650V 7A N-Channel Enhancement Mode Power MOSFET

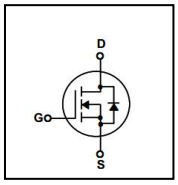
General Description

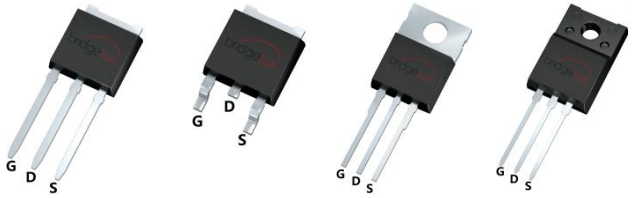
BXP7N65 is Bridgelux high voltage MOSFET family based on advanced planar stripe DMOS technology. This advanced MOSFET family has optimized on-state resistance, and also provides superior switching performance and higher avalanche energy strength. This device family is suitable for high efficiency switch mode power supplies.

FEATURES

- RDSON≤1.4Ω @Vgs=10V, Id=3.5A
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Fast switching capability
- Lead free product is acquired

SYMBOL





TO-251L TO-252 TO-220 TO-220F

ASSEMBLY MESSAGE

Product Name	Marking	Package	Packaging
BXP7N65U	BXP7N65U	TO-251L	Tube
BXP7N65D	BXP7N65D	TO-252	Tube/Reel
BXP7N65P	BXP7N65P	TO-220	Tube
BXP7N65CF	BXP7N65C	TO-220F	Tube

ABSOLUTE MAXIMUM RATINGS (T_C=25°C unless otherwise noted)

Parameter		Symbol	Rating			Unit
			BXP7N65U/D	BXP7N65P	BXP7N65CF	
Drain-Source Voltage		V_{DSS}	650			V
Drain Current	Continuous (T_C = 25°C)	I_D	7			A
	Continuous (T_C = 100°C)		3.9			A
Drain Current	Pulsed (Note1)	I_{DM}	28			A
Gate-Source Voltage		V_{GSS}	±30			V
Avalanche Energy	Single Pulse (Note2)	E_{AS}	450			mJ
	Repetitive (Note1)	E_{AR}	21			mJ
Avalanche Current (Note1)		I_{AR}	7			A
Peak Diode Recovery dv/dt (Note3)		dv/dt	4.6			V/ns
Power Dissipation (Note 2)	T_C =25°C	P_D	145	167	46	W
	Derate above 25°C		1.16	1.34	0.37	W/°C
Maximum Junction Temperature		T_J	150			°C
Storage Temperature Range		T_{STG}	-55 to 150			°C

Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. L=18mH, V_{DD}=50V, RG=25 Ω, Starting TJ = 25°C

3. I_{SD} ≤ 7.0A, di/dt ≤ 300A/μs, V_{DD} ≤ BV_{DSS}, Starting TJ = 25°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Max.			Unit
		BXP7N65U/D	BXP7N65P	BXP7N65CF	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.86	0.75	2.72	°C / W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.5	120	°C / W

ELECTRICAL CHARACTERISTICS（T_J=25℃,unless otherwise Noted）

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	VGS=0V, ID=250μA	650			V
Zero Gate Voltage Drain Current	I_{DSS}	VDS=650V, VGS=0V			1	uA
		VDS=520V, TC = 125°C			100	uA
Gate-Body Leakage Current, Forward	I_{GSS}	VGS=30V			100	nA
Gate-Body Leakage Current, Reverse		VGS=-30V			-100	nA
Breakdown Voltage Temperature Coefficient	△BVDSS/ △TJ	ID = 250 μA		0.62		V/℃
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	VDS=VGS, ID=250μA	2		4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	VGS=10V, ID=3.5A		1.17	1.4	Ω
Forward Transconductance (Note4)	g_{FS}	VDS = 50V, ID = 3.5A		3.2		S
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	VDS=25V, VGS=0V, f=1.0MHz		970		pF
Output Capacitance	C_{OSS}			90		pF
Reverse Transfer Capacitance	C_{RSS}			8.3		pF
SWITCHING PARAMETERS						
Turn-ON Delay Time	$t_{D(ON)}$	VDD=325V, ID=7 A, VGS = 10V ,RG=10Ω (Note4,5)		24		ns
Turn-ON Rise Time	t_R			16		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			40		ns
Turn-OFF Fall-Time	t_F			15.7		ns
Total Gate Charge(Note5)	Q_G	VDS =520V, VGS =10V, ID =7A (Note4,5)		21		nC
Gate Source Charge	Q_{GS}			5.6		nC
Gate Drain Charge	Q_{GD}			9		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V_{SD}	IS=7A, VGS=0V			1.4	V
Diode Continuous Forward Current	I_S				7	A
Pulsed Drain-Source Current	I_{SM}				28	A
Reverse Recovery Time	t_{RR}	VGS = 0 V, ISD = 7A di/dt=100 A/μs (Note4,5)		320		ns
Reverse Recovery Charge	Q_{RR}			2.9		uC

