

P-Ch 60V Fast Switching MOSFETs

Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$

Applications

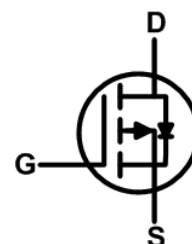
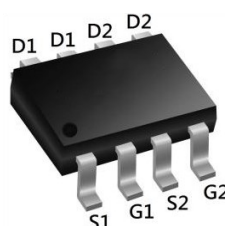
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Product Summary



BVDSS	RDSON	ID
-60V	42mΩ	-10A

SOP8 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-60	V
V_{GS}	Gate-Source Voltage	±20	V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, V_{GS} @ 10V ^{1,6}	-10	A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current, V_{GS} @ 10V ^{1,6}	-5	A
I_{DM}	Pulsed Drain Current ²	-40	A
EAS	Single Pulse Avalanche Energy ³	48	mJ
I_{AS}	Avalanche Current	---	A
$P_D@T_C=25^{\circ}C$	Total Power Dissipation ⁴	40	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	---	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	3.12	°C/W

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-100	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	---	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-4A$	---	42	54	$m\Omega$
		$V_{GS}=-4.5V$, $I_D=-2A$	---	54	77	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1.3	-1.8	-2.3	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	$mV/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-60V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=-60V$, $V_{GS}=0V$, $T_J=100^\circ\text{C}$	---	---	---	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V$, $I_D=-6A$	---	---	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	5	---	Ω
Q_g	Total Gate Charge	$V_{DS}=-30V$, $V_{GS}=-10V$, $I_D=-4A$	---	11.6	---	nC
Q_{gs}	Gate-Source Charge		---	2.4	---	
Q_{gd}	Gate-Drain Charge		---	1.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{GS}=-10V$, $V_{DD}=-30V$, $R_G=3\Omega$, $I_D=-4A$	---	10	---	ns
T_r	Rise Time		---	6	---	
$T_{d(off)}$	Turn-Off Delay Time		---	40	---	
T_f	Fall Time		---	13	---	
C_{iss}	Input Capacitance	$V_{DS}=-30V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	667	---	pF
C_{oss}	Output Capacitance		---	114	---	
C_{rss}	Reverse Transfer Capacitance		---	5.2	---	

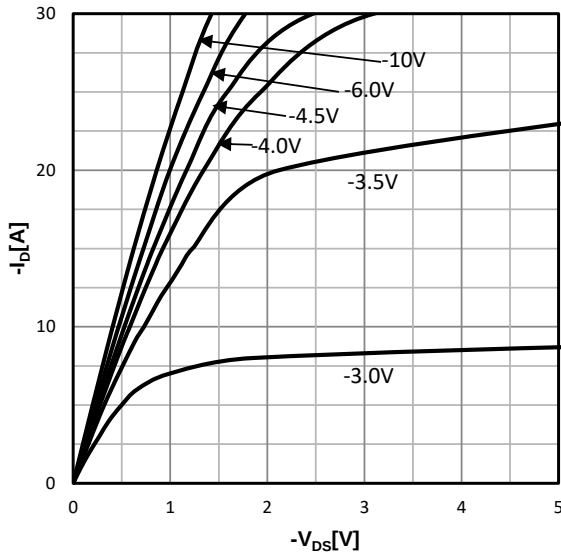
Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,4}	$V_G=V_D=0V$, Force Current	---	---	-10	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-4A$, $T_J=25^\circ\text{C}$	---	---	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F=-4A$, $di/dt=100A/\mu s$,	---	28	---	nS
Q_{rr}	Reverse Recovery Charge	$T_J=25^\circ\text{C}$, $V_{DD}=-30V$	---	40	---	nC

a1: Repetitive rating; pulse width limited by maximum junction temperature
a2: $V_{DD}=-30V$, $L=0.3\text{mH}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

