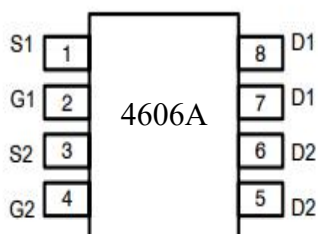


**Features**

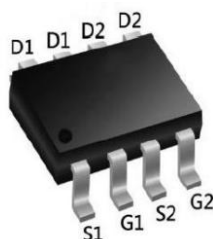
- Super Low Gate Charge
- Green Device Available
- Excellent Cdv/dt effect decline
- Advanced high cell density Trench technology

Bvdss**30V****-30V****Rdson****15mΩ****30mΩ****ID****7A****-6A****Application**

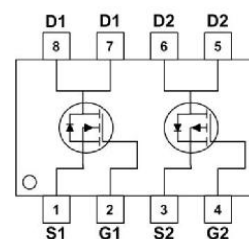
- Power management in half bridge and inverters
- Load Switch
- DC-DC Converter

RoHS**Package**

Marking and pin assignment



SOP-8 top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Quantity
4606A	4606A	SOP-8	4000

Absolute Maximum Ratings

Parameter	Symbol	Value		Unit
		N-Channel	P-Channel	
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current	I_D	7	-6	A
Pulsed Drain Current	I_{DM}	20	-12	A
Single Pulsed Avalanche Energy	E_{AS}	72	59	mJ
Avalanche Current	I_{AS}	21	-19	A
Total Power Dissipation	$P_D@T_c=25^\circ\text{C}$	2.5	2.08	W
Junction Temperature Range	T_J	-55 ~ +150		$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 ~ +150		$^\circ\text{C}$



Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	--	85	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	--	50	°C/W

Ordering Information

Ordering Number	Package	Pin Assignment			Packing
Halogen Free		G	D	S	
HL4606A	SOP-8	2,4	5,6,7,8	1,3	Tape Reel