Note： 4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

5. Essentially independent of operating temperature

TYPICAL CHARACTERISTICS

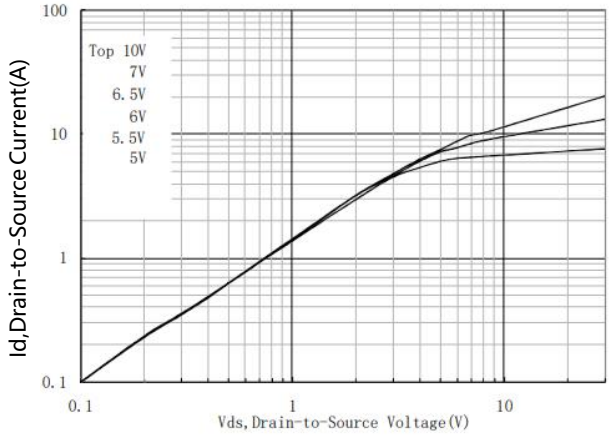


Figure1. Typical Output Characteristics

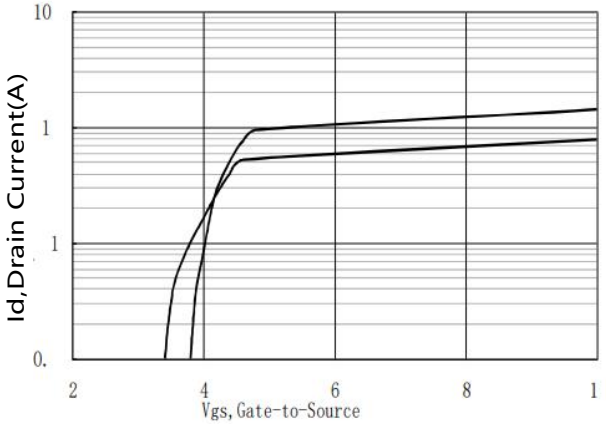


Figure2. Typical Transfer Characteristics

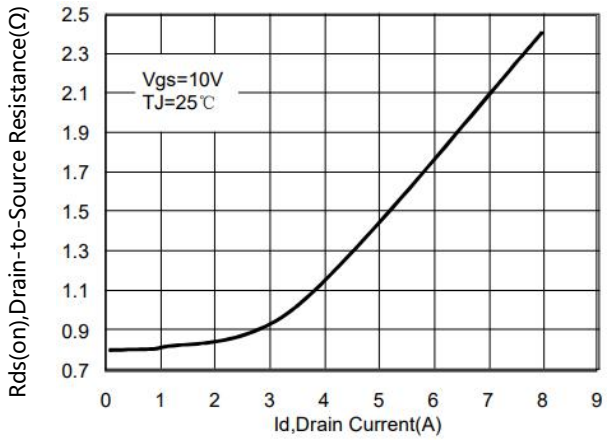


Figure3. On-Resistance versus Drain Current

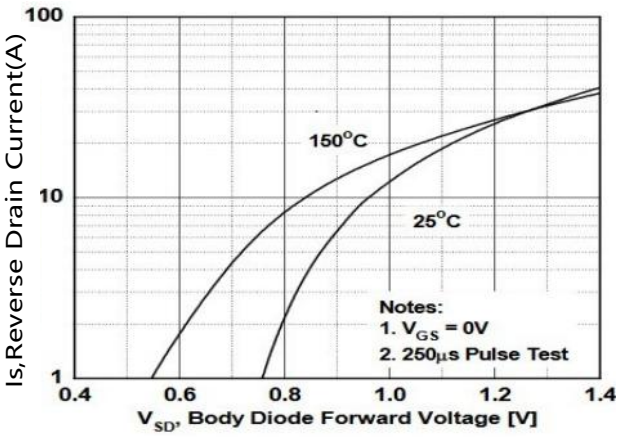


Figure4. Diode forward voltage versus Current

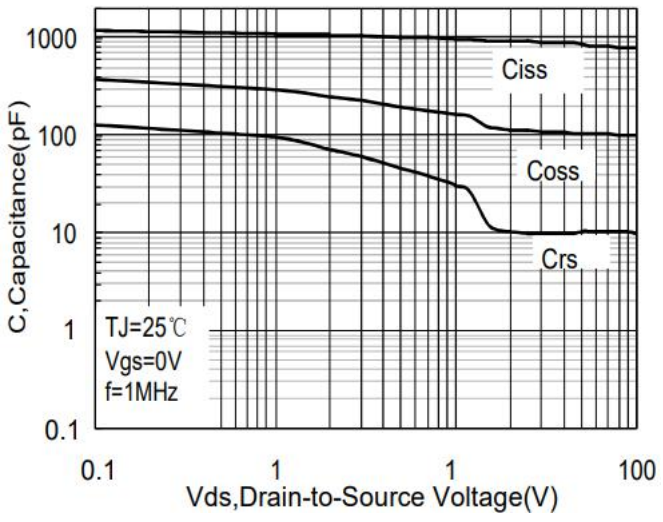


Figure5. Typical Capacitance versus V_{DS}

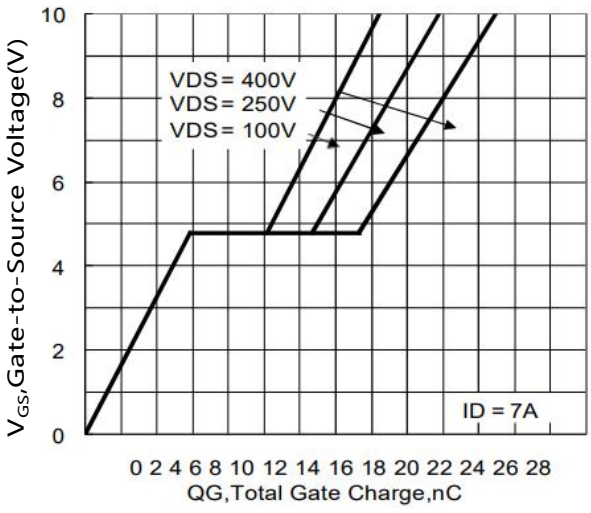


Figure6. Typical Gate Charge versus V_{GS}

TYPICAL CHARACTERISTICS(Cont.)

