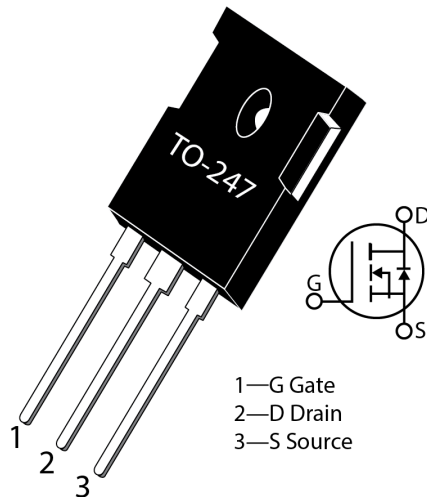


MSC280SMA120B Silicon Carbide N-Channel Power MOSFET

1 Product Overview

This section shows the product overview for the MSC280SMA120B device.



1.1 Features

The following are key features of the MSC280SMA120B device:

- Low capacitances and low gate charge
- Fast switching speed due to low internal gate resistance (ESR)
- Stable operation at high junction temperature, $T_{J(max)} = 175\text{ }^{\circ}\text{C}$
- Fast and reliable body diode
- Superior avalanche ruggedness
- RoHS compliant

1.2 Benefits

The following are benefits of the MSC280SMA120B device:

- High efficiency to enable lighter, more compact system
- Simple to drive and easy to parallel
- Improved thermal capabilities and lower switching losses
- Eliminates the need for external freewheeling diode
- Lower system cost of ownership

1.3 Applications

The MSC280SMA120B device is designed for the following applications:

- PV inverter, converter, and industrial motor drives
- Smart grid transmission and distribution
- Induction heating and welding
- H/EV powertrain and EV charger
- Power supply and distribution

2 Device Specifications

This section shows the specifications for the MSC280SMA120B device.

2.1 Absolute Maximum Ratings

The following table shows the absolute maximum ratings for the MSC280SMA120B device.

Table 1 • Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
V _{DSS}	Drain-source voltage	1200	V
I _D	Continuous drain current at T _C = 25 °C	9.4	A
	Continuous drain current at T _C = 100 °C	6.6	
I _{DM}	Pulsed drain current ¹	20	
V _{GS}	Gate-source voltage	25 to -10	V
P _D	Total power dissipation at T _C = 25 °C	55	W
	Linear derating factor	0.37	W/°C

Note:

1. Repetitive rating: pulse width and case temperature limited by maximum junction temperature. The following table shows the thermal and mechanical characteristics of the MSC280SMA120B device.

Table 2 • Thermal and Mechanical Characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
R _{θJC}	Junction-to-case thermal resistance		1.8	2.7	°C/W
T _J	Operating junction temperature	-55		175	°C
T _{STG}	Storage temperature	-55		175	
T _L	Soldering temperature for 10 seconds (1.6 mm from case)			260	
	Mounting torque, 6-32 or M3 screw			10	lbf-in
					1.1
Wt	Package weight		0.22		oz
			6.2		g

2.2 Electrical Performance

The following table shows the static characteristics for the MSC280SMA120B device. $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 3 • Static Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 100\text{ }\mu\text{A}$	1200			V
$R_{DS(on)}$	Drain-source on resistance ¹	$V_{GS} = 20\text{ V}$, $I_D = 5\text{ A}$		280	350	m Ω
$V_{GS(th)}$	Gate-source threshold voltage	$V_{GS} = V_{DS}$, $I_D = 1\text{ mA}$	1.8	2.8		V
$\Delta V_{GS(th)}/\Delta T_J$	Threshold voltage coefficient	$V_{GS} = V_{DS}$, $I_D = 1\text{ mA}$		TBD		mV/ $^\circ\text{C}$
I_{GSS}	Zero gate voltage drain current	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$			100	μA
		$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$ $T_J = 125\text{ }^\circ\text{C}$			500	
I_{GSS}	Gate-source leakage current	$V_{GS} = 20\text{ V}/-10\text{ V}$			± 100	nA

Note:

