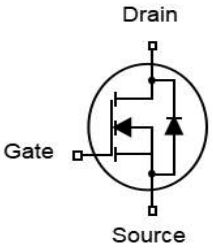
Features

- N-Channel
- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- Easy to use/drive
- RoHS compliant
- 100% EAS Tested

V_{DS}	650	V
$R_{DS(on),TYP}$@ V_{GS}=10 V	110	mΩ
I_D	30	A

TO-220F



Part ID	Package Type	Marking	Packing
ZT65R128FF	TO-220F	ZT65R128FF	1000pcs/Tape

Absolute Maximum Ratings T_A =25°C, unless otherwise specified

Symbol	Parameter		Rating	Unit
Common Ratings (T_C=25°C Unless Otherwise Noted)				
V_{GS}	Gate-Source Voltage		±30	V
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage		650	V
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
I_{DM}	Drain Current-Continuous@ Current-Pulsed (Note 2)	T_C =25°C	90	A
Mounted on Large Heat Sink				
I_D	Drain Current-Continuous (Note 1)	T_C =25°C	30	A
		T_C =100°C	18	A
P_D	Maximum Power Dissipation		34	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case		3.65	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient		80	°C/W
Drain-Source Avalanche Ratings				
EAS	Avalanche Energy, Single Pulsed		636	mJ
EAR	Repetitive Avalanche Energy		0.96	mJ
dv/dt	Reverse Diode dv/dt (Note 3)		50	V/ns

Electrical Characteristics (T_J=25℃ unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ T_j=25°C (unless otherwise stated)						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	650	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V,V_{GS}=0V, T_J = 25ºC	--	--	3	μA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V,V_{GS}=0V, T_J = 150ºC	--	--	3000	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±30V,V_{DS}=0V	--	--	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	3.0	4.0	5.0	V
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=10V, I_D=15A	--	110	128	mΩ
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
Ciss	Input Capacitance	V_{DS}=100V,V_{GS}=0V, f=1MHz	--	2536	--	pF
Coss	OutputCapacitance		--	92	--	pF
Crss	ReverseTransferCapacitance		--	2.5	--	pF
Rg	Gate Resistance	f=1MHz	--	4	--	Ω
Qg	Total Gate Charge	V_{DD}=520V,I_D=30A, V_{GS}=10V	--	57	--	nC
Qgs	Gate-SourceCharge		--	17	--	nC
Qgd	Gate-DrainCharge		--	23	--	nC
$V_{Plateau}$	Gate Plateau Voltage		--	6.5	--	V
Switching Characteristics (Note 2)						
Td(on)	Turn-on Delay Time	V_{DD}=400V, I_D =30A, R_G=15Ω, V_{GS}=10V	--	15	--	ns
Tr	Turn-on Rise Time		--	10	--	ns
Td(off)	Turn-Off Delay Time		--	60	--	ns
Tf	Turn-Off Fall Time		--	10	--	ns
Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)						
V_{SD}	Forward on voltage	I_S=15A,V_{GS}=0V	--	1.0	1.5	V
Trr	Reverse Recovery Time	T_j=25℃,I_F =15A, V_R =400V di/dt=100A/μs	--	170	--	ns
Qrr	Reverse Recovery Charge		--	1.1	--	uC
Irrm	Peak Reverse Recovery Current		--	13	--	A

Notes:

1. Limited by maximum junction temperature.
2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3. Identical low side and high side switch with identical R_G.