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

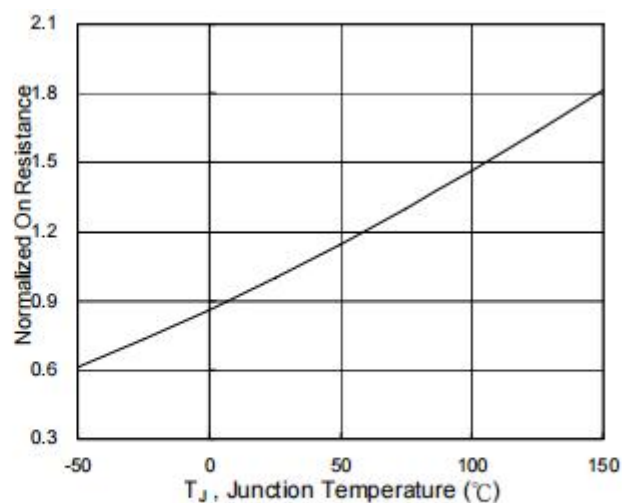
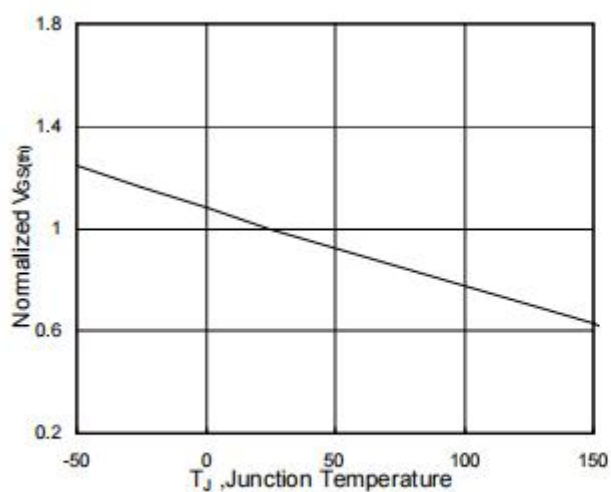
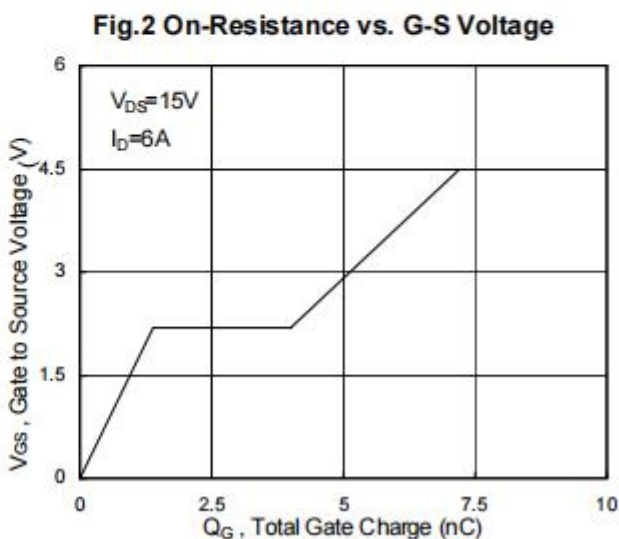
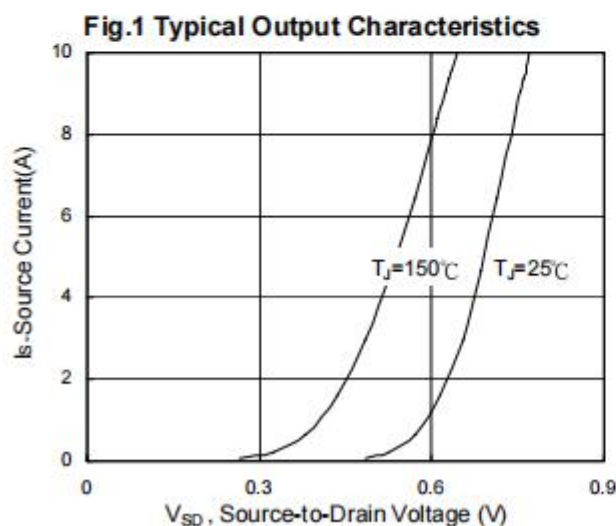
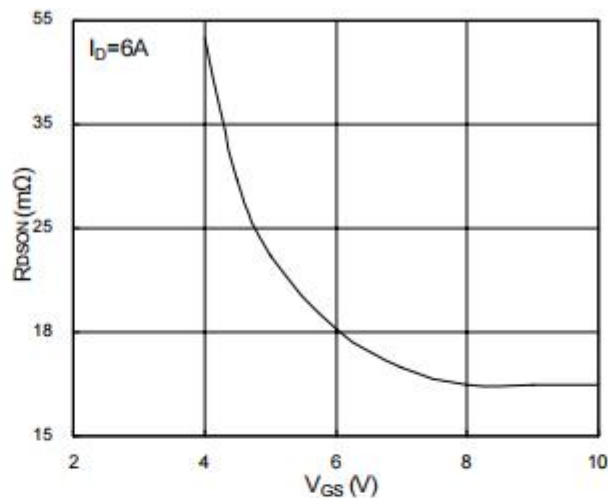
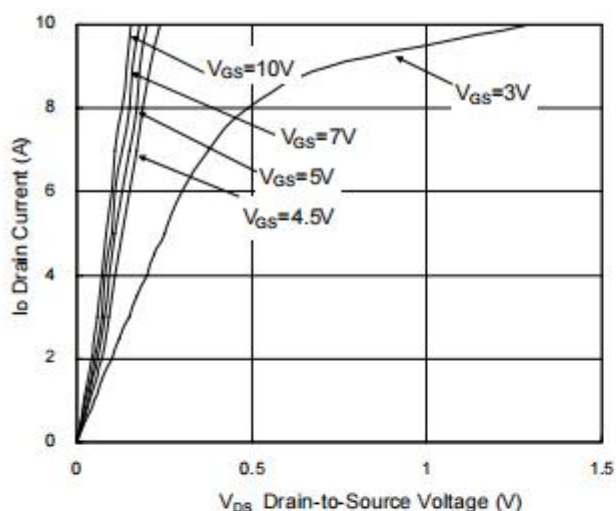
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$, $I_D=-250\mu A$	30	-	-	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V$, $I_D=3A$	-	15	18	$m\Omega$
		$V_{GS}=4.5V$, $I_D=2A$	-	22	25	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.0	1.5	2.5	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V$, $V_{GS}=0V$,	-	-	1	μA
Gate to Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V$, $V_{DS}=0V$	-	-	± 100	nA
Forward Transconductance	g_{fs}	$V_{DS}=15V$, $I_D=5A$	-	10	-	S