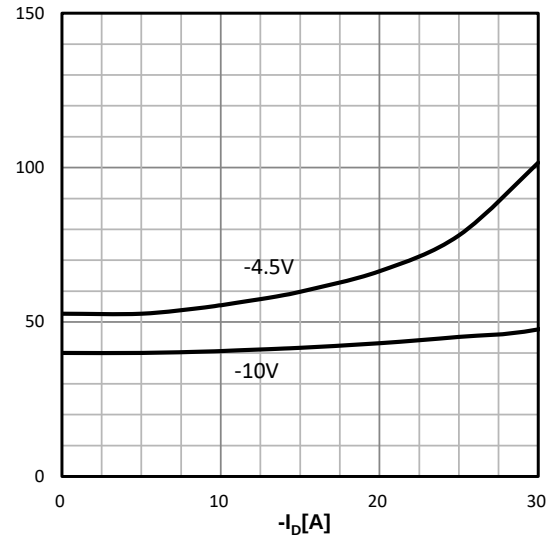
General Description:

Figure 1: Typ. output characteristics



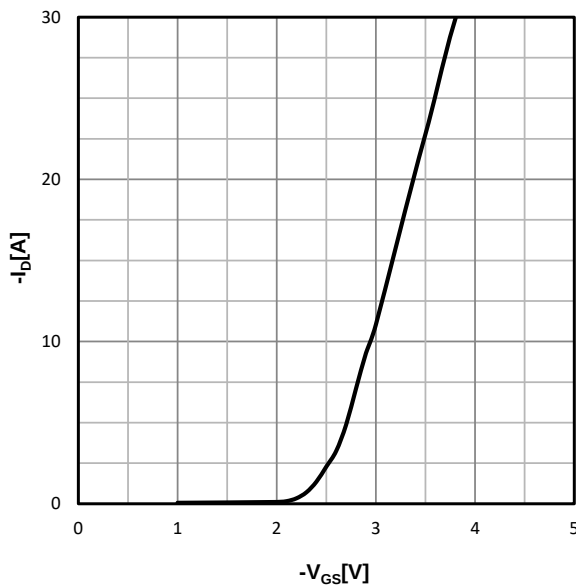
$$I_D = f(V_{DS}), T_j = 25^\circ\text{C}; \text{ parameter: } V_{GS}$$

Figure 2: Typ. drain-source on resistance



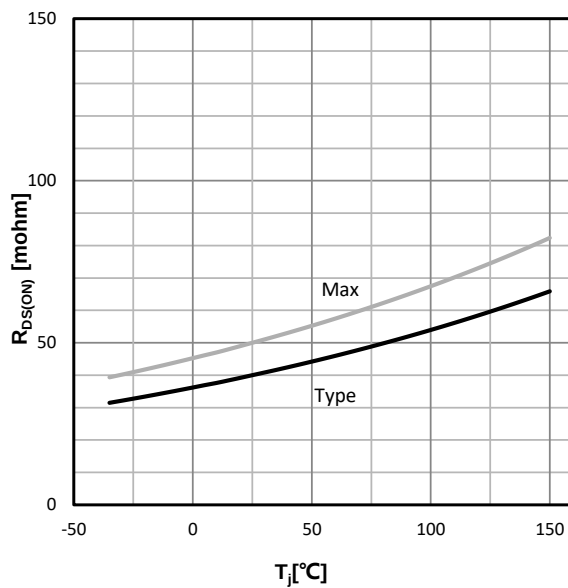
$$R_{DS(on)} = f(I_D), T_j = 25^\circ\text{C}; \text{ parameter: } V_{GS}$$