Typical Characteristics T_J = 25ºC, unless otherwise noted

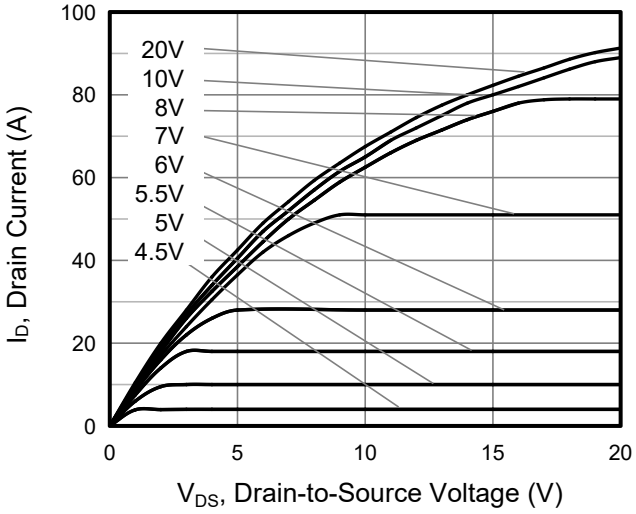


Figure 1. Output Characteristics

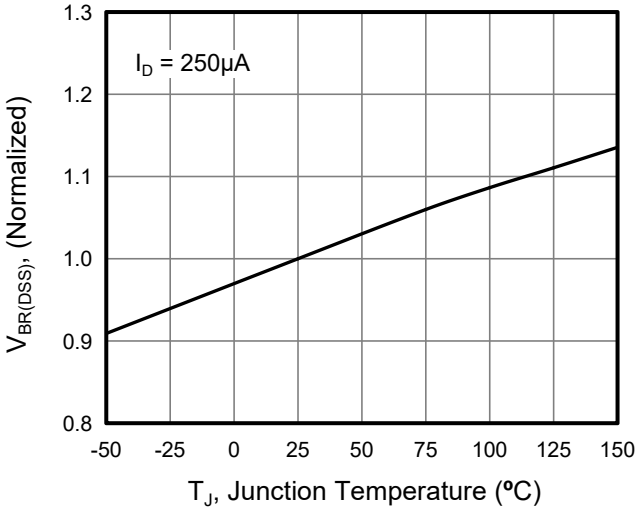


Figure 4. Breakdown Voltage vs. Junction Temperature

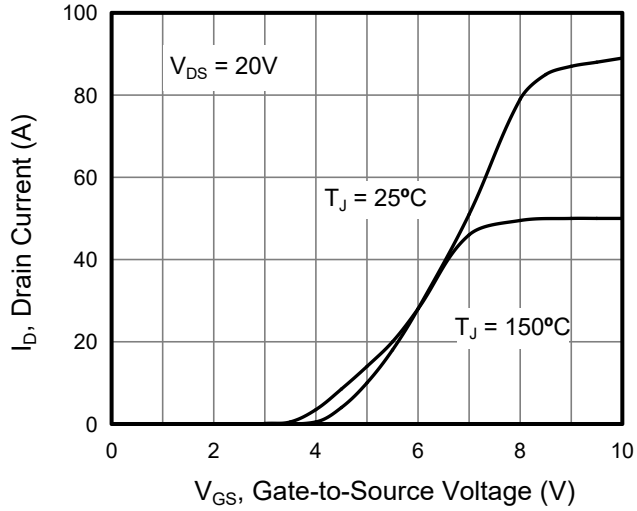


Figure 2. Transfer Characteristics

