

## 1. Description

BLP04N11, the N-channel Enhanced Power MOSFETs, is obtained by advanced **double trench II** technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. This is suitable device for motor drivers and high speed switching applications.

### KEY CHARACTERISTICS

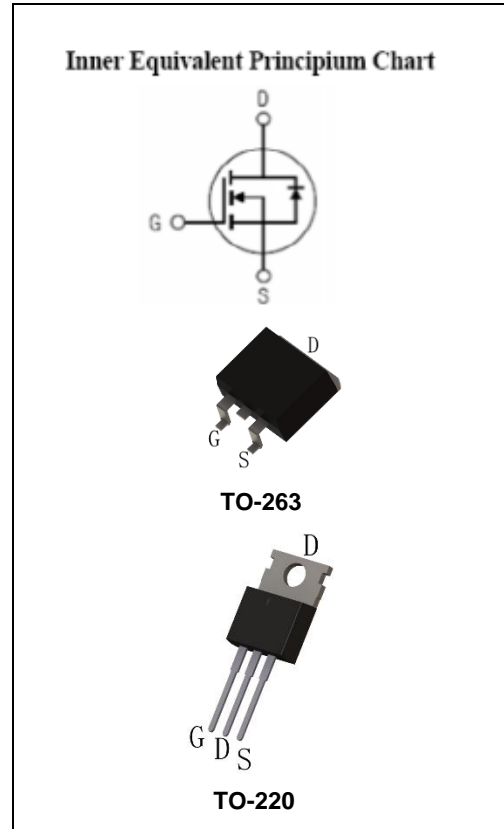
Parameter	Value	Unit
V <sub>DSS</sub>	110	V
I <sub>D</sub>	120	A
R <sub>DS(on).typ</sub>	3.2	mΩ

### FEATURES

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

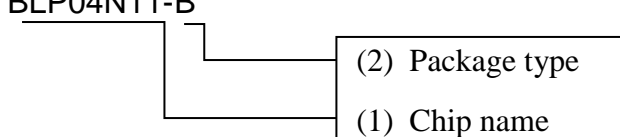

### APPLICATIONS

- Switching applications
- Motor drivers



## ORDERING INFORMATION

Ordering Codes	Package	Product Code	Packing
BLP04N11-B	TO-263	P04N11	Reel
BLP04N11-P	TO-220	P04N11	Tube

<p>BLP04N11-B</p>  <p>(2) Package type (1) Chip name</p> <p>(1) BLP04N11: 4mΩ/110V (2) B: TO-263 P: TO-220</p>	 <p>XXXX: Product Code YYWW: Year&amp;Week ZZ: Assembly Code SSSSS: 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	110	V
$I_D$	Continuous Drain Current, Silicon Limited	182	A
	Continuous Drain Current, Package Limited	120	A
	Continuous Drain Current @ $T_C=100^{\circ}\text{C}$ , Silicon Limited	115.5	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	625	mJ
$P_D$	Power Dissipation	227.2	W
	Derating Factor above $25^{\circ}\text{C}$	1.82	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:  $L=0.5\text{mH}$ ,  $I_{as}=50\text{A}$ , Start  $T_J=25^{\circ}\text{C}$

## 3. Thermal characteristics

Symbol	Parameter	Max	Units
$R_{\theta JC}$	thermal resistance, Junction-Case	0.55	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	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	$V_{GS}=0\text{V}$ , $I_D=250\mu\text{A}$	110	116	--	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=100\text{V}$ , $V_{GS}=0\text{V}$	--	--	1	$\mu\text{A}$
		$V_{DS}=80\text{V}$ , $V_{GS}=0\text{V}$ @ $T_C=125^{\circ}\text{C}$	--	--	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	$V_{GS}=10V, I_D=50A$	--	3.2	3.8	m $\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	3.0	4.0	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	$V_{DS}=50V, V_{GS}=0, f=1MHz$	--	6754	--	pF
$C_{oss}$	Output Capacitance		--	2045	--	
$C_{rss}$	Reverse Transfer Capacitance		--	135	--	
$Q_g$	Total Gate Charge	$V_{DD}=50V, I_D=50A, V_{GS}=10V$	--	116	--	nC
$Q_{gs}$	Gate-Source charge		--	34	--	
$Q_{gd}$	Gate-Drain charge		--	30	--	

