

BST15NH039SK1

N-Channel Power MOSFET

150 V, 250 A, 3.9 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.

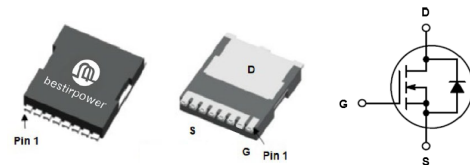
Features

BV_{DSS}	I_D	$R_{DS(on),max}$	$Q_{rr,typ}$
150 V	250 A	3.9 mΩ	279 nC

- $R_{DS(on),MAX}=3.9m\Omega@V_{gs}=10V$
- Low gate Charge (typical 100nC)
- Low C_{rss} (typical 14.9pF)
- Low On-Resistance
- Excellent FoM(figure of merit)
- 100% UIS and Rg tested

Applications

- Motor Driver
- DC/DC Converter
- Battery Management System



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

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		150	V
V_{GSS}	Gate to Source Voltage		± 20	V
I_D	Continuous Drain Current, ($T_C = 25^\circ\text{C}$) ¹⁾		250	A
	Continuous Drain Current, ($T_C = 100^\circ\text{C}$) ¹⁾		175	
I_{DM}	Drain Current (2)	Pulsed	1000	A
E_{AS}	Single Pulsed Avalanche Energy (3)		1094	mJ
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	481	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		0.26	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		25	

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	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	150	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 150\text{V}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	-	-	1	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 70\text{ A}$	-	3.3	3.9	mΩ

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 75\text{V},$ $f = 1.0\text{MHz}$	-	6547	-	pF
C_{oss}	Output Capacitance		-	779	-	pF
C_{rss}	Reverse transfer capacitance		-	14.9	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10 V	$V_{GS} = 10\text{V}, V_{DD} = 75\text{V}$ $I_D = 70\text{A}$	-	100	-	nC
Q_{gs}	Gate to Source Charge		-	40	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	24	-	nC
R_G	Gate Resistance	$f = 1\text{ MHz}$	-	2.5	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DD} = 75\text{V}$ $R_G = 3\Omega, I_D = 70\text{A}$	-	32	-	ns
t_r	Turn-On Rise Time		-	60	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	87	-	ns
t_f	Turn-Off Fall Time		-	48	-	ns

Source-Drain Diode Characteristics

I_S	Continuous Diode Forward Current		-	250	-	A
$I_{S\text{ pulse}}$	Diode Pulsed Current ²⁾		-	1000	-	
V_{SD}	Diode Forward Voltage	$T_J = 25^\circ\text{C}, I_S = 70\text{A}, V_{GS} = 0\text{V}$	-	0.79	1.4	V
t_{rr}	Reverse Recovery Time	$I_F = 70\text{A}, diF/dt = 100\text{A/us}$	-	122	-	ns
Q_{rr}	Reverse Recovery Charge		-	279	-	nC

Notes

- 1) Limited by maximum junction temperature.
- 2) Repetitive Rating: Pulse width limited by maximum junction temperature.
- 3) $L = 0.5\text{mH}, R_G = 25\Omega, V_{GS} = 10\text{V}, V_{DD} = 75\text{V}, \text{Start } T_J = 25^\circ\text{C}$.

