

### 1. Description

BLP039N08, the N-channel Enhanced Power MOSFETs, is obtained by advanced double trench technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. This is suitable device for Synchronous rectification and high speed switching applications.

#### KEY CHARACTERISTICS

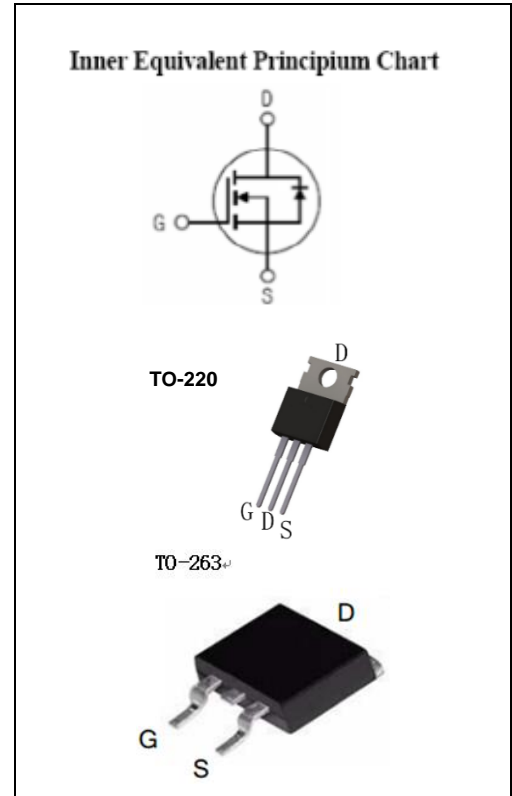
Parameter	Value	Unit
V <sub>DSS</sub>	80	V
I <sub>D</sub>	120	A
R <sub>DS(on)</sub> @10V.typ	3.9	mΩ

#### FEATURES

- Fast Switching
- Low On-Resistance
- Low Gate Charge
- Low Reverse transfer capacitances
- High avalanche ruggedness
- RoHS product

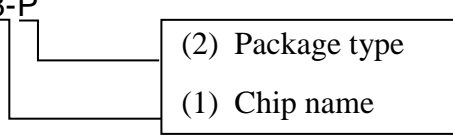

#### APPLICATIONS

- Synchronous rectification
- High speed switching applications



### ORDERING INFORMATION

Ordering Codes	Package	Product Code	Packing
BLP039N08-P	TO-220	P039N08	Tube
BLP039N08-B	TO-263	P039N08	Reel

<p>BLP039N08-P</p>  <p>(2) Package type (1) Chip name</p> <p>(1) BLP039N08 3.9mΩ/80V (2) P: TO-220 B: TO-263</p>	 <p>XXXX YYWW ZZ SSSS VV</p> <p>XXXX: Product Code YYWW: Year&amp;Week ZZ: Assembly Code SSSS: Lot Code VV: Classification</p>
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## 2. ABSOLUTE RATINGS

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

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-Source Voltage	80	V
$I_D$	Continuous Drain Current, Silicon Limited	146	A
	Continuous Drain Current, Package Limited	120	A
	Continuous Drain Current @ $T_C=100^{\circ}\text{C}$ , Silicon Limited	92.8	A
$I_{DM}$ <sup>Note1</sup>	Pulsed Drain Current	480	A
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$ <sup>Note2</sup>	Avalanche Energy	361	mJ
$P_D$	Power Dissipation	173.6	W
	Derating Factor above $25^{\circ}\text{C}$	1.39	W/ $^{\circ}\text{C}$
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	150, $-55$ to $150$	$^{\circ}\text{C}$
$T_L$	Maximum Temperature for Soldering	260	$^{\circ}\text{C}$

Note1: Repetitive Rating: Pulse width limited by maximum junction temperature

Note2:  $L=0.5\text{mH}$ ,  $I_{as}=38\text{A}$ , Start  $T_J=25^{\circ}\text{C}$

## 3. Thermal characteristics

Symbol	Parameter	Max	Units
$R_{\theta JC}$	thermal resistance, Junction-Case	0.72	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	thermal resistance, Junction-Ambient	62.5	$^{\circ}\text{C}/\text{W}$

## 4. Electrical Characteristics

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

OFF Characteristics						
Symbol	Parameter	Test Conditions	Values			Units
			Min	Typ	Max	
$V_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$	80	90	--	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=80\text{V}$ , $V_{GS}=0\text{V}$	--	--	1	$\mu\text{A}$
		$V_{DS}=64\text{V}$ , $V_{GS}=0\text{V}$ @ $T_C=125^{\circ}\text{C}$	--	--	100	$\mu\text{A}$
$I_{GSS(F)}$	Gate-Source Forward Leakage	$V_{GS}=+20\text{V}$	--	--	100	nA
$I_{GSS(R)}$	Gate-Source Reverse Leakage	$V_{GS}=-20\text{V}$	--	--	-100	nA

