

## 40V N-Channel MOSFET

### Applications:

- Power Supply
- DC-DC Converters

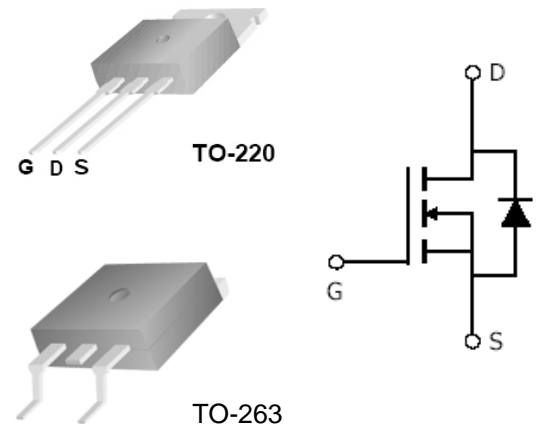
### Features:

- LeadFree
- Low  $R_{DS(ON)}$  to Minimize Conductive Loss
- Low Gate Charge for Fast Switching Application
- Optimized  $B_{V_{DSS}}$  Capability

$V_{DSS}$	$R_{DS(ON)}$ (Max)	$I_D^a$
40 V	4.0 m $\Omega$	173 A

### Ordering Information

Part Number	Package	Brand
MXP4004BT	TO220	MXP
MXP4004BE	TO263	MXP



### Absolute Maximum Ratings

$T_c=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Value	Units
$V_{DS}$	Drain-to-Source Voltage	40	V
$I_D^a$	Continuous Drain Current ( $T_c=25^\circ\text{C}$ )	173	A
$I_{DM}$	Pulsed Drain Current @ $V_G=10\text{V}$	693	
$E_{AS}$	Single Pulse Avalanche Energy ( $L=1\text{mH}$ )	724	mJ
$I_{AS}$	Pulsed Avalanche Energy	Figure.9	A
$T_J$ and $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 175	$^\circ\text{C}$

a. Calculated continuous current based upon maximum allowable junction temperature,  $+175^\circ\text{C}$ . Package limitation current is 80A.

### OFF Characteristics

$T_J=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	40			V	$V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$
$I_{DSS}$	Drain-to-Source Leakage Current			1	$\mu\text{A}$	$V_{DS}=32\text{V}$ , $V_{GS}=0\text{V}$
				100		$V_{DS}=32\text{V}$ , $V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage			100	nA	$V_{GS}=+20\text{V}$
	Gate-to-Source Reverse Leakage			100		$V_{GS}=-20\text{V}$

## ON Characteristics

$T_J=25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance		2.5	4	m $\Omega$	$V_{GS}=10\text{V}$ , $I_D=24\text{A}$
$V_{GS(TH)}$	Gate Threshold Voltage	2		4	V	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$

## Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
$C_{iss}$	Input Capacitance		5016		pF	$V_{GS}=0\text{V}$ , $V_{DS}=20\text{V}$ , $f=1.0\text{MHz}$
$C_{oss}$	Output Capacitance		787			
$C_{rss}$	Reverse Transfer Capacitance		292			
$Q_g$	Total Gate Charge		70		nC	$V_{DD}=20\text{V}$ , $I_D=86\text{A}$ , $V_G=10\text{V}$
$Q_{gs}$	Gate-to-Source Charge		24			
$Q_{gd}$	Gate-to-Drain ("Miller") Charge		24			
$t_{d(on)}$	Turn-on Delay Time		19		ns	$V_{DD}=20\text{V}$ , $I_D=86\text{A}$ , $V_G=10\text{V}$ , $R_G=4.7\Omega$
$t_r$	Rise Time		67			
$t_{d(off)}$	Turn-off Delay Time		49			
$t_f$	Fall Time		31			

## Source-Drain Diode Characteristics

$T_C=25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Min	Typ	Max	Units	Test Conditions
$V_{SD}$	Diode Forward Voltage			1.2	V	$I_S=24\text{A}$ , $V_{GS}=0\text{V}$
$T_{rr}$	Reverse Recovery Time		51	77	ns	$I_S=38\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
$Q_{rr}$	Reverse Recovery Charge		35	53	nC	

---

Published by

MaxPower Semiconductor Inc.

