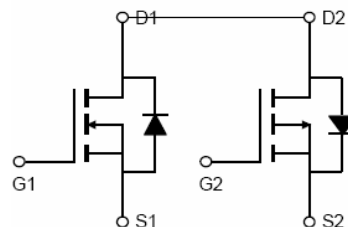
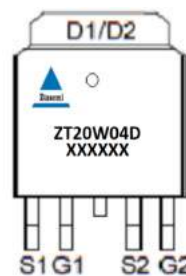


Features

- N and P-Channel
- Trench Technology Power MOSFET
- Low Gate Charge and $R_{DS(ON)}$
- Low Gate Resistance
- 100% EAS Tested

V_{DS}	40	V
$R_{DS(on),TYP@ V_{GS}=10V}$	12	$m\Omega$
$R_{DS(on),TYP@ V_{GS}=4.5V}$	19	$m\Omega$
I_D	28	A

TO-252-4L



Part ID	Package Type	Marking	Packing
ZT20W04D	TO-252-4L	ZT20W04D	2500pcs/Reel

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

Symbol	Parameter	N-Ch	P-Ch	Unit	
Common Ratings ($T_C = 25^\circ\text{C}$ Unless Otherwise Noted)					
V_{GS}	Gate-Source Voltage	± 20	± 20	V	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	40	-40	V	
T_J	Maximum Junction Temperature	150	150	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ\text{C}$	
I_{DM}	Drain Current-Continuous@ Current-Pulsed (Note 2)	$T_C = 25^\circ\text{C}$	112	-112	A
Mounted on Large Heat Sink					
I_D	Drain Current-Continuous (Note 2)	$T_C = 25^\circ\text{C}$	28	-28	A
		$T_C = 100^\circ\text{C}$	20	-20	A
P_D	Maximum Power Dissipation (Note 4)	24	31	W	
$R_{\theta JC}$	Thermal Resistance-Junction to Case (Note 1)	5.1	5	$^\circ\text{C/W}$	
$R_{\theta JA}$	Thermal Resistance Junction-Ambient (Note 1)	61	61	$^\circ\text{C/W}$	
Drain-Source Avalanche Ratings					
EAS	Avalanche Energy, Single Pulsed (Note 3)	65	70	mJ	

Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted) N channel

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ $T_J=25^{\circ}\text{C}$ (unless otherwise stated)						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=32V, V_{GS}=0V$	--	--	1	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.2	V
$R_{DS(on)}$	Drain-Source On-State Resistance ^(Note 2)	$V_{GS}=10V, I_D=10A$	--	12	19	$m\Omega$
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=4.5V, I_D=5A$	--	19	26	$m\Omega$
Dynamic Electrical Characteristics @ $T_J = 25^{\circ}\text{C}$ (unless otherwise stated)						
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1\text{MHz}$	--	1108	--	pF
C_{oss}	Output Capacitance		--	105	--	pF
C_{rss}	Reverse Transfer Capacitance		--	89	--	pF
R_g	Gate Resistance	$f=1\text{MHz}$	--	3.3	--	Ω
Q_g	Total Gate Charge	$V_{DS}=32V, I_D=15A,$ $V_{GS}=4.5V$	--	16	--	nC
Q_{gs}	Gate-Source Charge		--	2.6	--	nC
Q_{gd}	Gate-Drain Charge		--	4.7	--	nC
Switching Characteristics						
$T_d(on)$	Turn-on Delay Time	$V_{DD}=20V,$ $I_D=15A,$ $R_G=3.3\Omega,$ $V_{GS}=10V$	--	2.6	--	ns
T_r	Turn-on Rise Time		--	13	--	ns
$T_d(off)$	Turn-Off Delay Time		--	19	--	ns
T_f	Turn-Off Fall Time		--	6.1	--	ns
Source- Drain Diode Characteristics @ $T_J = 25^{\circ}\text{C}$ (unless otherwise stated)						
I_{SD}	Source-Drain Current (Body Diode) ^(Note 1,5)	$V_G=V_D=0V$	--	--	28	A
V_{SD}	Forward on voltage ^(Note 2)	$I_S=1A, V_{GS}=0V$	--	--	1.2	V
T_{rr}	Reverse Recovery Time	$T_J=25^{\circ}\text{C}, I_F=15A,$	--	10	--	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100A/\mu s$	--	3.0	--	nC