**ON Characteristics**

Symbol	Parameter	Test Conditions	Values			Unit s
			Min	Typ	Max	
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS}=10V, I_D=50A$	--	3.9	4.5	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V

Pulse width  $t_p \leq 300\mu s$ ,  $\delta \leq 2\%$

**Dynamic Characteristics**

Symbol	Parameter	Test Conditions	Values			Units
			Min	Typ	Max	
$C_{iss}$	Input Capacitance	$V_{DS}=40V,$ $V_{GS}=0,$ $f=1MHz$	--	3641	--	pF
$C_{oss}$	Output Capacitance		--	1142	--	
$C_{rss}$	Reverse Transfer Capacitance		--	50	--	
$Q_g$	Total Gate Charge	$V_{DD}=40V,$ $I_D=50A,$ $V_{GS}=10V$	--	60	--	nC
$Q_{gs}$	Gate-Source charge		--	19	--	
$Q_{gd}$	Gate-Drain charge		--	13	--	
$R_G$	Gate resistance	$V_{GS}=0, V_{DS}=0$		2		$\Omega$

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Values			Units
			Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=40V,$ $I_D=40A,$ $V_{GS}=10V,$ $R_G=3\Omega,$ Resistive Load	--	17	--	ns
$t_r$	Rise Time		--	16	--	
$t_{d(off)}$	Turn-Off Delay Time		--	36	--	
$t_f$	Fall Time		--	16	--	

**Source-Drain Diode Characteristics**

Symbol	Parameter	Test Conditions	Values			Units
			Min	Typ	Max	
$I_S$	Continuous Source Current		--	--	120	A
$I_{SM}$	Maximum Pulsed Current		--	--	480	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=50A$	--	--	1.2	V
$T_{rr}$	Reverse Recovery Time	$I_S=40A, V_{GS}=0,$ $di/dt=100A/us$	--	36	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	40	--	nC

