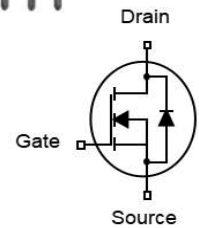


## Features

- N-Channel
- Lead free product is acquired
- High Power and current handing capability
- 100% EAS Tested

$V_{DS}$	40	V
$R_{DS(on),TYP@ V_{GS}=10V}$	2.5	m $\Omega$
$R_{DS(on),TYP@ V_{GS}=4.5V}$	3.5	m $\Omega$
$I_D$	140	A

**TO-220**


Part ID	Package Type	Marking	Packing
ZT025N04	TO-220	ZT025N04	1000pcs/Tape

## Absolute Maximum Ratings $T_A=25^{\circ}\text{C}$ , unless otherwise specified

Symbol	Parameter	Rating	Unit	
<b>Common Ratings (<math>T_c=25^{\circ}\text{C}</math> Unless Otherwise Noted)</b>				
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	40	V	
$T_J$	Maximum Junction Temperature	175	$^{\circ}\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 175	$^{\circ}\text{C}$	
$I_{DM}$	Drain Current-Continuous@ Current-Pulsed (Note 1)	$T_c=25^{\circ}\text{C}$ 560	A	
<b>Mounted on Large Heat Sink</b>				
$I_D$	Drain Current-Continuous	$T_c=25^{\circ}\text{C}$	140	A
		$T_c=100^{\circ}\text{C}$	95	A
$P_D$	Maximum Power Dissipation	$T_c=25^{\circ}\text{C}$	114	W
		$T_c=100^{\circ}\text{C}$	56	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case	1.3	$^{\circ}\text{C/W}$	
<b>Drain-Source Avalanche Ratings</b>				
EAS	Avalanche Energy, Single Pulsed (Note 2)	576	mJ	

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Electrical Characteristics @ T<sub>J</sub>=25°C (unless otherwise stated)</b>						
V(BR)DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	--	--	1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.7	2.5	V
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	--	2.5	3.0	mΩ
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	--	3.5	4.5	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A	--	38	--	S
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	--	6455	--	pF
C <sub>oss</sub>	Output Capacitance		--	453	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	275	--	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	--	0.67	--	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V	--	110	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	16.1	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	26.9	--	nC
<b>Switching Characteristics</b>						
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =20V, R <sub>L</sub> =1Ω, R <sub>G</sub> =3Ω, V <sub>GS</sub> =10V	--	18	--	ns
T <sub>r</sub>	Turn-on Rise Time		--	4.3	--	ns
T <sub>d(off)</sub>	Turn-Off Delay Time		--	66	--	ns
T <sub>f</sub>	Turn-Off Fall Time		--	9.4	--	ns
<b>Source- Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
I <sub>SD</sub>	Source-Drain Current (Body Diode)		--	--	140	A
V <sub>SD</sub>	Forward on voltage <sup>(Note 3)</sup>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V	--	--	1.2	V
T <sub>rr</sub>	Reverse Recovery Time	T <sub>J</sub> =25°C, I <sub>F</sub> =20A, V <sub>GS</sub> =0V	--	6	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=500A/μs	--	14	--	nC

Notes :

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2.E<sub>AS</sub> condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=40V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH.
- 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

