

650V 4A N-Channel Super Junction Power MOSFET

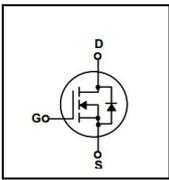
FEATURES

- $R_{DS(ON)} \leq 1 \Omega$ @ $V_{GS}=10V, I_D=2A$
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Fast switching capability
- Lead free product is acquired

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

SYMBOL


TO-251

TO-252

TO-220F

ASSEMBLY MESSAGE

Product Name	Package	Packaging
BXC65R1K0U	TO-251	Tube
BXC65R1K0D	TO-252	Tube/Reel
BXC65R1K0F	TO-220F	Tube

ABSOLUTE MAXIMUM RATINGS ($T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Rating		Unit
		BXC65R1K0U/D	BXC65R1K0F	
Drain-Source Voltage	V_{DSS}	650		V
Drain Current	Continuous ($T_C = 25^\circ\text{C}$)	4		A
	Continuous ($T_C = 100^\circ\text{C}$)	2.7		A
Drain Current	Pulsed (Note1)	16		A
Gate-Source Voltage	V_{GSS}	± 30		V
Avalanche Energy	Single Pulse (Note2)	50		mJ
	Repetitive (Note1)	0.1		mJ
Avalanche Current (Note1)	I_{AR}	0.9		A
Peak Diode Recovery dv/dt	dv/dt	5		V/ns
Power Dissipation (Note 2)	$T_C = 25^\circ\text{C}$	45	29	W
	Derate above 25°C	0.36	0.23	W/ $^\circ\text{C}$
Maximum Junction Temperature	T_J	150		$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to 150		$^\circ\text{C}$

Note: 1. Limited by maximum junction temperature, maximum duty cycle is 0.75
 2. $L=5\text{mH}$, $V_{DD}=50\text{V}$, $R_G=25 \Omega$, Starting $T_J = 25^\circ\text{C}$

THERMAL CHARACTERISTICS

Parameter	Symbol	Max.		Unit
		BXC65R1K0U/D	BXC65R1K0F	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.8	4.4	°C / W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62	73	°C / W

ELECTRICAL CHARACTERISTICS ($T_J=25^{\circ}\text{C}$, unless otherwise Noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV_{DSS}	VGS=0V, ID=250 μ A	650			V	
Zero Gate Voltage Drain Current	I_{DSS}	VDS=650V, VGS=0V			1	μ A	
		VDS=520V, TC = 125°C		10		μ A	
Gate-Body Leakage Current, Forward	I_{GSS}	VGS=30V			100	nA	
Gate-Body Leakage Current, Reverse		VGS=-30V			-100	nA	
ON CHARACTERISTICS							
Gate Threshold Voltage	$V_{GS(TH)}$	VDS=VGS, ID=250 μ A	2.5		4.0	V	
Drain-Source On-State Resistance	$R_{DS(ON)}$	VGS=10V, ID=2A		0.88	1	Ω	
DYNAMIC PARAMETERS							
Input Capacitance	C_{ISS}	VDS=100V, VGS=0V, f=1.0MHz		315		pF	
Output Capacitance	C_{OSS}				27		pF
Reverse Transfer Capacitance	C_{RSS}				1.2		pF
SWITCHING PARAMETERS							
Turn-ON Delay Time	$t_{D(ON)}$	VDD=400V, ID=2A, VGS = 10V, RG=25 Ω		9.4		ns	
Turn-ON Rise Time	t_R			22.6		ns	
Turn-OFF Delay Time	$t_{D(OFF)}$			36.4		ns	
Turn-OFF Fall-Time	t_F			25.4		ns	
Total Gate Charge(Note5)	Q_G	VDS =520V, VGS =10V, ID =2A		9.1		nC	
Gate Source Charge	Q_{GS}			2.1		nC	
Gate Drain Charge	Q_{GD}			4.0		nC	
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Drain-Source Diode Forward Voltage	V_{SD}	IF=2A, VGS=0V		0.85		V	
Diode Continuous Forward Current	I_S				4	A	
Pulsed Drain-Source Current	I_{SM}				16	A	
Reverse Recovery Time	t_{RR}	VR = 50 V, IF = 2A di/dt=100 A/ μ s		159		ns	
Reverse Recovery Charge	Q_{RR}			0.93		μ C	