**Switching Characteristics**

Symbol	Parameter	Test Conditions	Values			Units
			Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=50V, I_D=50A, V_{GS}=10V, R_G=3\Omega, \text{Resistive Load}$	--	29	--	ns
$t_r$	Rise Time		--	23	--	
$t_{d(off)}$	Turn-Off Delay Time		--	56	--	
$t_f$	Fall Time		--	25	--	

**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	$I_S=50A, di/dt=100A/us$	--	78	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	168	--	$\mu C$

## 5. Characteristics Curves

Figure 1. Safe Operating Area

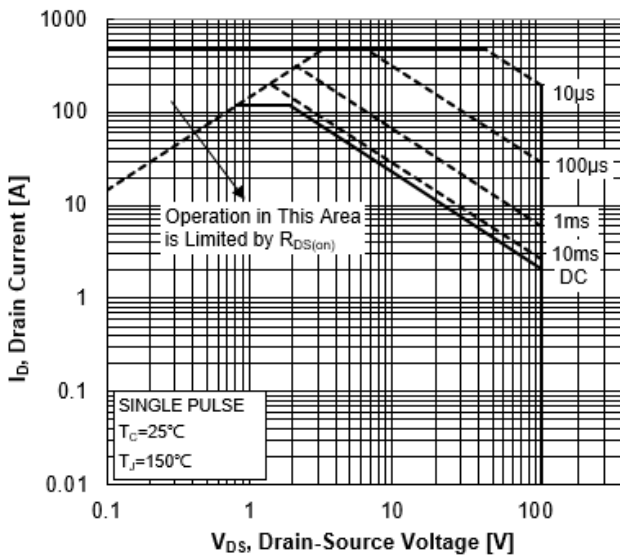


Figure 2. Maximum Power Dissipation vs Case Temperature

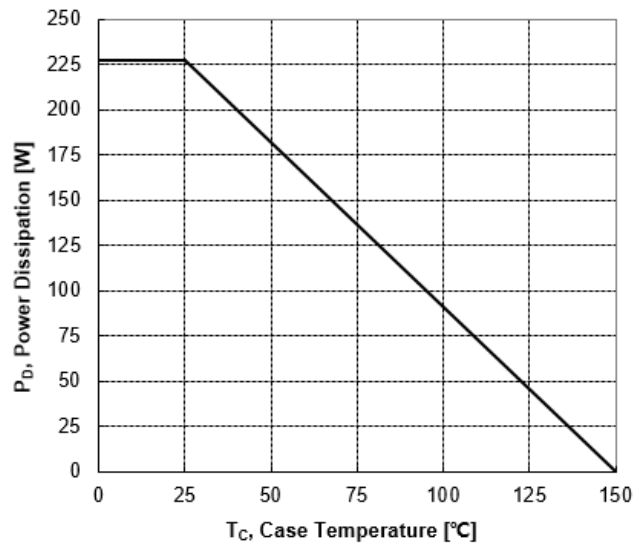


Figure 3. Maximum Continuous Drain Current vs Case Temperature

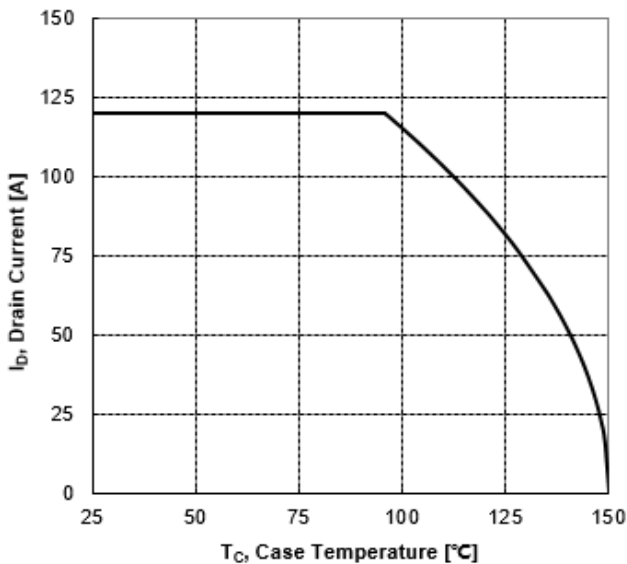


Figure 4. Typical Output Characteristics