## Typical Electrical And Thermal Characteristics (Curves)

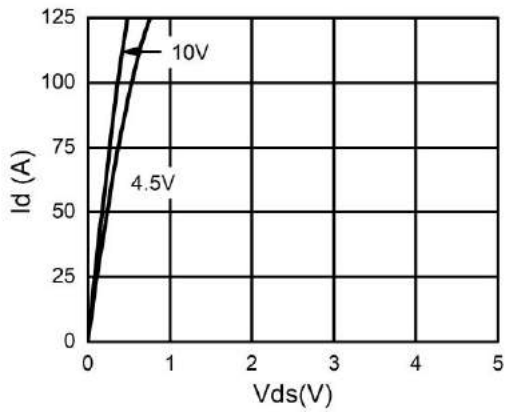


Figure 1. Output Characteristics

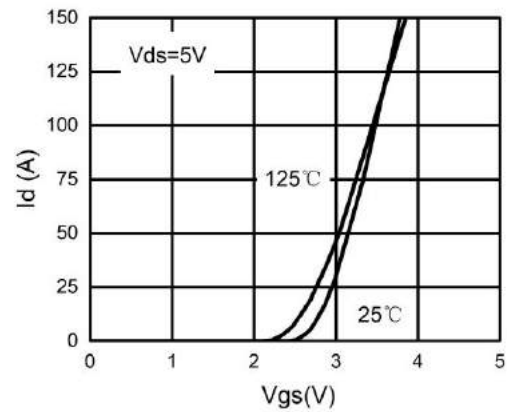


Figure 4. Transfer Characteristics

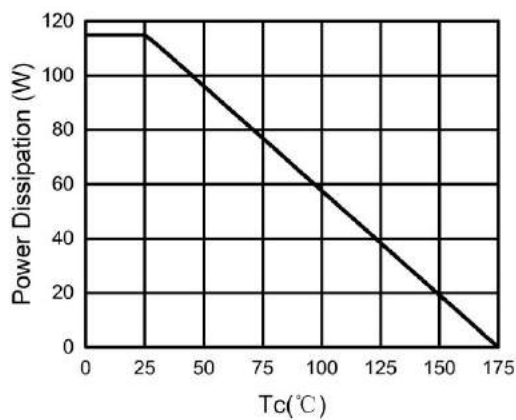


Figure 2. Power Dissipation

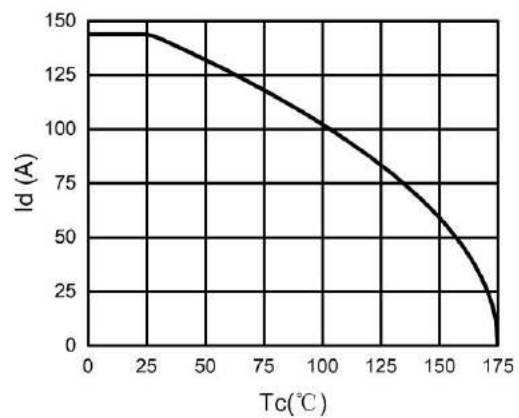


Figure 5. Drain Current

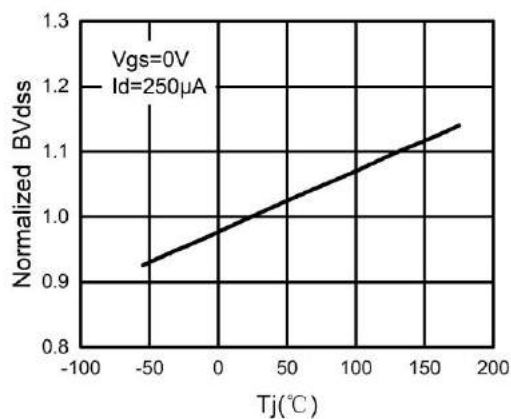


Figure 3.  $BV_{DSS}$  vs Junction Temperature