Gate Resistance	R_g	$V_{DS}=24V$, $V_{GS}=0V$, $f=1MHz$	-	2.5	-	Ω
Total Gate Charge	Q_g	$V_{GS}=4.5V$, $V_{DS}=20V$, $I_D=6A$	-	7.2	-	nC
Gate-Source Charge	Q_{gs}		-	1.4	-	
Gate-Drain Charge	Q_{gd}		-	2.2	-	
Turn-On Delay Time	$T_{d(on)}$	$V_{GS}=10V$, $V_{DD}=12V$, $R_G=3.3\Omega$, $I_D=5A$	-	3.9	-	ns
Rise Time	T_r		-	9.2	-	
Turn-Off Delay Time	$T_{d(off)}$		-	14.5	-	
Fall Time	T_f		-	6.0	-	
Input Capacitance	C_{iss}	$V_{DS}=25V$, $V_{GS}=0V$, $f=1MHz$	-	370	-	pF
Output Capacitance	C_{oss}		-	54	-	
Reverse Transfer Capacitance	C_{rss}		-	40	-	
Single Pulse Avalanche Energy	EAS	$V_{DD}=25V$, $L=0.1mH$, $I_{AS}=10A$	16	-	-	mJ
Diode Forward Voltage	V_{SD}	$I_S=5A$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$	-	-	1.2	V
Continuous Source Current	I_S	$V_G=V_D=0V$, Force Current	-	-	7	A
Pulsed Drain to Source Diode Current	I_{SM}		-	-	20	A