Note :

- 1、 The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、 The EAS data shows Max. rating . The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=10A$
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

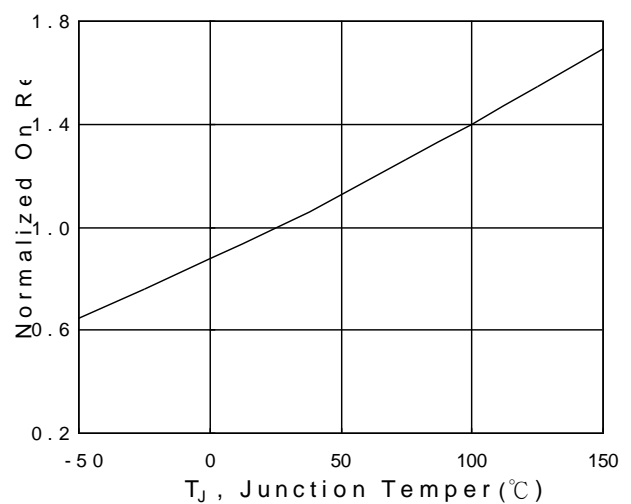
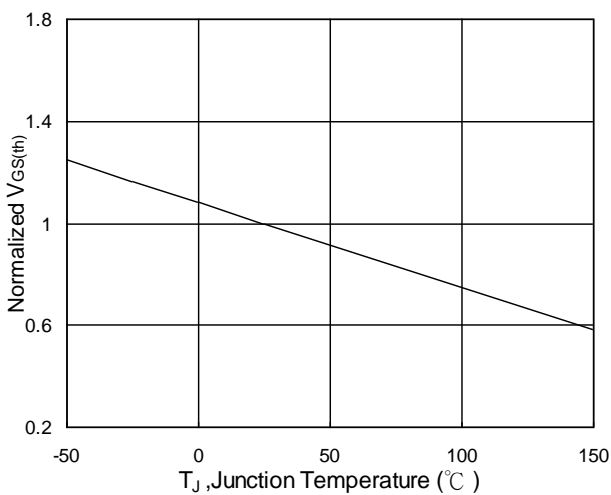
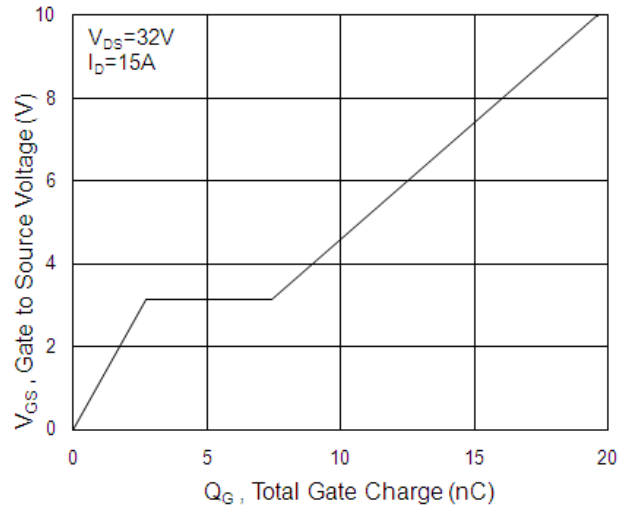
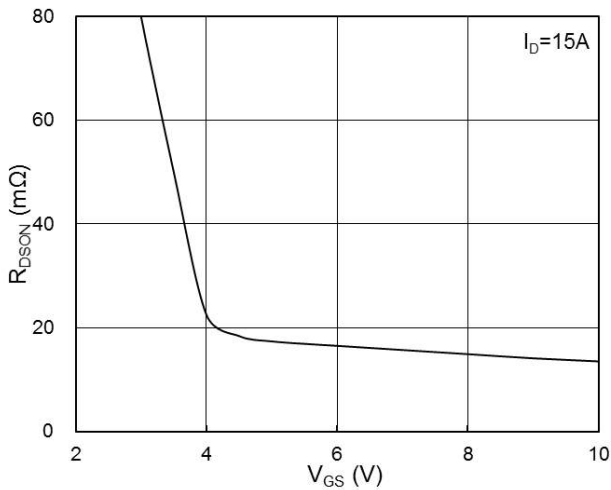
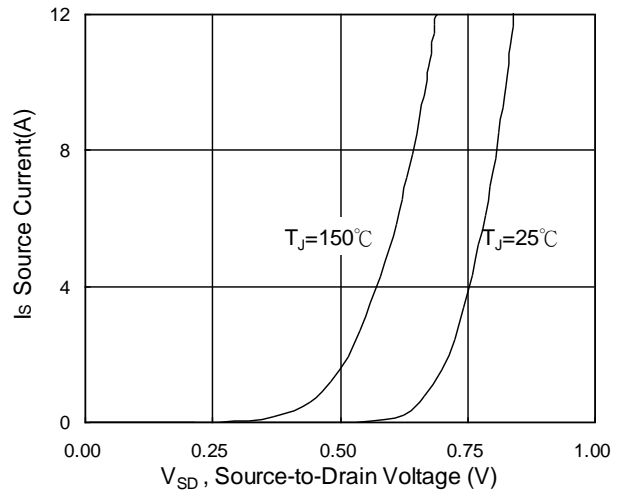
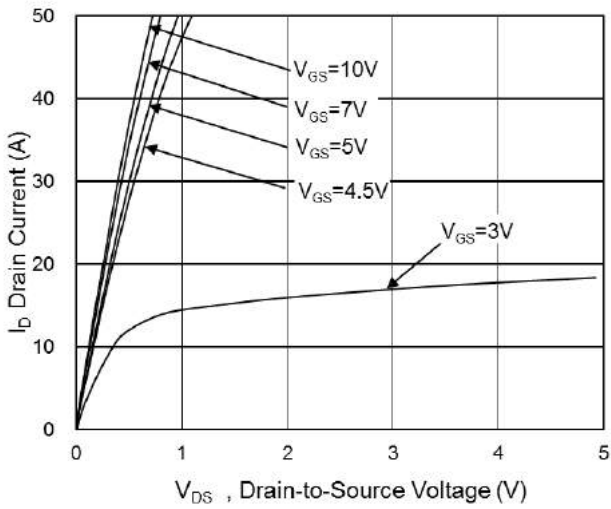
Electrical Characteristics (T_J=25°C unless otherwise noted) P channel

