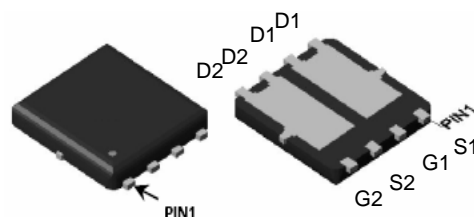


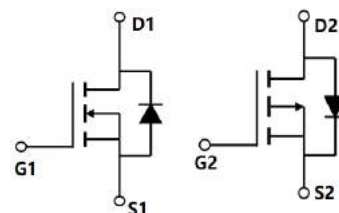
## Features

- 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
$R_{DS(on),TYP@ V_{GS}=10V}$	13	m $\Omega$
$R_{DS(on),TYP@ V_{GS}=4.5V}$	18	m $\Omega$
$I_D$	21	A



Part ID	Package Type	Marking	Packing
ZT20W04G	DFN5x6	ZT20W04G	5000pcs/Reel



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

Symbol	Parameter	N-Ch	P-Ch	Unit	
<b>Common Ratings (<math>T_C = 25^\circ\text{C}</math> Unless Otherwise Noted)</b>					
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	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)	$T_C = 25^\circ\text{C}$	36	-32	A
<b>Mounted on Large Heat Sink</b>					
$I_D$	Drain Current-Continuous (Note 2)	$T_C = 25^\circ\text{C}$	21	-18	A
		$T_C = 100^\circ\text{C}$	17	-15	A
$P_D$	Maximum Power Dissipation (Note 4)	24	31	W	
$R_{\theta JC}$	Thermal Resistance-Junction to Case (Note 1)	5	5	$^\circ\text{C/W}$	
$R_{\theta JA}$	Thermal Resistance Junction-Ambient (Note 1)	61	61	$^\circ\text{C/W}$	
<b>Drain-Source Avalanche Ratings</b>					
EAS	Avalanche Energy, Single Pulsed (Note 3)	71	71	mJ	

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

Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Electrical Characteristics @ <math>T_J=25^{\circ}\text{C}</math> (unless otherwise stated)</b>						
$V_{(BR)DSS}$	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	$\mu A$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.0	V
$R_{DS(on)}$	Drain-Source On-State Resistance <sup>(Note 2)</sup>	$V_{GS}=10V, I_D=10A$	--	13	17	m $\Omega$
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=4.5V, I_D=5A$	--	18	22	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5V, I_D=15A$	--	33	--	S
<b>Dynamic Electrical Characteristics @ <math>T_J = 25^{\circ}\text{C}</math> (unless otherwise stated)</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1\text{MHz}$	--	1108	--	pF
$C_{oss}$	Output Capacitance		--	112	--	pF
$C_{rss}$	Reverse Transfer Capacitance		--	79	--	pF
$R_g$	Gate Resistance	$f=1\text{MHz}$	--	2.3	--	$\Omega$
$Q_g$	Total Gate Charge	$V_{DS}=32V, I_D=15A,$ $V_{GS}=4.5V$	--	11	--	nC
$Q_{gs}$	Gate-Source Charge		--	2.6	--	nC
$Q_{gd}$	Gate-Drain Charge		--	4.7	--	nC
<b>Switching Characteristics</b>						
$T_d(on)$	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
<b>Source- Drain Diode Characteristics @ <math>T_J = 25^{\circ}\text{C}</math> (unless otherwise stated)</b>						
$I_{SD}$	Source-Drain Current (Body Diode) <sup>(Note 1,5)</sup>	$V_G=V_D=0V$	--	--	21	A
$V_{SD}$	Forward on voltage <sup>(Note 2)</sup>	$I_S=1A, V_{GS}=0V$	--	--	1.2	V
$T_{rr}$	Reverse Recovery Time	$T_J=25^{\circ}\text{C}, I_F=15A,$ $di/dt=100A/\mu s$	--	10	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	3.0	--	nC

**Note :**

- 1、The data tested by surface mounted on a 1 inch<sup>2</sup> 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  $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=10A$
- 4、The power dissipation is limited by  $150^{\circ}\text{C}$  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<sub>J</sub>=25°C unless otherwise noted) P channel**

