

BSS04N014SA1

N-Channel Power MOSFET

40 V, 190 A, 1.45 mΩ

Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency. It has been optimized for low gate charge, low $R_{DS(on)}$, fast switching speed.

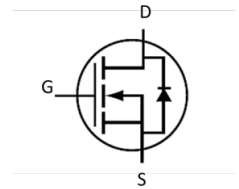
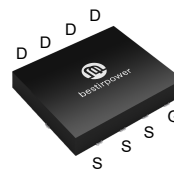
Applications

- High-frequency DC-to-DC converters
- Motor controllers
- Battery management and protection
- Server power

Features

BV_{DSS}	I_D	$R_{DS(on),max}$	$Q_{rr,typ}$
40 V	190 A	1.45 mΩ	110 nC

- Shielded-gate trench technology
- Low on-resistance and low gate-charge
- RoHS compliant
- 100% avalanche tested



Absolute Maximum Ratings $(T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Continuous Drain Current, Silicon Limited $(T_c = 25^\circ\text{C})$ ¹⁾	190	A
	Continuous Drain Current, Silicon Limited $(T_c = 100^\circ\text{C})$ ¹⁾	120	
I_{DM}	Drain Current ²⁾	Pulsed	A
E_{AS}	Single Pulsed Avalanche Energy ³⁾	128	mJ
I_{AS}	Avalanche Current ⁴⁾	30	A
P_D	Power Dissipation $(T_c = 25^\circ\text{C})$	89	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁵⁾	45	

(1) Rated according to $R_{\theta JC}$

(2) Limited by maximum T_J

(3) Starting $T_J = 25^\circ\text{C}$, $L = 0.1\text{ mH}$, $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$

(4) Pulse width limited by maximum T_J

(5) Surface-mounted on 1 inch² FR4 board, 2 oz Cu

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.2	-	2.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$	-	1.15	1.45	mΩ
		$V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$	-	1.55	2	mΩ
g_{fs}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 20\text{ A}$	-	140	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}, f = 1\text{ MHz}$	-	6120	-	pF
C_{oss}	Output Capacitance		-	2300	-	pF
C_{rss}	Reverse transfer capacitance		-	180	-	pF
$Q_{g(tot)}$	Total Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}, I_D = 50\text{ A}$	-	87	-	nC
Q_{gs}	Gate to Source Charge		-	20	-	nC
Q_{gd}	Gate to Drain Charge		-	10	-	nC
R_G	Gate Resistance	$f = 1\text{ MHz}$	-	3.6	-	Ω