TYPICAL CHARACTERISTICS

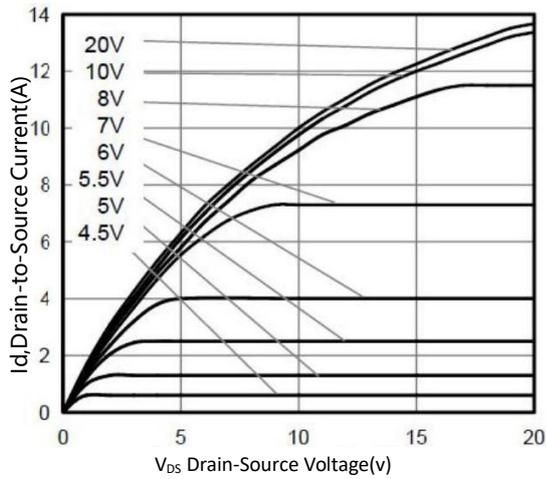


Figure1. Typical Output Characteristics

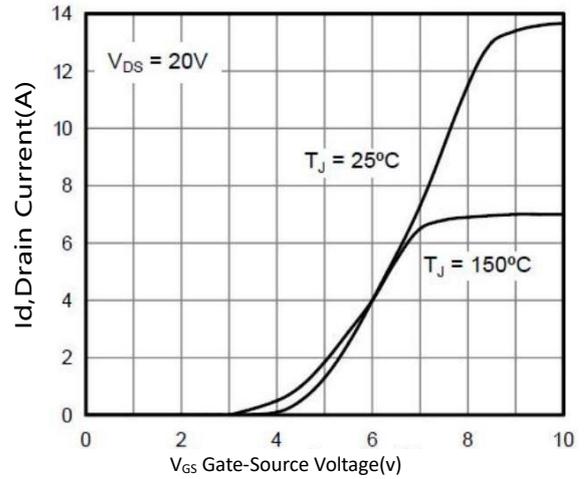


Figure2. Typical Transfer Characteristics

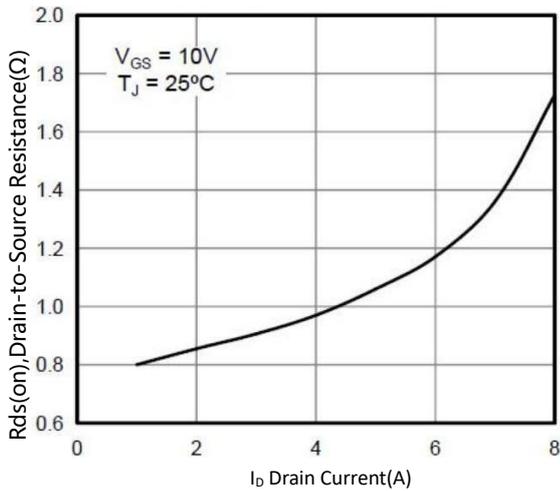


Figure3. On-Resistance versus Drain Current

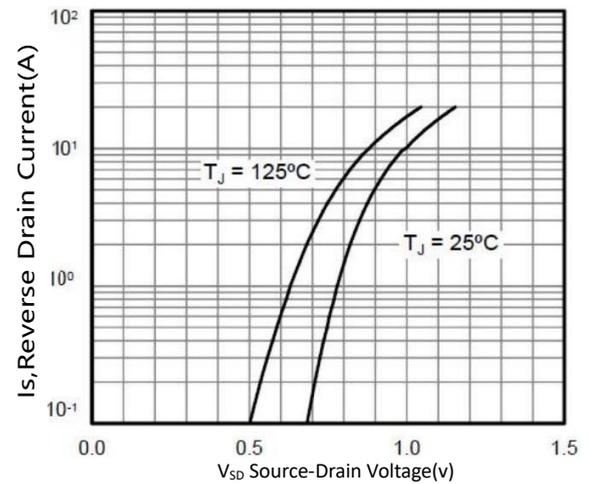


Figure4. Diode forward voltage versus Current