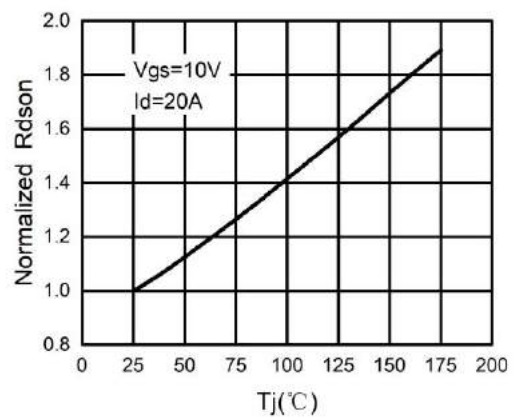


Figure 6.  $R_{DS(ON)}$  vs Junction Temperature

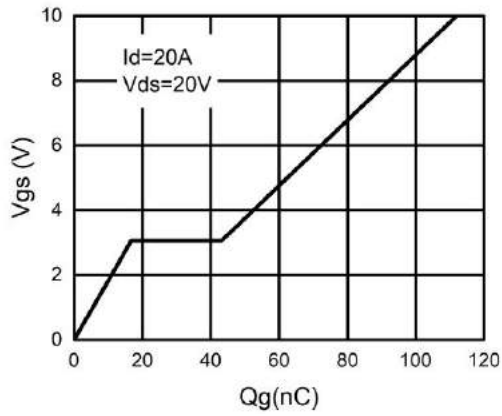


Figure 7. Gate Charge Waveforms

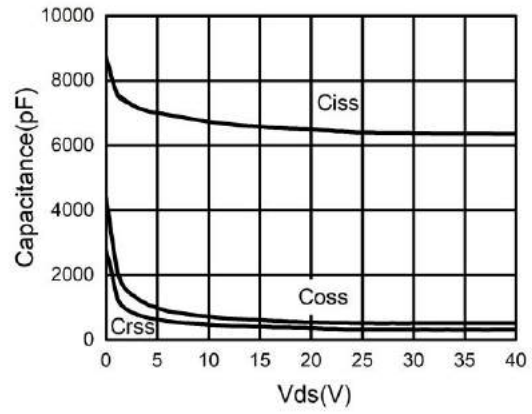


Figure 9. Capacitance

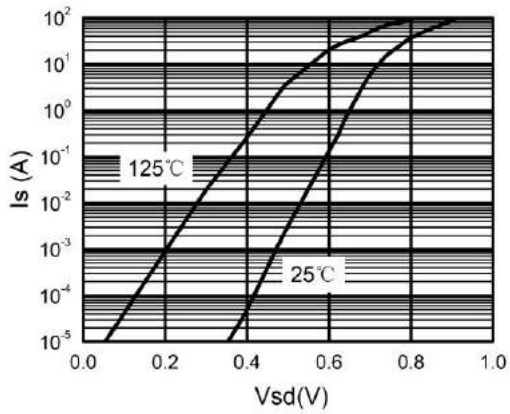


Figure 8. Body-Diode Characteristics

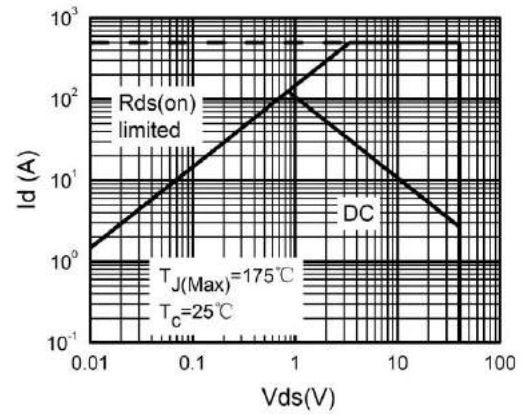
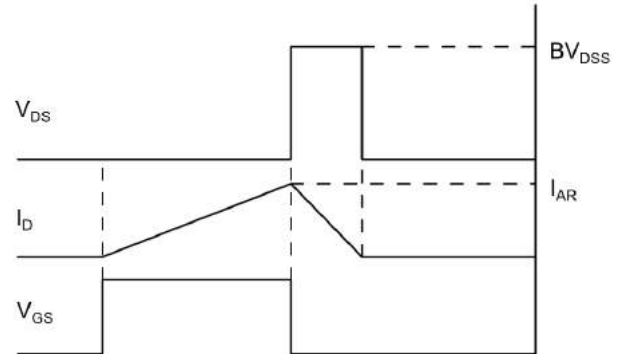
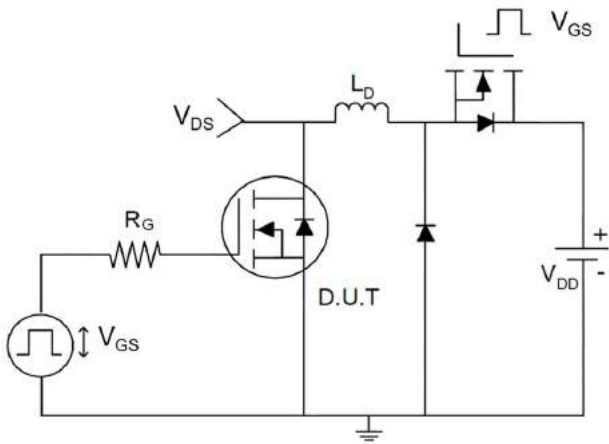