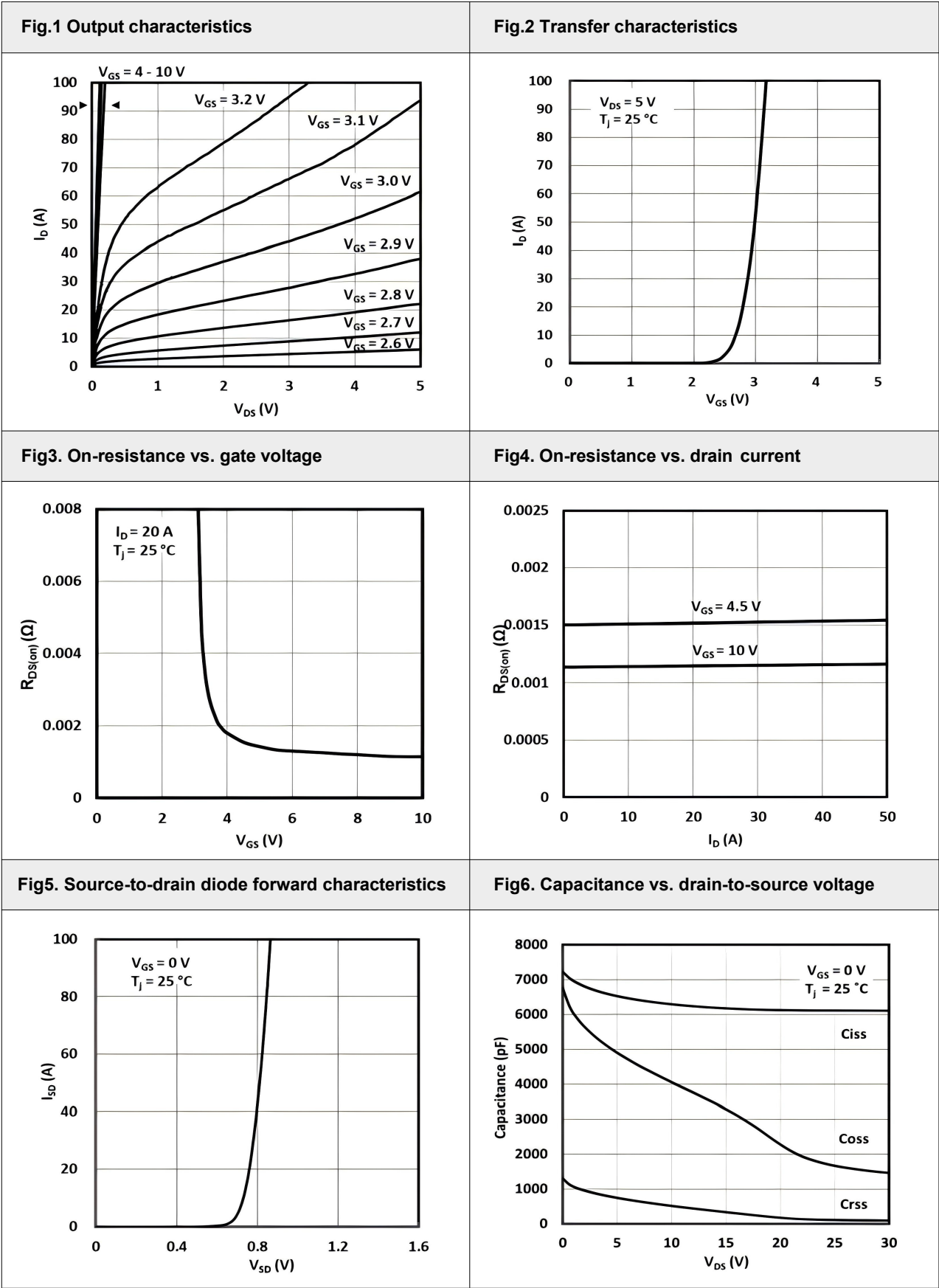
Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}, V_{DS} = 20\text{ V}, R_G = 3\Omega$	-	22	-	ns
t_r	Turn-On Rise Time		-	82	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	60	-	ns
t_f	Turn-Off Fall Time		-	18	-	ns