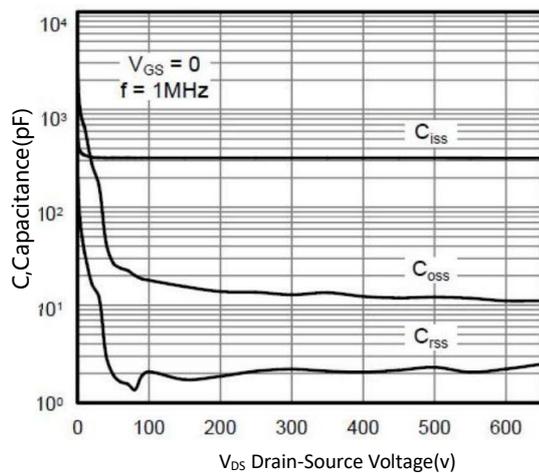


Figure5. Typical Capacitance versus VDS

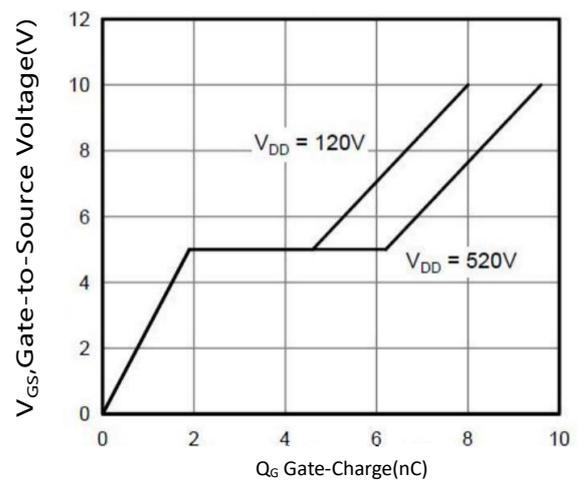


Figure6. Typical Gate Charge versus VGS

TYPICAL CHARACTERISTICS(Cont.)

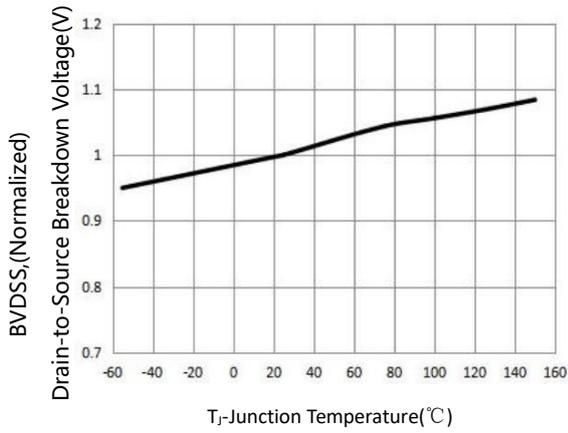


Figure7. BV_{DSS} Variation with Temperature

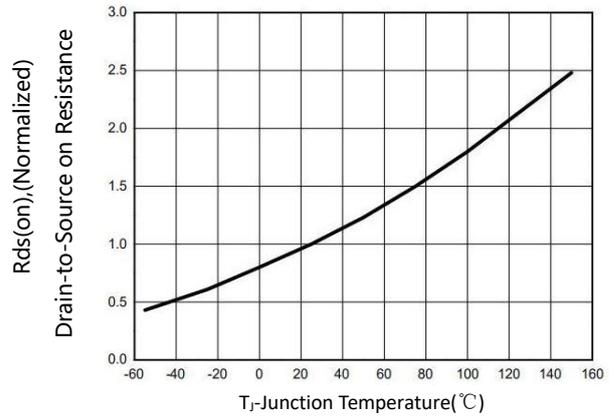
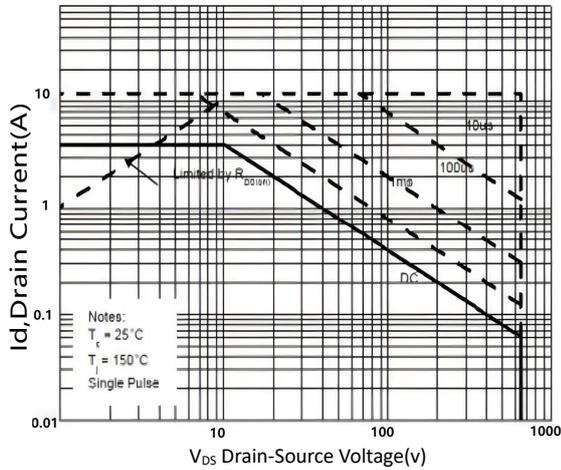
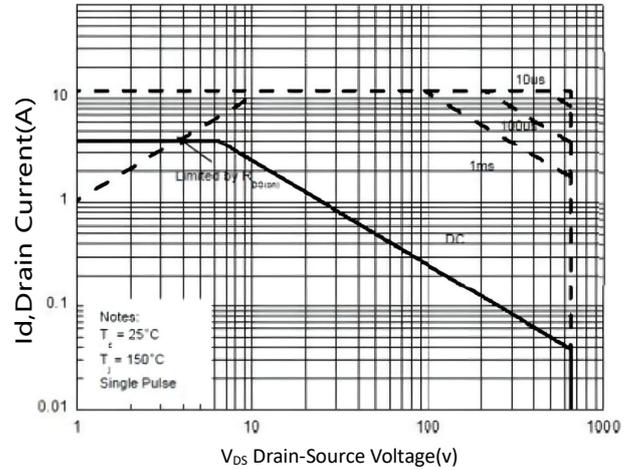