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1	-1.5	-2.5	V
Drain-Source On-State Resistance ³	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-3A$	-	30	35	m Ω
		$V_{GS}=-4.5V, I_D=-2A$	-	47	52	
Input Capacitance ⁴	C_{iss}	$V_{DS} = -15V, V_{GS} = 0V,$ $f = 1MHz$	-	530	-	pF
Output Capacitance ⁴	C_{oss}		-	70	-	
Reverse Transfer Capacitance ⁴	C_{rss}		-	56	-	
Total Gate Charge ⁴	Q_g	$V_{DS} = -15V, V_{GS} = -10V,$ $I_D = -4.1A$	-	6.8	-	nC
Gate-Source Charge ⁴	Q_{gs}		-	1	-	
Gate-Drain Charge ⁴	Q_{gd}		-	1.4	-	
Turn-On Delay Time ⁴	$T_{d(on)}$	$V_{DS} = -15V, V_{GS} = -10V,$ $R_G = 2.5\Omega, R_L = 15\Omega$	-	14	-	ns
Rise Time ⁴	T_r		-	61	-	
Turn-Off Delay Time ⁴	$T_{d(off)}$		-	19	-	
Fall Time ⁴	T_f		-	10	-	
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-4.1A$	-	-	-1.2	V
Continuous Source Current	I_S		-	-	-6	A
Pulsed Drain to Source Diode Current	I_{SM}		-	-	-	A