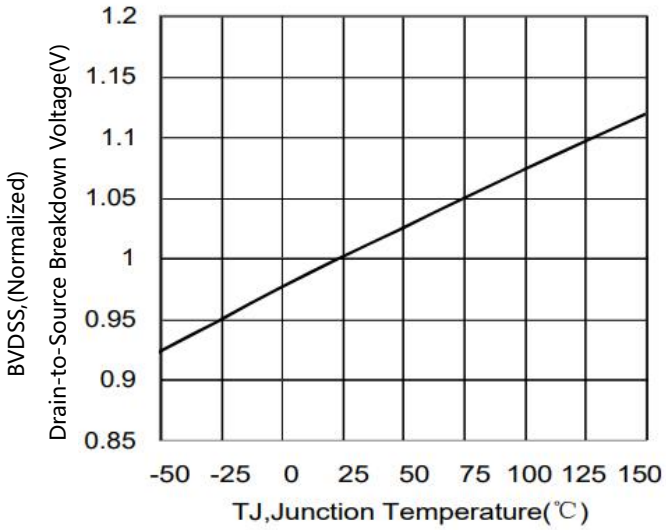


Figure7. BV_{DSS} Variation with Temperature

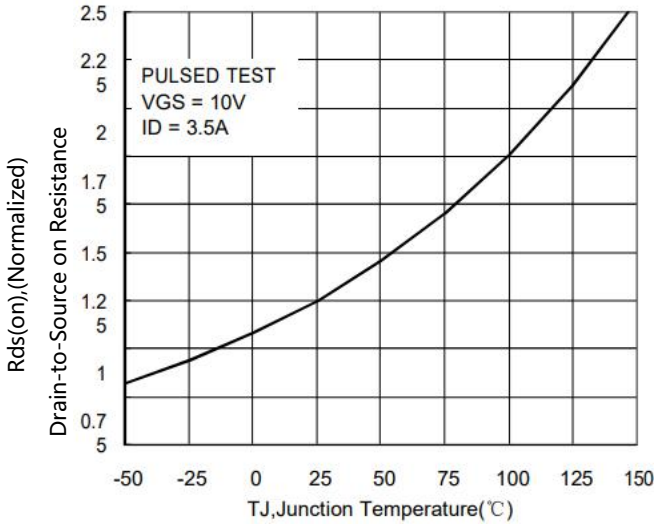


Figure8. On-Resistance Variation with Temperature

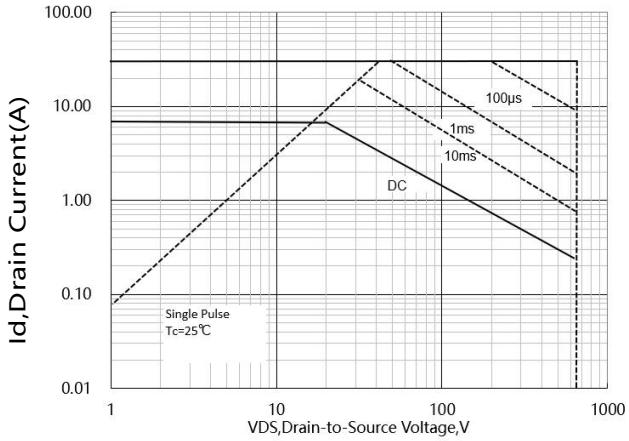


Figure9. Maximum Safe Operating Area