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	-46	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-32V, 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	-1.1	-1.7	-2.5	V
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A	--	32	39	mΩ
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A	--	43	53	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-8A	--	12.3	--	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> =-15V, V <sub>GS</sub> =0V, f=1MHz	--	1117	--	pF
C <sub>oss</sub>	Output Capacitance		--	121	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	79	--	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	--	14	--	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-20V, I <sub>D</sub> =-12A, V <sub>GS</sub> =-4.5V	--	9	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	2.6	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	3.2	--	nC
<b>Switching Characteristics</b>						
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =-15V, I <sub>D</sub> =-1A, R <sub>G</sub> =3.3Ω, V <sub>GS</sub> =-10V	--	18	--	ns
T <sub>r</sub>	Turn-on Rise Time		--	13	--	ns
T <sub>d(off)</sub>	Turn-Off Delay Time		--	49	--	ns
T <sub>f</sub>	Turn-Off Fall Time		--	4.5	--	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)		--	--	-18	A
V <sub>SD</sub>	Forward on voltage (Note 2)	I <sub>S</sub> = -1A, V <sub>GS</sub> =0V	--	--	-1.0	V
T <sub>rr</sub>	Reverse Recovery Time	T <sub>J</sub> =25°C, I <sub>F</sub> = 15A,	--	10	--	nS
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs	--	3.0	--	nC

**Note :**

- 1、The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、The EAS data shows Max. rating . The test condition is V<sup>DD</sup>=-25V, V<sup>GS</sup>=-10V, L=0.1mH, I<sup>AS</sup>=-10A
- 4、The power dissipation is limited by 150°C junction temperature
- 5、The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