N-Channel Typical Characteristics



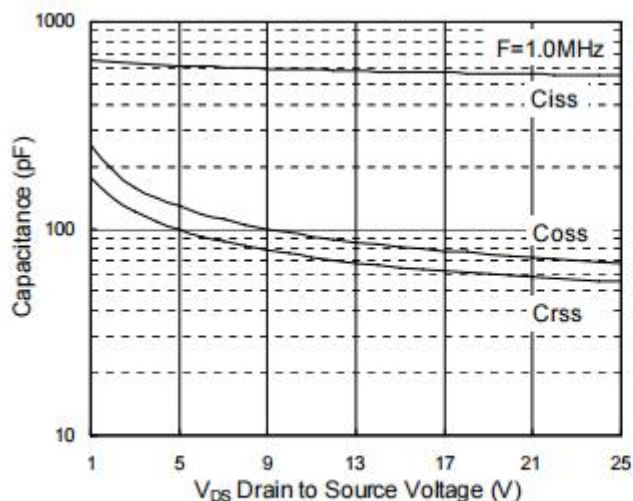


Fig.7 Capacitance

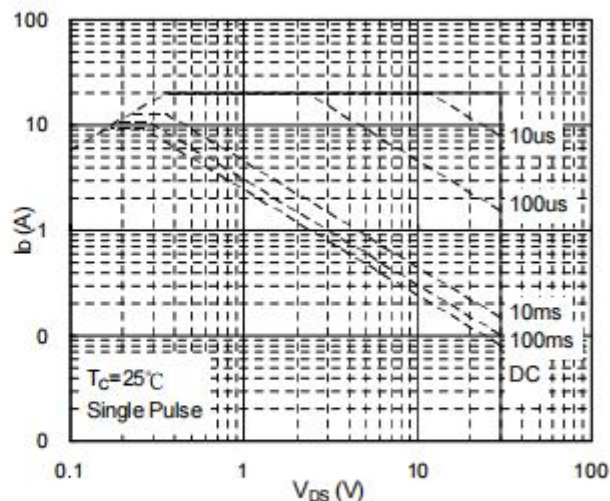


Fig.8 Safe Operating Area

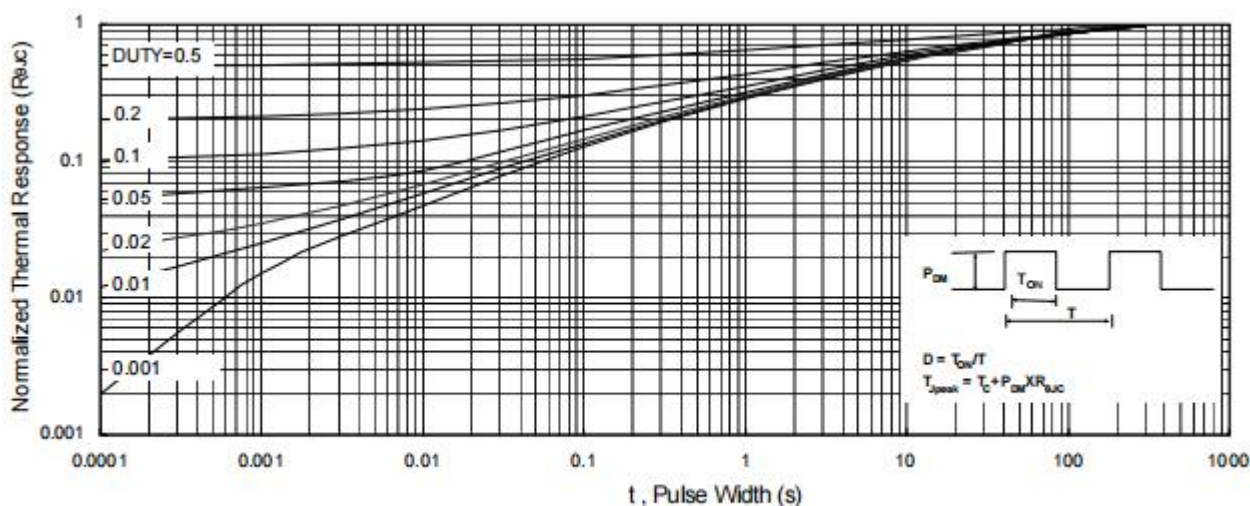


Fig.9 Normalized Maximum Transient Thermal Impedance

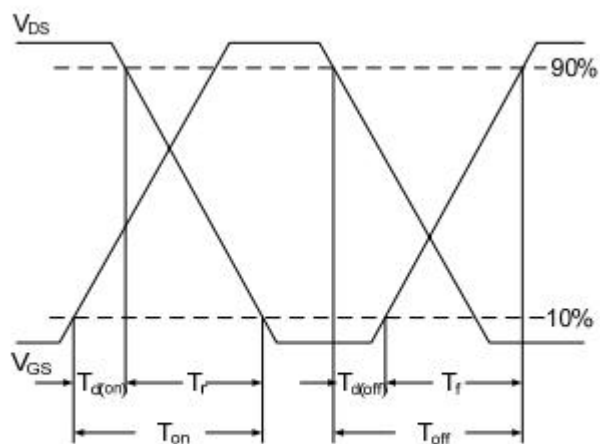


Fig.10 Switching Time Waveform

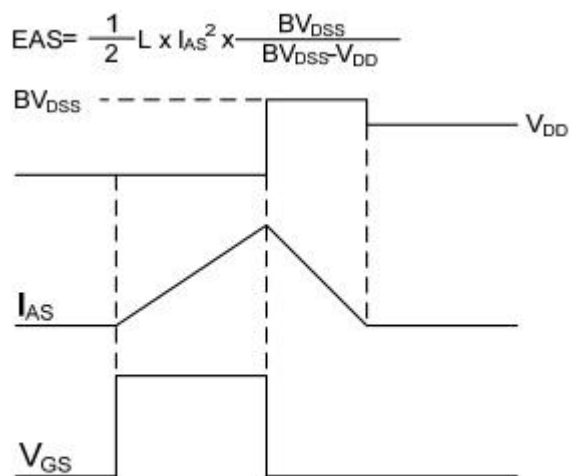
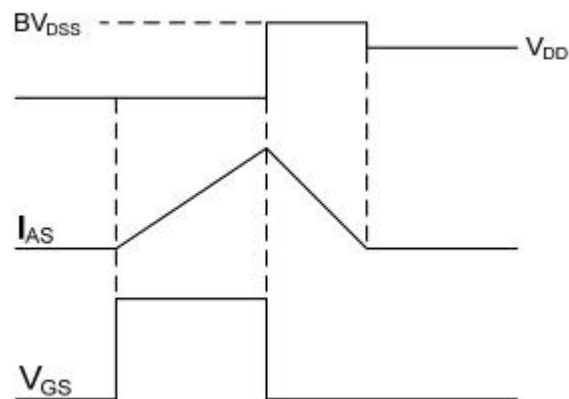


