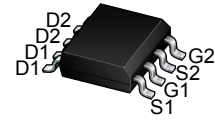


Description

The TX4614CS uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



SOP-8

General Features

$V_{DS} = 40V$ $I_D = 6A$

$R_{DS(ON)} < 34m\Omega$ @ $V_{GS}=10V$

$V_{DS} = -40V$ $I_D = 5A$

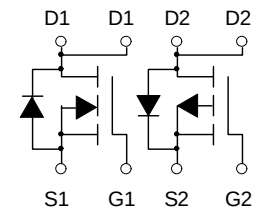
$R_{DS(ON)} < 75m\Omega$ @ $V_{GS}=10V$

Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel and P-Channel

Absolute Maximum Ratings ($T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D @ T_A=25^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	6	-5	A
$I_D @ T_A=70^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	5.1	-4.3	A
I_{DM}	Pulsed Drain Current ²	22	-18	A
EAS	Single Pulse Avalanche Energy ³	15.2	33	mJ
I_{AS}	Avalanche Current	15	-23	A
$P_D @ T_A=25^\circ C$	Total Power Dissipation ⁴	1.5	1.4	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	75		$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	30		$^\circ C/W$



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	40	---	---	V
$\frac{\partial BV_{DSS}}{\partial T_J}$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.034	---	$V/^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V$, $I_D=5A$	---	26	34	$m\Omega$
		$V_{GS}=4.5V$, $I_D=4A$	---	36	43	
$V_{GS(th)}$	Gate Threshold Voltage		1.0	---	2.5	V
$\frac{\partial V_{GS(th)}}{\partial T_J}$	$V_{GS(th)}$ Temperature Coefficient	$V_{GS}=V_{DS}$, $I_D=250\mu A$	---	-4.56	---	$mV/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=32V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=32V$, $V_{GS}=0V$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=5A$	---	14	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	2.6	---	
Q_g	Total Gate Charge (4.5V)		---	5.5	---	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=20V$, $V_{GS}=4.5V$, $I_D=5A$	---	1.25	---	
Q_{gd}	Gate-Drain Charge		---	2.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V$, $V_{GS}=10V$, $R_G=3.3$ $I_D=1A$	---	8.9	---	ns
T_r	Rise Time		---	2.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	41	---	
T_f	Fall Time		---	2.7	---	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	593	---	pF
C_{oss}	Output Capacitance		---	76	---	
C_{rss}	Reverse Transfer Capacitance		---	56	---	
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	6.1	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	23	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ\text{C}$	---	---	1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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 $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=18A$
- 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.

P-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-40	---	---	V
$\frac{\partial BV_{DSS}}{\partial T_J}$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.02	---	$V/^{\circ}\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-5A$	---	62	75	$m\Omega$
		$V_{GS}=-4.5V$, $I_D=-4A$	---	90	105	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1.0	---	-2.5	V
$\frac{\partial V_{GS(th)}}{\partial T_J}$	$V_{GS(th)}$ Temperature Coefficient		---	3.72	---	$mV/^{\circ}\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-32V$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=-32V$, $V_{GS}=0V$, $T_J=55^{\circ}\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V$, $I_D=-6A$	---	13	---	S
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-20V$, $V_{GS}=-4.5V$, $I_D=-6A$	---	11.5	---	nC
Q_{gs}	Gate-Source Charge		---	3.5	---	
Q_{gd}	Gate-Drain Charge		---	3.3	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-1A$	---	22	---	ns
T_r	Rise Time		---	15.7	---	
$T_{d(off)}$	Turn-Off Delay Time		---	59	---	
T_f	Fall Time		---	5.5	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	1415	---	pF
C_{oss}	Output Capacitance		---	134	---	
C_{rss}	Reverse Transfer Capacitance		---	102	---	
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-6	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	-22	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^{\circ}\text{C}$	---	---	-1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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 $V_{DD}=-25V$, $V_{GS}=-10V$, $L=0.1\text{mH}$, $I_{AS}=-28A$
- 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.