## 5. Characteristics Curves

Figure 1. Safe Operating Area

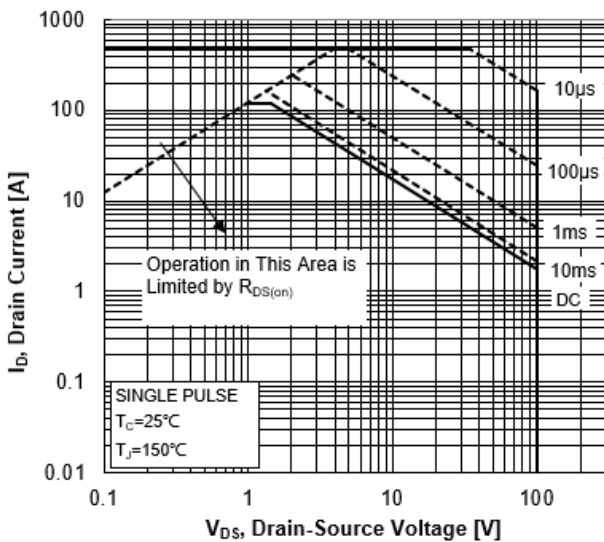


Figure 2. Maximum Power Dissipation vs Case Temperature

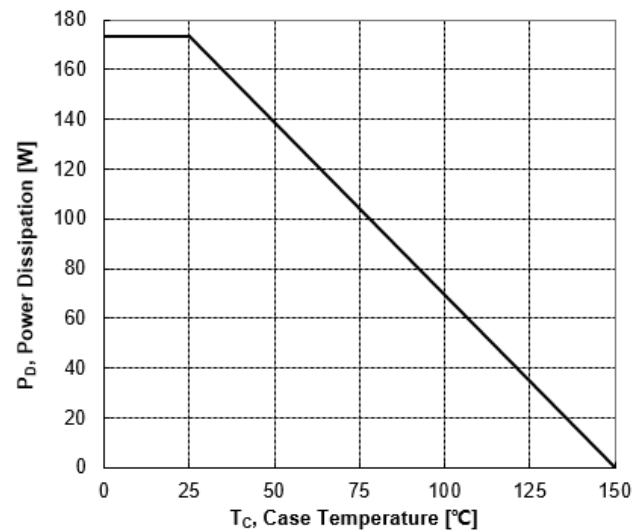


Figure 3. Maximum Continuous Drain Current vs Case Temperature

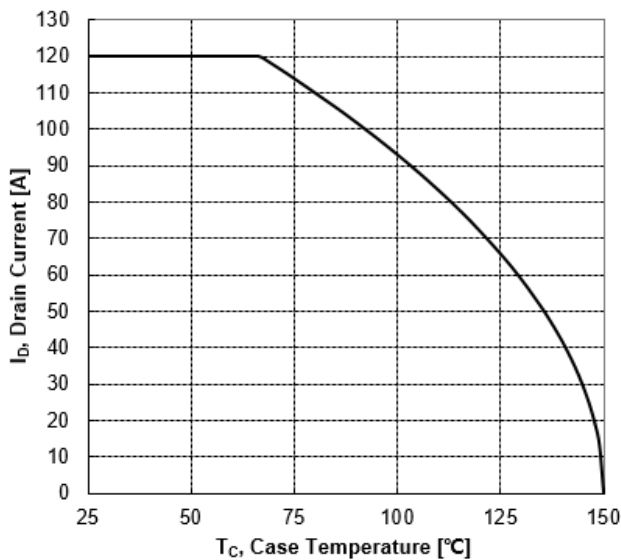