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	-40	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-32V, V _{GS} =0V	--	--	-1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V	--	--	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1.1	-1.6	-2.5	V
R _{DS(on)}	Drain-Source On-State Resistance	V _{GS} =-10V, I _D =-8A	--	26	35	mΩ
R _{DS(on)}	Drain-Source On-State Resistance	V _{GS} =-4.5V, I _D =-4A	--	33	48	mΩ
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	--	1117	--	pF
C _{oss}	Output Capacitance		--	121	--	pF
C _{rss}	Reverse Transfer Capacitance		--	79	--	pF
R _g	Gate Resistance	f=1MHz	--	6.8	--	Ω
Q _g	Total Gate Charge	V _{DS} =-20V, I _D =-12A, V _{GS} =-4.5V	--	9	--	nC
Q _{gs}	Gate-Source Charge		--	2.6	--	nC
Q _{gd}	Gate-Drain Charge		--	3.2	--	nC
Switching Characteristics						
T _{d(on)}	Turn-on Delay Time	V _{DD} =-15V, I _D =-1A, R _G =3.3Ω, V _{GS} =-10V	--	18	--	ns
T _r	Turn-on Rise Time		--	13	--	ns
T _{d(off)}	Turn-Off Delay Time		--	49	--	ns
T _f	Turn-Off Fall Time		--	4.5	--	ns
Source- Drain Diode Characteristics @ T_J = 25°C (unless otherwise stated)						
I _{SD}	Source-Drain Current (Body Diode)		--	--	-28	A
V _{SD}	Forward on voltage ^(Note 2)	I _S =-1A, V _{GS} =0V	--	--	-1.2	V
T _{rr}	Reverse Recovery Time	T _J =25°C, I _F =15A,	--	10	--	nS
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs	--	3.0	--	nC

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-10A
- The power dissipation is limited by 150°C junction temperature
- The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