Figure 3: Typ. transfer characteristics



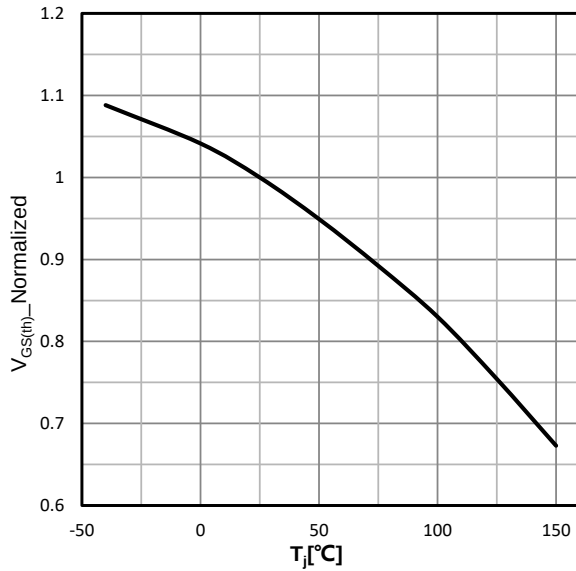
$$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)}\text{max};$$

Figure 4: drain-source on resistance



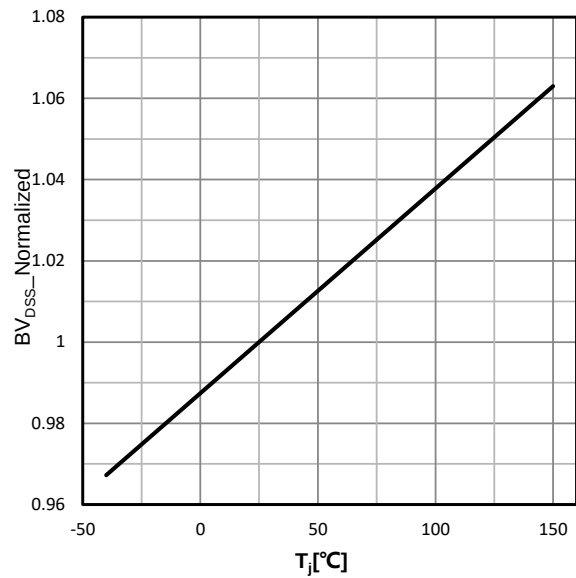
$$R_{DS(on)} = f(T_j), I_D = -10\text{A}, V_{GS} = -10\text{V};$$

Figure 5: Typ. gate threshold voltage



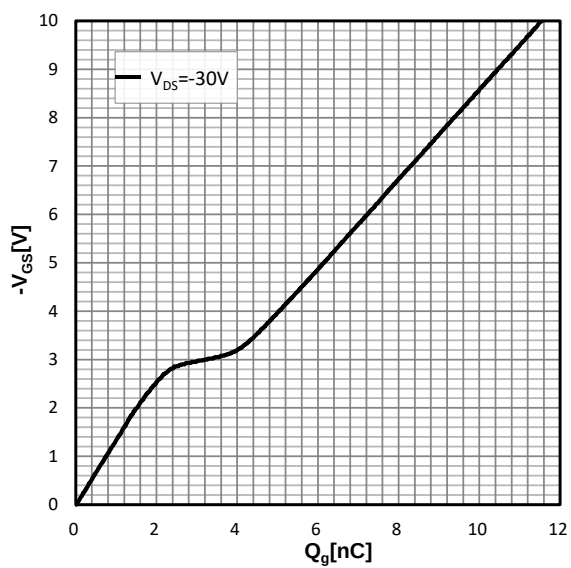
$$V_{GS}=f(T_j), V_{GS}=V_{DS}, I_D=-250\mu A;$$