N-Channel Typical Characteristics

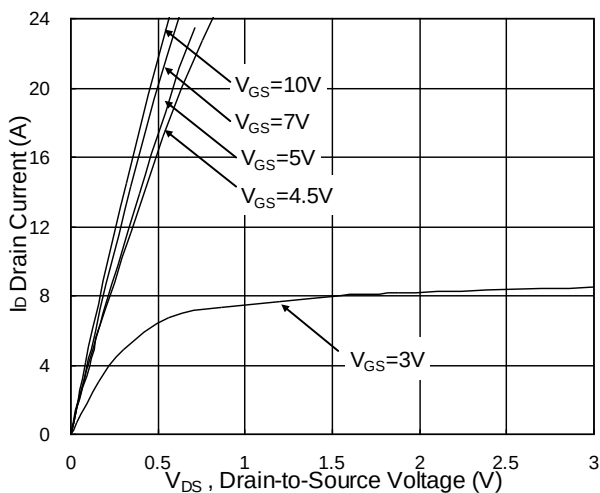


Fig.1 Typical Output Characteristics

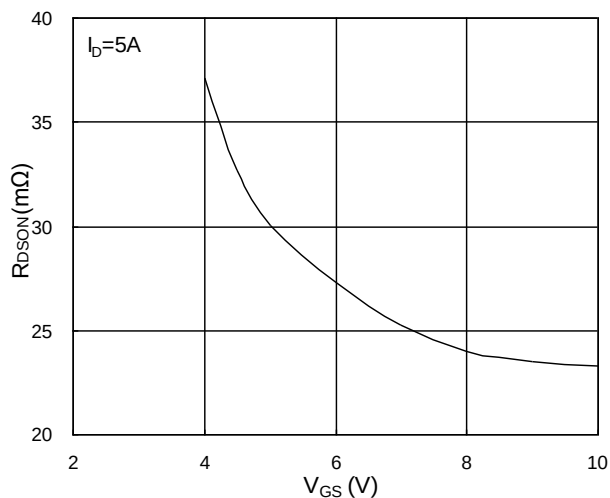


Fig.2 On-Resistance vs. G-S Voltage

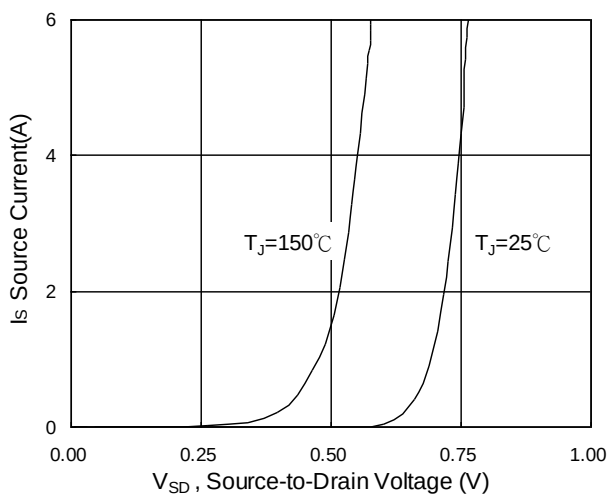


Fig.3 Forward Characteristics of Reverse

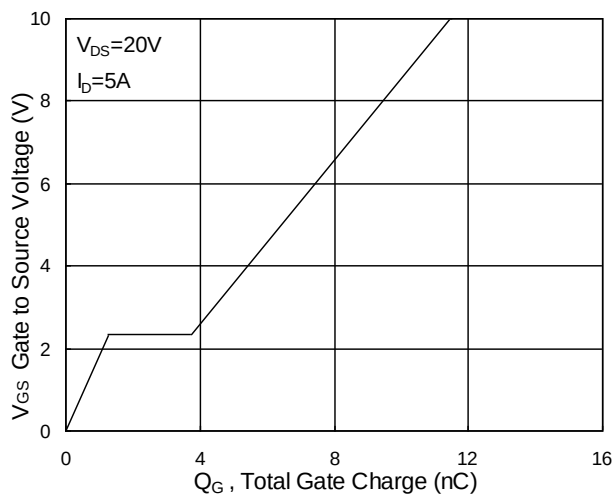