## N-Typical Characteristics

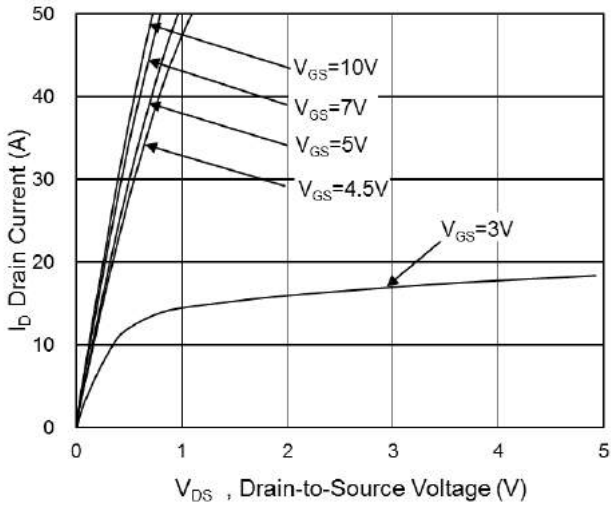


Fig.1 Typical Output Characteristics

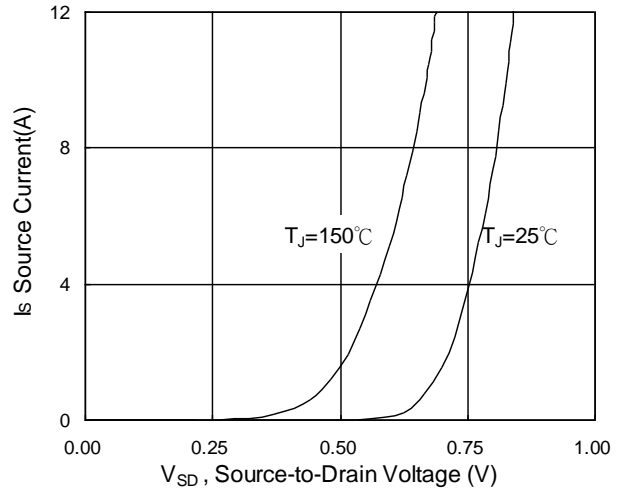


Fig.4 Forward Characteristics of Reverse

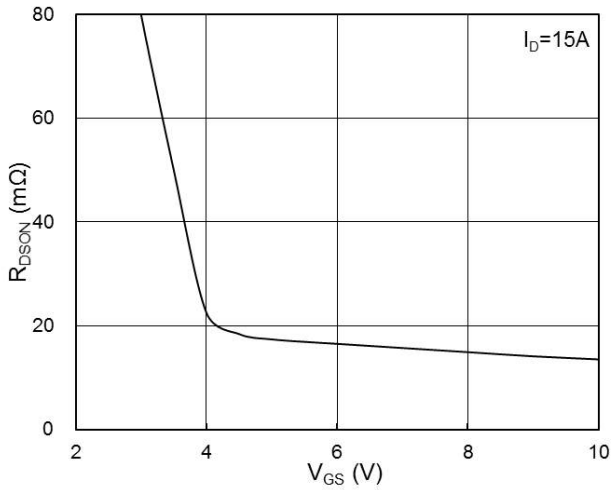


Fig.2 On-Resistance vs. G-S Voltage

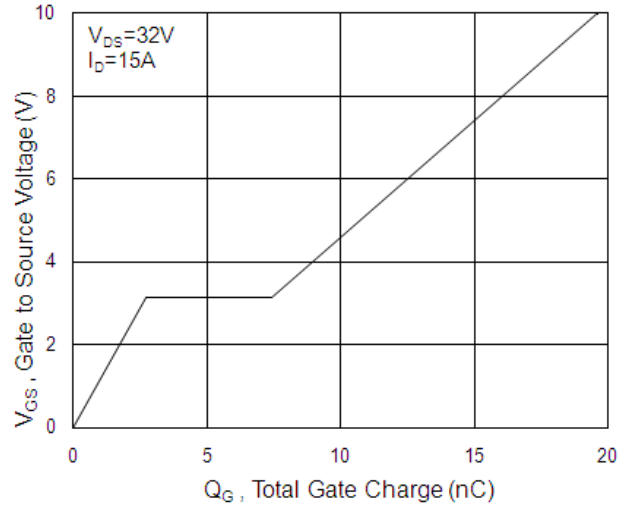


Fig.5 Gate-Charge Characteristics

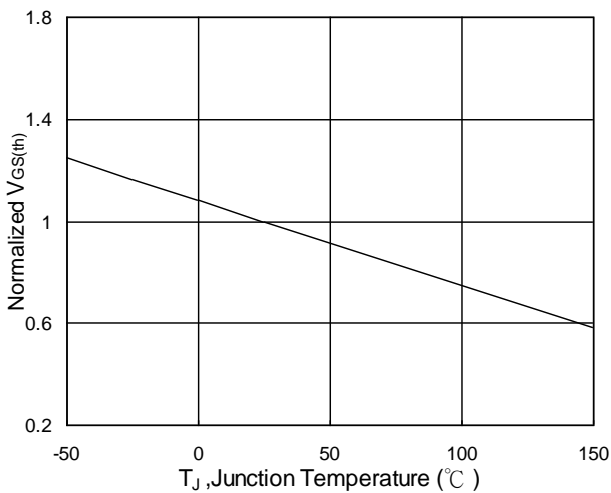


Fig.3 Normalized  $V_{GS(th)}$  vs.  $T_J$