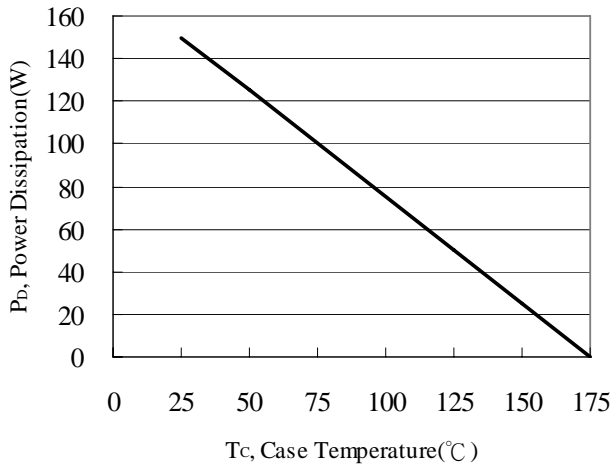
4800 Great America Parkway, Suite# 205, Santa Clara, CA 95054

©MaxPower Semiconductor Inc.

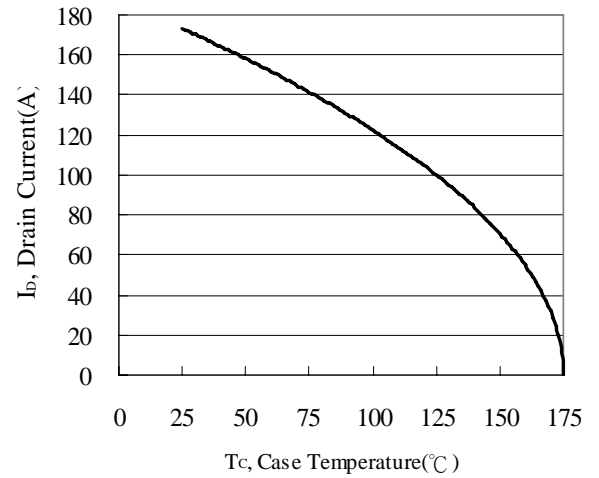
All Rights Reserved.

MXP4004BT Rev 1.0, Sep 2011

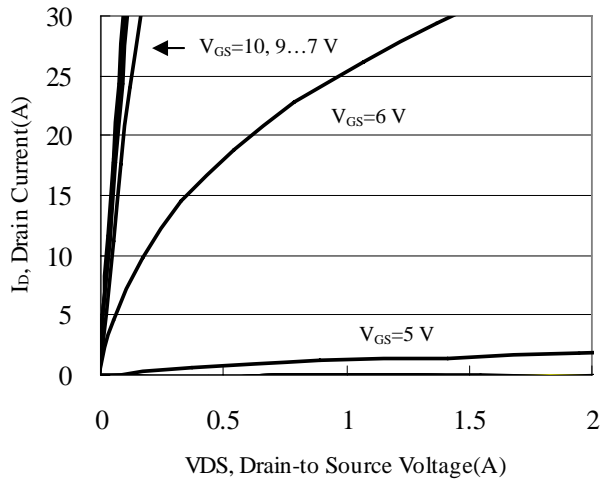
**Figure 1. Maximum Power Dissipation V.S Case Temperature**



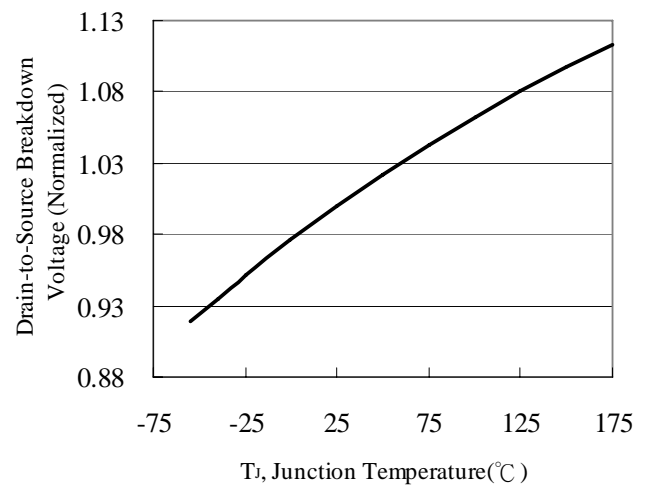
**Figure 2. Maximum Continuous Drain Current V.S Case Temperature**