Fig.4 Gate-Charge Characteristics

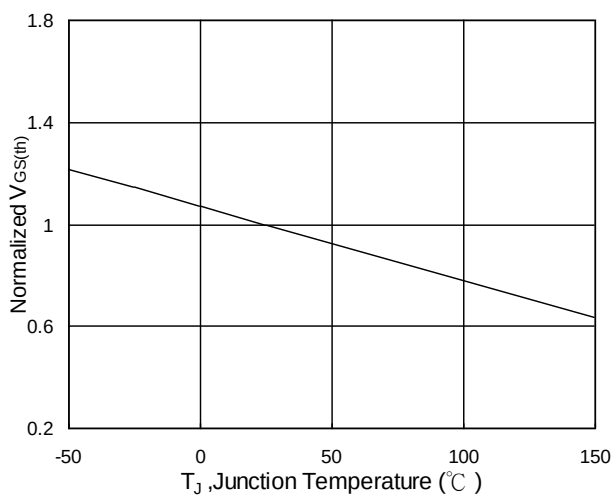


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

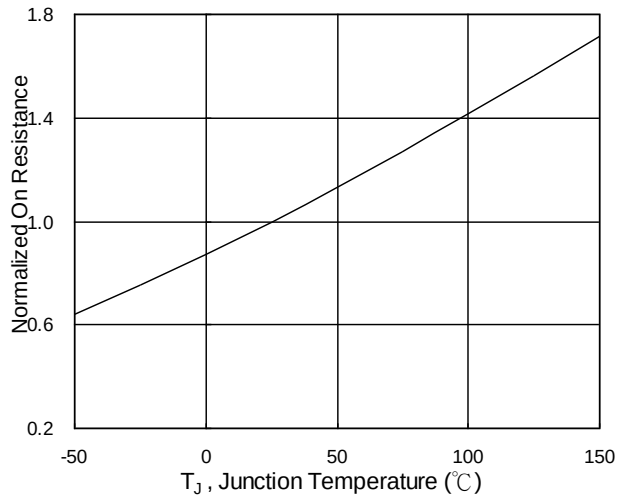


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

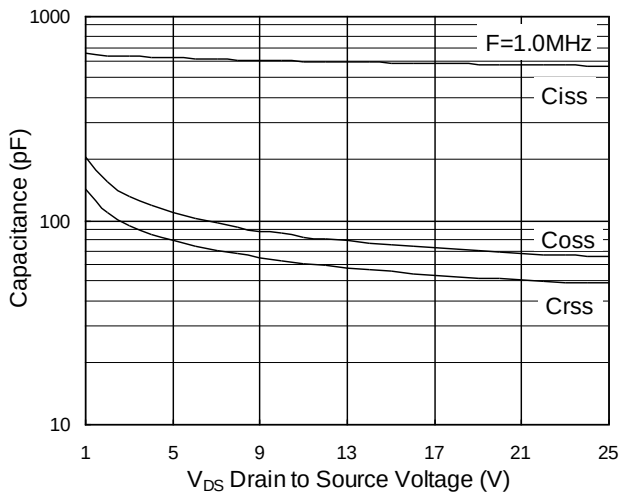


Fig.7 Capacitance