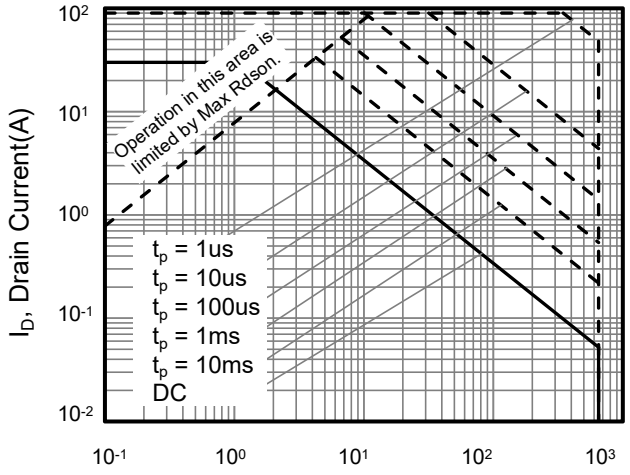


Figure 5. Safe Operation Area

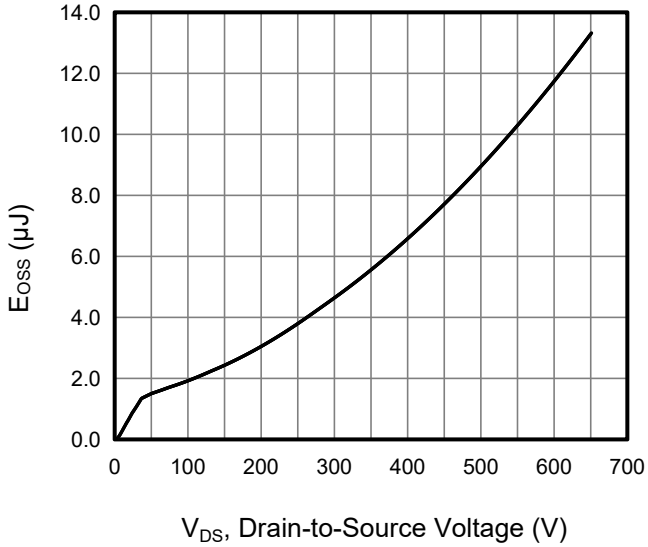


Figure 3 . Typ. Coss Stored Energy

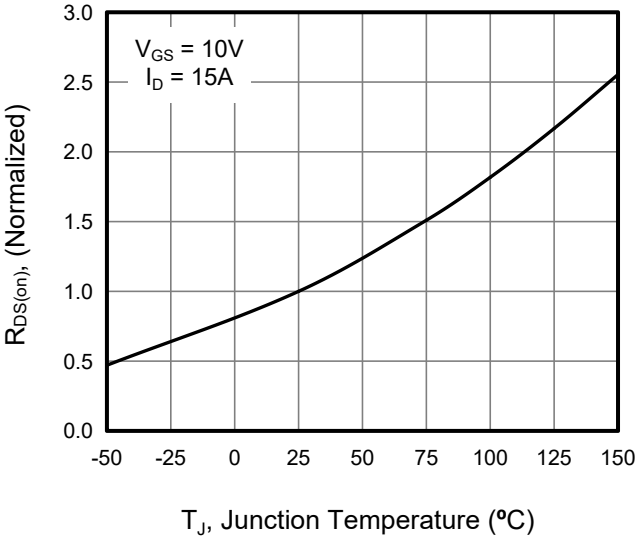


Figure 6 . On-Resistance vs. Temperature

Typical Characteristics T_J = 25ºC, unless otherwise noted

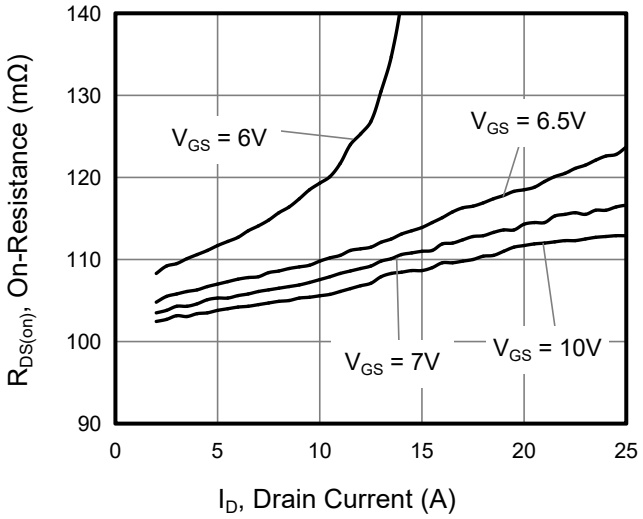