Figure 4. Typical Output Characteristics

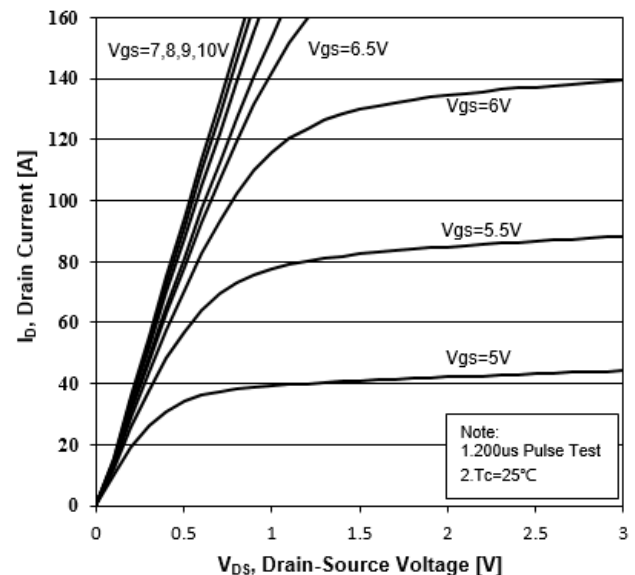


Figure 5. Transient Thermal Impedance

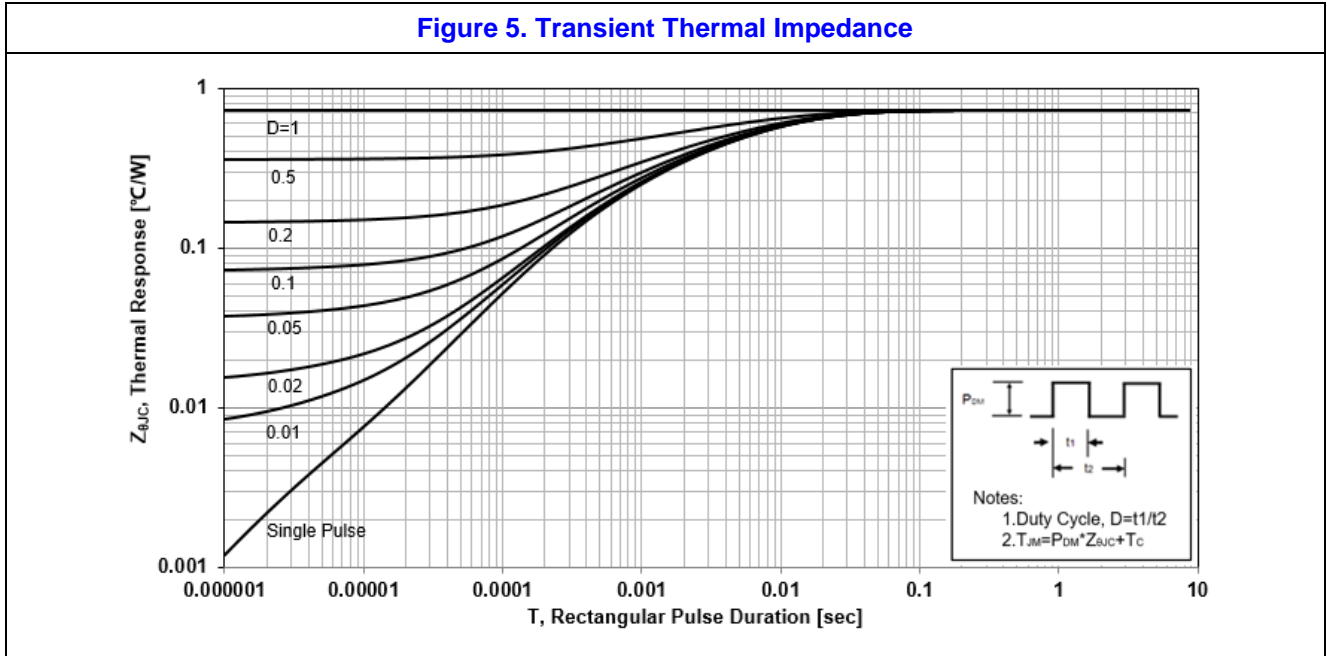


Figure 6. Typical Transfer Characteristics

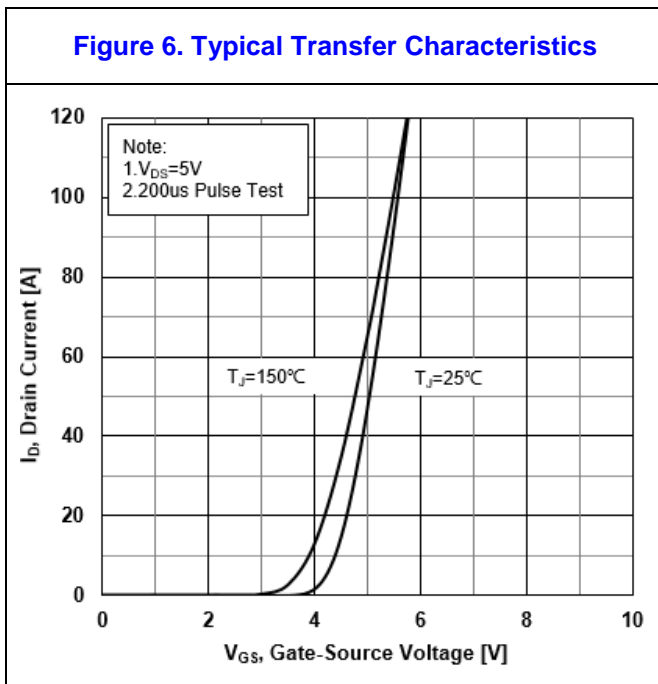
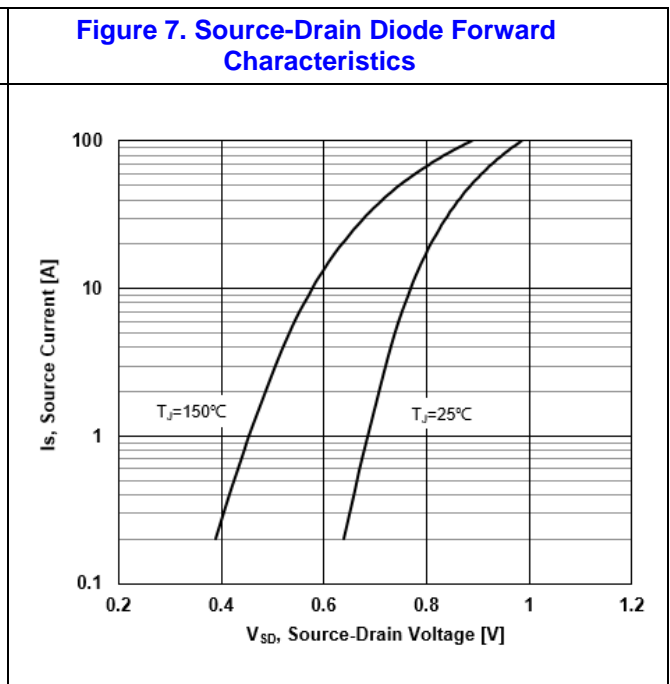
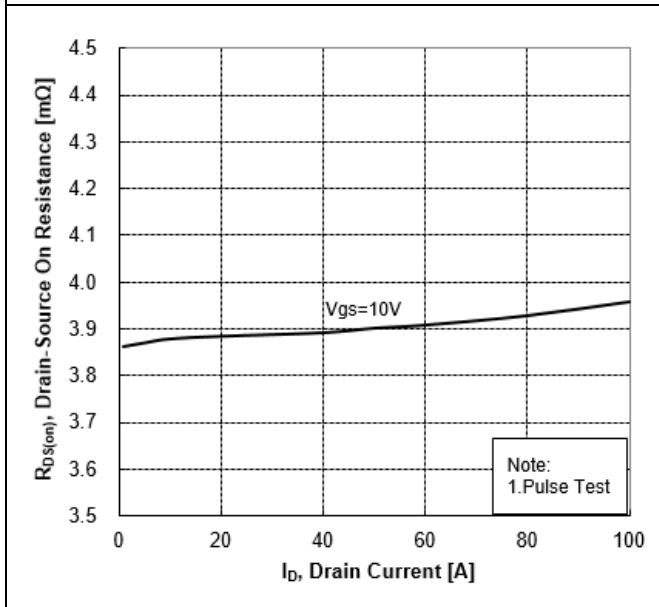


