

BSC03N1R5SA1

N-Channel Power MOSFET

30 V, 145 A, 1.5 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.

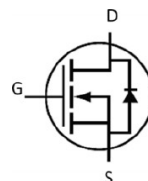
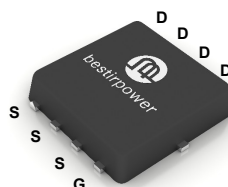
Applications

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

Features

$BV_{DSS} @ T_{J,max}$	I_D	$R_{DS(on),max}$	$Q_{g,typ}$
30 V	145 A	1.5 mΩ	33 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_{DSS}	Drain to Source Voltage		30	V
V_{GSS}	Gate to Source Voltage		± 20	V
I_D	Continuous Drain Current, Package Limited ($T_C = 25^\circ\text{C}$)		145	A
	Continuous Drain Current, Silicon Limited ($T_C = 25^\circ\text{C}$) (1)		169	
	Continuous Drain Current, Silicon Limited ($T_C = 100^\circ\text{C}$) (1)		119	
I_{DM}	Drain Current (2)	Pulsed	676	A
E_{AS}	Single Pulsed Avalanche Energy (3)		188	mJ
I_{AR}	Avalanche Current (3)		40	A
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	68	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.(4)	50	
T_L	Soldering temperature, wave soldering only allowed at leads	260	$^\circ\text{C}$

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

(2) Limited by maximum T_J .

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

(4) 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	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	-	-	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	-	2.2	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}, T_J = 25^\circ\text{C}$	-	1.2	1.5	mΩ

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	-	2660	-	pF
C_{oss}	Output Capacitance		-	860	-	pF
C_{rss}	Reverse transfer capacitance		-	70	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10 V	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	-	33	-	nC
Q_{gs}	Gate to Source Charge		-	6.6	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	3.8	-	nC

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, V_{DS} = 15\text{ V}, R_G = 3.0\text{ }\Omega$	-	8	-	ns
t_r	Turn-On Rise Time		-	10	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	36	-	ns
t_f	Turn-Off Fall Time		-	18	-	ns

Source-Drain Diode Characteristics

V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_s = 50\text{ A}, T_J = 25^\circ\text{C}$	-	0.8	-	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_s = 30\text{ A}, dI_s/dt = 100\text{ A}/\mu\text{s}$	-	28	-	ns
Q_{rr}	Reverse Recovery Charge		-	34	-	μC