Figure 7. On-Resistance vs. Drain Current

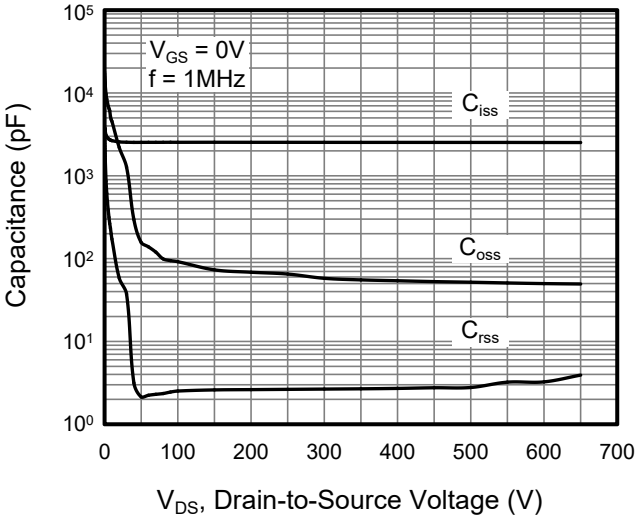


Figure 9. Capacitance

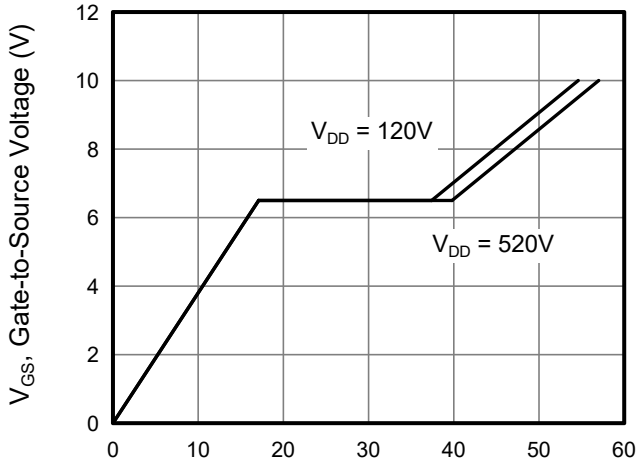


Figure 8. Gate Charge

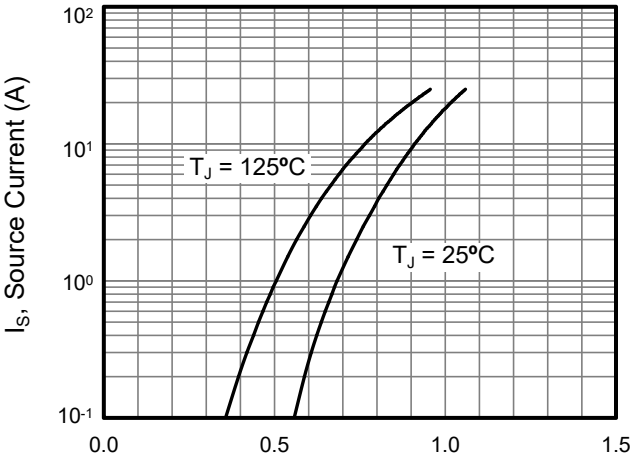


Figure 10. Body Diode Forward Voltage

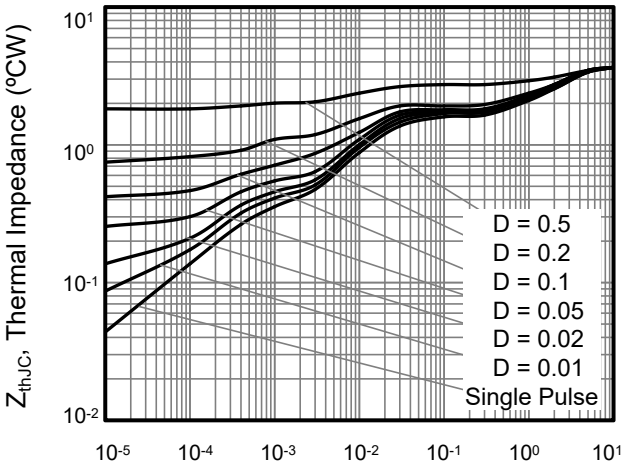