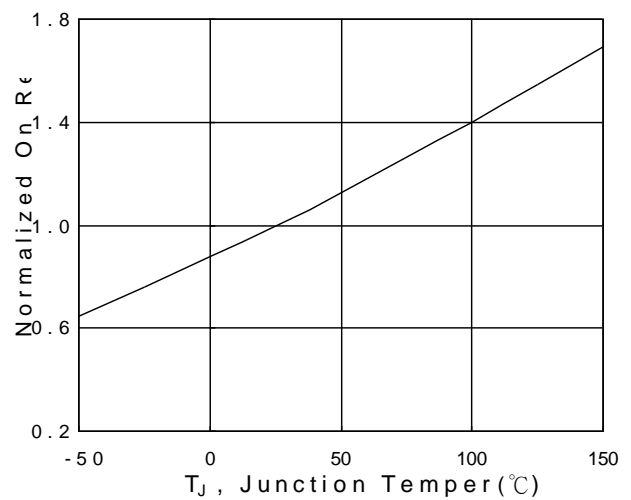


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

## N-Typical Characteristics

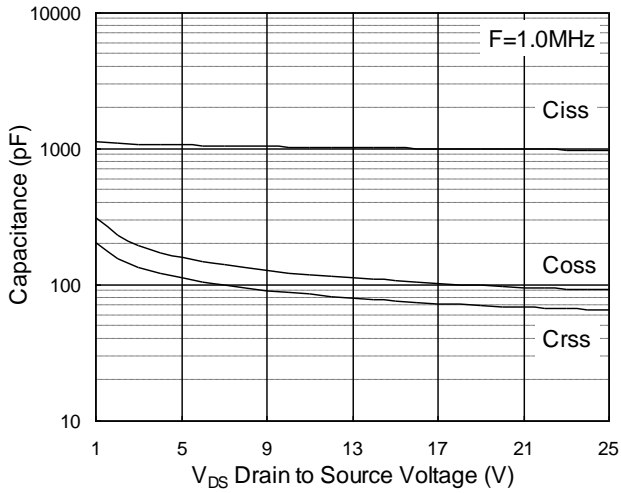


Fig.7 Capacitance

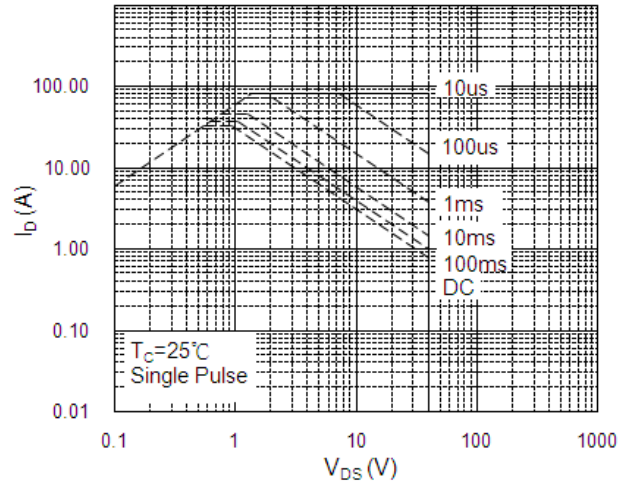


Fig.8 Safe Operating Area

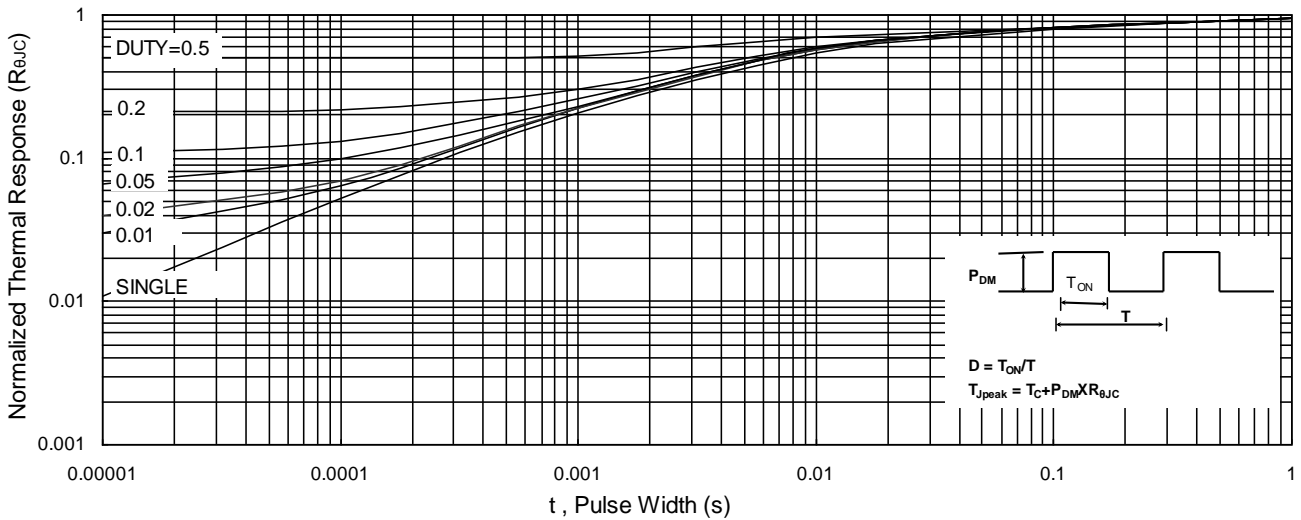


Fig.9 Normalized Maximum Transient Thermal Impedance

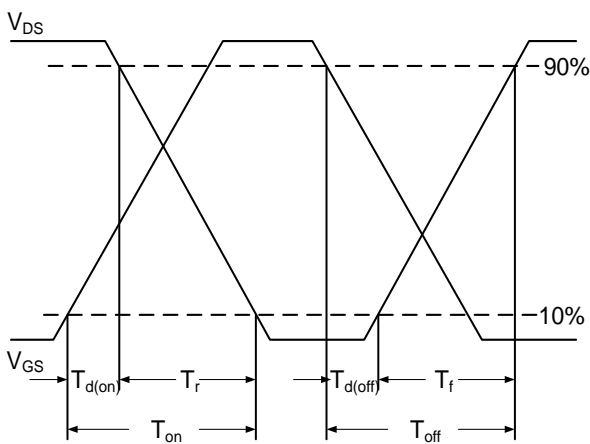