Fig.11 Unclamped Inductive Waveform

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DS}}{BV_{DS} - V_{DD}}$$





P-Channel Typical Characteristics

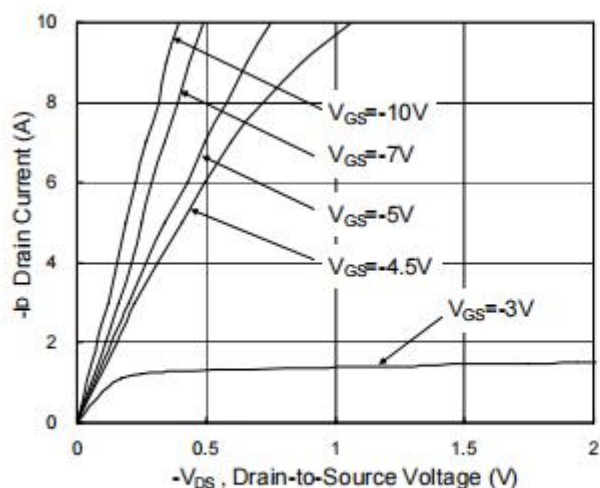


Fig.1 Typical Output Characteristics

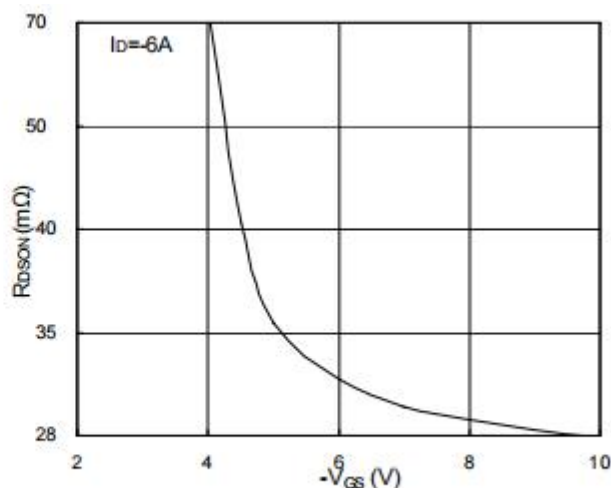


Fig.2 On-Resistance vs. Gate-Source

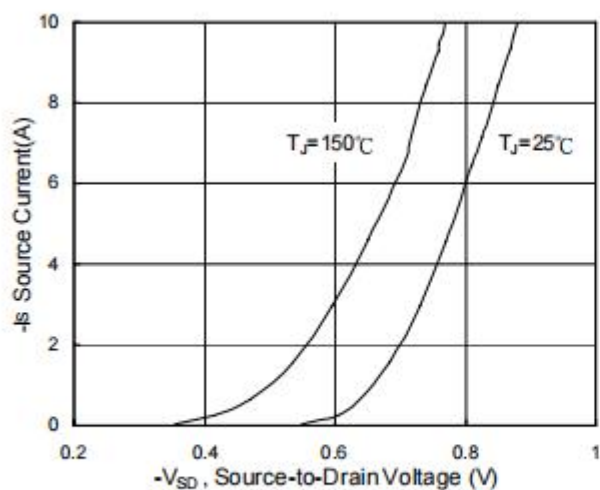
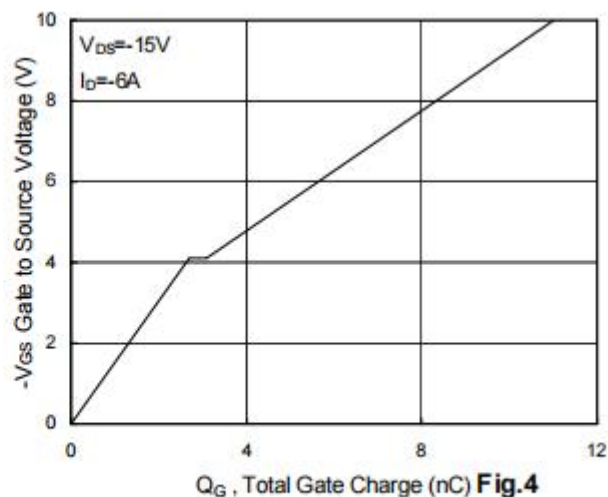
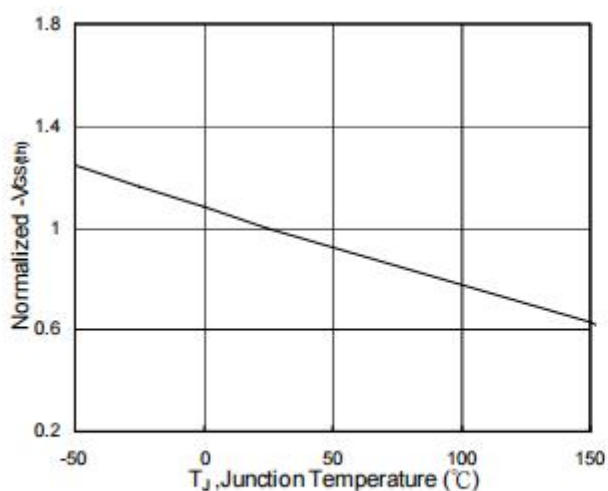
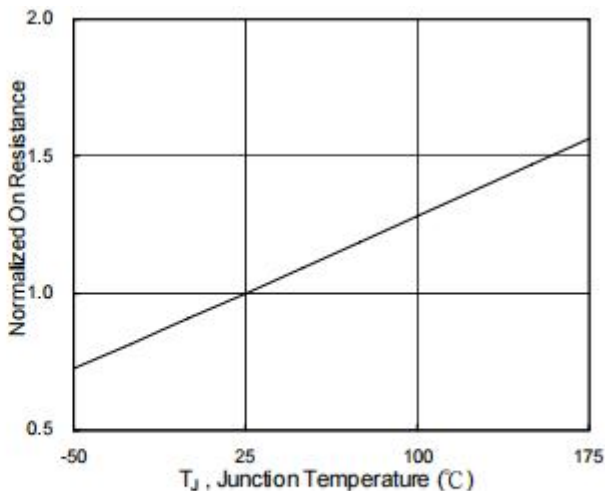