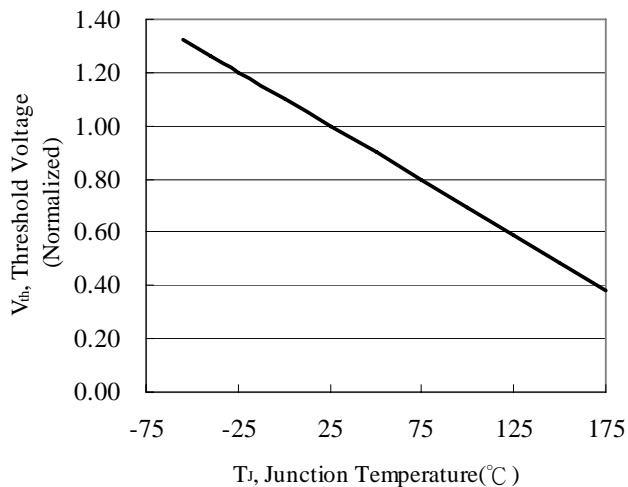
**Figure 3. Typical Output Characteristics**



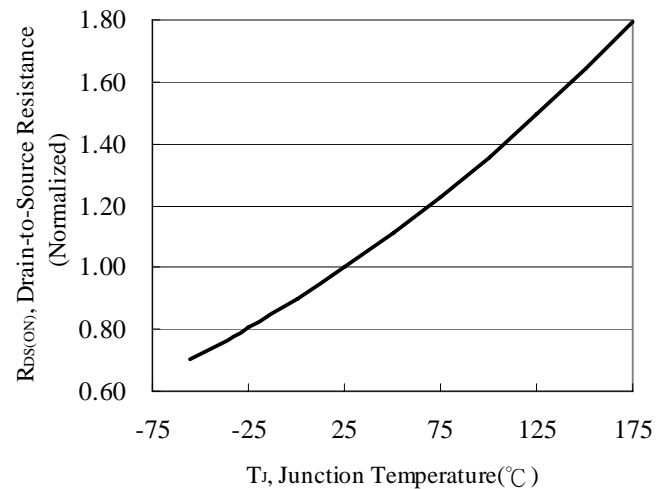
**Figure 4. Breakdown Voltage V.S Junction Temperature**



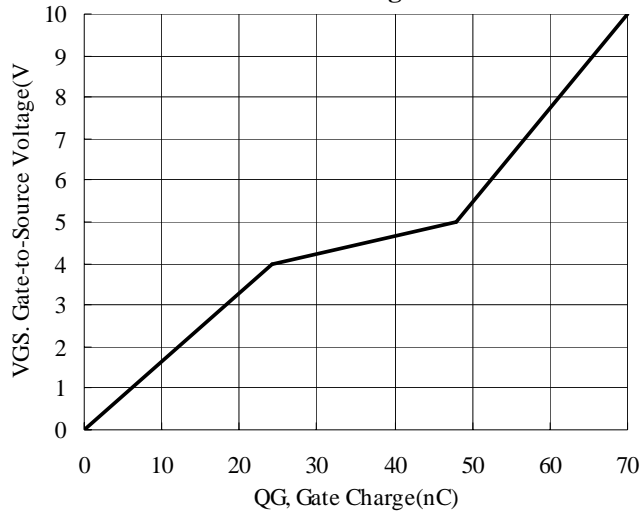
**Figure 5. Threshold Voltage V.S Junction Temperature**



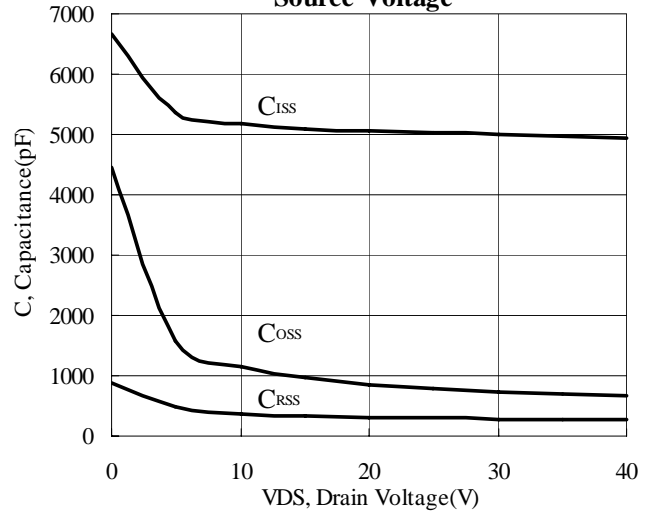
**Figure 6. Drain-to-Source Resistance V.S Junction Temperature**