N-Typical Characteristics



N-Typical Characteristics

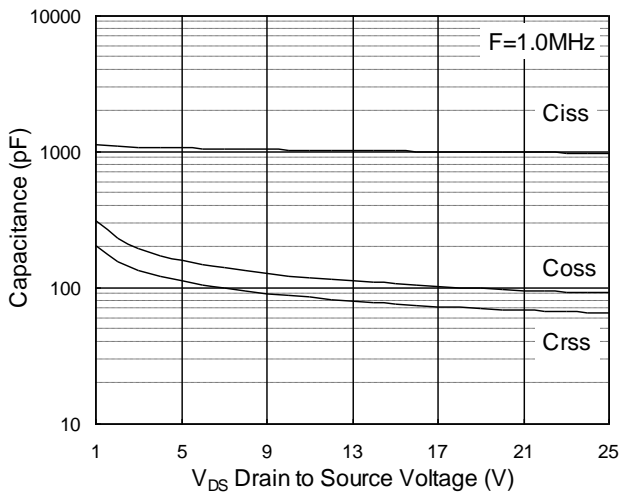


Fig.7 Capacitance

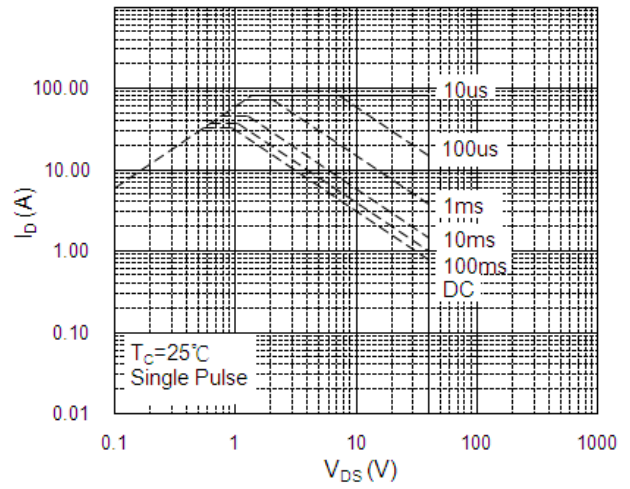


Fig.8 Safe Operating Area

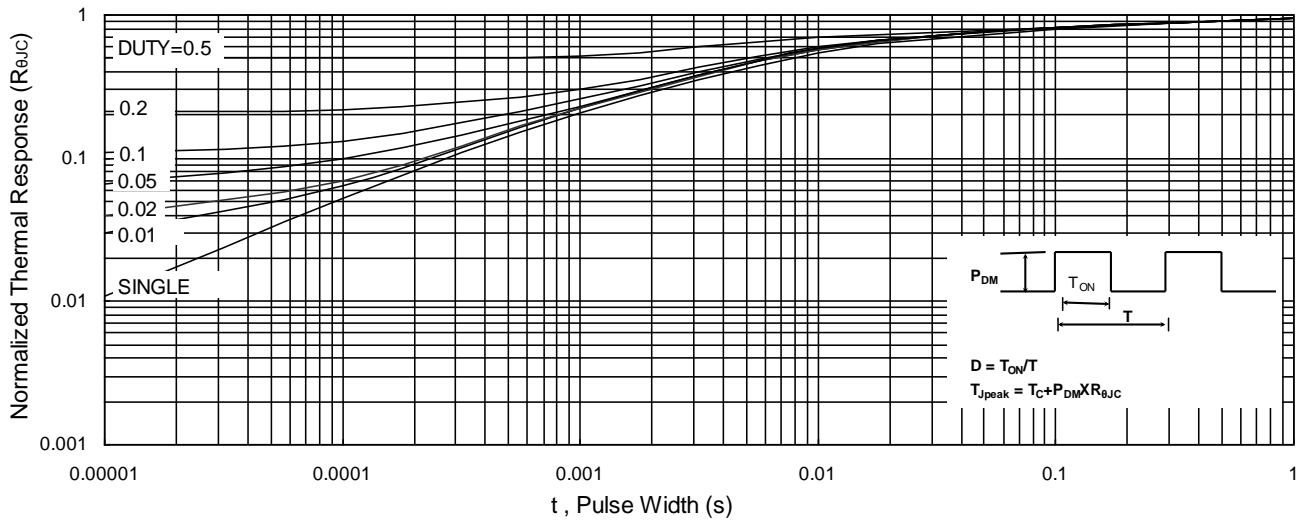


Fig.9 Normalized Maximum Transient Thermal Impedance

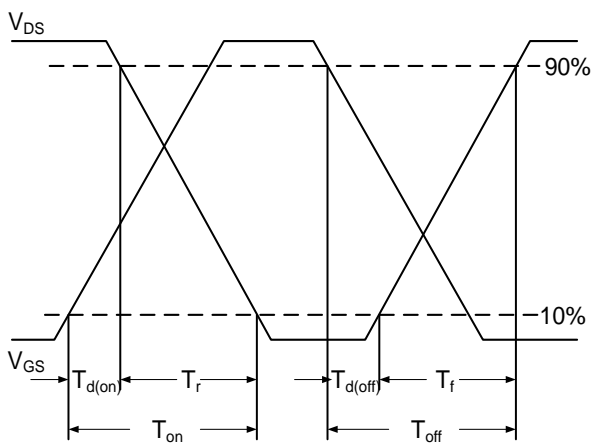


Fig.10 Switching Time Waveform