BXP7N65U/D/P

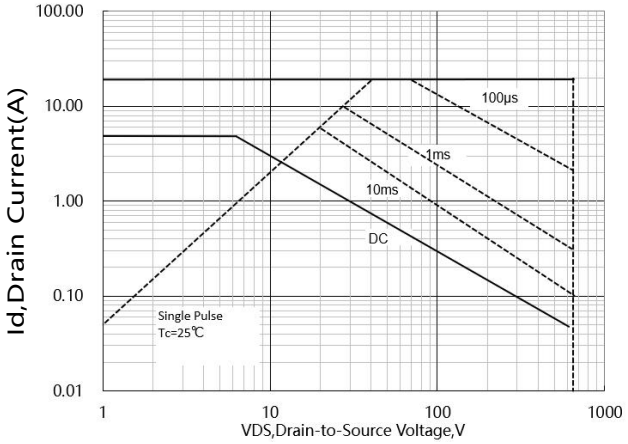


Figure9. Maximum Safe Operating Area

BXP7N65CF

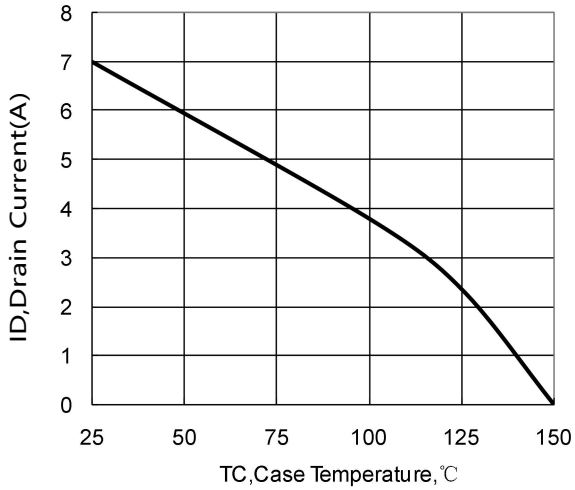
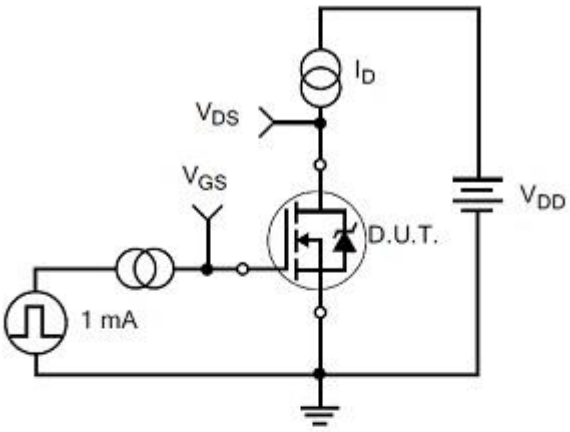
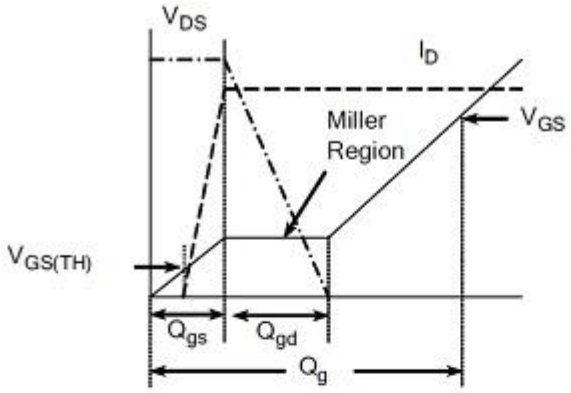