Fig.10 Switching Time Waveform

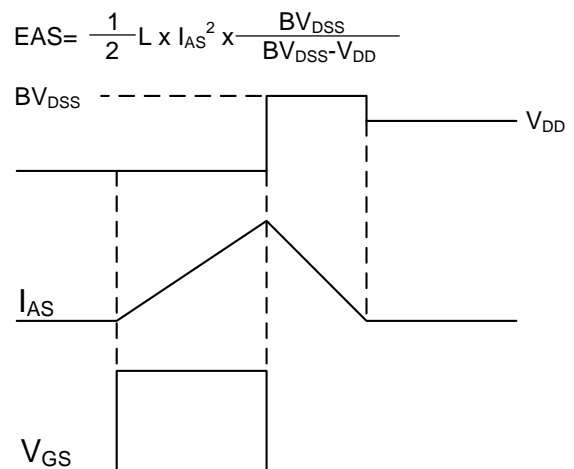


Fig.11 Unclamped Inductive Switching Waveform

## P-Typical Characteristics

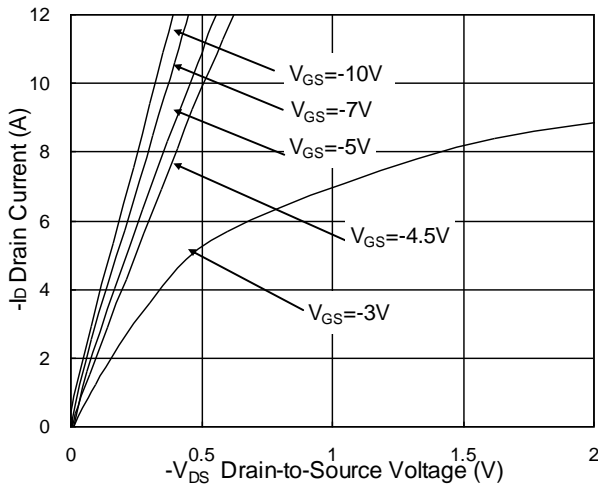


Fig.1 Typical Output Characteristics

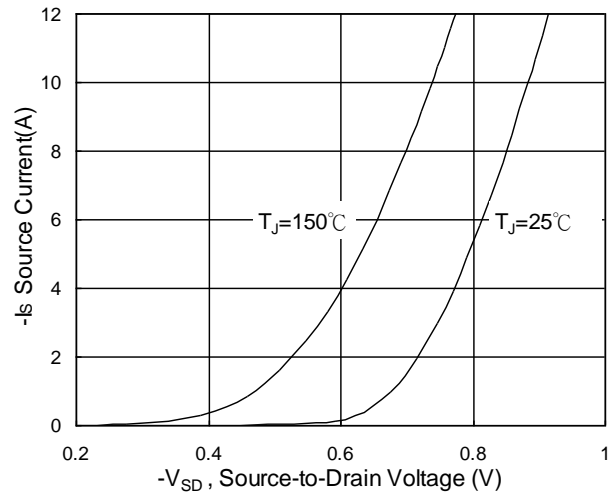


Fig.4 Forward Characteristics of Reverse

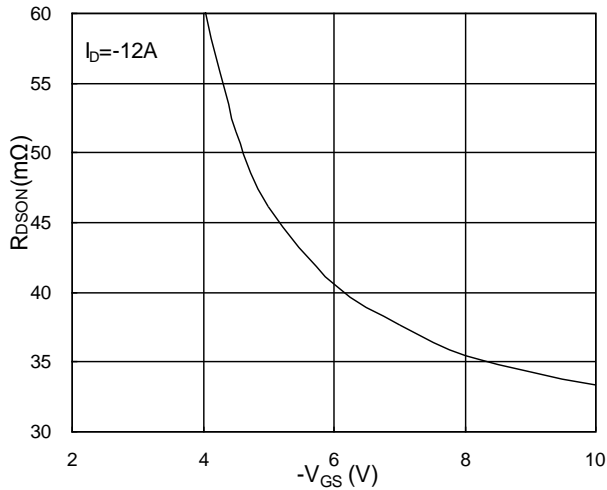


Fig.2 On-Resistance v.s Gate-Source

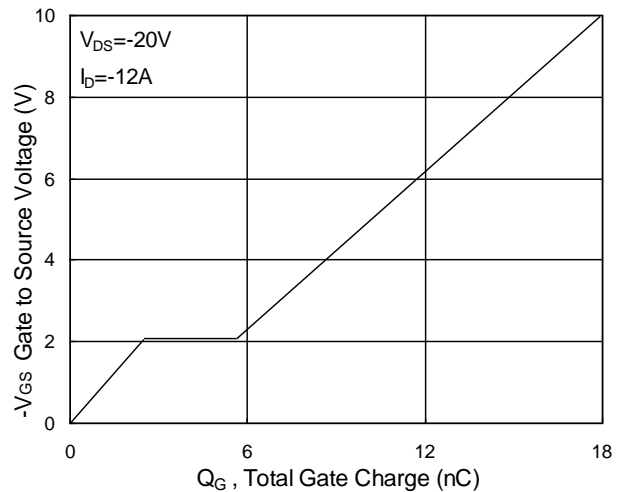