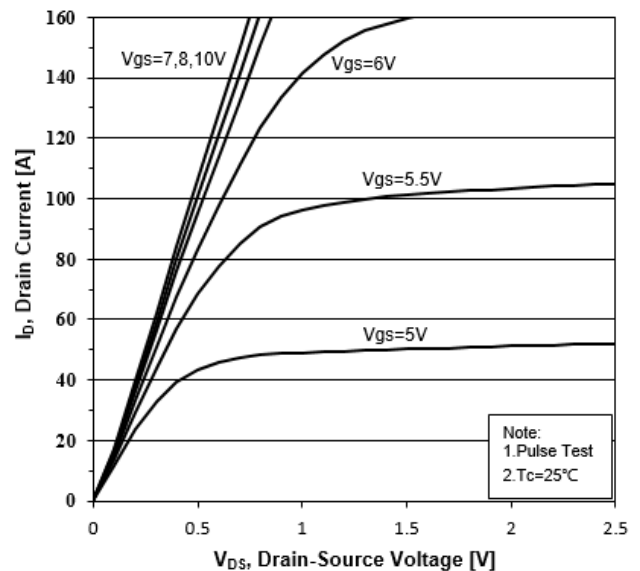


Figure 5. Transient Thermal Impedance

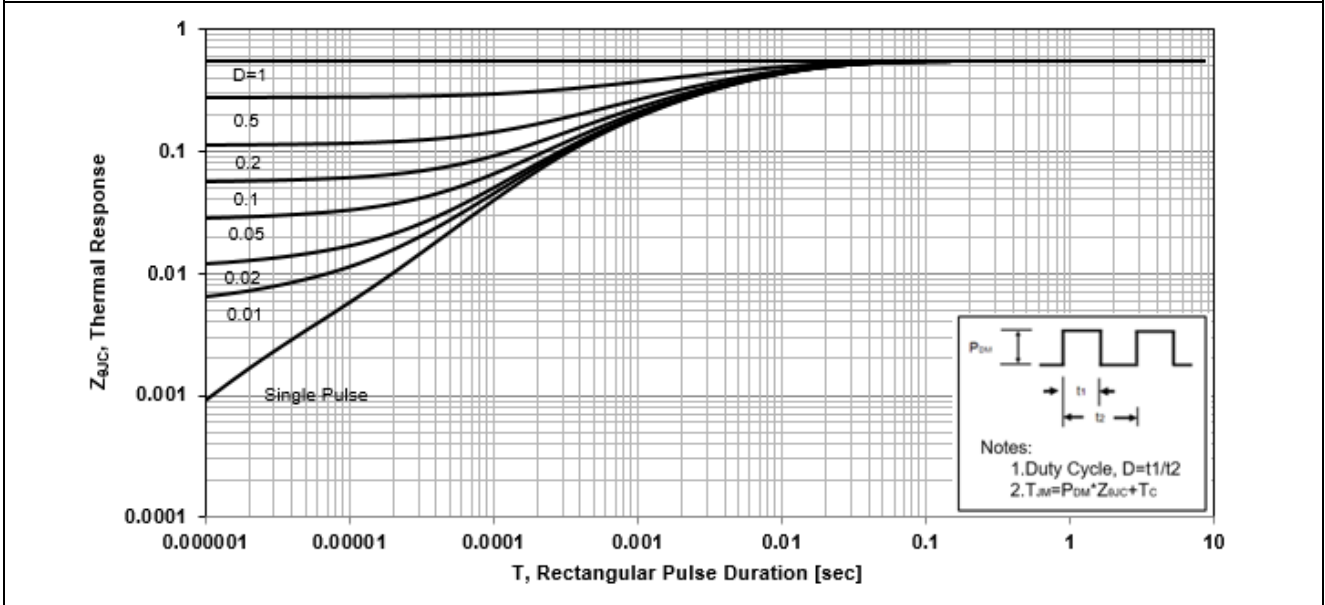


Figure 6. Typical Transfer Characteristics

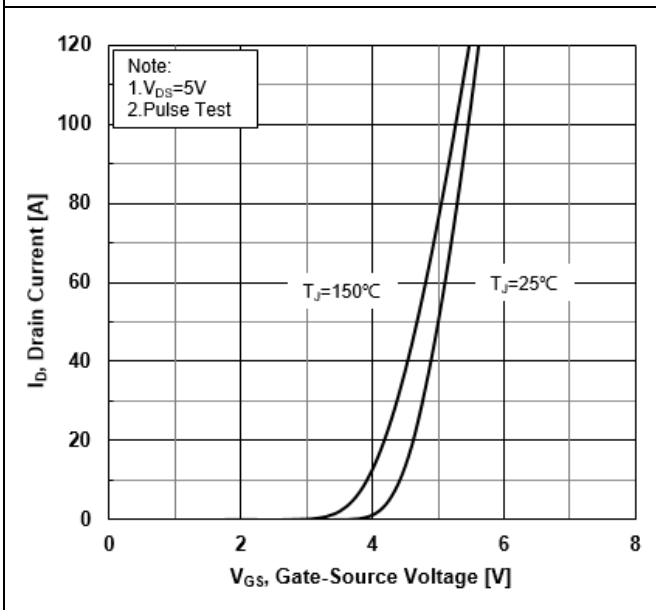
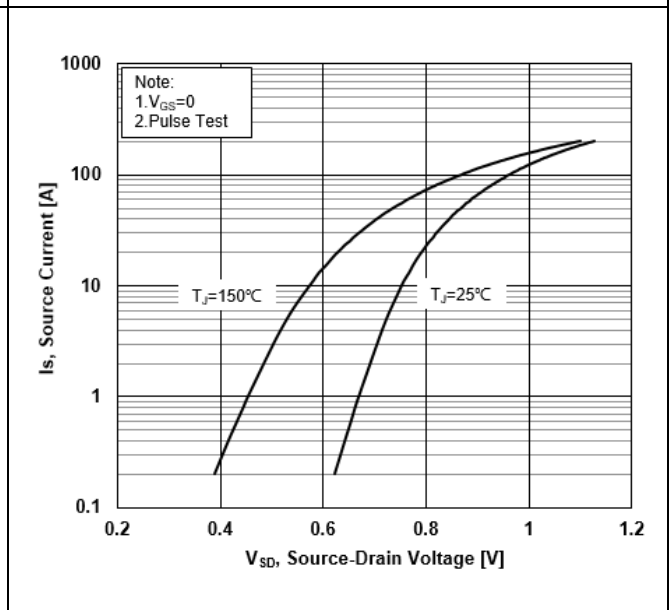
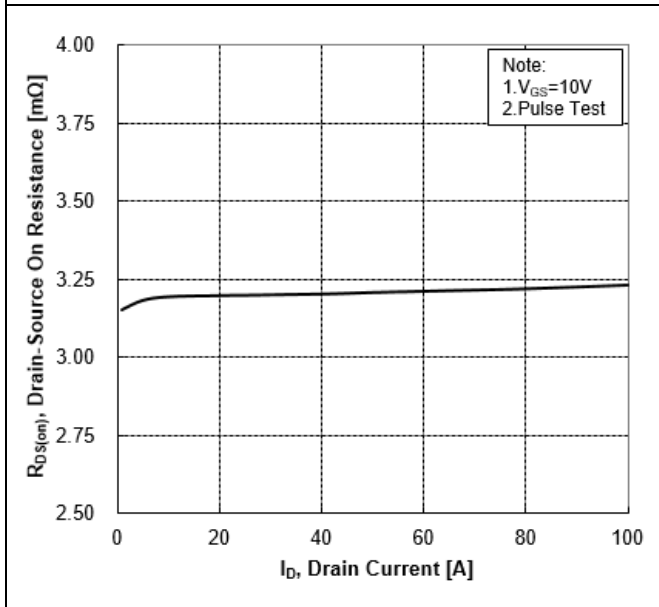


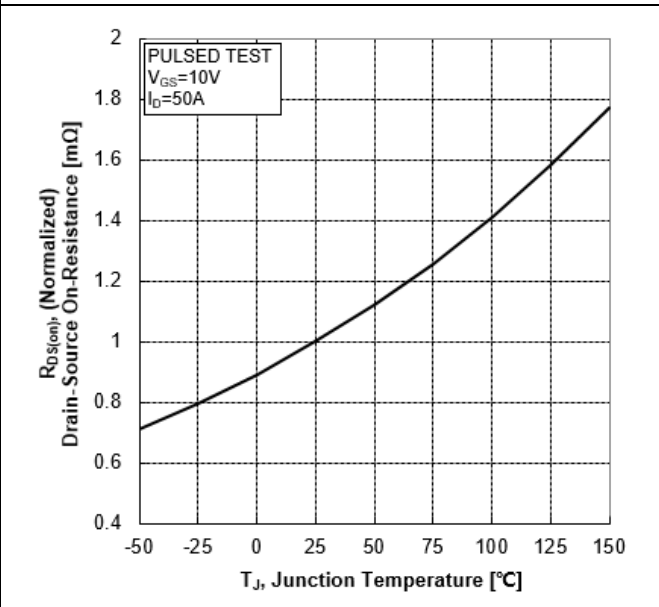
Figure 7. Source-Drain Diode Forward Characteristics