Figure10. Maximum Continuous Drain Current versus Case Temperature

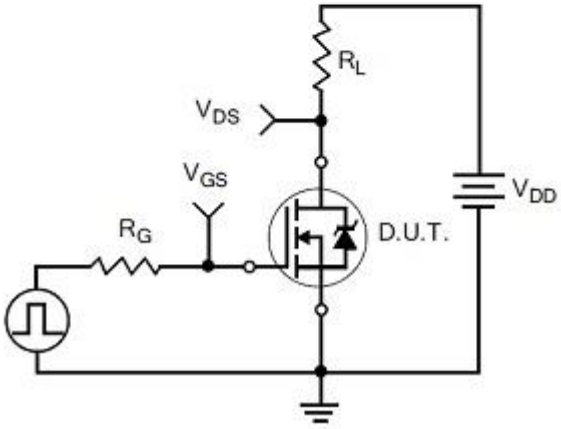
TEST CIRCUITS AND WAVEFORMS



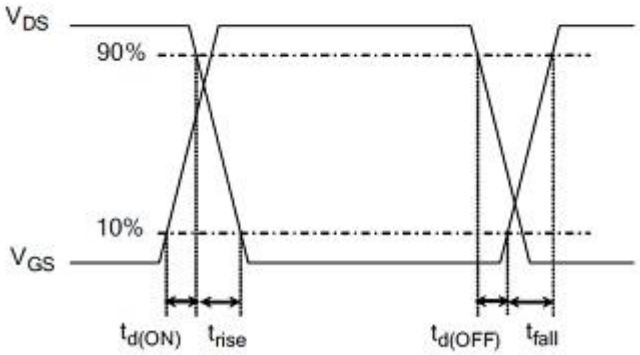
Gate Charge Test Circuit



Gate Charge Waveform

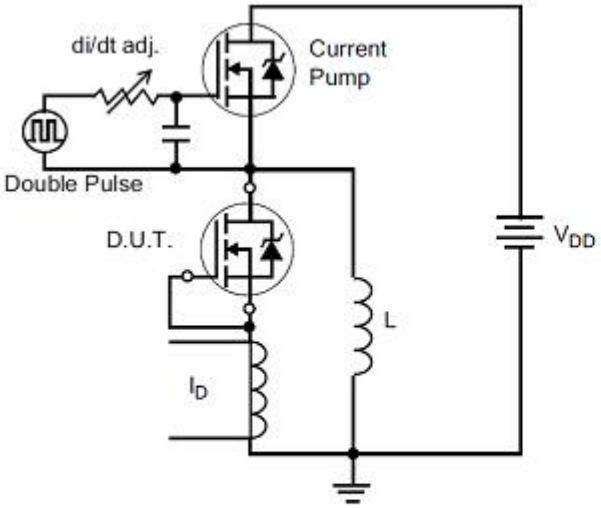


Resistive Switching Test Circuit

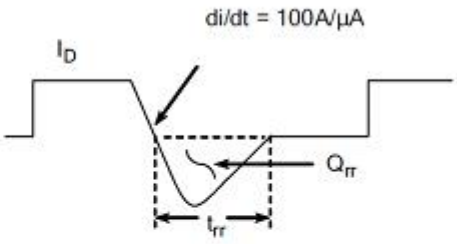