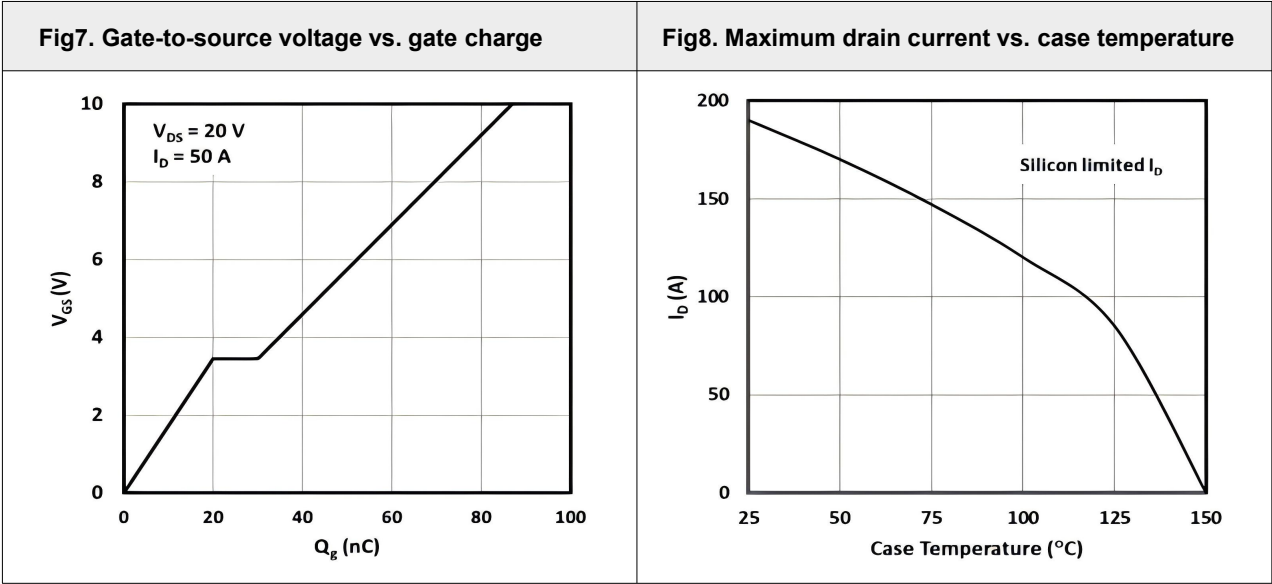
Source-Drain Diode Characteristics

V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 50\text{ A},$	-	0.8	-	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}, dI_S/dt = 100\text{ A}/\mu\text{s}$	-	80	-	ns
Q_{rr}	Reverse Recovery Charge		-	110	-	nC