Typical Performance Characteristics

Figure 1. Transient Thermal Impedance

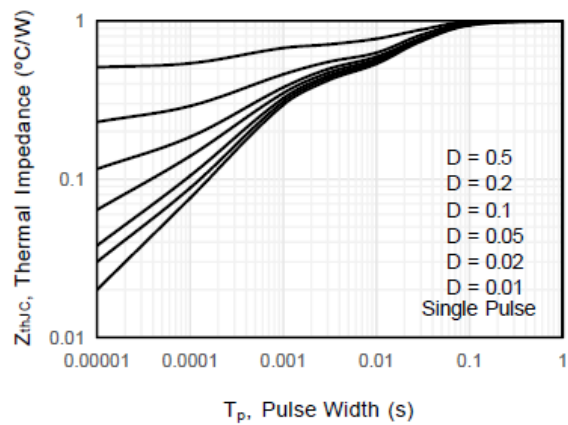


Figure 2 . Safe Operation Area

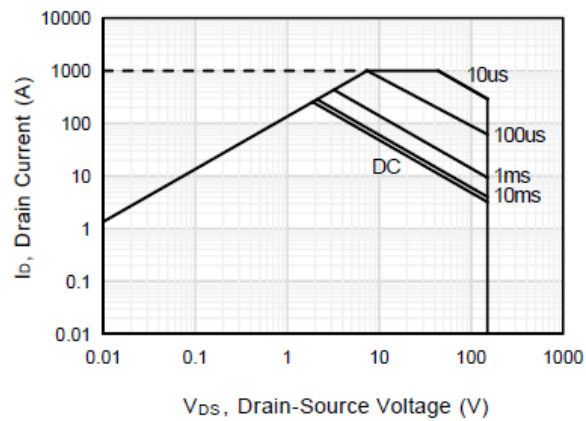


Figure 3 . Output Characteristics

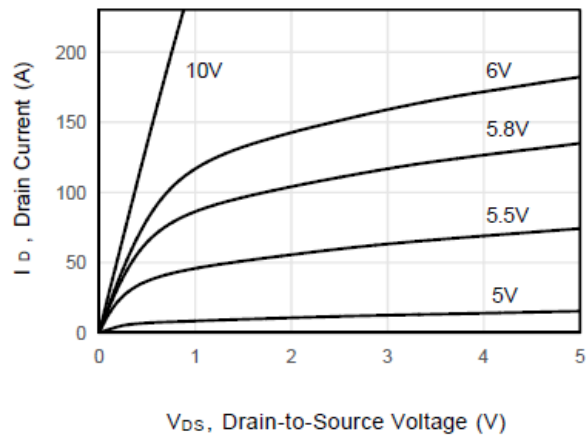


Figure 4 . Transfer Characteristics

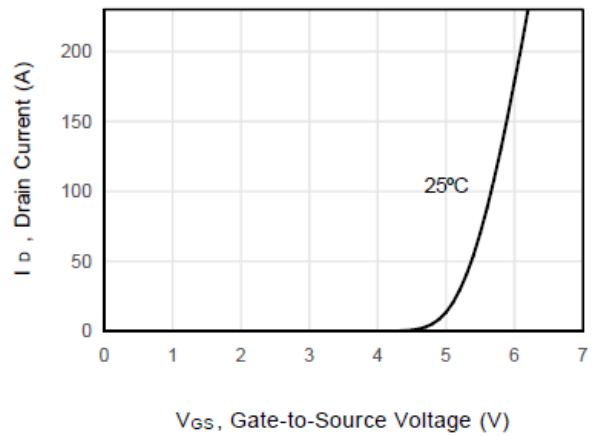


Figure 5 . On-Resistance vs Drain Current

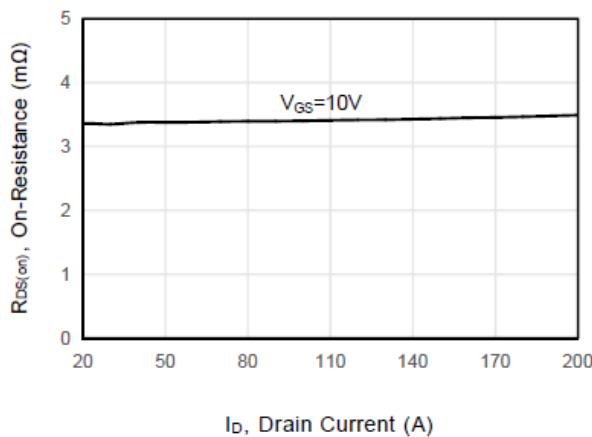
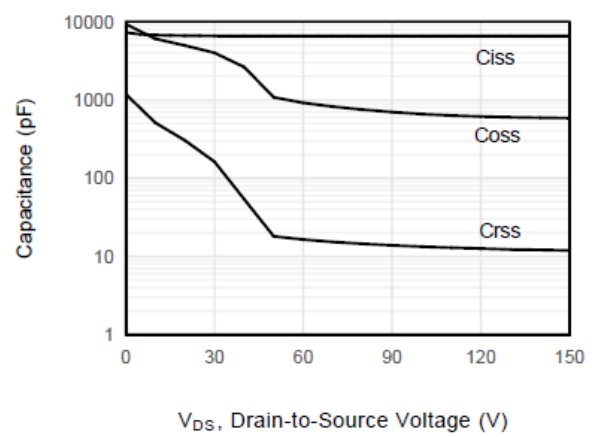