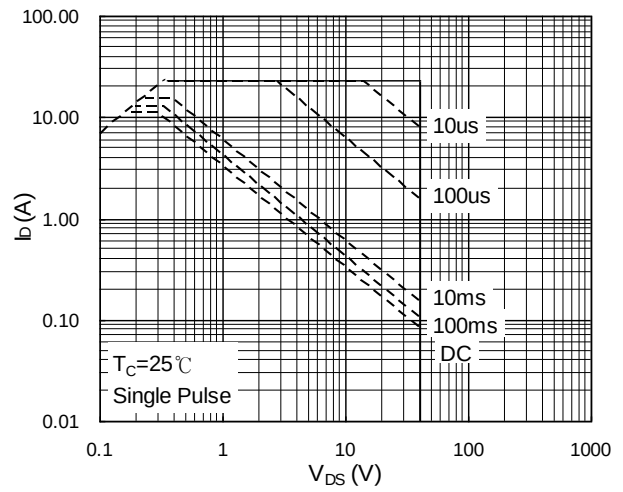


Fig.8 Safe Operating Area

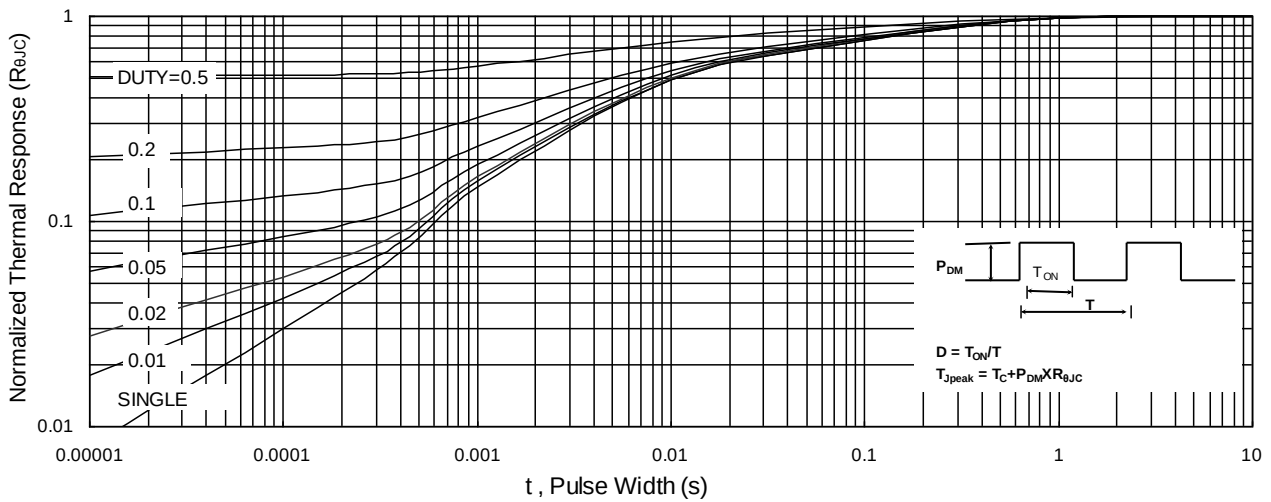


Fig.9 Normalized Maximum Transient Thermal Impedance

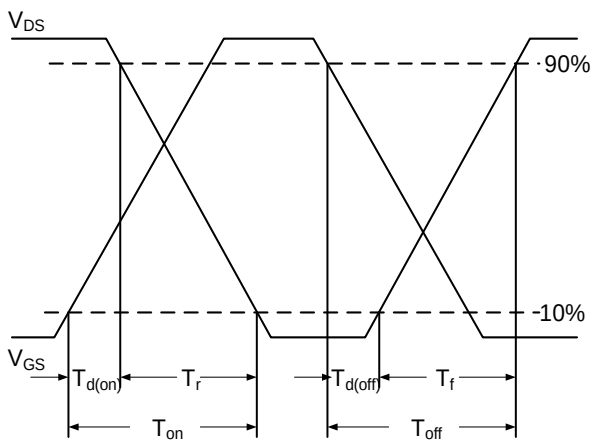


Fig.10 Switching Time Waveform

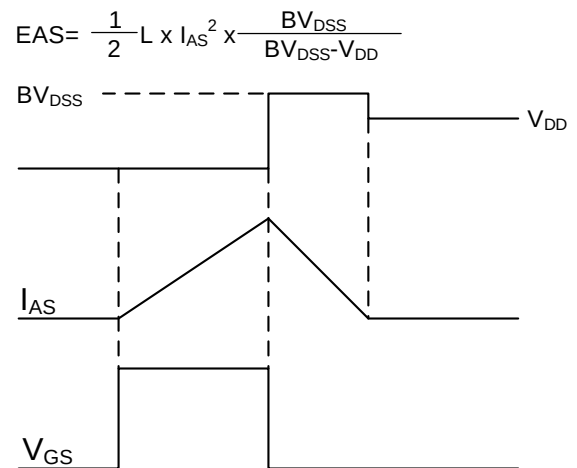


Fig.11 Unclamped Inductive Switching Wave