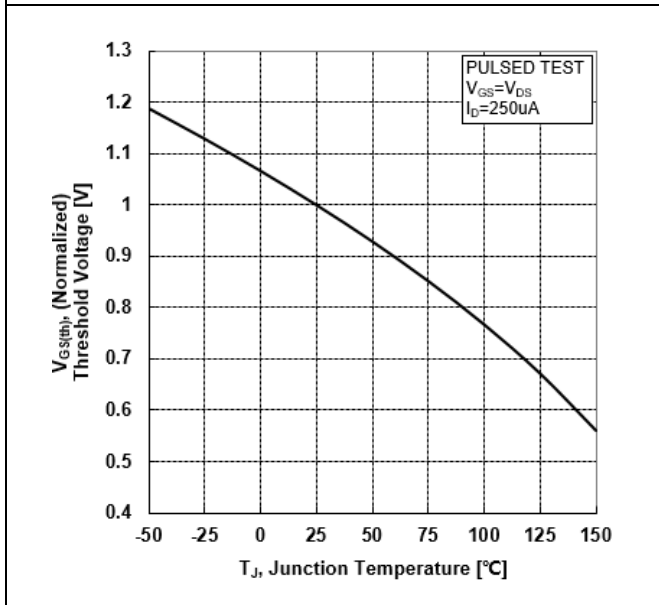
**Figure 8. Drain-Source On-Resistance vs Drain Current**