Resistive Switching Waveforms

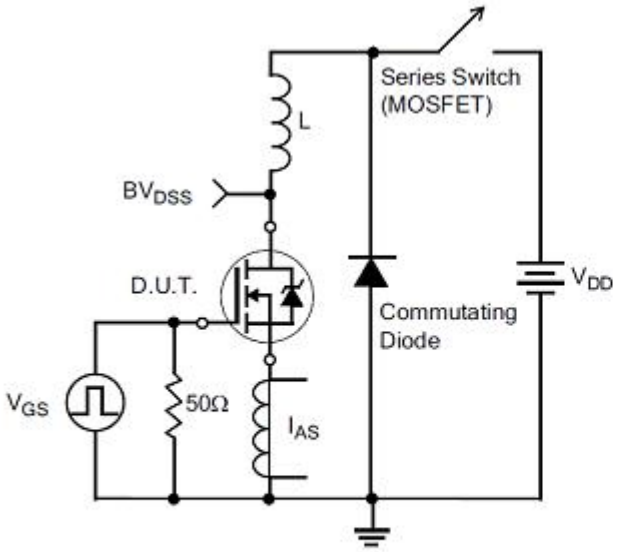
TEST CIRCUITS AND WAVEFORMS(Cont.)



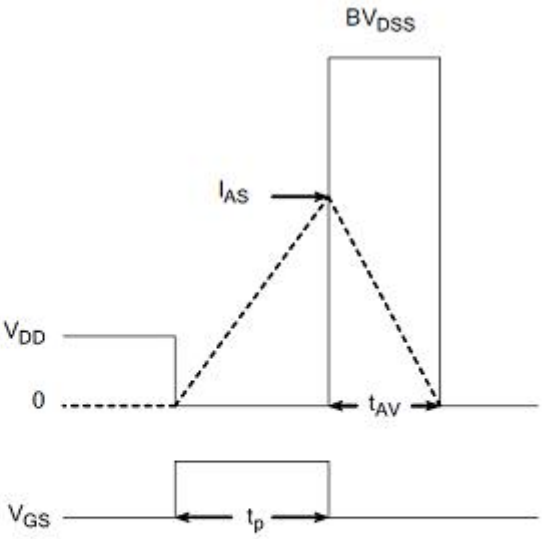
Diode Reverse Recovery Test Circuit



Diode Reverse Recovery Waveform



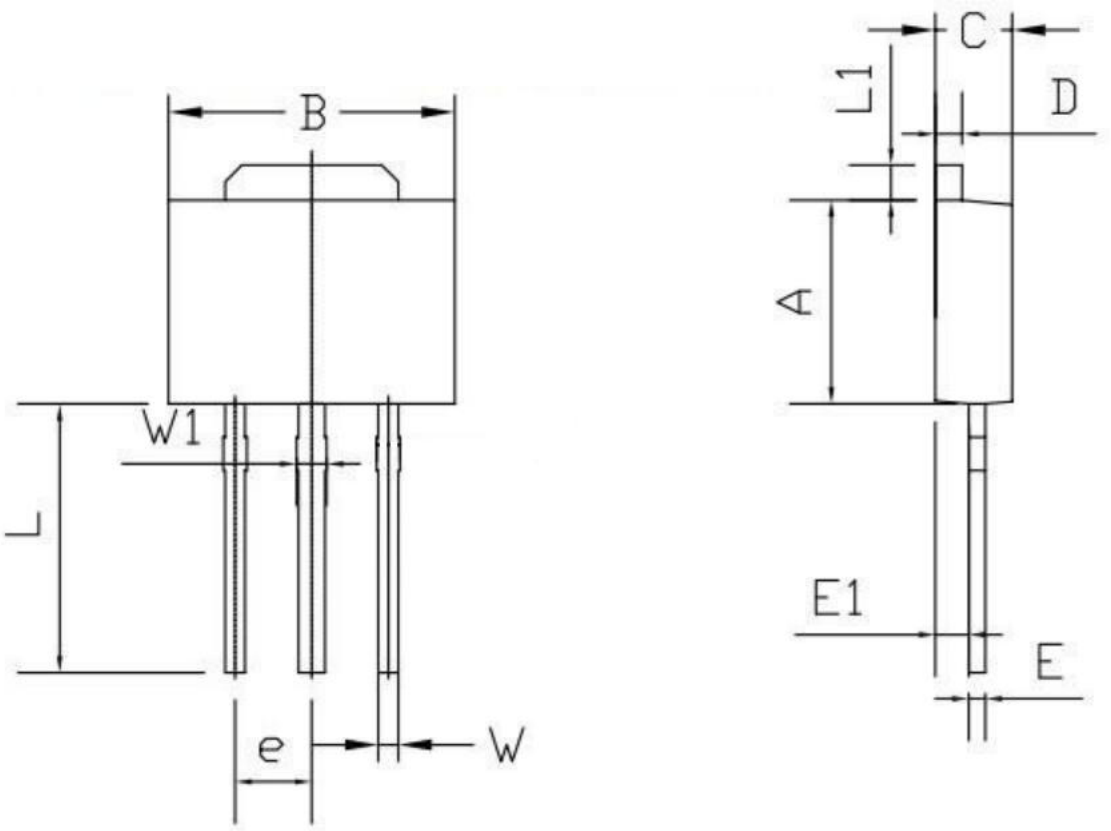
Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