1. Pulse test: pulse width < 380 μs , duty cycle < 2%.

The following table shows the dynamic characteristics for the MSC280SMA120B device. $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 4 • Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}$, $V_{DD} = 1000\text{ V}$, $V_{AC} = 25\text{ mV}$		300		pF
C_{rss}	Reverse transfer capacitance	$f = 1\text{ MHz}$		5		
C_{oss}	Output capacitance			30		
Q_g	Total gate charge	$V_{GS} = -5\text{ V}/20\text{ V}$, $V_{DD} = 800\text{ V}$, $I_D = 5\text{ A}$		20		nC
Q_{gs}	Gate-source charge			TBD		
Q_{gd}	Gate-drain charge			TBD		

2.3 Body Diode Characteristics

The following table shows the body diode characteristics for the MSC280SMA120B device. $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Table 5 • Body Diode Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Diode forward voltage	$I_{SD} = 5\text{ A}$, $V_{GS} = 0\text{ V}$		3.5		V
		$I_{SD} = 5\text{ A}$, $V_{GS} = -5\text{ V}$		3.7		V
t_{rr}	Reverse recovery time	$I_{SD} = 5\text{ A}$, $V_{GS} = -5\text{ V}$, $V_{DD} = 800\text{ V}$		30		ns
Q_{rr}	Reverse recovery charge	$dI/dt = -1000\text{ A}/\mu\text{s}$		60		nC
I_{RRM}	Reverse recovery current			2		A

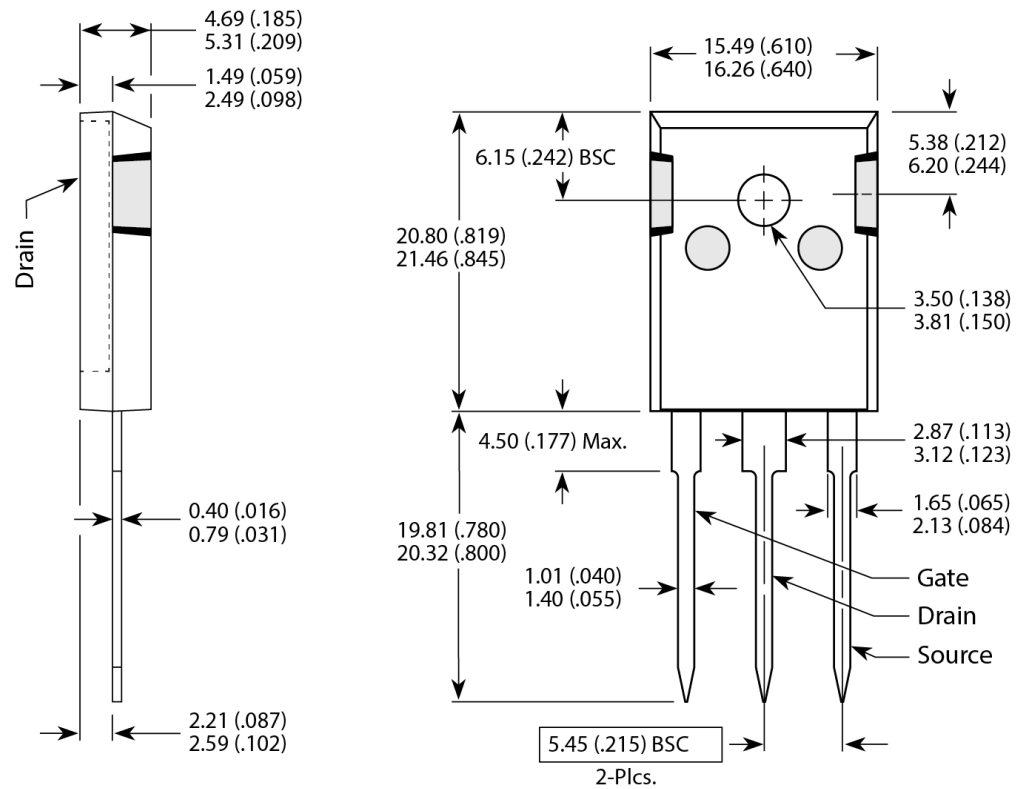
3 Package Specification

This section shows the package specification for the MSC280SMA120B device.

3.1 Package Outline Drawing

This section shows the TO-247 package drawing for the MSC280SMA120B device. The dimensions in the figure below are in millimeters and (inches).

Figure 1 • Package Outline Drawing





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