Figure 6 . Capacitance



Typical Performance Characteristics

Figure 7 . Gate Charge

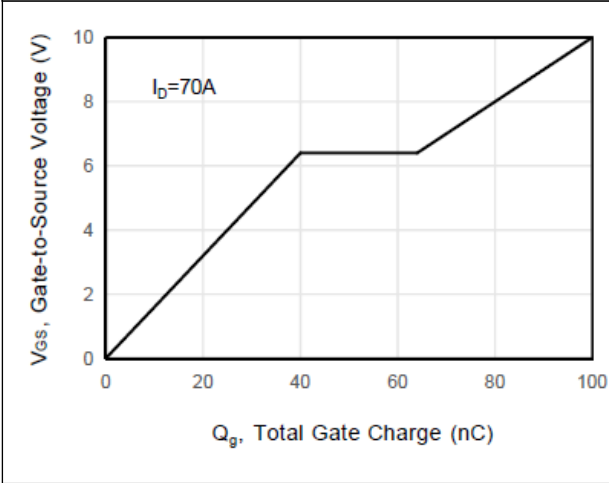


Figure 8 . Body Diode Forward Voltage

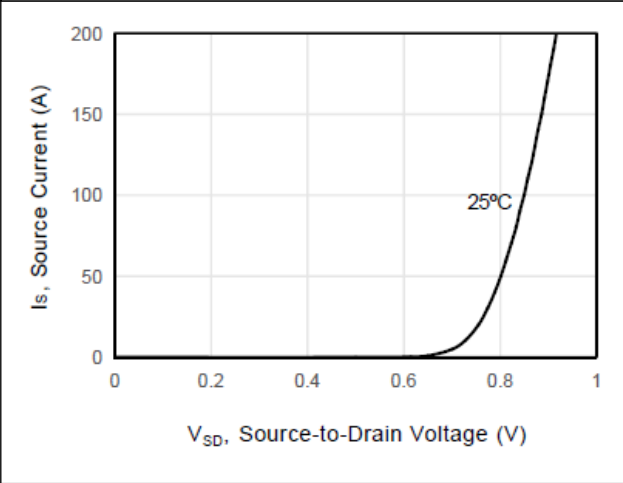


Figure 9. Breakdown Voltage vs Junction Temperature

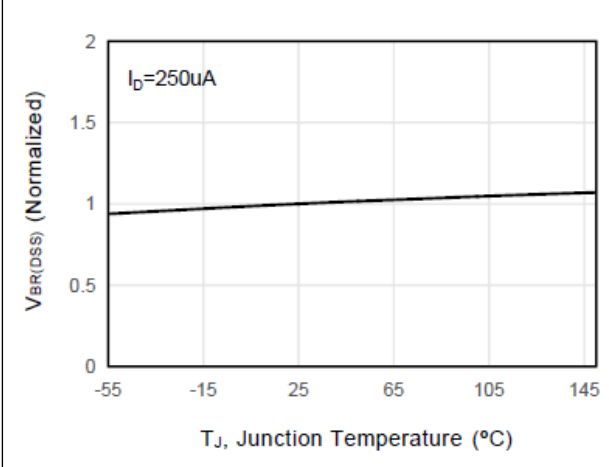


Figure 10. On-Resistance vs Temperature

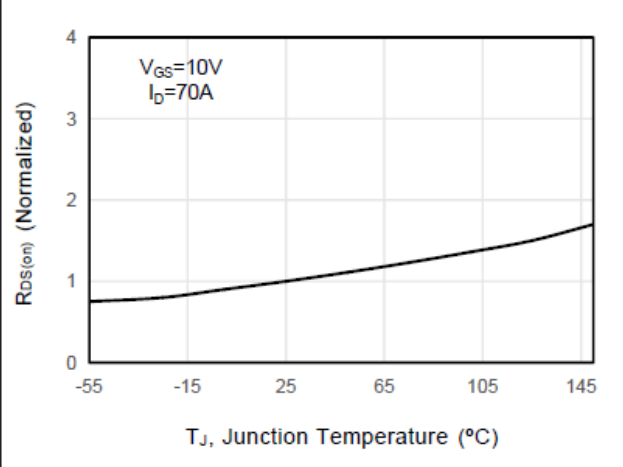
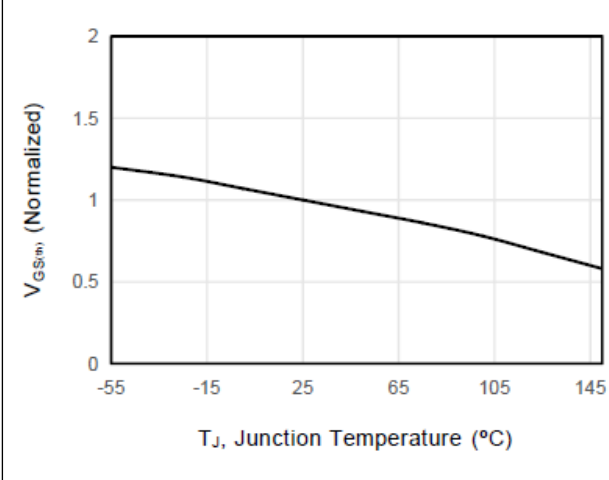