Figure 6: Drain-source breakdown voltage



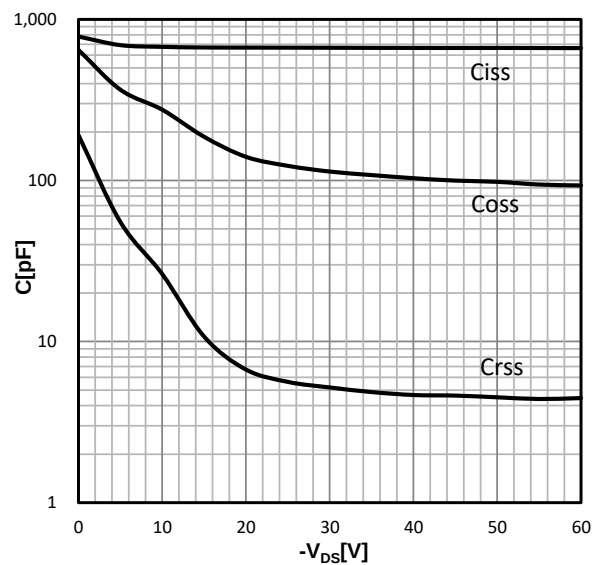
$$V_{BR(DSS)}=f(T_j); I_D=-250\mu A;$$

Figure 7: Typ. gate charge



$$V_{GS}=f(Q_g), I_D=-10A, T_j=25^{\circ}C; \text{parameter: } V_{DS}$$

