



1200V, 32A, 80mΩ

# Silicon Carbide Power MOSFET

## **FEATURES**

- Fast switching with low EMI/RFI
- Low R<sub>DS(on)</sub>
- + Ultra low  $\mathbf{C}_{\mathrm{rss}}$  for improved noise immunity
- Low gate charge
- Short Circuit Withstand Rated
- RoHS compliant *//*

# **TYPICAL APPLICATIONS**

- PFC and other boost converter
- Buck converter
- Two switch forward (asymmetrical bridge)
- Single switch forward
- Flyback
- Inverters



## **Maximum Ratings**

Symbol	Parameter	Ratings	Unit
V <sub>DSS</sub>	Drain Source Voltage	1200	V
	Continuous Drain Current @ T <sub>c</sub> = 25°C	32	
Г <sub>D</sub>	Continuous Drain Current @ T <sub>c</sub> = 100°C	23	А
I <sub>DM</sub>	Pulsed Drain Current <sup>①</sup>	100	
V <sub>GS</sub>	Gate-Source Voltage	-10 to +25	V
SCWT	Short Circuit Withstand Time: $V_{DS}$ = 960V, $V_{GS}$ = 20V, $T_{C}$ =25°C	8	μs
P <sub>D</sub>	Total Power Dissipation @ $T_c = 25^{\circ}C$	165	W
	Linear Derating Factor	1.1	W/C

## **Thermal and Mechanical Characteristics**

Symbol	Characteristic	Min	Тур	Тур	Unit
R <sub>ejc</sub>	Junction to Case Thermal Resistance			0.91	°C/W
T_,T <sub>STG</sub>	Operating and Storage Junction Temperature Range	-55		175	°C
Torque	Mounting Torque (SOT-227 Package), 6-32 or M3 screw			10	in∙lbf
				1.1	N∙m

## Static Characteristics

## T<sub>J</sub> = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions		Min	Тур	Max	Unit
V <sub>BR(DSS)</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA		1200			V
$\Delta V_{BR(DSS)} / \Delta T_{J}$	Breakdown Voltage Temperature Coefficient	Reference to 25°C, I <sub>D</sub> = 1mA			0.250		V/°C
R <sub>DS(on)</sub>	Drain-Source On Resistance@	V <sub>GS</sub> = 20V, I <sub>D</sub> = 20A			80	100	mΩ
V <sub>GS(th)</sub>	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = 1mA$		1.7	3.0		V
$\Delta V_{GS(th)} / \Delta T_J$	Threshold Voltage Temperature Coefficient				-6		mV/°C
	Zoro Gato Voltago Drain Current	V <sub>DS</sub> = 1200V	T <sub>J</sub> = 25°C		1	100	
DSS	Zero Gale Voltage Drain Current	$V_{GS} = 0V$	T <sub>J</sub> = 125°C			500	μΑ
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = +20V / -10V				±100	nA
ESR	Equivalent Series Resistance	f = 1MHz, 25mV, Drain Short			1.3		Ω

**Dynamic Characteristics** 

## T<sub>J</sub> = 25°C unless otherwise specified

APT40SM120J

Symbol	Parameter	Test Conditions	Min	Тур	Мах	Unit
C <sub>iss</sub>	Input Capacitance			2560		
C <sub>rss</sub>	Reverse Transfer Capacitance	$v_{GS} = 00, v_{DD} = 10000$		20		pF
C <sub>oss</sub>	Output Capacitance			120		
Q <sub>g</sub>	Total Gate Charge	V <sub>cs</sub> = 0/20V		130		
$Q_{gs}$	Gate-Source Charge	V <sub>DD</sub> = 800V		30		nC
$Q_{gd}$	Gate-Drain Charge	$I_{D} = 20A$		60		
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>22</sub> = 800V		10		
t,	Current Rise Time	V <sub>GS</sub> = 20V		10		ns
t <sub>d(off)</sub>	Turn-Off Delay Time	I <sub>D</sub> = 20A		40		
t <sub>r</sub>	Current Fall Time	$R_{\alpha} = 0.7 \Omega^{-3}$		25		
E <sub>on2</sub>	Turn-On Switching Energy <sup>4</sup>	L = 115 $\mu$ H T <sub>c</sub> = 25°C V <sub>DD</sub> = 800V V <sub>cc</sub> = 20V		435		1
E <sub>off</sub>	Turn-Off Switching Energy			130		μυ
t <sub>d(on)</sub>	Turn-On Delay Time			10		
t,	Current Rise Time			10		
t <sub>d(off)</sub>	Turn-Off Delay Time	l <sub>p</sub> = 20A		45		ns
t <sub>f</sub>	Current Fall Time	$R_{c} = 0.7 \Omega^{-3}$		30		
E <sub>on2</sub>	Turn-On Switching Energy <sup>4</sup>	L = 115 μH		405		1
E <sub>off</sub>	Turn-Off Switching Energy	T <sub>c</sub> = 150°C		140		μυ

## Source-Drain Diode Characteristics T<sub>J</sub> = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Тур	Мах	Unit
V <sub>SD</sub>	Diode Forward Voltage	I <sub>SD</sub> = 20A, T <sub>J</sub> = 25°C, V <sub>GS</sub> = 0V		3.9		V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = 20A, V <sub>DD</sub> = 800V dI/dt = 100A/µs, T <sub>J</sub> = 25°C		140		ns
Q <sub>rr</sub>	Reverse Recovery Charge			115		nC
I <sub>rrm</sub>	Reverse Recovery Current			2.0		А

① Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

(2) Pulse test: Pulse Width <  $380\mu$ s, duty cycle < 2%.

 $\bigcirc$  R<sub>G</sub> is total gate resistance including internal gate driver impedance (MIC4452).

(4) Free wheeling diode APT10SCD120B

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

#### **TYPICAL PERFORMANCE CURVES**













#### SOT-227 (ISOTOP®) Package Outline



#### **Disclaimer:**

The information contained in the document (unless it is publicly available on the Web without access restrictions) is PROPRIETARY AND CONFIDENTIAL information of Microsemi and cannot be copied, published, uploaded, posted, transmitted, distributed or disclosed or used without the express duly signed written consent of Microsemi. If the recipient of this document has entered into a disclosure agreement with Microsemi, then the terms of such Agreement will also apply. This document and the information contained herein may not be modified, by any person other than authorized personnel of Microsemi. No license under any patent, copyright, trade secret or other intellectual property right is granted to or conferred upon you by disclosure or delivery of the information, either expressly, by implication, inducement, estoppels or otherwise. Any license under such intellectual property rights must be approved by Microsemi in writing signed by an officer of Microsemi.

Microsemi reserves the right to change the configuration, functionality and performance of its products at anytime without any notice. This product has been subject to limited testing and should not be used in conjunction with life-support or other mission-critical equipment or applications. Microsemi assumes no liability whatsoever, and Microsemi disclaims any express or implied warranty, relating to sale and/or use of Microsemi products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. Any performance specifications believed to be reliable but are not verified and customer or user must conduct and complete all performance and other testing of this product as well as any user or customers final application. User or customer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the customer's and user's responsibility to independently determine suitability of any Microsemi product and to test and verify the same. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the User. Microsemi specifically disclaims any liability of any kind including for consequential, incidental and punitive damages as well as lost profit. The product is subject to other terms and conditions which can be located on the web at http://www.microsemi.com/terms-a-conditions.