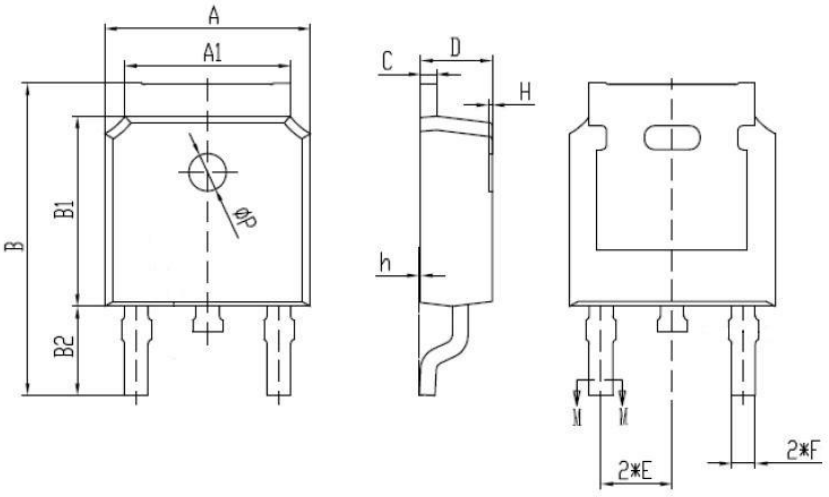
Unclamped Inductive Switching Waveforms

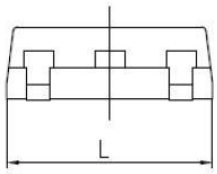
TO-251 Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	6.00	6.20	0.235	0.245
B	6.45	6.70	0.253	0.264
C	2.05	2.55	0.080	0.101
D	0.70	0.90	0.027	0.036
E	0.49	0.53	0.019	0.021
E1	0.97	1.20	0.038	0.048
e	2.28	2.31	0.089	0.091
L	9.11	9.55	0.358	0.376
L1	0.92	1.55	0.036	0.062
W	0.65	0.95	0.025	0.038
W1	0.75	1.35	0.029	0.054