Figure 8: Typ. Capacitances



$$C=f(V_{DS}); V_{GS}=0V; f=1.0 \text{ MHz};$$

Figure 9: Power dissipation

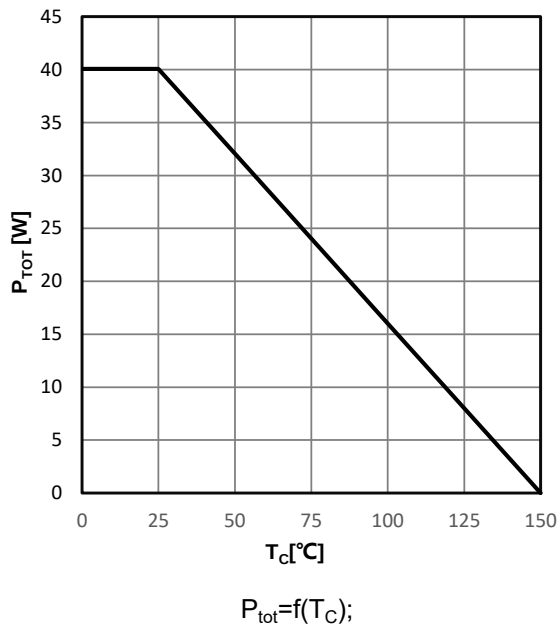


Figure 10: Drain current

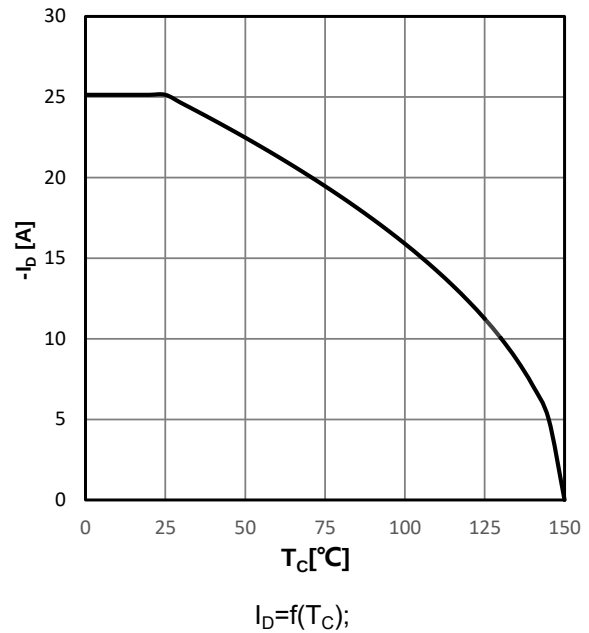