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



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



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

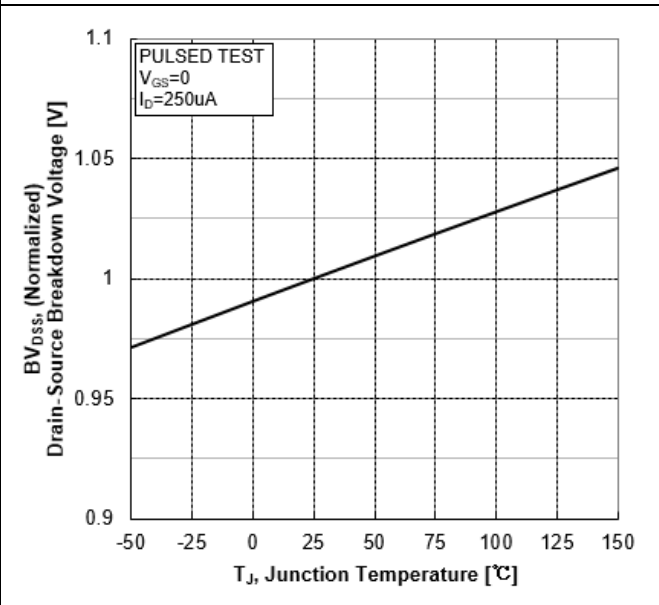


Figure 12. Capacitance Characteristics

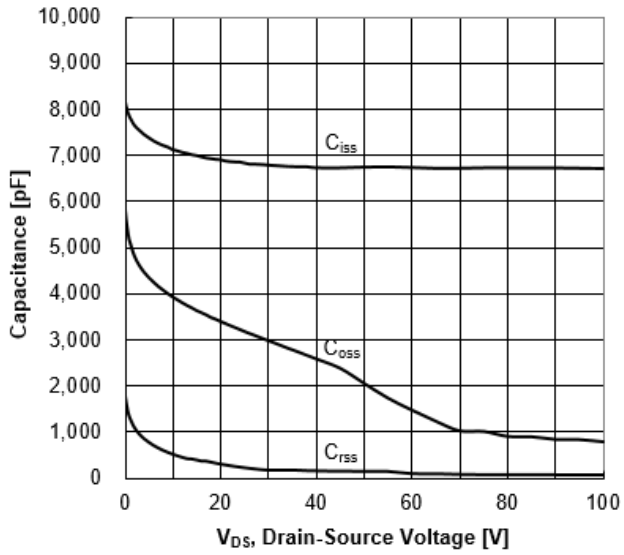
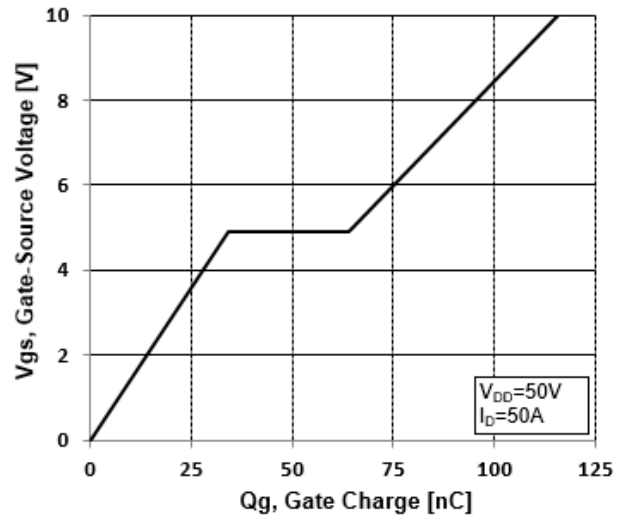