Figure 11. Transient Thermal Impedance

Figure A：Gate Charge Test Circuit and Waveform

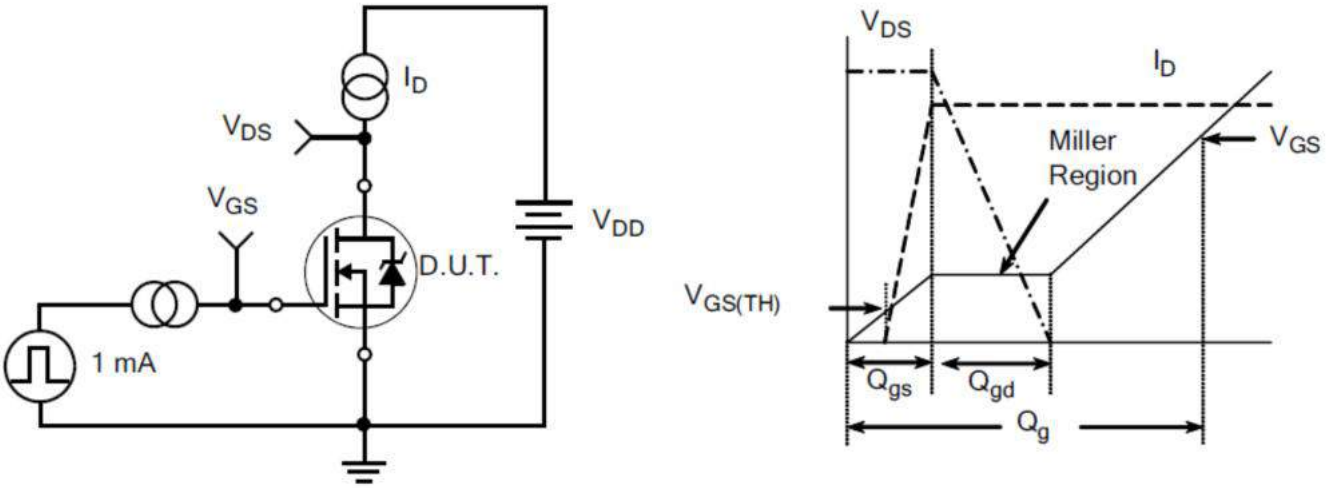


Figure B：Resistive Switching Test Circuit and Waveform

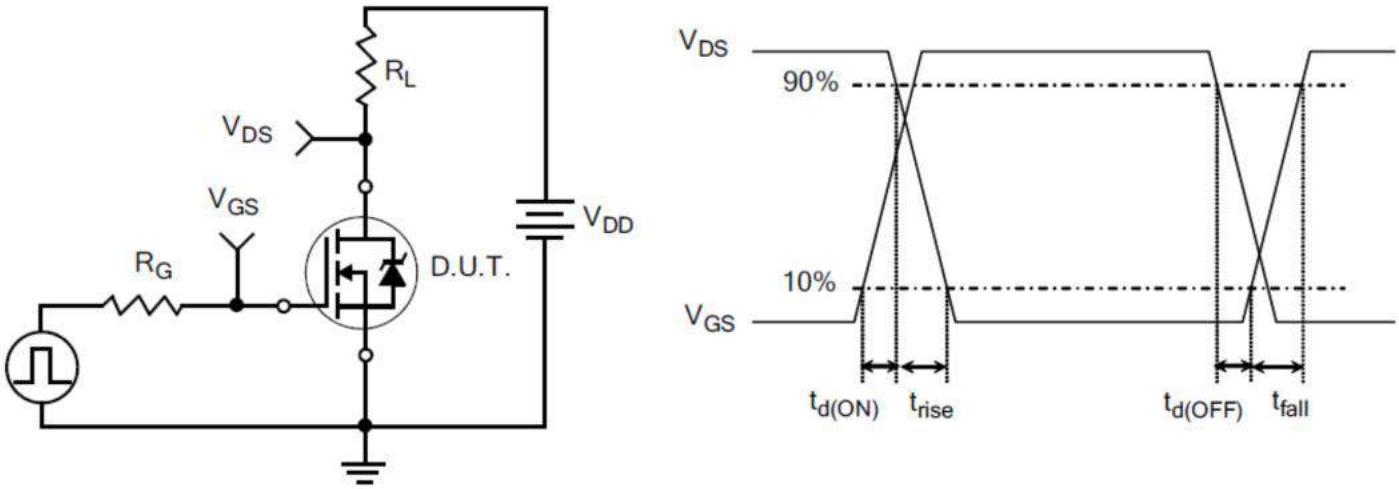
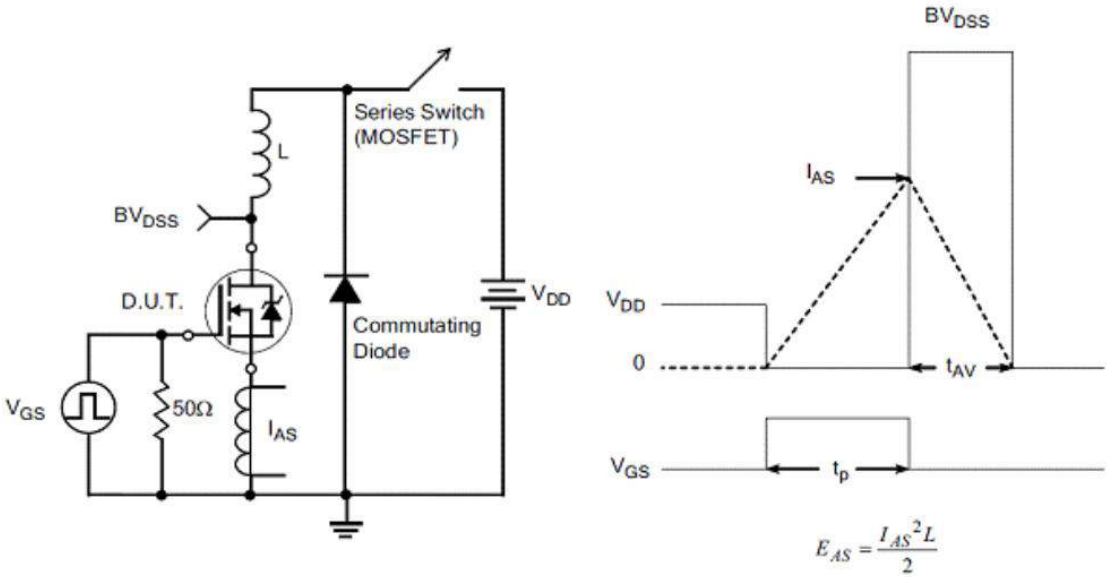
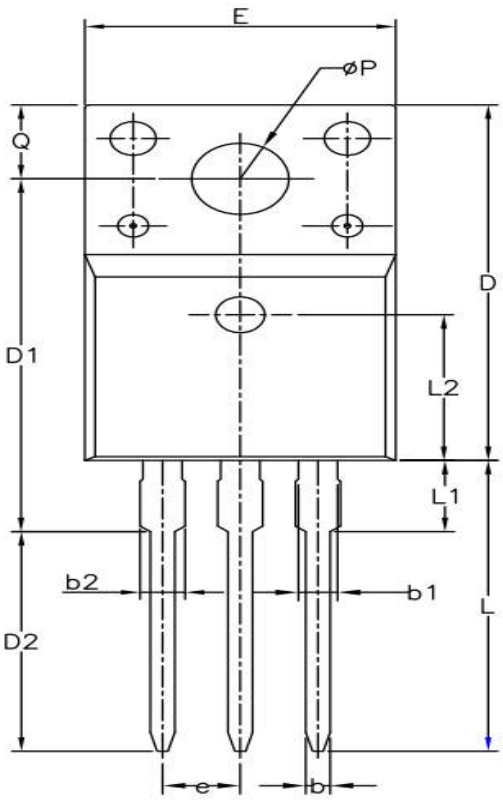