Figure 11: Safe operating area

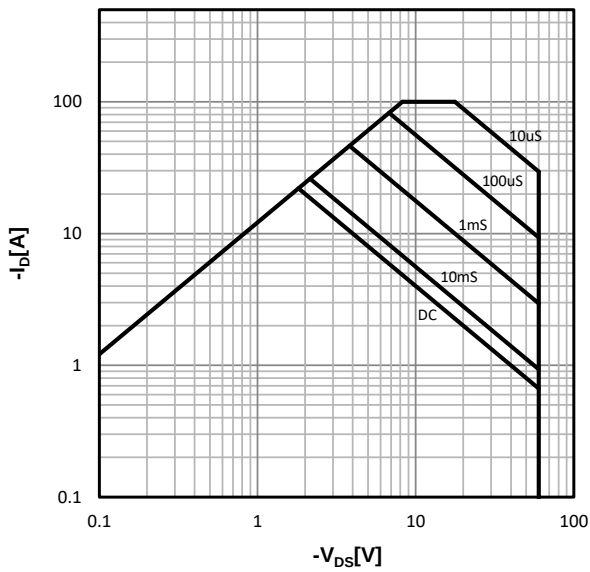


Figure 12: Typ. forward characteristics

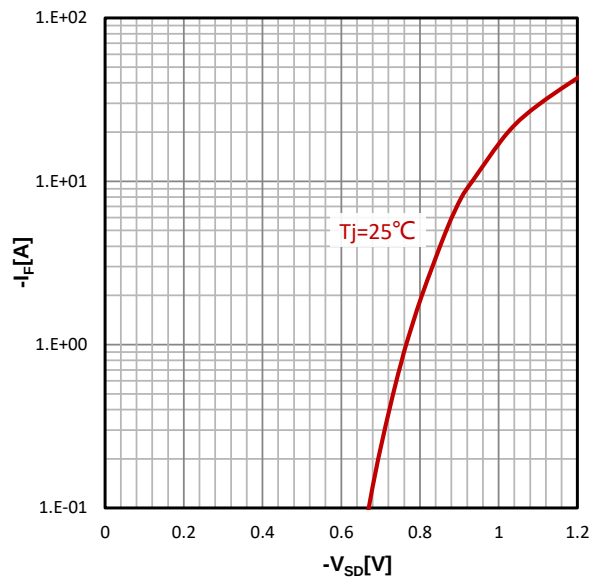
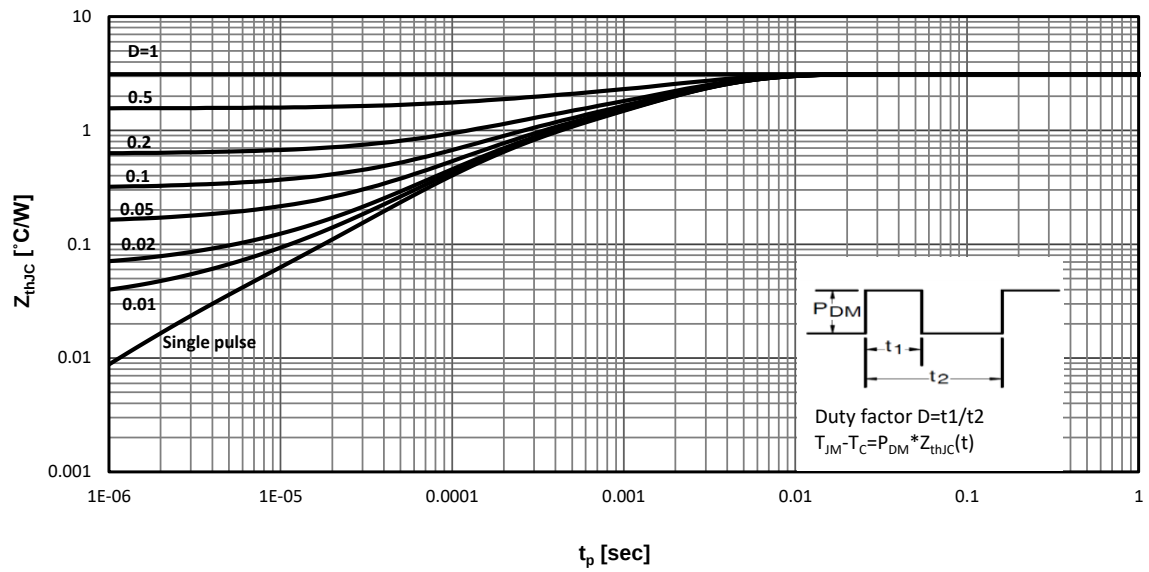
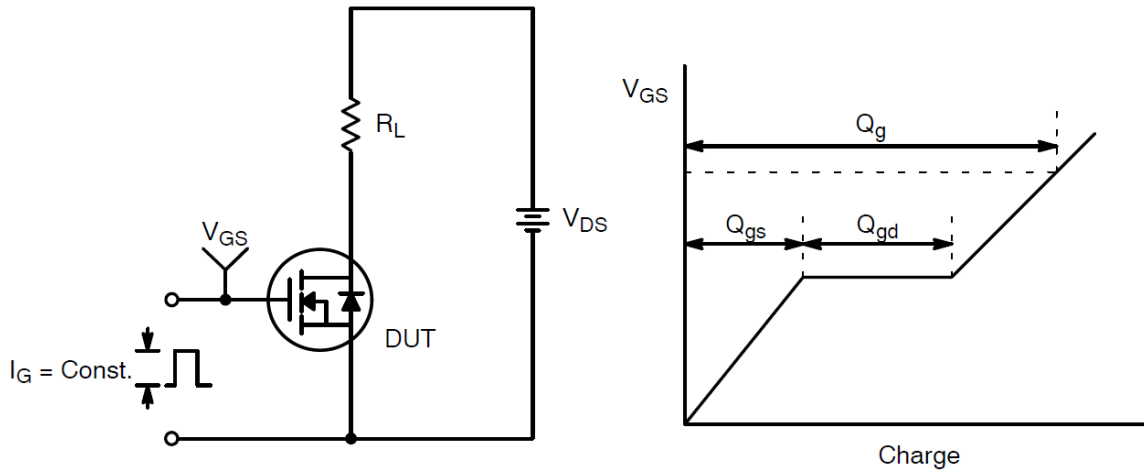