Figure 13. Typical Gate Charge vs Gate-Source Voltage



## 6. Test Circuit and Waveform

Figure 14. Resistive Switching Test Circuit

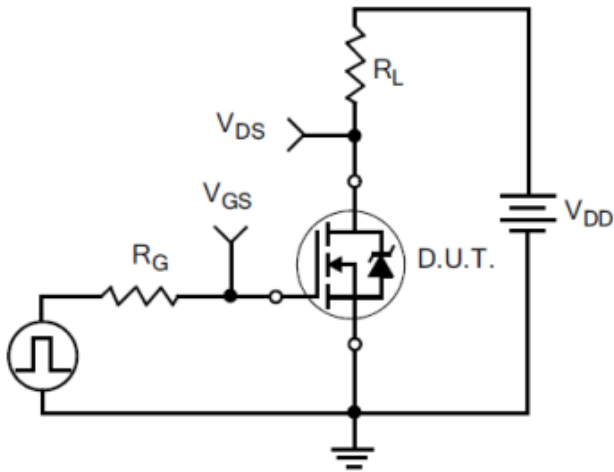


Figure 15. Resistive Switching Waveforms

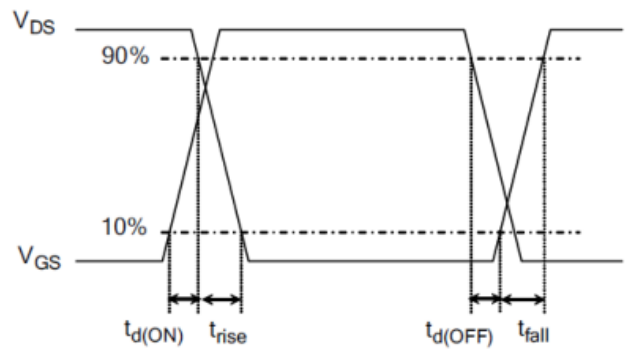


Figure 16. Gate Charge Test Circuit

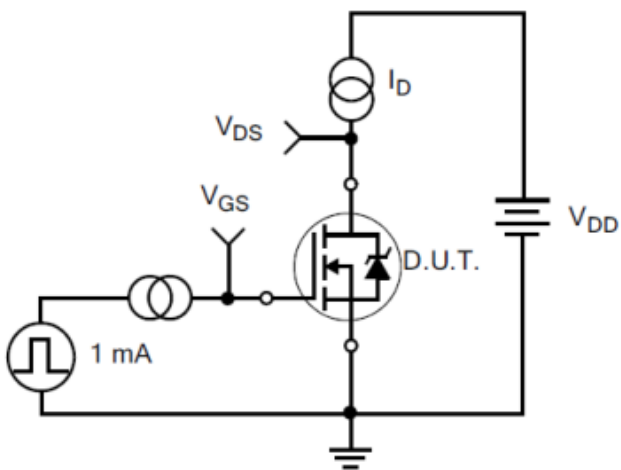
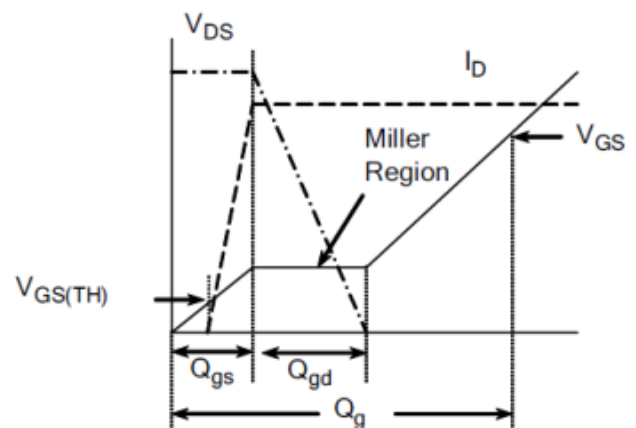
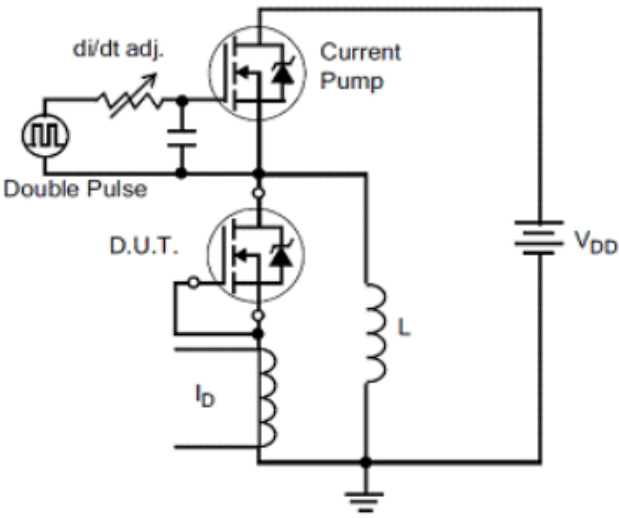
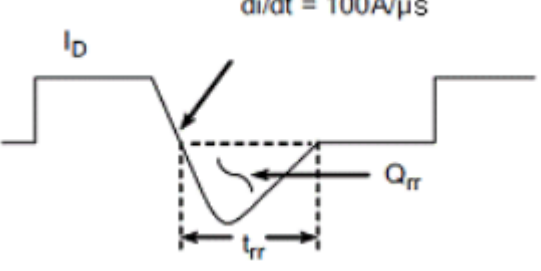
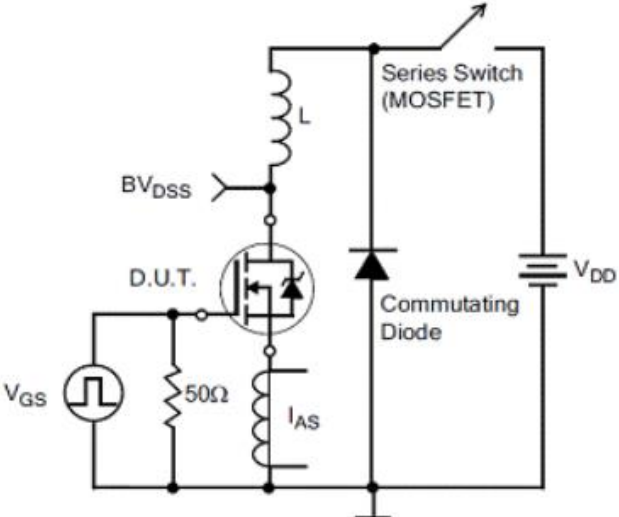
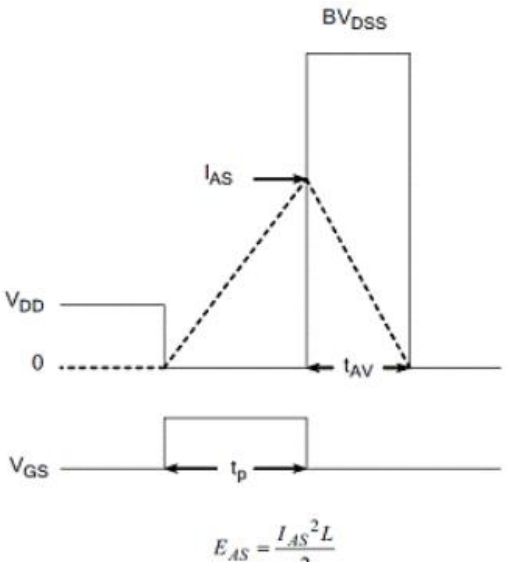