Fig.5 Gate-Charge Characteristics

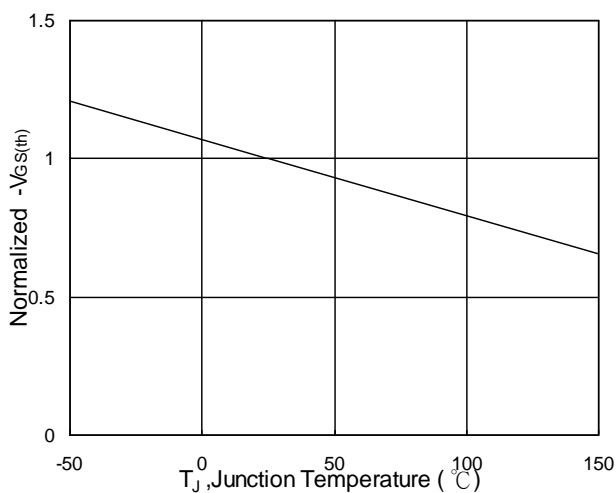


Fig.3 Normalized  $V_{GS(th)}$  v.s  $T_J$

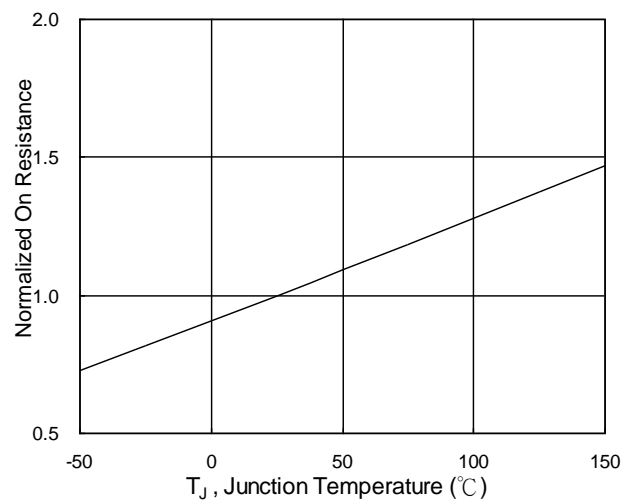


Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$

## P-Typical Characteristics

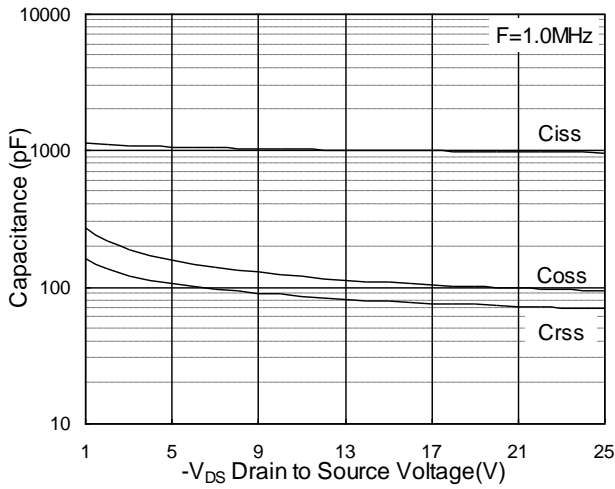


Fig.7 Capacitance

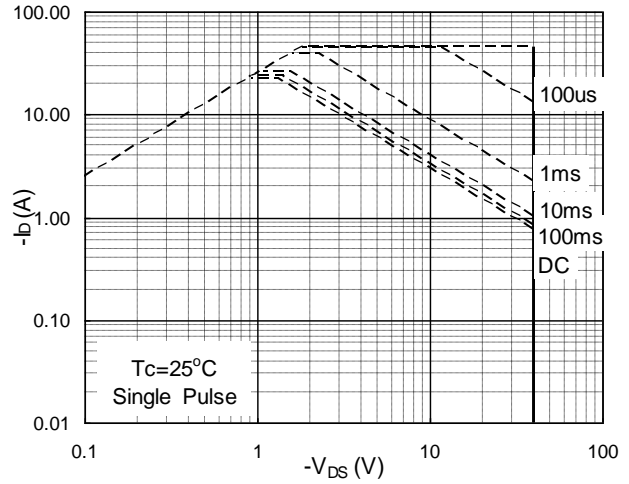


Fig.8 Safe Operating Area

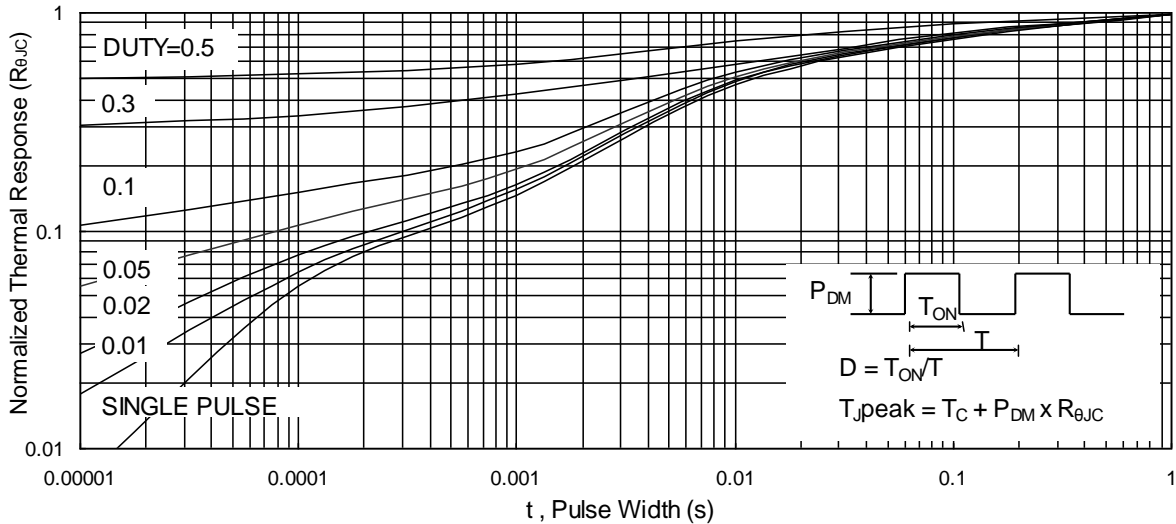