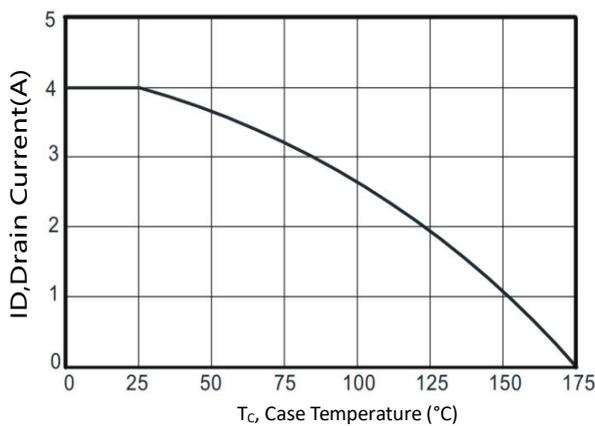
Figure8. On-Resistance Variation with Temperature



**Figure9. Maximum Safe Operating Area
BXC65R1K0U/D**

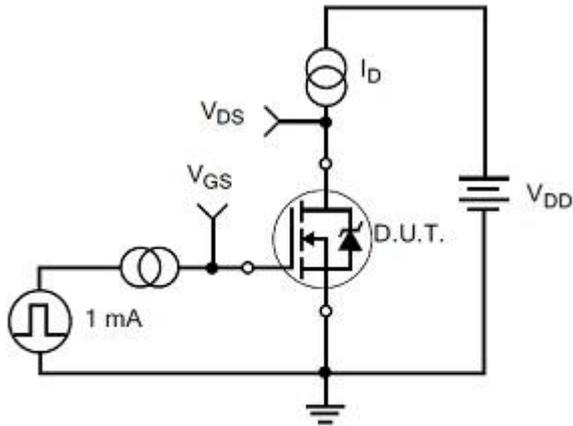


**Figure9. Maximum Safe Operating Area
BXC65R1K0F**

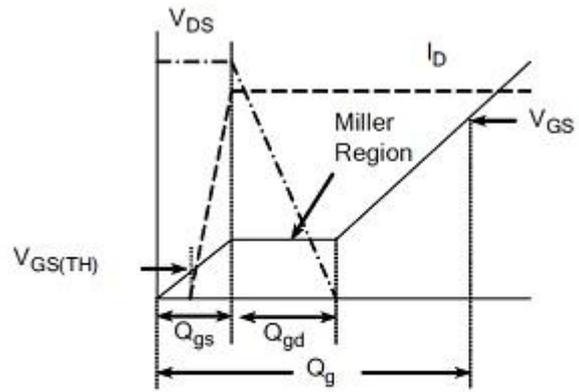


**Figure10. Maximum Continuous Drain Current
versus Case Temperature**

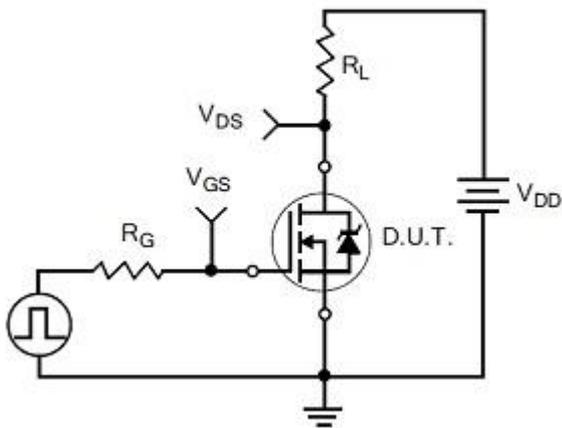
TEST CIRCUITS AND WAVEFORMS



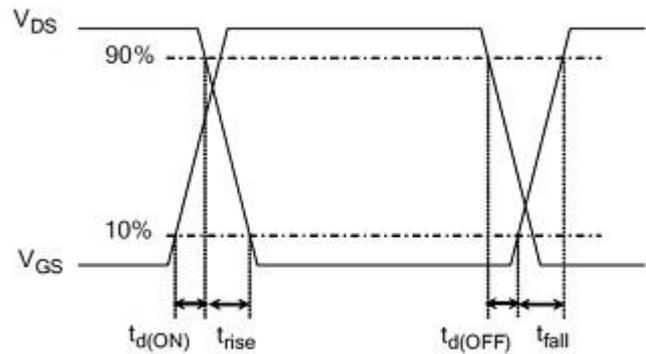
Gate Charge Test Circuit



Gate Charge Waveform

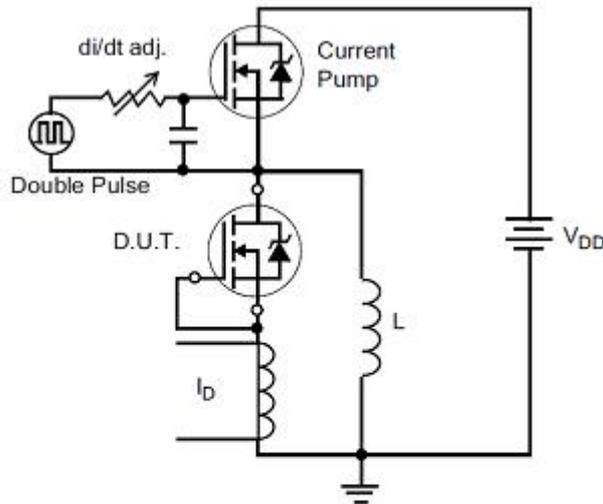