Figure 17. Gate Charge Waveforms

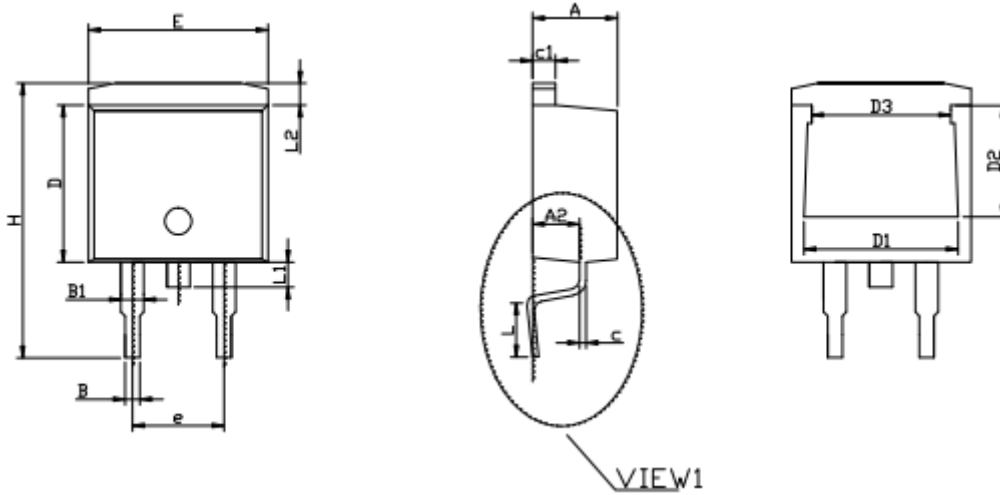




<p><b>Figure 18. Diode Reverse Recovery Test Circuit</b></p> 	<p><b>Figure 19. Diode Reverse Recovery Waveform</b></p> 
<p><b>Figure 20. Unclamped Inductive Switching Test Circuit</b></p> 	<p><b>Figure 21. Unclamped Inductive Switching Waveform</b></p>  $E_{AS} = \frac{I_{AS}^2 L}{2}$

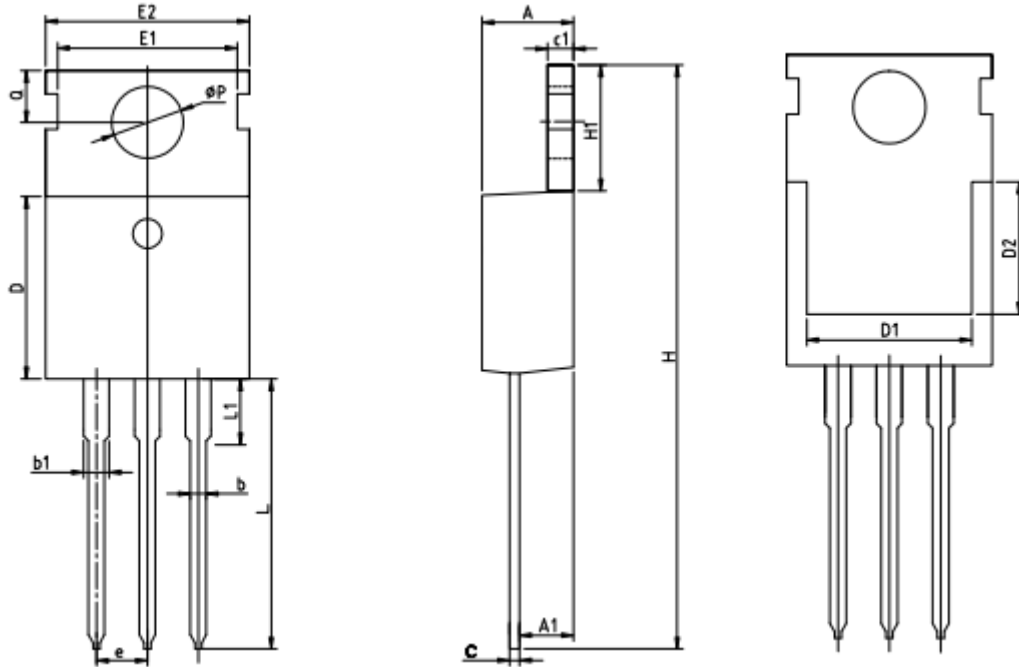
## 7. Package Description

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°

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

**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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