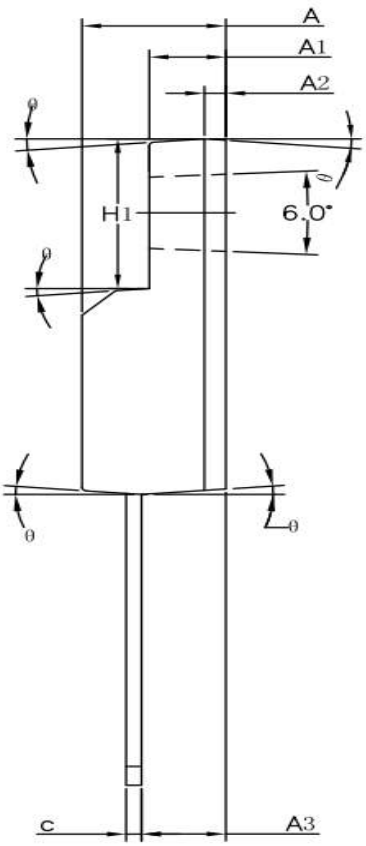
Figure C：Unclamped Inductive Switching Test Circuit and Waveform

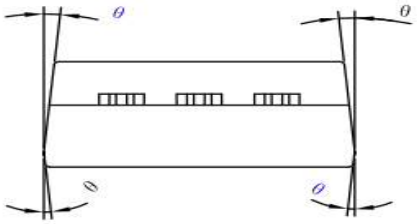


$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

TO-220-3L Package Information







SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2		0.70 REF	
A3	2.56	2.76	2.93
b	0.70	—	0.90
b1	1.18	—	1.38
b2	—	—	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.0
E	9.96	10.16	10.36
e		2.54BSC	
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	—	—	3.50
L2		6.50REF	
øP	3.08	3.18	3.28
Q	3.20	—	3.40
θ 1	1°	3°	5°

Customer Service

Sales and Service:

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