Fig.3 Forward Characteristics of Reverse



Gate-charge Characteristics

Fig.5 Normalized $V_{GS(th)}$ vs. T_J Fig.6 Normalized $R_{DS(on)}$ vs. T_J

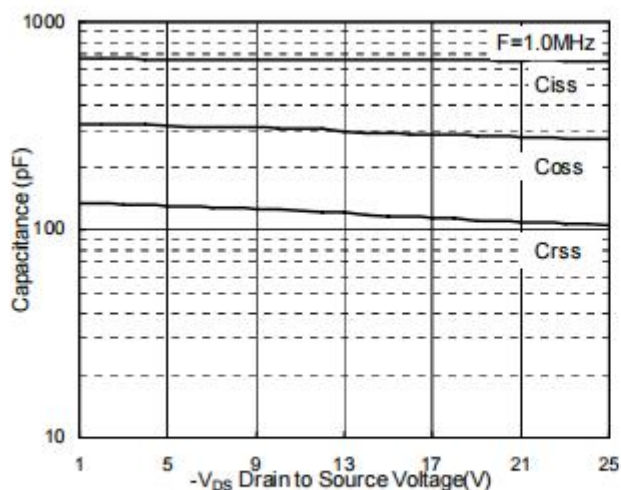


Fig.7 Capacitance

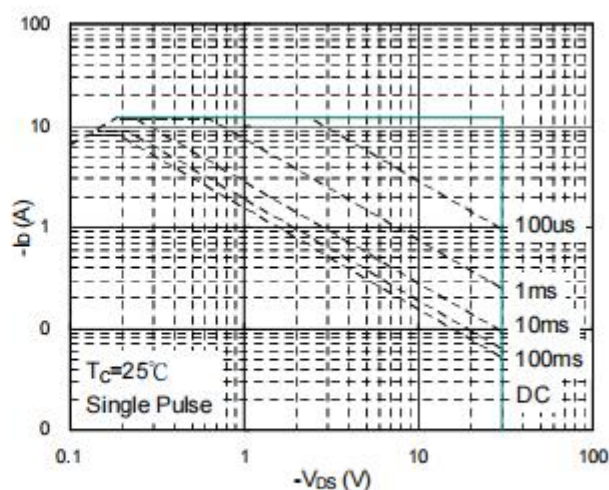


Fig.8 Safe Operating Area

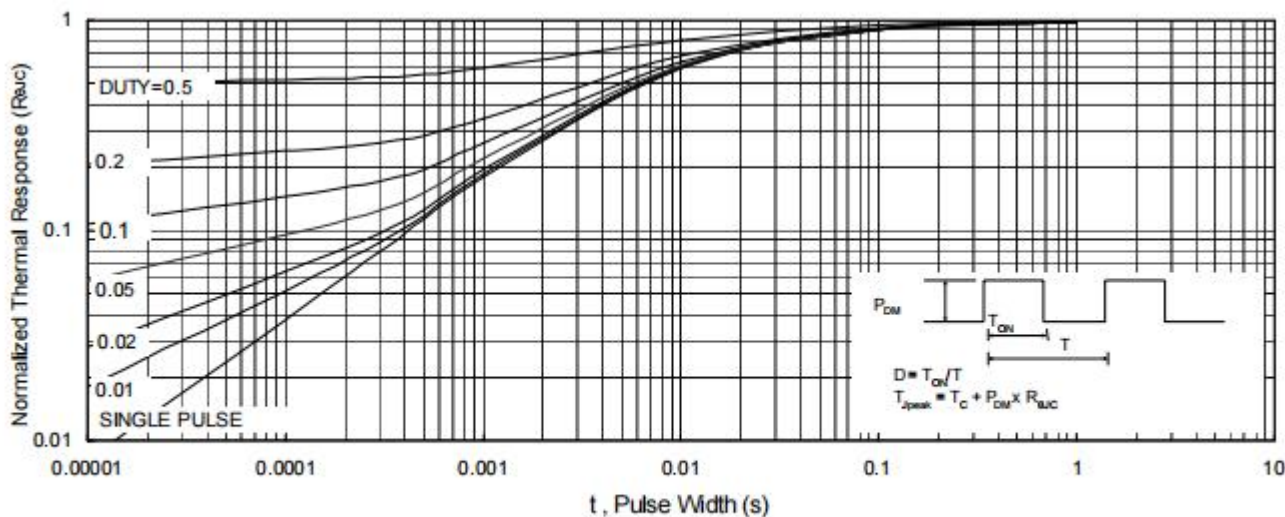


Fig.9 Normalized Maximum Transient Thermal Impedance

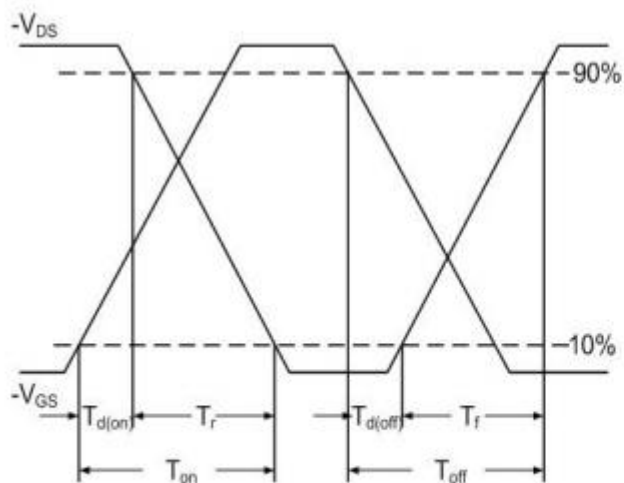


Fig.10 Switching Time Waveform

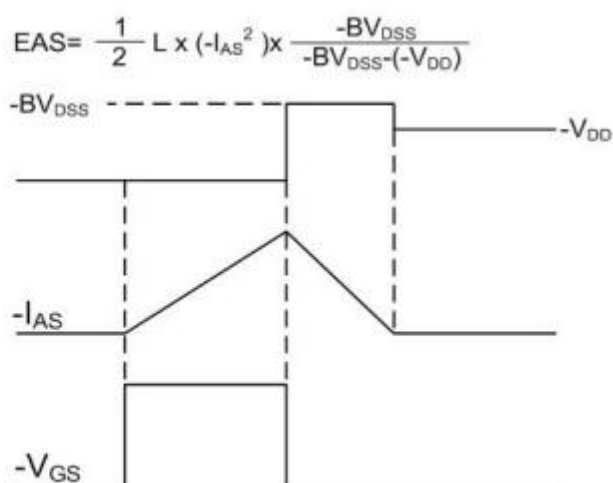