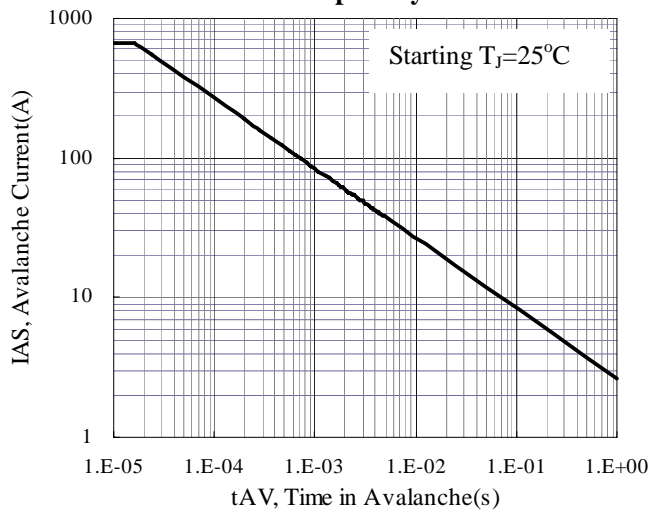
**Figure 7. Typical Gate Charge vs. Gate-to-Source Voltage**



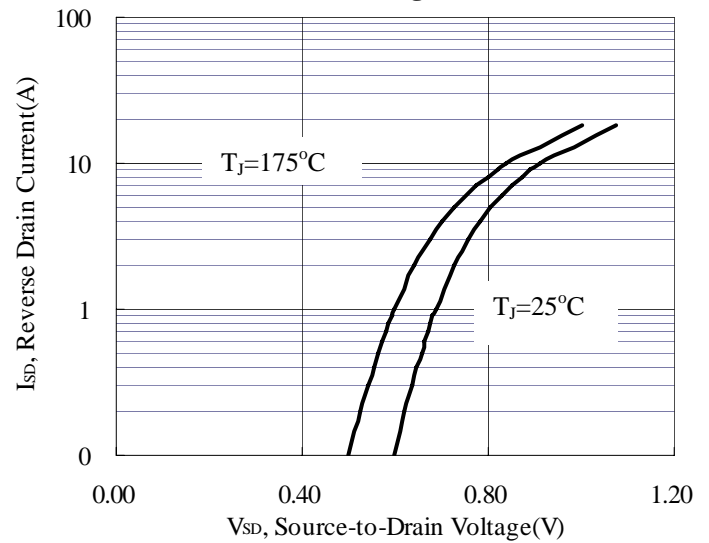
**Figure 8. Typical Capacitance vs. Drain-to-Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Source-Drain Diode Forward Voltage**



## **Disclaims:**

MaxPower Semiconductor Inc. (MXP) reserves the right to make changes without notice in order to improve reliability, function or design and to discontinue any product or service without notice. Customers should obtain the latest relevant information before orders and should verify that such information is current and complete. All products are sold subject to MXP's terms and conditions supplied at the time of order acknowledgement.

MaxPower Semiconductor Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf, disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

MaxPower Semiconductor Inc. disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify MXP's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

MaxPower Semiconductor Inc. warrants performance of its hardware products to the specifications at the time of sale, testing, reliability and quality control are used to the extent MXP deems necessary to support this warrantee. Except where agreed upon by contractual agreement, testing of all parameters of each product is not necessarily performed.

MaxPower Semiconductor Inc. does not assume any liability arising from the use of any product or circuit designs described herein. Customers are responsible for their products and applications using MXP's components. To minimize risk, customers must provide adequate design and operating safeguards.

MaxPower Semiconductor Inc. does not warrant or convey any license to any intellectual property rights either expressed or implied under its patent rights, nor the rights of others. Reproduction of information in MXP's data sheets or data books is permissible only if reproduction is without modification or alteration. Reproduction of this information with any alteration is an unfair and deceptive business practice.

MaxPower Semiconductor Inc. is not responsible or liable for such altered documentation. Resale of MXP's products with statements different from or beyond the parameters stated by MaxPower Semiconductor Inc. for that product or service voids all express or implied warranties for the associated MXP product or service and is an unfair and deceptive business practice. MaxPower Semiconductor Inc. is not responsible or liable for any such statements.