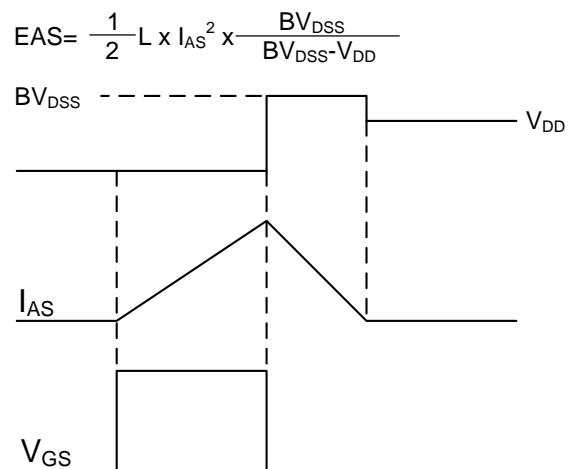


Fig.11 Unclamped Inductive Switching Waveform

P-Typical Characteristics

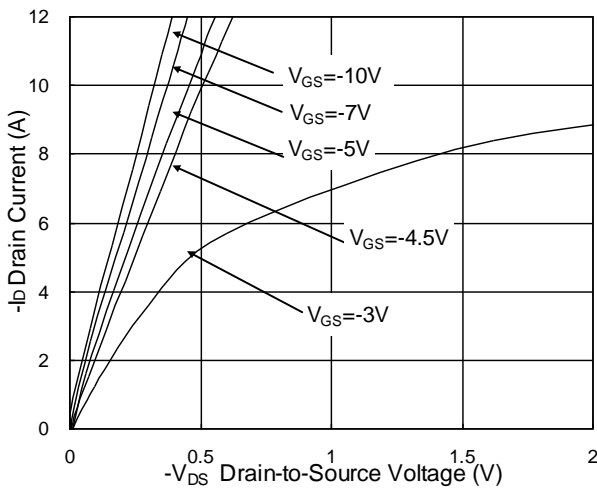


Fig.1 Typical Output Characteristics

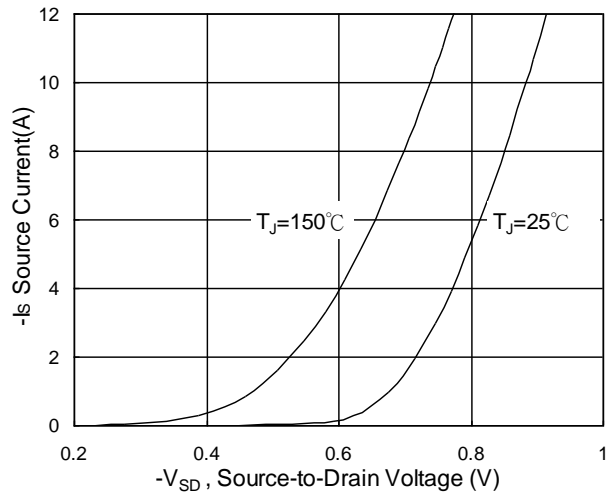


Fig.4 Forward Characteristics of Reverse

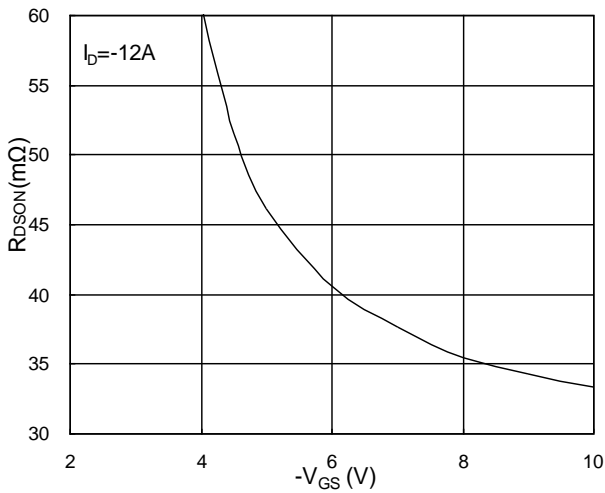


Fig.2 On-Resistance v.s Gate-Source

