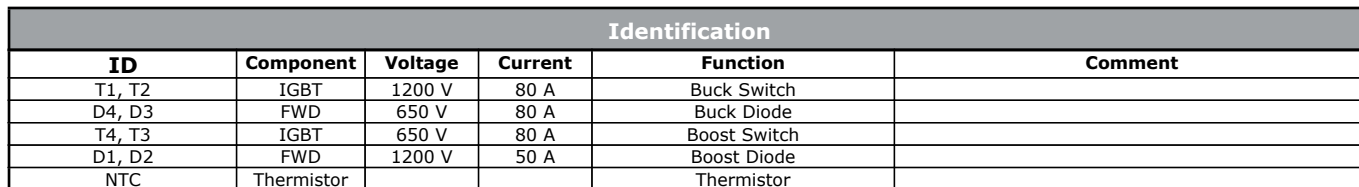


The technical drawing shows the top and bottom views of a component. The top view is a rectangular shape with rounded corners and a central circular feature. It has 20 pins labeled 1 through 20. The bottom view is a similar shape with rounded corners and a central circular feature. It has 20 pins labeled 1 through 20. The dimensions are given in millimeters. The width is 16, the height is 16, and the distance between the pins is 16. The pin locations are marked with dots and numbers. The pin 1 is at the top right corner, pin 2 is at the top right, pin 3 is at the top right, pin 4 is at the top right, pin 5 is at the top right, pin 6 is at the top right, pin 7 is at the top right, pin 8 is at the top right, pin 9 is at the top right, pin 10 is at the top right, pin 11 is at the top right, pin 12 is at the top right, pin 13 is at the top right, pin 14 is at the top right, pin 15 is at the top right, pin 16 is at the top right, pin 17 is at the top right, pin 18 is at the top right, pin 19 is at the top right, pin 20 is at the top right. The dimensions are given in millimeters. The width is 16, the height is 16, and the distance between the pins is 16. The pin locations are marked with dots and numbers. The pin 1 is at the top right corner, pin 2 is at the top right, pin 3 is at the top right, pin 4 is at the top right, pin 5 is at the top right, pin 6 is at the top right, pin 7 is at the top right, pin 8 is at the top right, pin 9 is at the top right, pin 10 is at the top right, pin 11 is at the top right, pin 12 is at the top right, pin 13 is at the top right, pin 14 is at the top right, pin 15 is at the top right, pin 16 is at the top right, pin 17 is at the top right, pin 18 is at the top right, pin 19 is at the top right, pin 20 is at the top right.

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



datasheet





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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-FS12NMA080SH08-M260F98-D1-14	17 Jul. 2019		
10-FS12NMA080SH08-M260F98-D2-14	2 Nov. 2020	Thermal Paste change from PSX to PTM	2-7,9,11,12,14,26

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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.