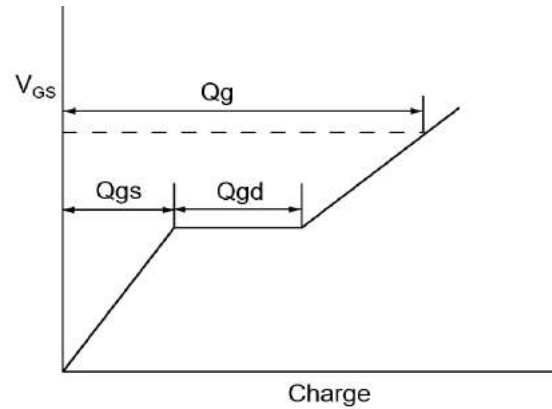
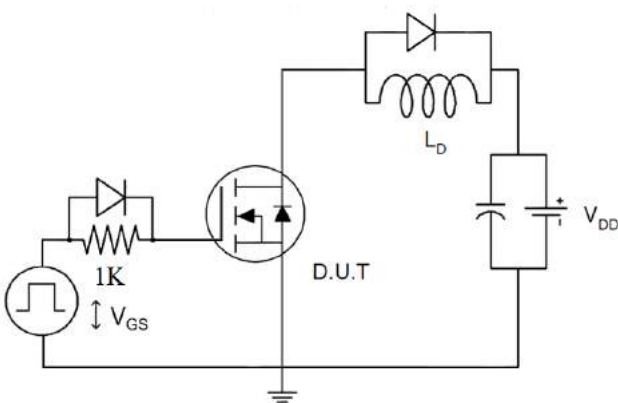
Figure 10. Maximum Safe Operating Area

## Test Circuit

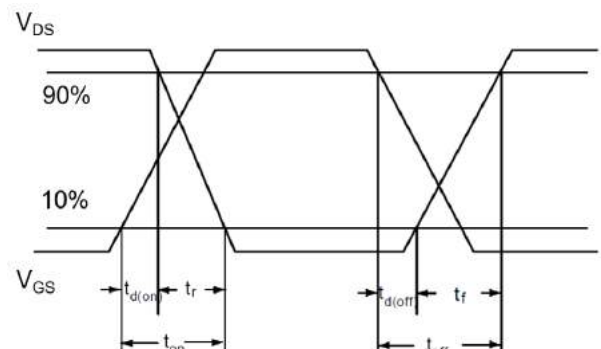
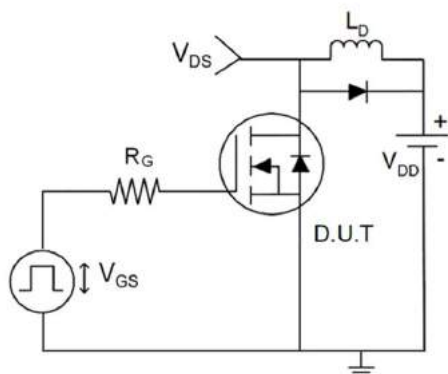
### 1) $E_{AS}$ Test Circuits