P-Channel Typical Characteristics

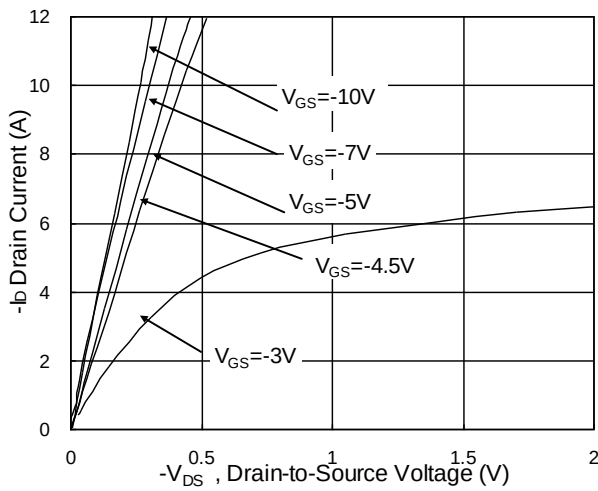


Fig.1 Typical Output Characteristics

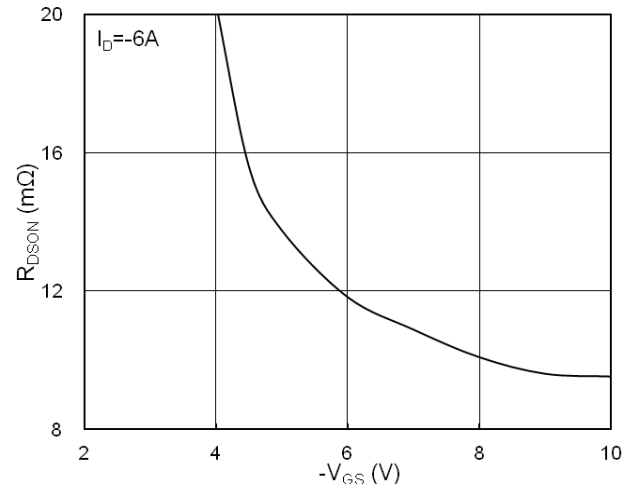


Fig.2 On-Resistance v.s Gate-Source

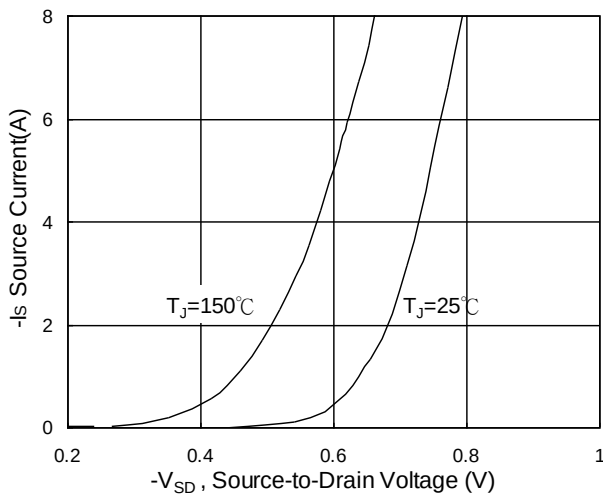


Fig.3 Forward Characteristics of Reverse