Typical Performance Characteristics

Fig 1. Output characteristics

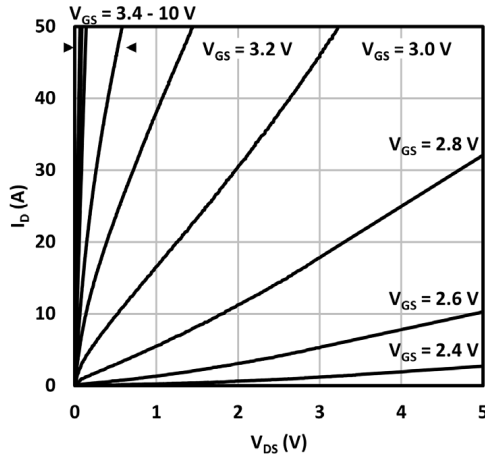


Fig 2. Transfer characteristics

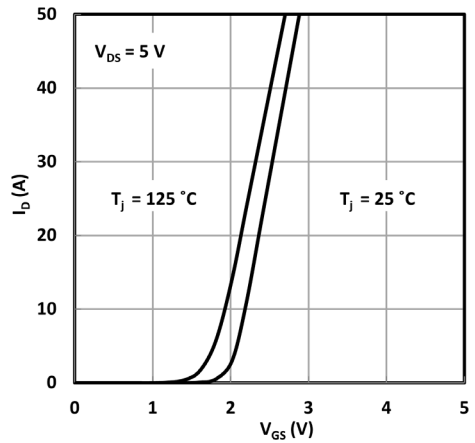


Fig 3. On-resistance vs. gate voltage

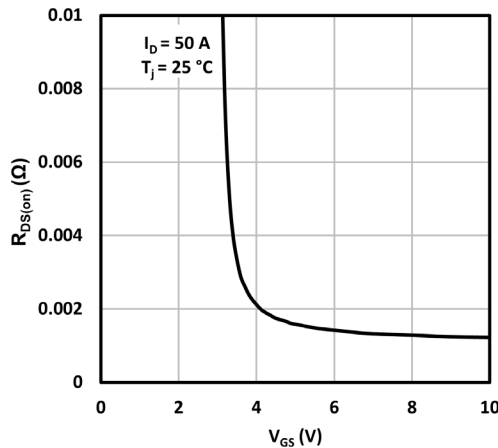


Fig 4. On-resistance vs. drain current

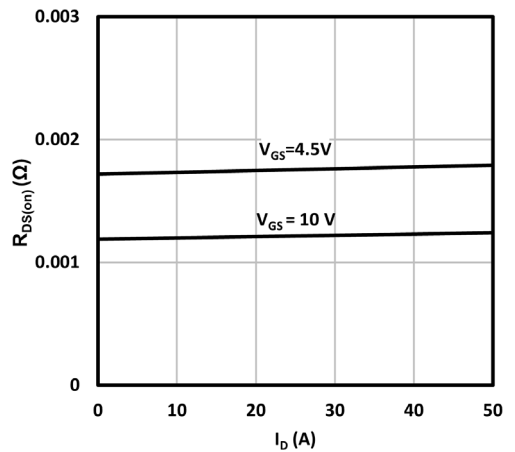


Fig 5. Source-to-drain diode forward characteristics

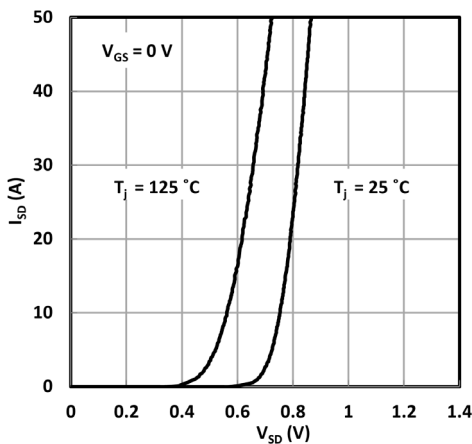
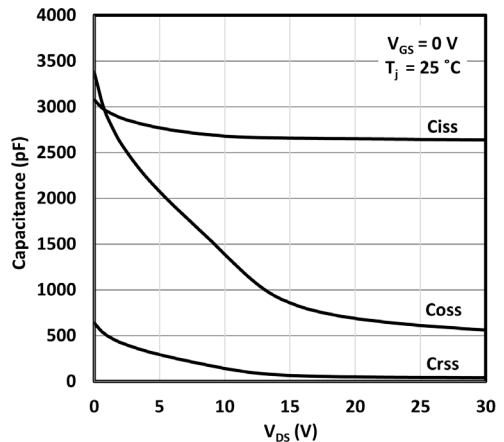