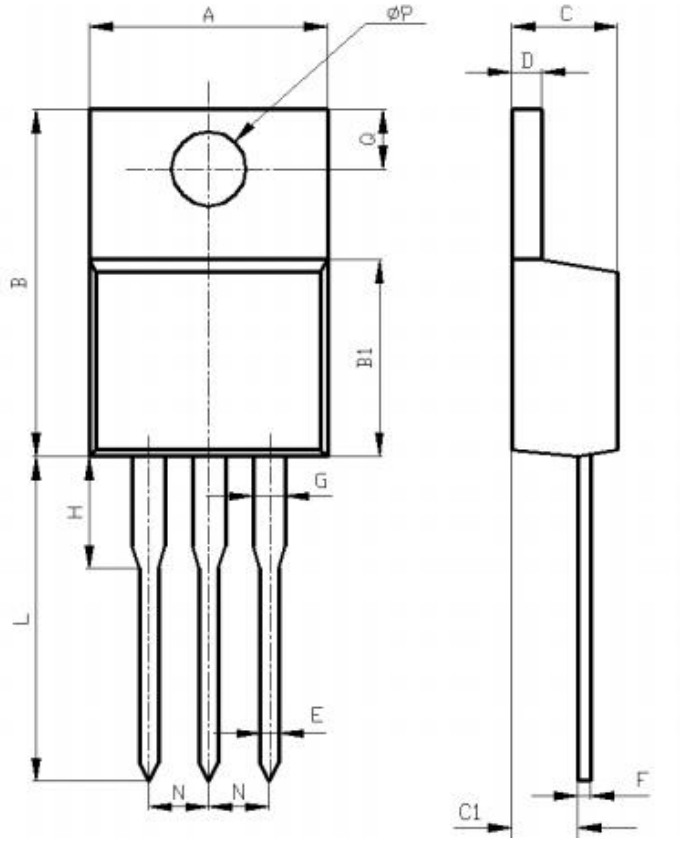
TO-252 Package





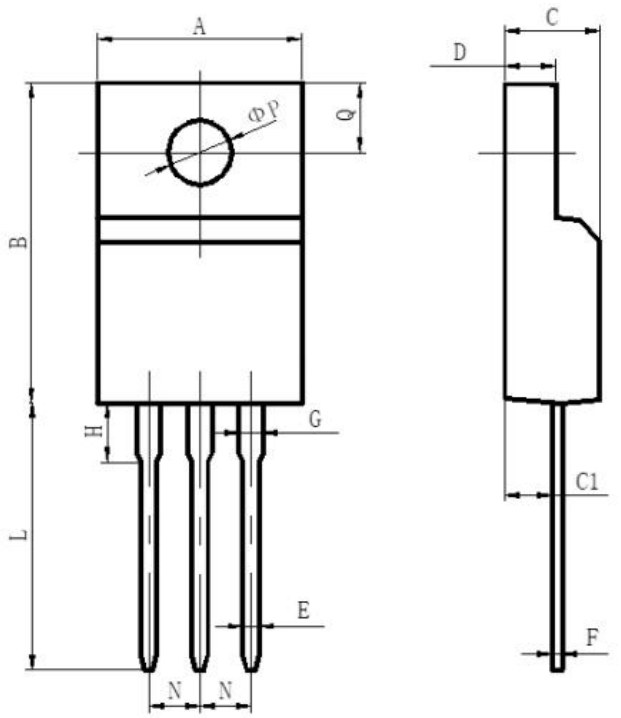
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	6.50	6.70	0.255	0.264
A1	5.25	5.38	0.206	0.212
B	9.80	10.40	0.385	0.410
B1	6.00	6.20	0.236	0.245
B2	2.70	3.10	0.106	0.123
C	0.49	0.52	0.019	0.021
D	2.20	2.40	0.086	0.095
E	2.18	2.39	0.085	0.095
F	0.74	0.80	0.029	0.032
H	0.00	0.30	0.000	0.012
h	0.00	0.13	0.000	0.006
L	6.50	6.70	0.255	0.264
ΦP	1.10	1.30	0.043	0.052

TO-220 Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	9.8	10.2	0.385	0.402
B	15.4	15.8	0.606	0.623
B1	9.00	9.20	0.354	0.363
C	4.56	4.58	0.179	0.181
C1	2.35	2.45	0.092	0.097
D	1.29	1.31	0.050	0.052
E	0.77	0.83	0.030	0.033
F	0.49	0.51	0.019	0.021
G	1.25	1.29	0.049	0.051
H	2.90	3.30	0.114	0.130
L	13.35	13.65	0.525	0.538
N	2.44	2.64	0.096	0.104
Q	2.70	2.90	0.106	0.115
φP	3.59	3.69	0.141	0.146

TO-220F Package



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	9.90	10.30	0.389	0.406
B	15.77	16.20	0.620	0.638
C	4.55	4.95	0.179	0.195
C1	2.10	2.88	0.082	0.114
D	2.40	2.80	0.094	0.111
E	0.60	1.00	0.023	0.040
F	0.42	0.58	0.016	0.023
G	1.10	1.50	0.043	0.060
H	2.90	3.50	0.114	0.138
L	12.50	13.65	0.492	0.538
N	2.30	2.70	0.090	0.107
Q	3.00	3.40	0.118	0.134
φP	3.00	3.52	0.118	0.139

Revision history

Document revision history

Date	Revision	Changes
18-Oct-2020	1.0	First release
9-Sep-2021	2.0	Update text formatting and other
25-Nov-2021	2.1	Add POD
19-Dec-2021	2.2	Update layout format
6-Jan-2022	2.3	Update parameter

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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