Fig.9 Normalized Maximum Transient Thermal Impedance

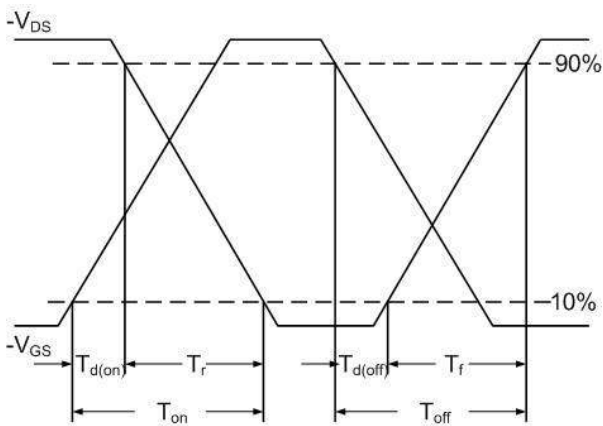


Fig.10 Switching Time Waveform

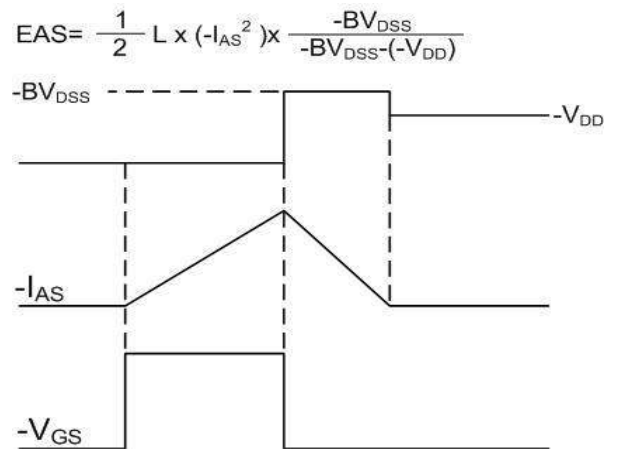
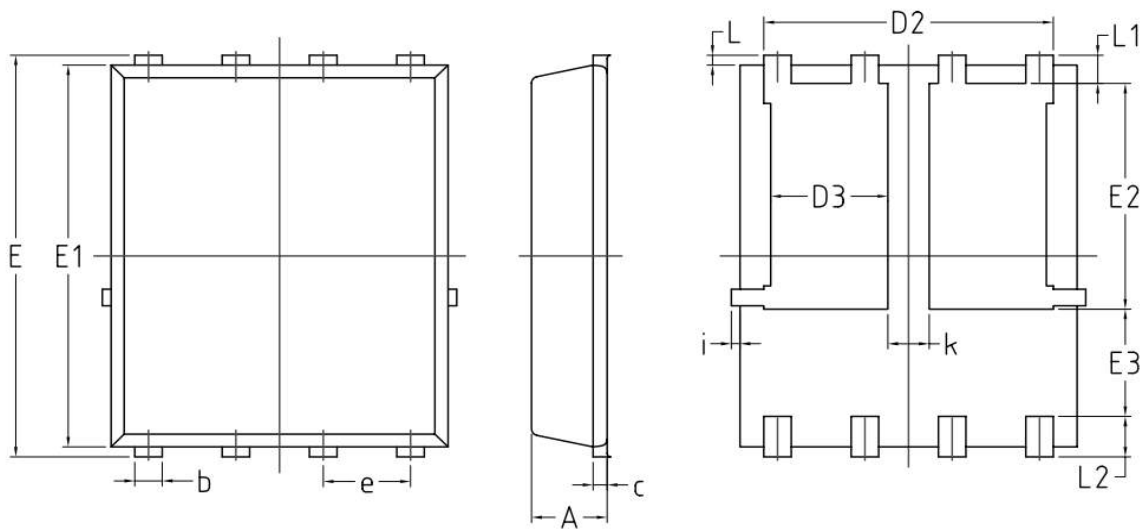


Fig.11 Unclamped Inductive Waveform

## DFN5x6-8L Package Information



SYMBOL	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.203 BSC		0.0080 BSC	
D	4.80	5.40	0.1890	0.2126
D1	4.80	5.00	0.1890	0.1969
D2	4.11	4.31	0.1620	0.1700
D3	1.60	1.80	0.0629	0.0708
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	3.30	3.50	0.1300	0.1378
E3	1.40	/	0.0551	/
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0019	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.71	0.0150	0.0280
i	/	0.18	/	0.0070
k	0.5	0.7	0.0197	0.0276

## Customer Service

Sales and Service:

[zj@ztasemi.com](mailto:zj@ztasemi.com)