Figure 11. $V_{GS(th)}$ vs Junction Temperature



Test Circuits

Figure 12: Gate Charge Test Circuit and Waveform

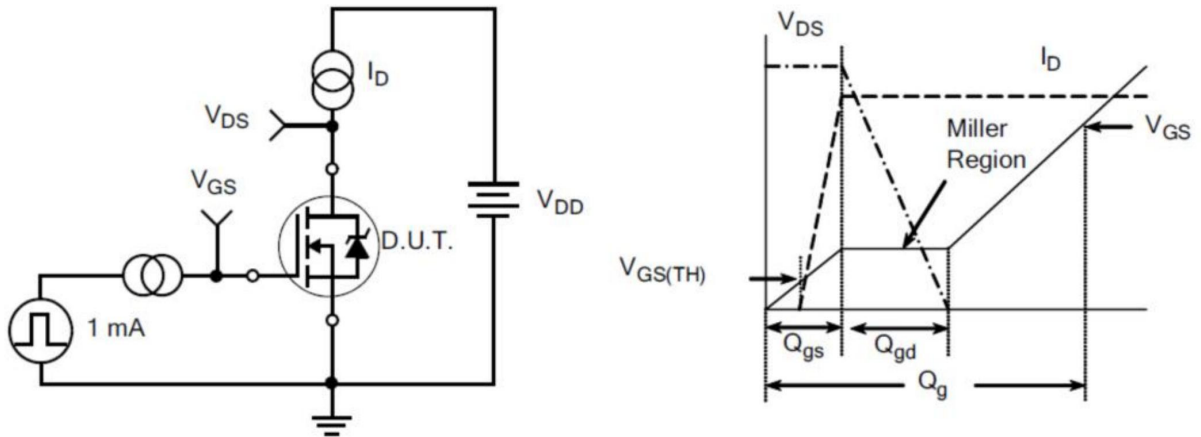


Figure 13: Resistive Switching Test Circuit and Waveform

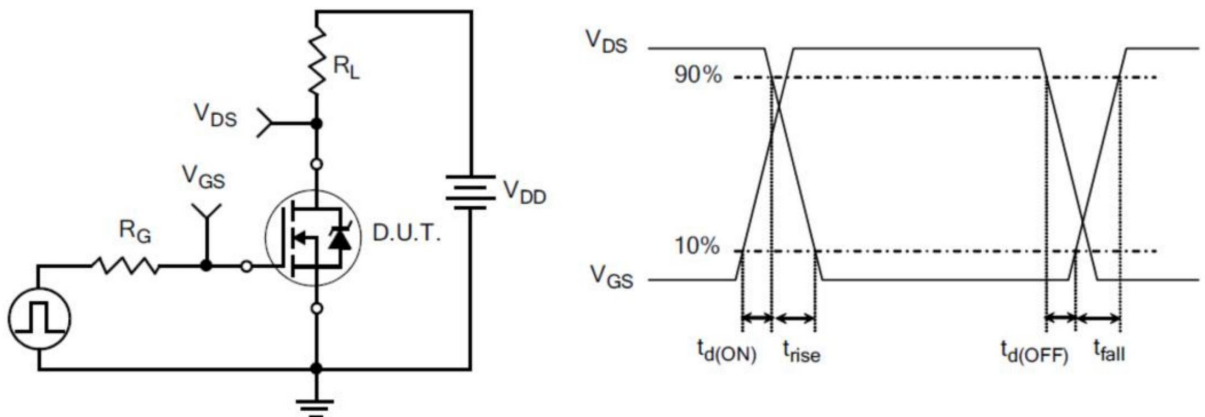
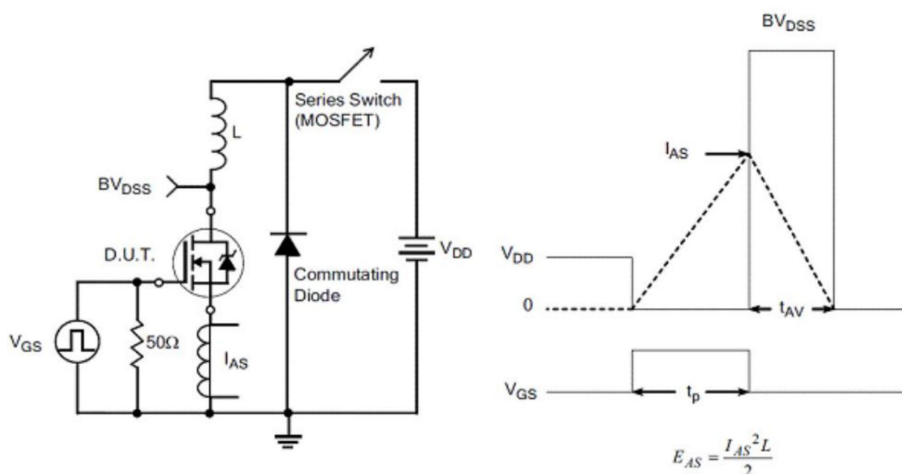
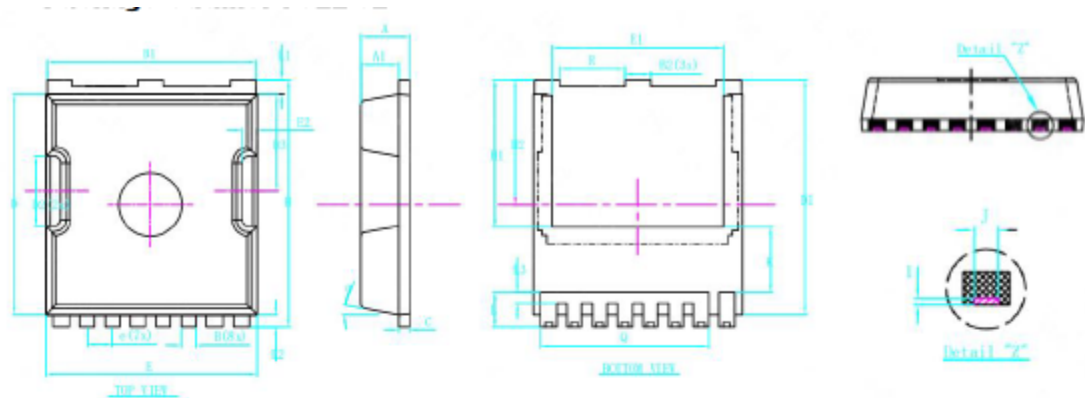


Figure 14: Unclamped Inductive Switching Test Circuit and Waveform



Package Outlines

TOLL



SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.200	2.300	2.400
A1	1.700	1.800	1.900
B	0.700	0.800	0.900
B1	9.700	9.800	9.900
B2	1.100	1.200	1.300
C	0.400	0.500	0.600
D	10.300	10.400	10.500
D1	11.000	11.100	11.200
D2	3.200	3.300	3.400
D3	4.470	4.570	4.670
E	9.800	9.900	10.000
E1	8.000	8.100	8.200
E2	0.500	0.600	0.700
e	1.200 BSC		
H	11.600	11.700	11.800
H1	6.950 BSC		
H2	5.900 BSC		
I	0.050	0.100	0.15
J	0.350 REF.		
K	3.100 REF.		
L	1.550	1.650	1.750
L1	0.600	0.700	0.800
L2	0.500	0.600	0.700
L3	0.400	0.500	0.600
Q	8.000 REF.		
R	3.000	3.100	3.200
a	10° REF.		

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BST15NH039SK1	BST15NH039SK1	TOLL	Tape & Reel	1200 units

Disclaimer

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