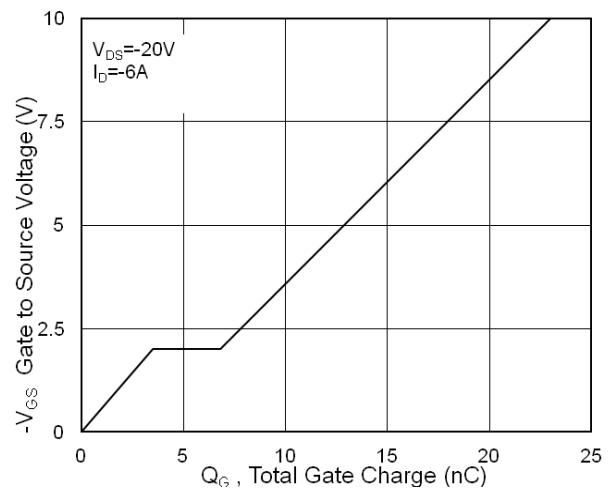


Fig.4 Gate-Charge Characteristics

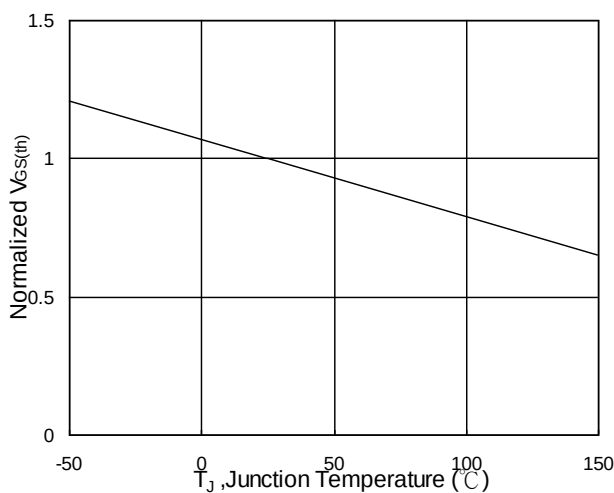


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

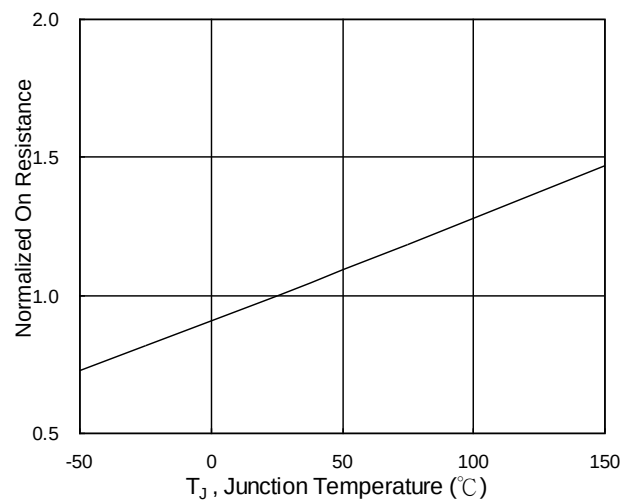


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

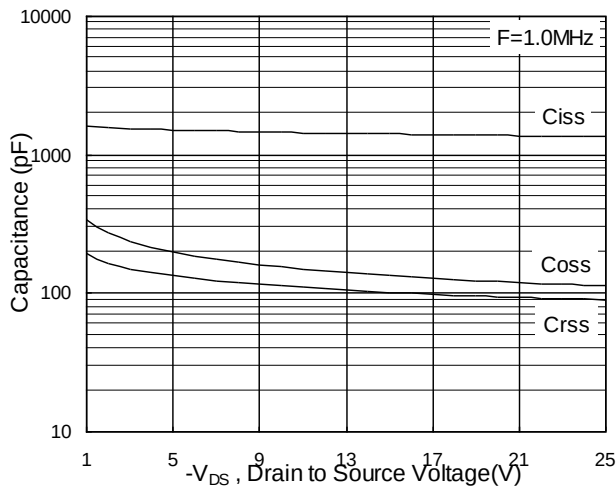