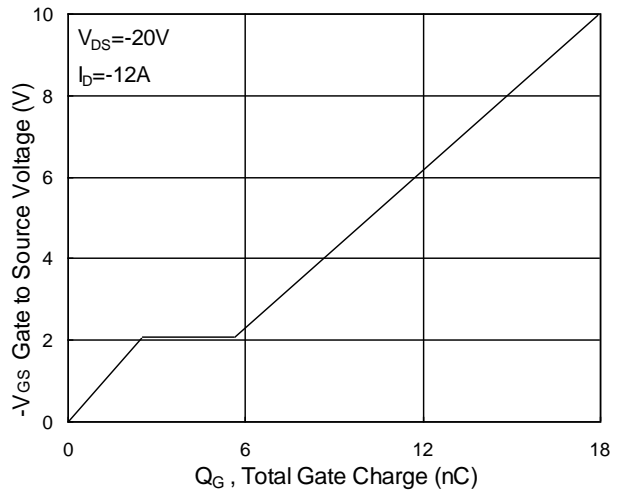


Fig.5 Gate-Charge Characteristics

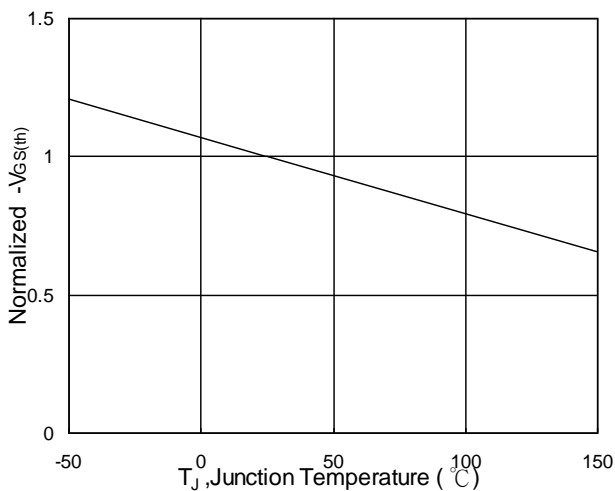


Fig.3 Normalized $V_{GS(th)}$ v.s T_J

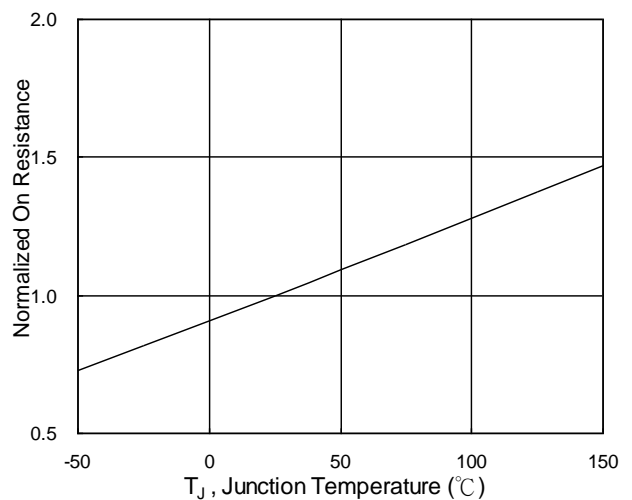


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

P-Typical Characteristics

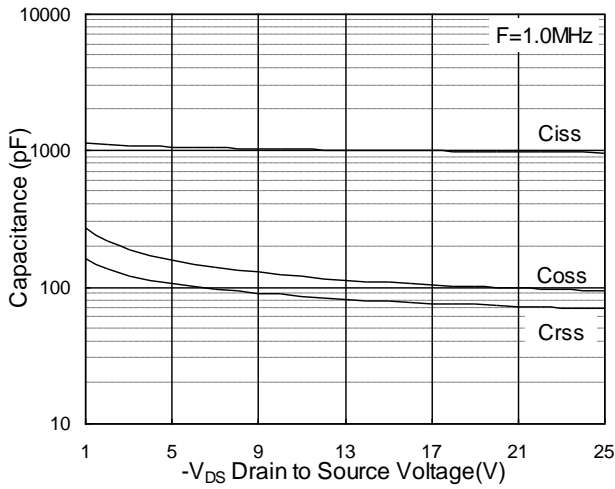


Fig.7 Capacitance