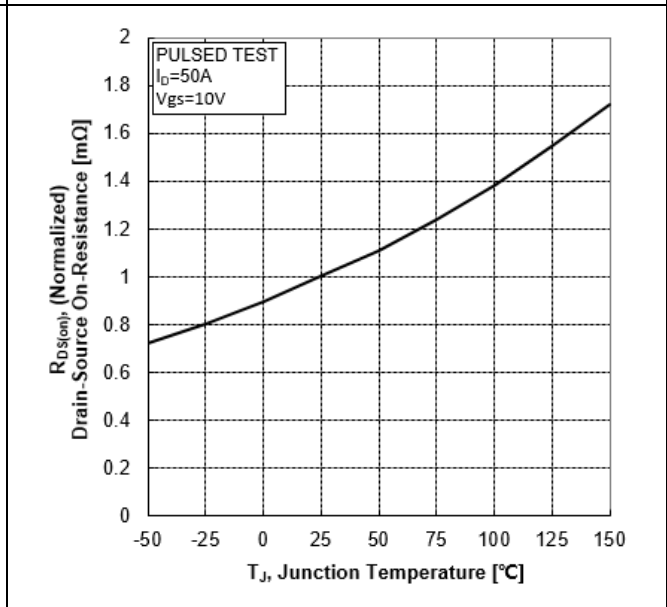
Figure 7. Source-Drain Diode Forward Characteristics



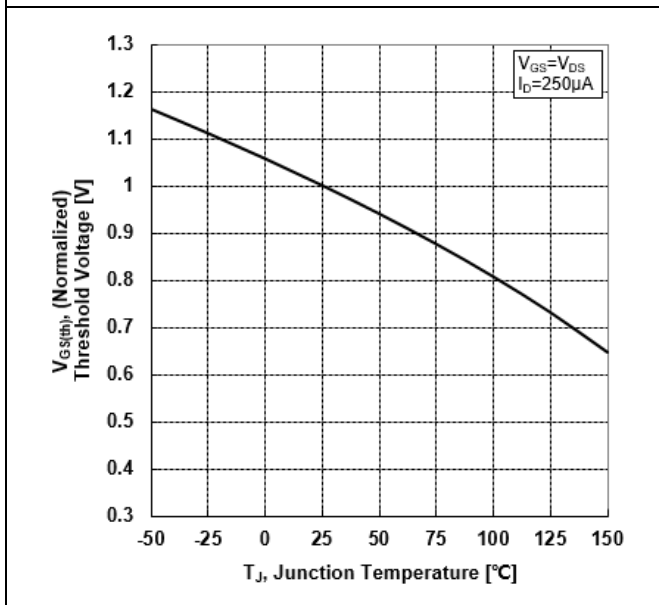
**Figure 8. Drain-Source On-Resistance vs Drain Current**