Resistive Switching Test Circuit

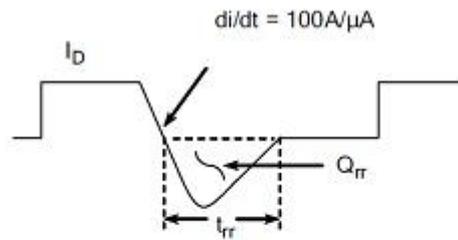


Resistive Switching Waveforms

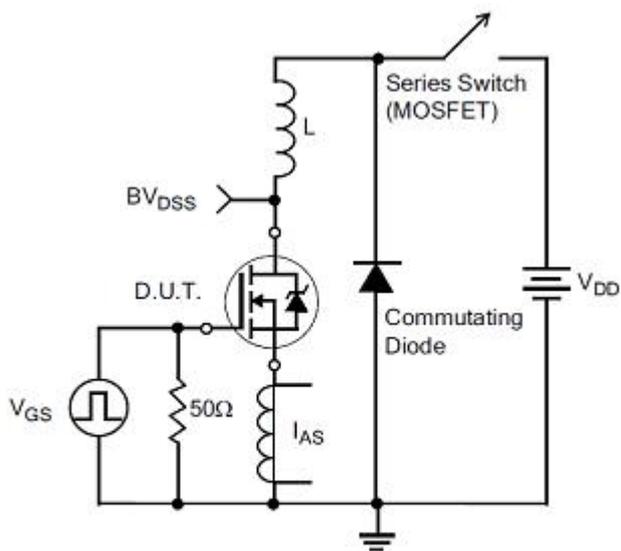
TEST CIRCUITS AND WAVEFORMS(Cont.)



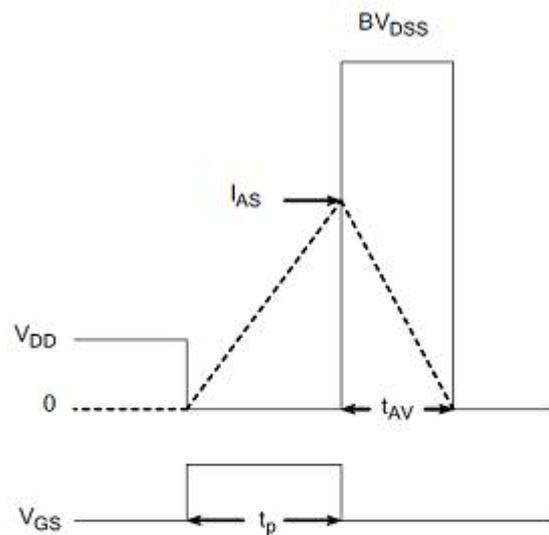
Diode Reverse Recovery Test Circuit



Diode Reverse Recovery Waveform



Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Unclamped Inductive Switching Waveforms

Revision history

Document revision history

Date	Revision	Changes
3-Sep-2021	1.0	First release
6-Dec-2021	1.1	Update parameter

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