Fig 6. Capacitance vs. drain-to-source voltage



Typical Performance Characteristics

Fig 7. Gate-to-source voltage vs. gate charge

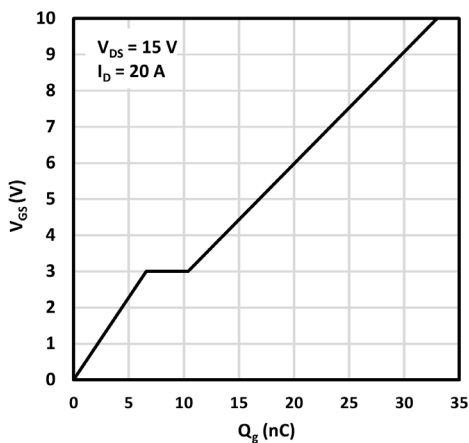


Fig 8. Maximum drain current vs. case temperature

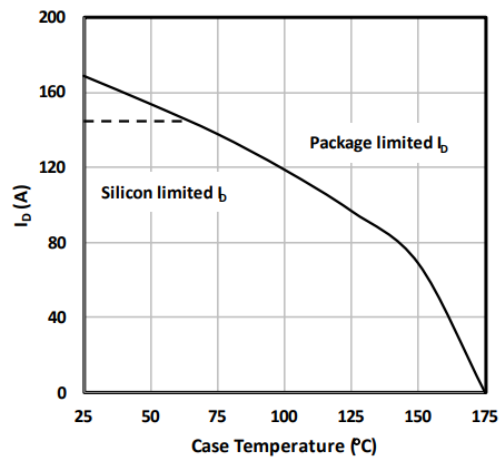


Fig 9. Safe operating area

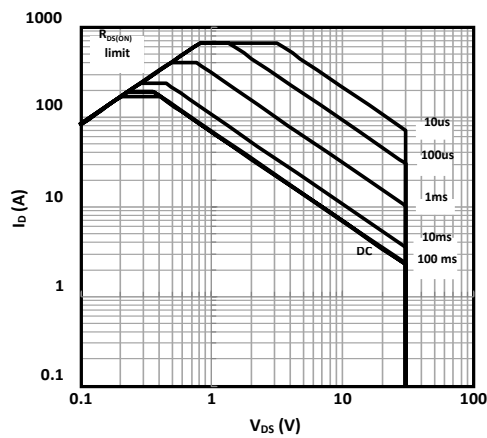
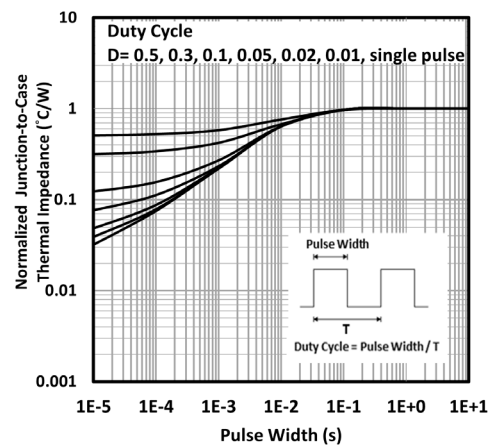


Fig 10. Junction-to-case thermal impedance



Test Circuits

Fig 11. Resistive switching time test circuit & waveforms

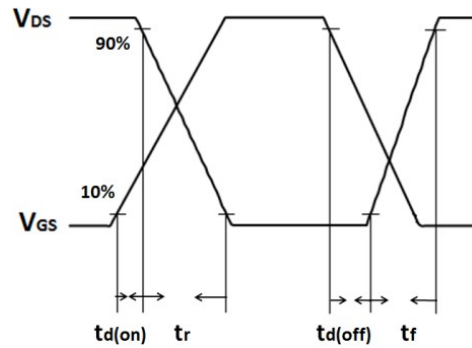
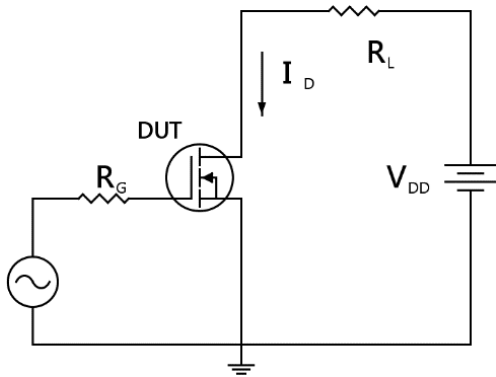