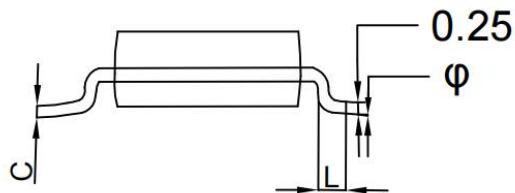
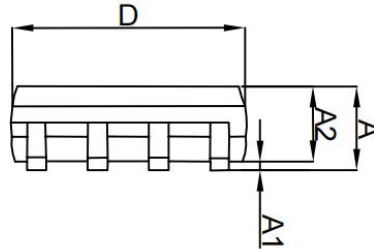
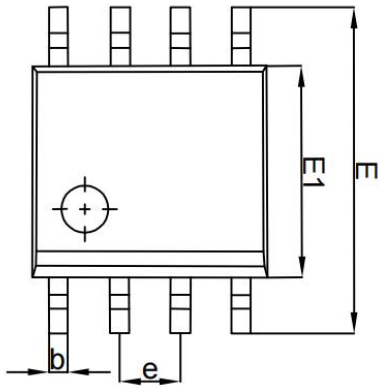


Fig.11 Unclamped Inductive Waveform



Package Dimensions SOP-8



Symbol	Dimensions In Millimetres	
	MIN	MAX
A	1.3500	1.7500
※ A1	0.0000	0.0700
A2	1.3000	1.5000
※ b	0.3900	0.4500
c	0.2100	0.2600
D	4.7000	5.1000
E	3.7000	4.1000
※ E1	5.8000	6.2000
※ e	1.25 BCS	
※ L	0.5000	0.8000
※ L1	0.9900	1.1000
φ	0°	8°

注：1. 标注※ 尺寸为测量尺寸



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