**Figure 9. Normalized On-Resistance vs Junction Temperature**



**Figure 10. Normalized Threshold Voltage vs Junction Temperature**



**Figure 11. Normalized Breakdown Voltage vs Junction Temperature**

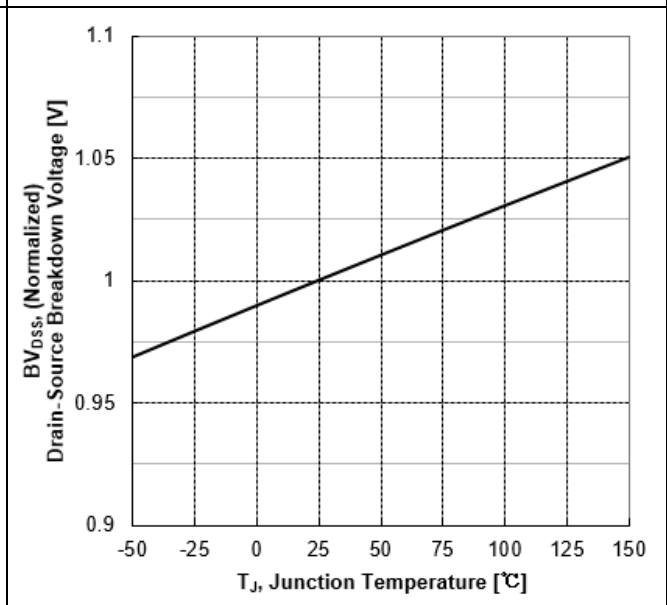


Figure 12. Capacitance Characteristics

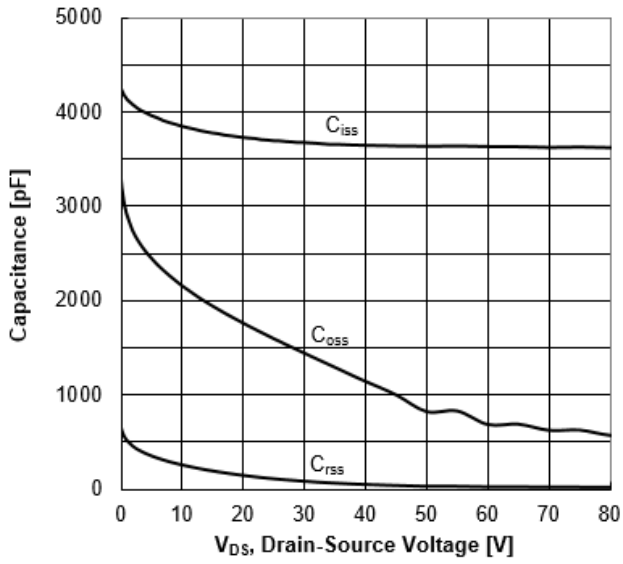
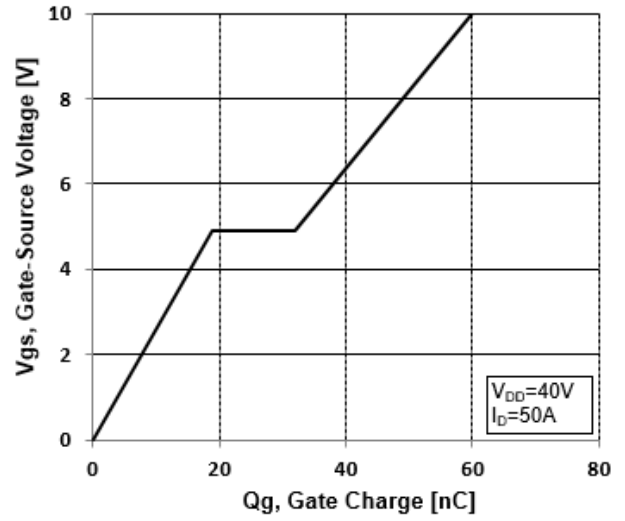


Figure 13. Typical Gate Charge vs Gate-Source Voltage



## 6. Test Circuit and Waveform

Figure 14. Resistive Switching Test Circuit



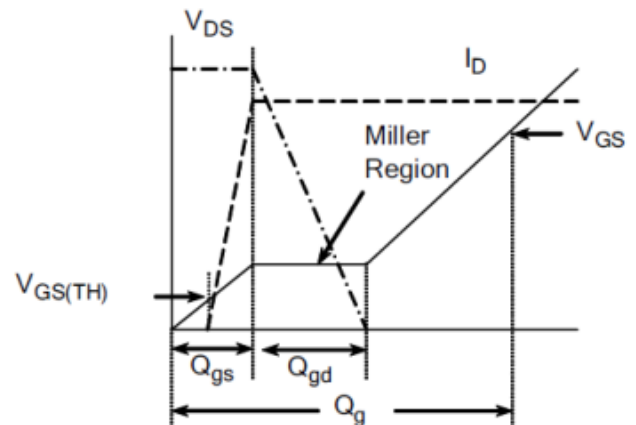
Figure 15. Resistive Switching Waveforms