Fig16. Gate charge test circuit & waveform

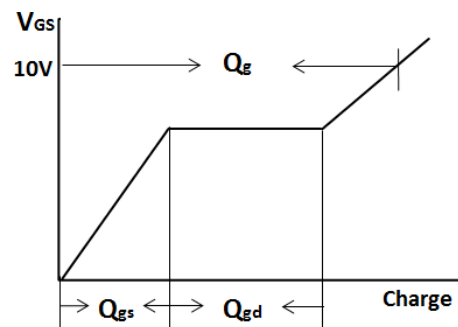
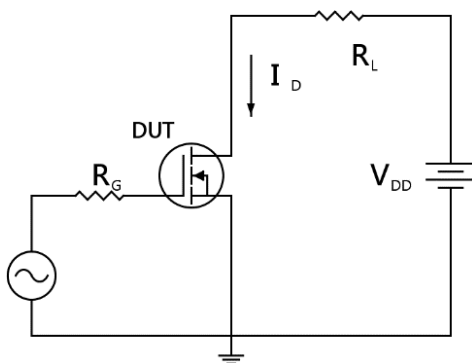
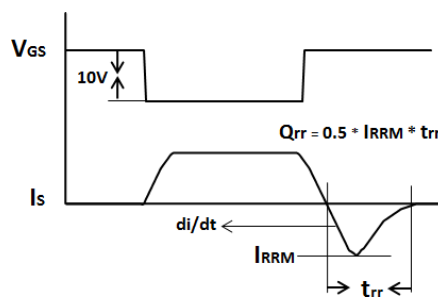
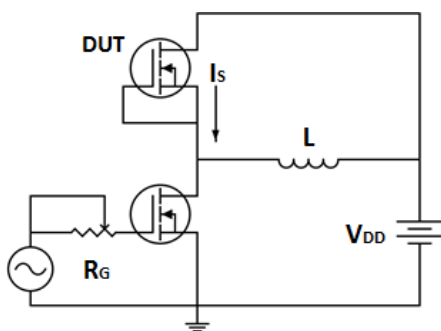
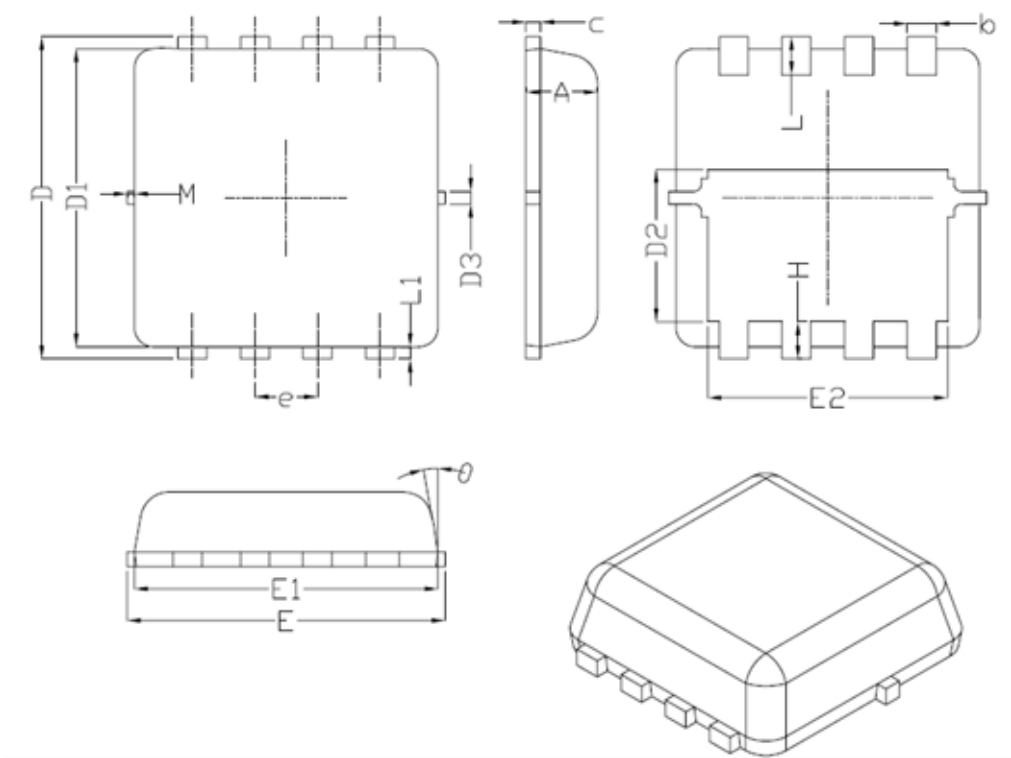


Fig17. Peak diode recovery dv/dt test circuit & waveforms



Package Outlines

DFN 3.3*3.3



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.80	0.90
b	0.25	0.32	0.39
c	0.10	0.15	0.25
D	3.00	3.30	3.60
D1	3.00	3.10	3.50
D2	1.48	2.00	2.20
D3	--	0.20	--
E	3.00	3.30	3.60
E1	3.00	3.10	3.25
E2	2.29	2.49	2.69
e	0.65 BSC		
H	0.15	0.25	0.50
L	0.15	0.40	0.60
L1	0.05	0.15	0.25
α	8°	10°	12°
M	--	0.10	--

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BSC03N1R5SA1	BSC03N1R5SA1	DFN 3.3*3.3	Tape & Reel	5000units

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