Figure 13: Max. Transient Thermal Impedance

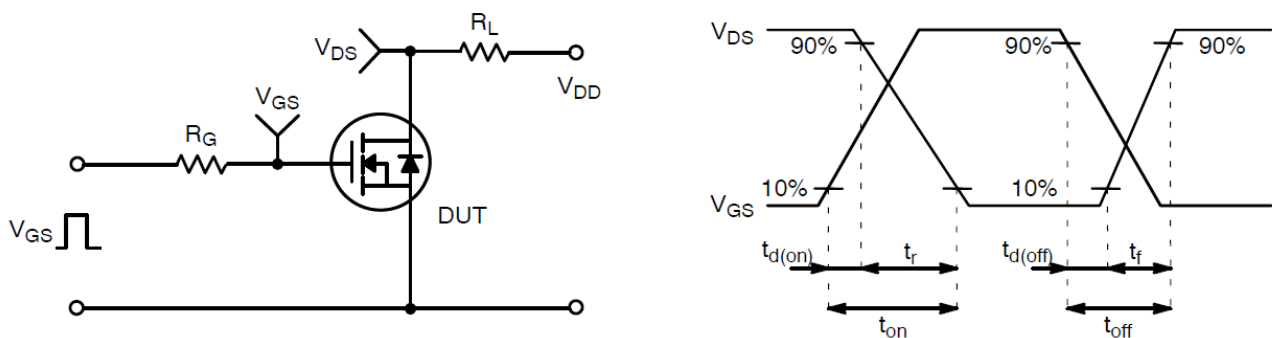


$$Z_{thJC} = f(t_p); \text{ parameter: } D$$

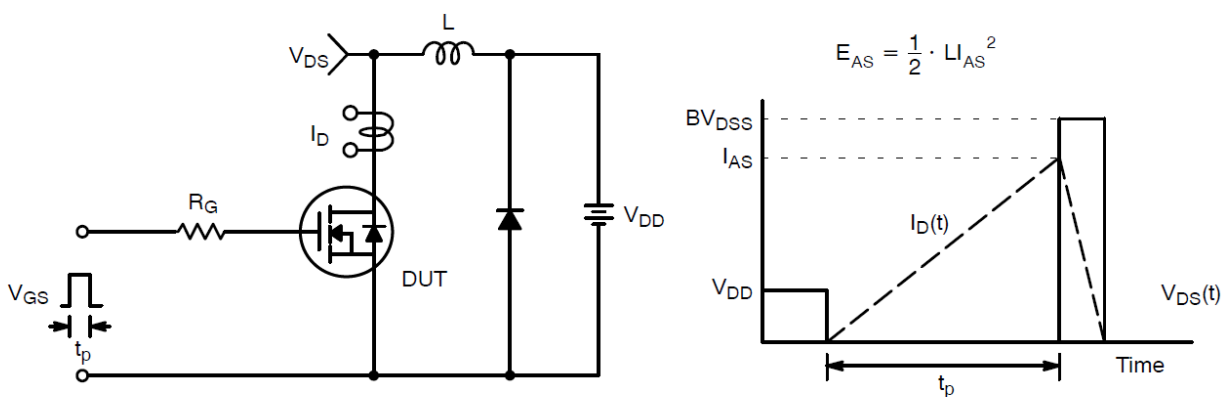
Test Circuit and Waveform:



Gate Charge Test Circuit & Waveform

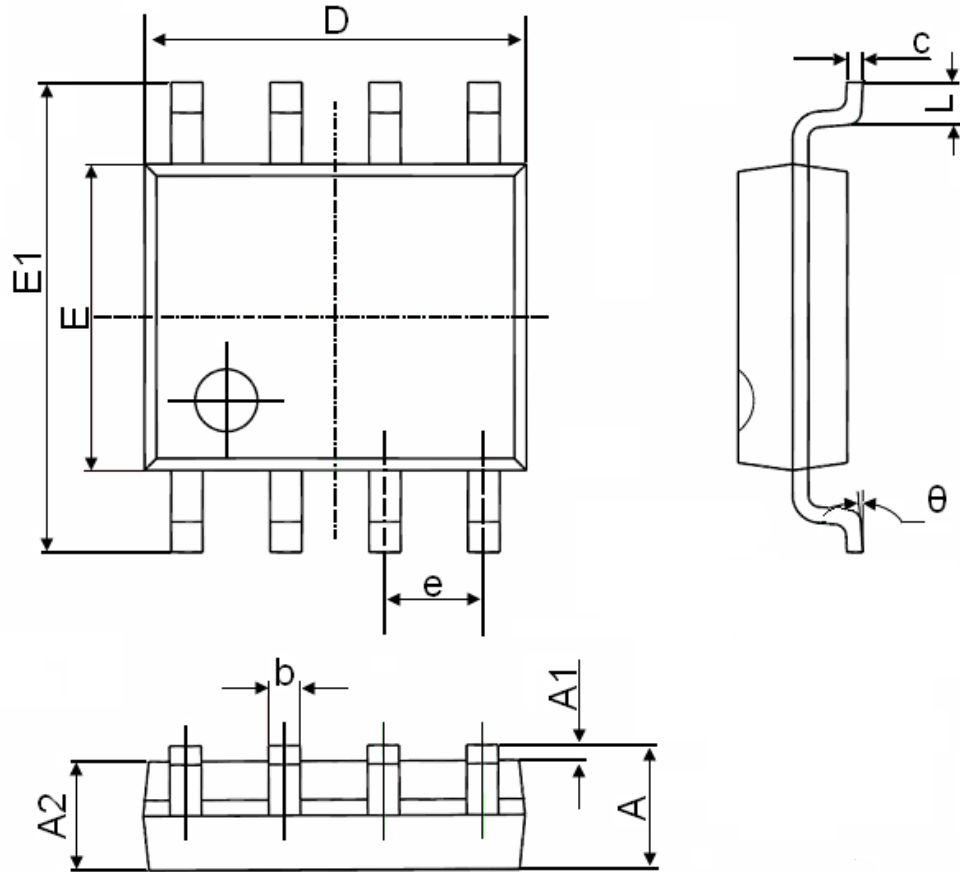


Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Package Mechanical Data- SOP8



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	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°