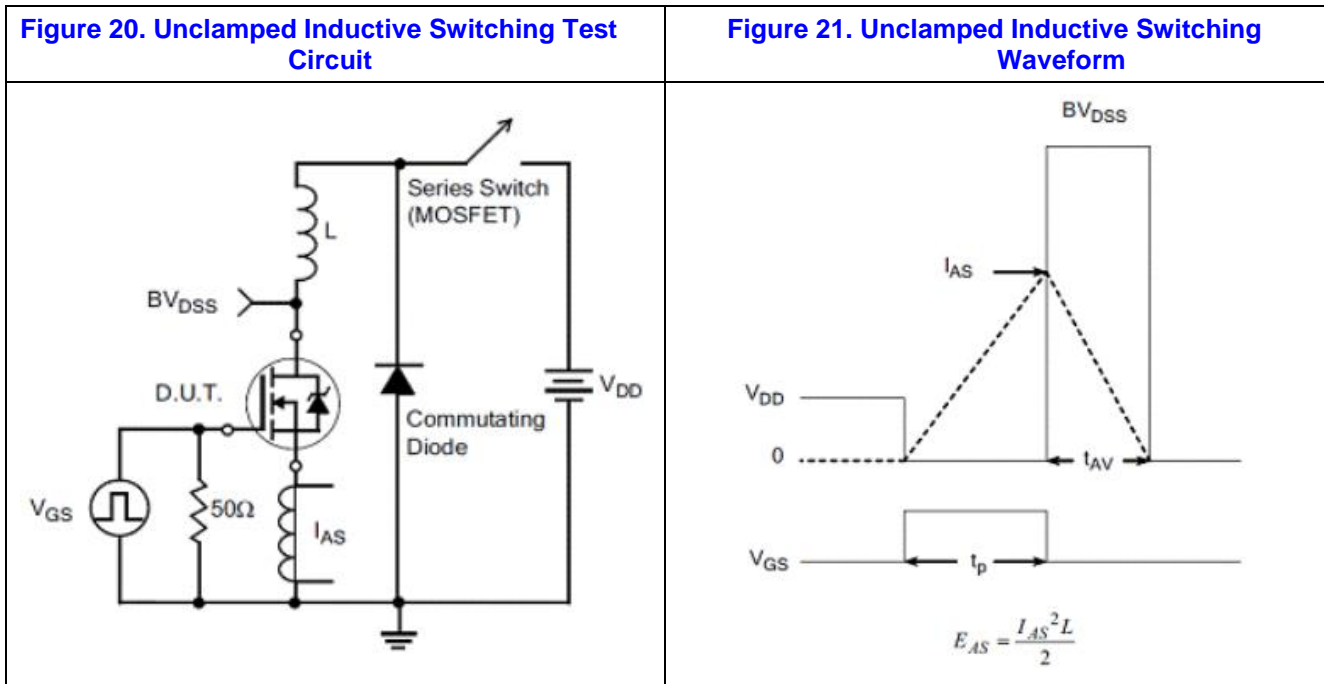
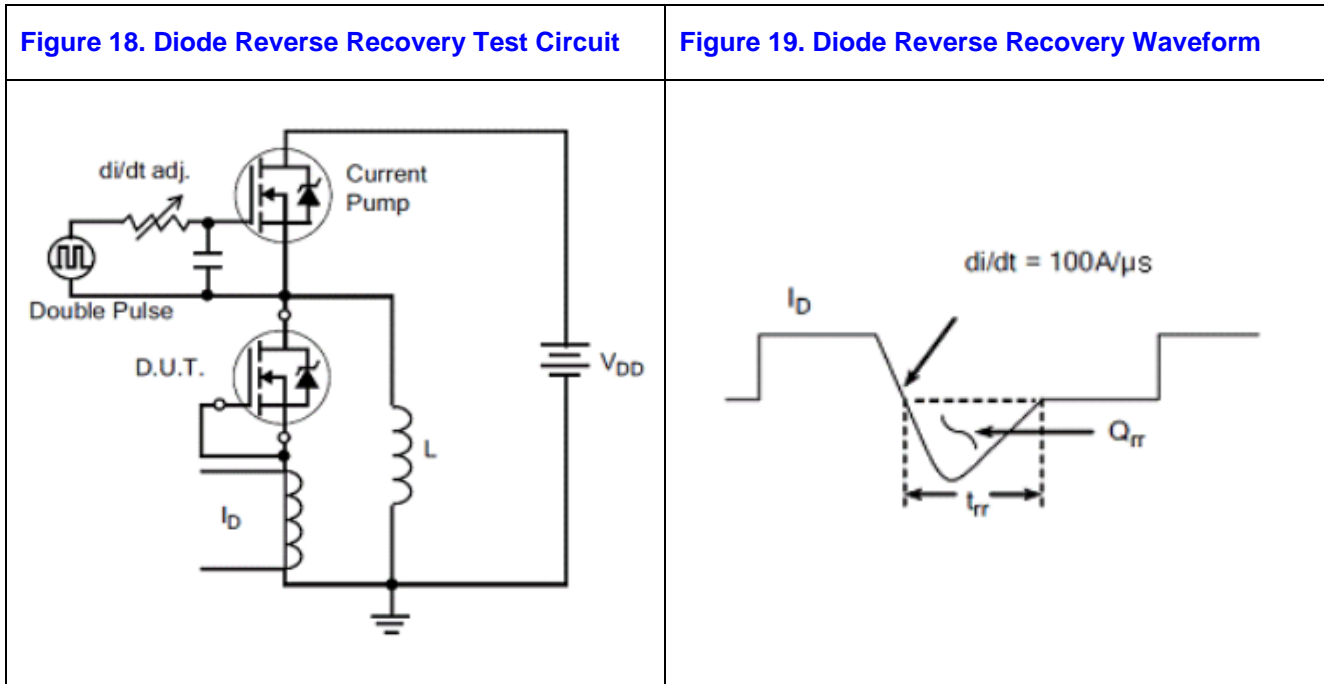
Figure 16. Gate Charge Test Circuit