Fig.7 Capacitance

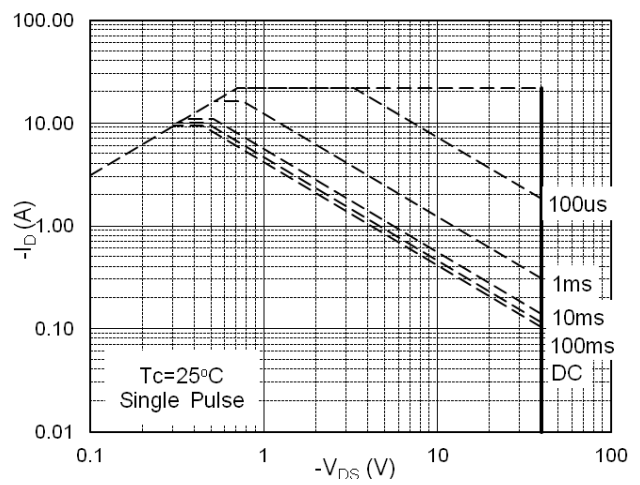


Fig.8 Safe Operating Area

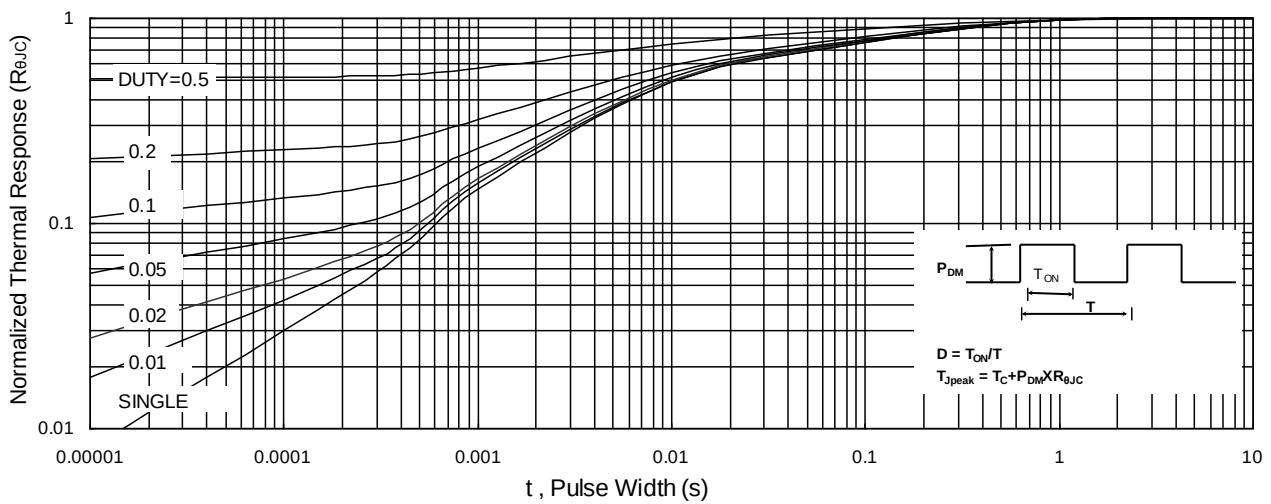


Fig.9 Normalized Maximum Transient Thermal Impedance

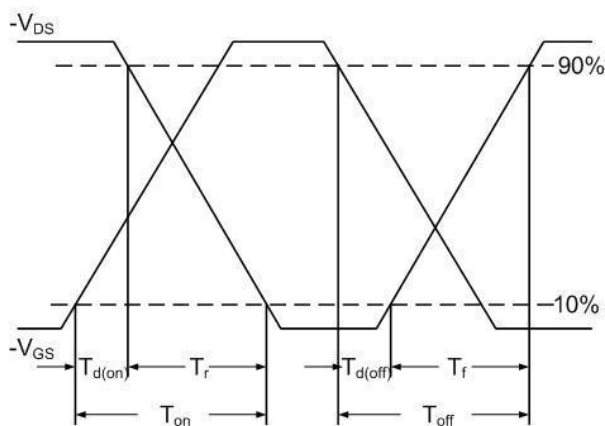


Fig.10 Switching Time Waveform

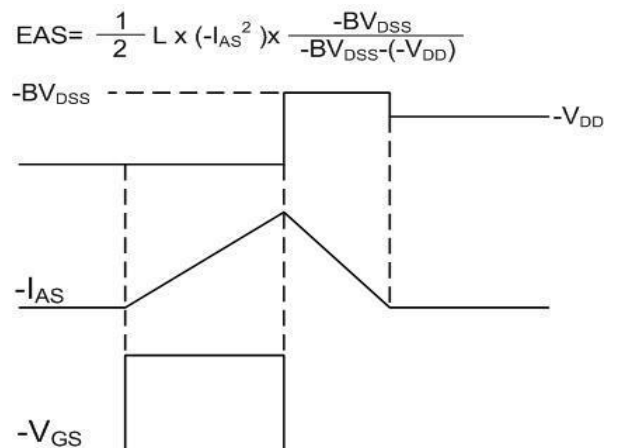