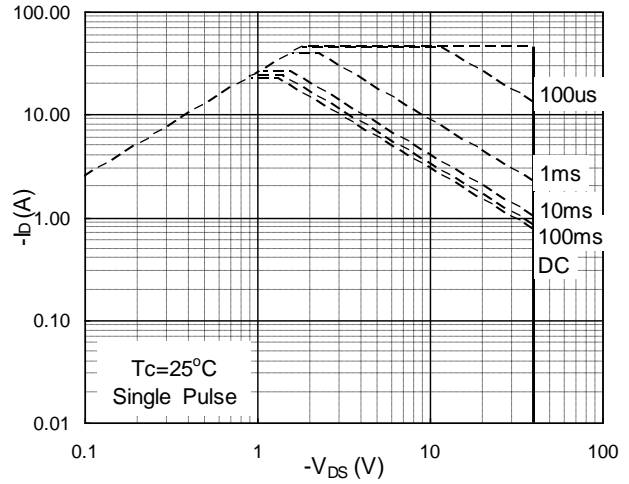


Fig.8 Safe Operating Area

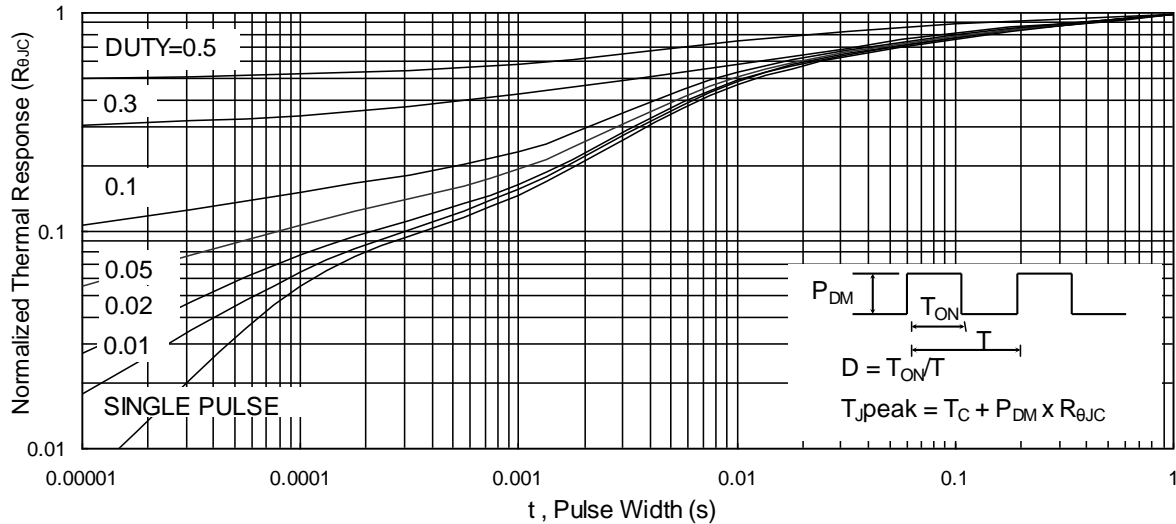


Fig.9 Normalized Maximum Transient Thermal Impedance

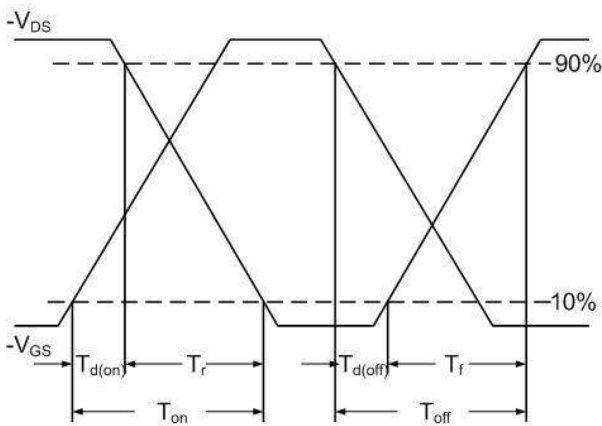


Fig.10 Switching Time Waveform

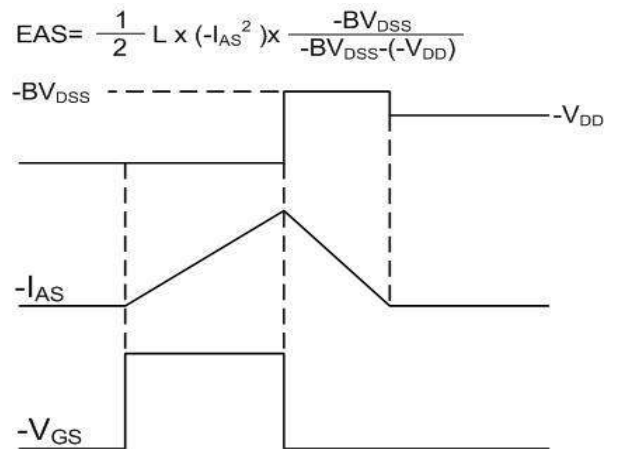
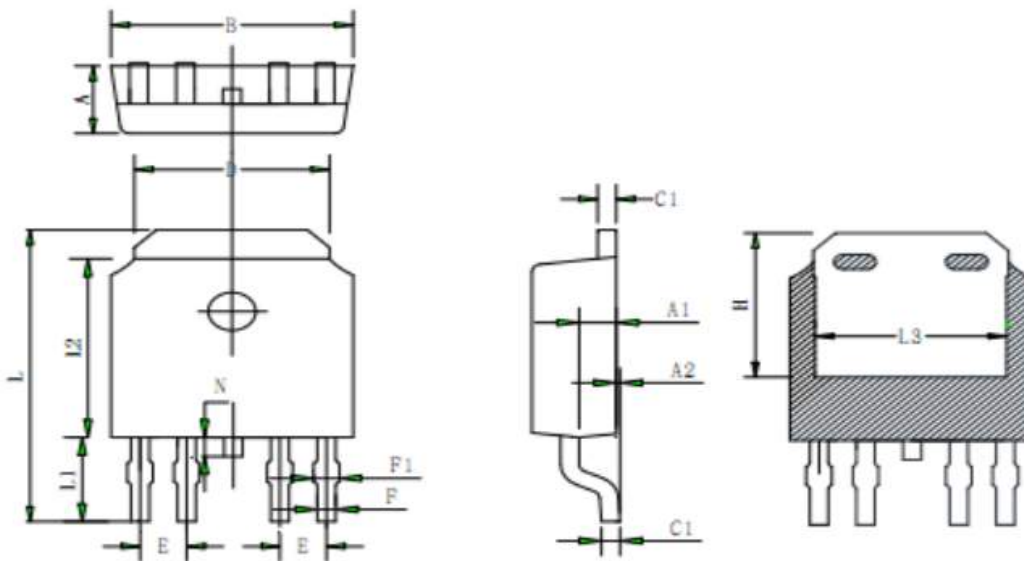


Fig.11 Unclamped Inductive Waveform

TO-252-4L Package Information



Symbol	Min	Typ	Max
A	2.20	2.30	2.40
A1	0.91	1.01	1.11
A2	0.05	0.15	0.25
B	6.45	6.60	6.75
C	0.45	0.50	0.58
C1	0.45	0.50	0.58
D	5.12	5.32	5.52
E	1.27 TYP		
F1	0.45	0.60	0.75
F	0.40	0.50	0.60
H	4.70	4.90	5.10
L	9.70	10.00	10.20
L1	2.6	2.8	3.0
L2	5.95	6.10	6.25
L3	5.00	5.20	5.40 ¹
N	0.45	0.65	0.85

Customer Service

Sales and Service:

zj@ztasemi.com