Figure 17. Gate Charge Waveforms

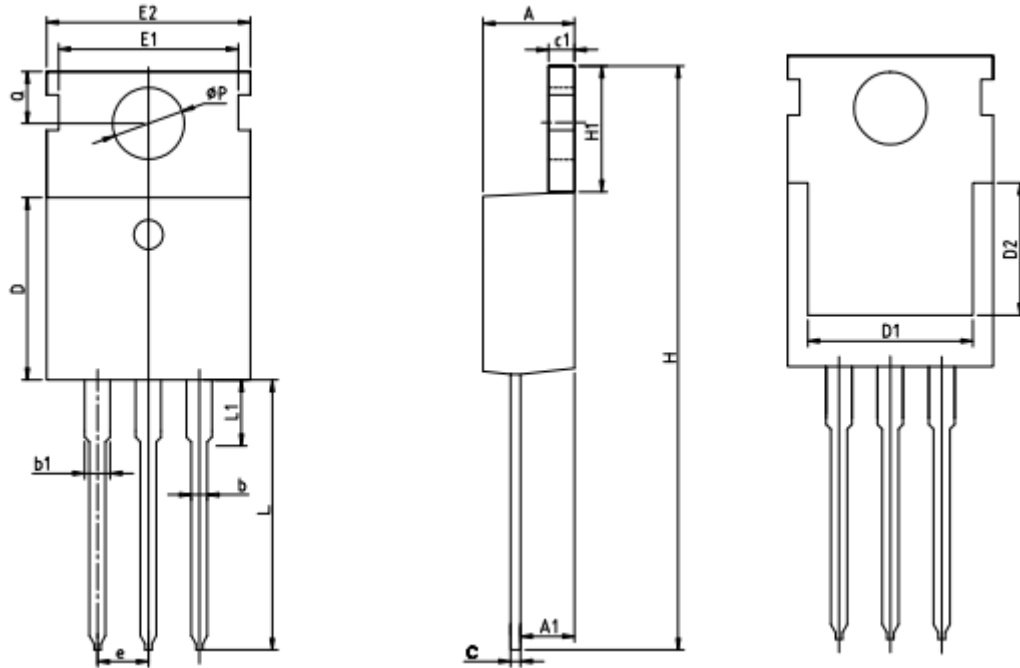






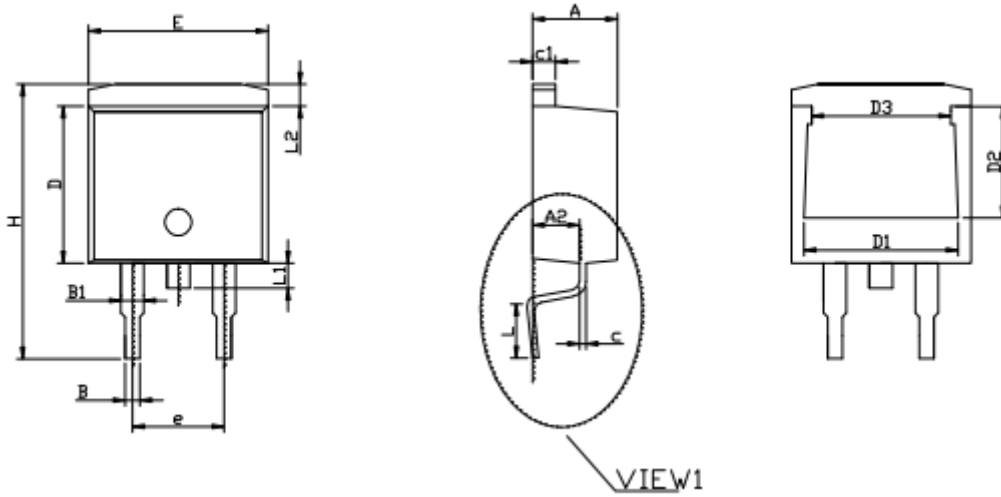
## 7. Package Description

### TO-220



	MIN	NOM	MAX
A	4.40	4.60	4.80
A1	2.25	2.40	2.55
b	0.72	0.82	0.92
b1	1.12	1.27	1.42
c	0.40	0.50	0.60
c1	1.20	1.30	1.40
D	8.80	9.10	9.40
D1	7.75	7.95	8.15
D2	6.55	6.75	6.95
e		2.54BSC	
E	9.65	10.00	10.35
E1		8.70	
E2	9.70	10.00	10.30
H	28.70	29.20	29.70
H1	6.25	6.50	6.85
L	13.20	13.50	13.80
L1	2.80	3.10	3.40
Q	2.60	2.80	3.00
ΦP	3.45	3.60	3.75

TO-263



	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	0.05	0.15	0.30
A2	2.45	2.60	2.70
B	0.72	0.82	0.92
B1	1.12	1.27	1.42
c	0.28	0.38	0.48
c1	1.17	1.27	1.37
D	8.46	8.66	8.86
D1	7.90	8.10	8.40
D2	5.50	5.70	5.90
D3	7.10	7.30	7.50
E	9.85	10.15	10.45
e		5.08BCS	
H	14.75	15.15	15.55
L	2.30	2.55	2.80
L1	1.20	1.40	1.60
L2	1.01	1.23	1.50
Θ	0°	7°	8°

**NOTE:**

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shanghai Belling reserves the right to make changes in this specification sheet and is subject to change without prior notice.

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