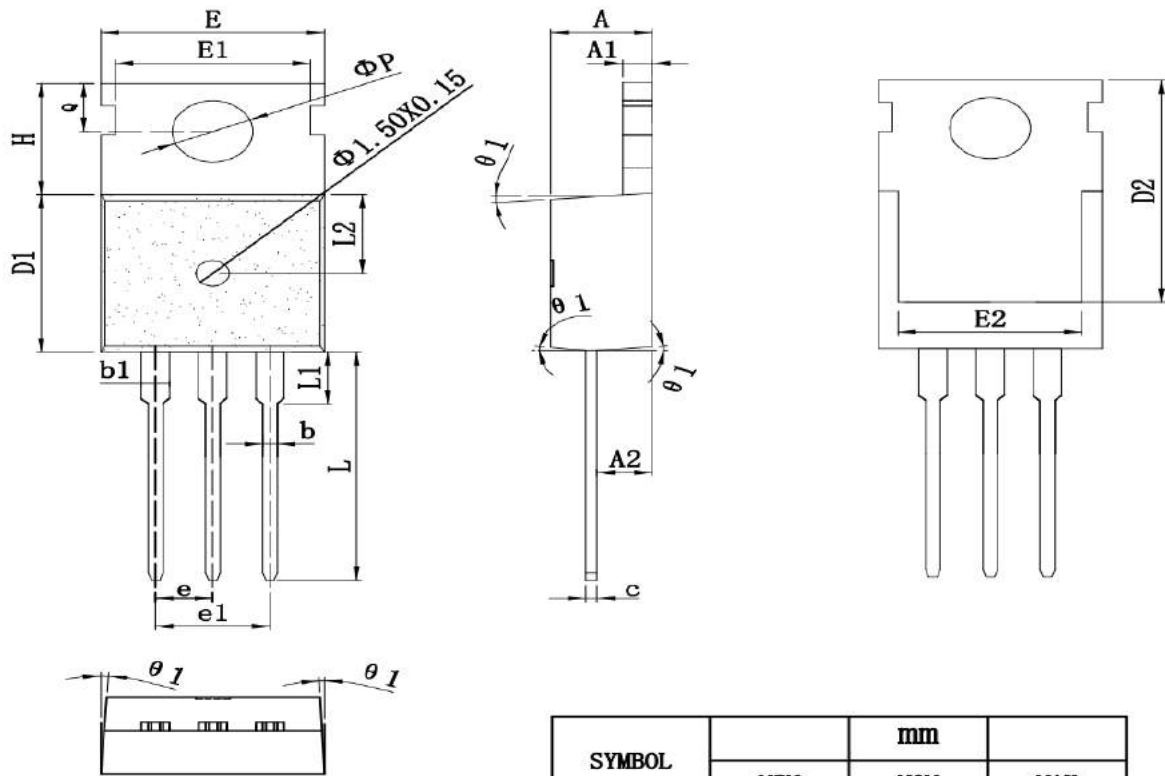
### 2) Gate Charge Test Circuit



### 3) Switch Time Test Circuit



TO-220-3L Package Information



SYMBOL	mm			
	MIN	NOM	MAX	
*A	4.40	4.50	4.60	
*A1	1.25	1.30	1.35	
*A2	2.30	2.40	2.50	
*b	0.75	0.80	0.85	
*b1	1.25	1.33	1.42	
*c	0.45	0.50	0.55	
*D1	9.10	9.20	9.30	
D2	12.90	13.10	13.30	
*E	9.80	10.02	10.15	
*E1	8.55	8.70	8.85	
E2	220FB框架	7.80	8.00	8.20
	220FC框架	7.40	7.60	7.80
*e	2.50	2.54	2.58	
e1	5.08REF			
H	6.40	6.50	6.60	
*L	13.00	13.28	13.45	
*L1	—	—	3.40	
L2	4.55	4.65	4.75	
* $\Phi P$	3.60	3.65	3.75	
*Q	2.70	2.80	2.90	
$\theta 1$	2°	—	7°	

Customer Service

Sales and Service:

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