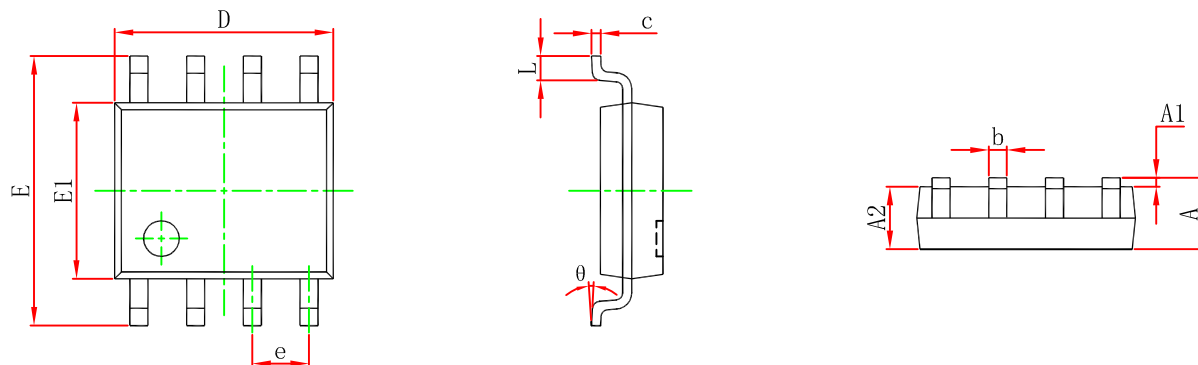
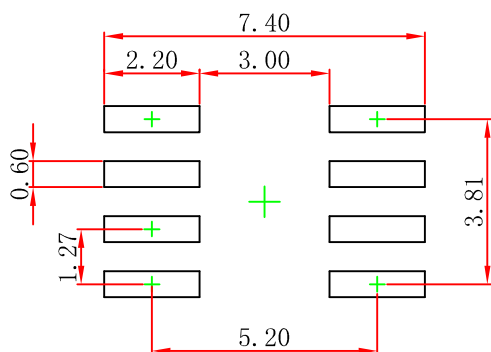


Fig.11 Unclamped Inductive Waveform

SOP-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Note:
1. Controlling dimension; in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

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