Typical Performance Characteristics



Typical Performance Characteristics



Test Circuits and Waveforms

Fig9. Resistive switching time test circuit & waveforms

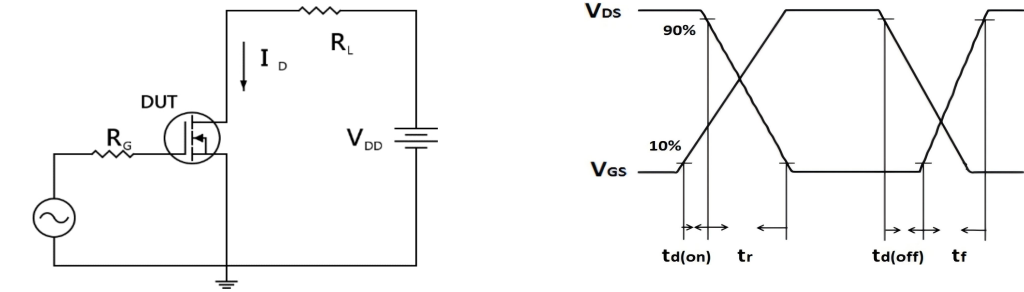


Figure 10. Gate charge test circuit & waveform

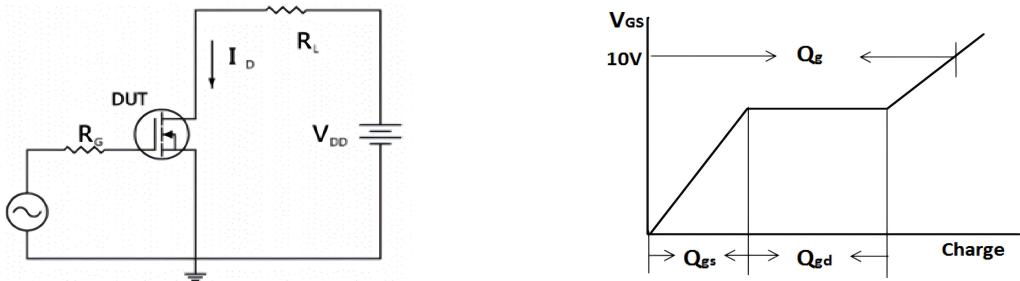


Fig11. Peak diode recovery dv/dt test circuit & waveforms

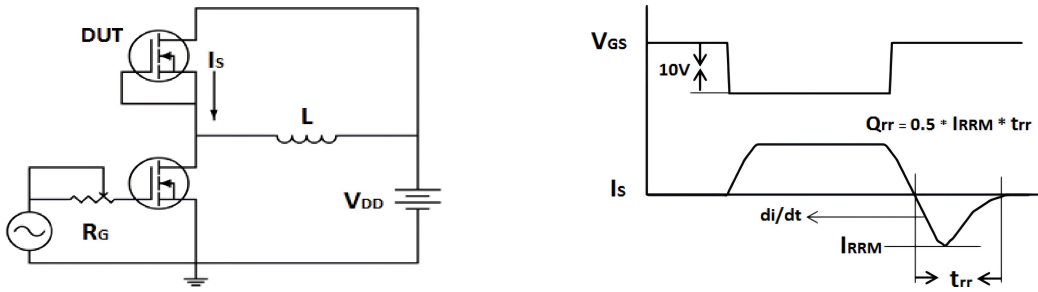
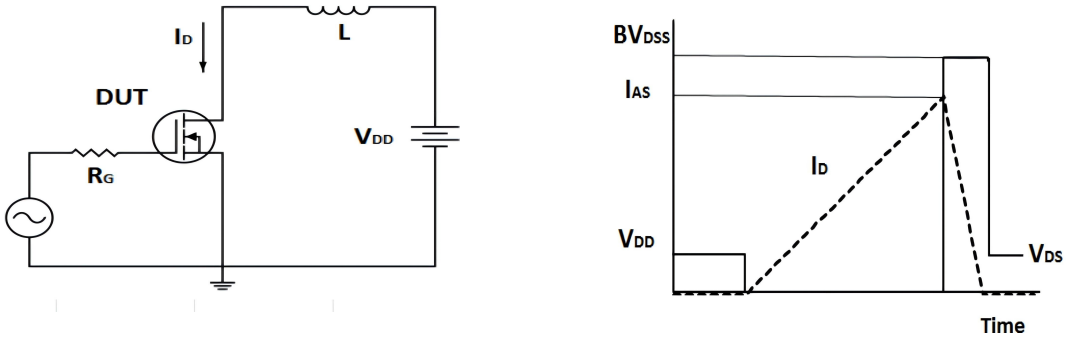
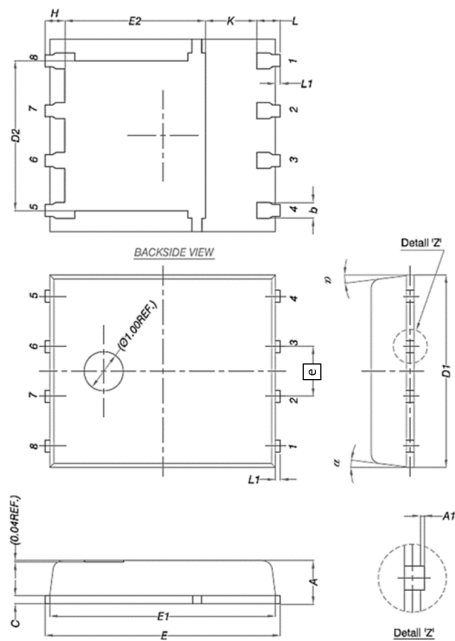


Fig12. Unclamped inductive switching test circuit & waveforms



Package Outlines

DFN 5x6



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.00	1.10	1.20
A1	0.00	-	0.05
b	0.30	0.40	0.50
c	0.15	0.25	0.35
D1	5.05	5.25	5.45
D2	3.80	4.10	4.25
E	5.95	6.15	6.35
E1	5.66	5.86	6.06
E2	3.52	3.72	3.92
e	1.27 BSC		
H	0.40	0.50	0.60
K	1.34	-	-
L	0.30	0.60	0.70
L1	0.05	0.15	0.25
α	0°	-	12°

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BSS04N014SA1	BSS04N014SA1	DFN 5×6	Tape & Reel	5000 units

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