

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

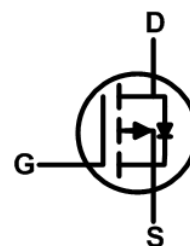
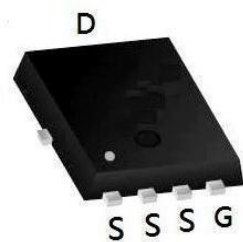
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Product Summary



BVDSS	RDSON	ID
-60V	42mΩ	-20A

PDFN5060-8L Pin Configuration



Absolute Maximum Ratings:

Symbol	Parameter		Value	Units
V_{DSS}	Drain-to-Source Voltage		-60	V
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$	-20	A
	Continuous Drain Current	$T_C=100^\circ\text{C}$	-12	A
I_{DM}^{a1}	Pulsed Drain Current		-100	A
V_{GS}	Gate-to-Source Voltage		± 20	V
P_D	Power Dissipation		38	W
E_{AS}^{a2}	Single pulse avalanche energy		48	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range		150, -55 to 150	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering		260	$^\circ\text{C}$

Thermal Characteristics:

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.12	$^\circ\text{C/W}$

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Electrical Characteristic ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise specified):

Static Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-60	--	--	V
I_{DSS}	Drain to Source Leakage Current	$V_{DS}=-60V, V_{GS}=0V$	--	--	1.0	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS}=-20V, V_{DS}=0V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS}=+20V, V_{DS}=0V$	--	--	-100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.3	-1.8	-2.3	V
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	$V_{GS}=-10V, I_D=-10A$	--	42	51	m Ω
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=-4.5V, I_D=-5.0A$	--	52	65	m Ω

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = -30V$ $f = 1.0MHz$	--	667	--	pF
C_{oss}	Output Capacitance		--	114	--	
C_{rss}	Reverse Transfer Capacitance		--	5.2	--	
R_G	Gate resistance	$V_{GS}=0V, V_{DS}$ Open	--	5.0	--	Ω

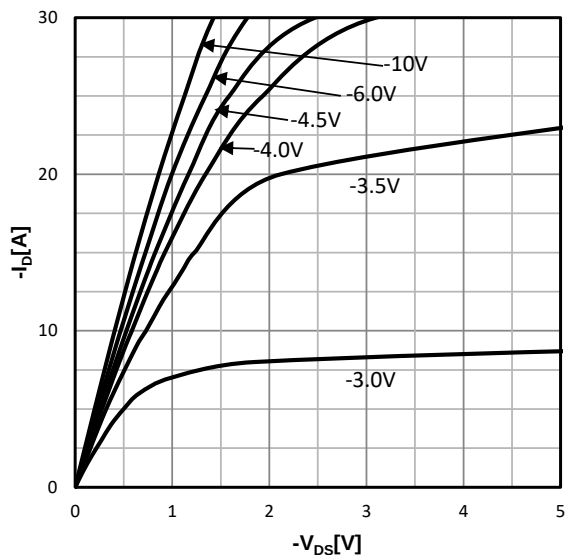
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = -10A$ $V_{DS} = -30V$ $V_{GS} = -10V$ $R_G = 3\Omega$	--	10	--	ns
t_r	Rise Time		--	6	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	40	--	
t_f	Fall Time		--	13	--	
Q_g	Total Gate Charge	$V_{GS} = -10V$ $V_{DS} = -30V$ $I_D = -10A$	--	11.6	--	nC
Q_{gs}	Gate Source Charge		--	2.4	--	
Q_{gd}	Gate Drain Charge		--	1.5	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	$T_C = 25\text{ }^{\circ}\text{C}$	--	--	-20	A
I_{SM}	Diode Pluse Current		--	--	-100	A
V_{SD}	Diode Forward Voltage	$I_S = -10A, V_{GS} = 0V$	--	--	-1.2	V
t_{rr}	Reverse Recovery time	$I_S = -10A, V_{DD} = -30V,$ $dI/dt = 100A/us$	--	28	--	ns
Q_{rr}	Reverse Recovery Charge		--	40	--	nC

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

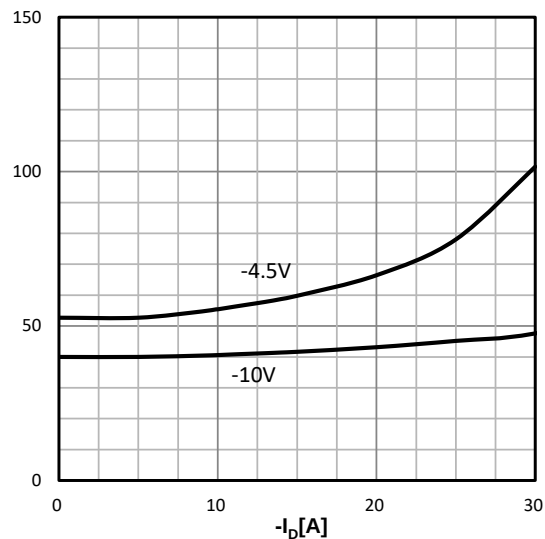
General Description:

Figure 1: Typ. output characteristics



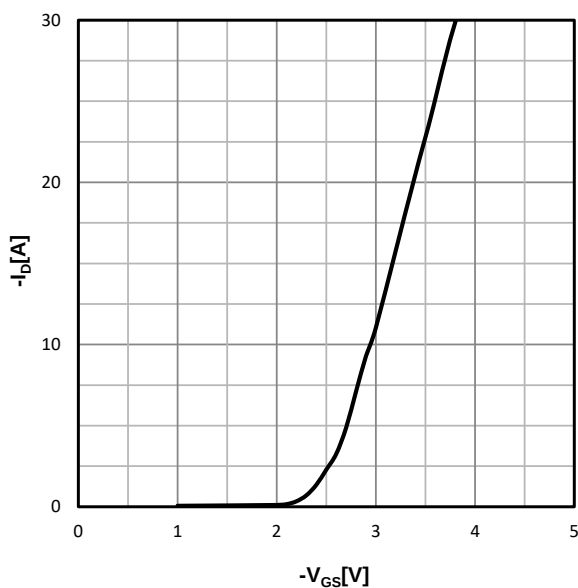
$$I_D = f(V_{DS}), T_j = 25^\circ\text{C}; \text{ parameter: } V_{GS}$$

Figure 2: Typ. drain-source on resistance



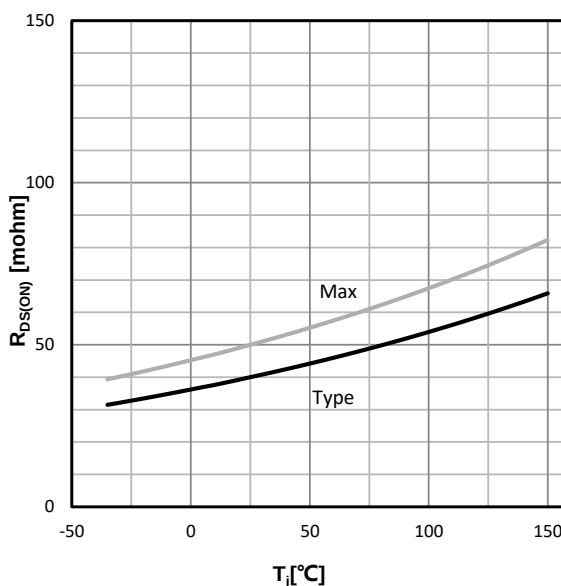
$$R_{DS(on)} = f(I_D), T_j = 25^\circ\text{C}; \text{ parameter: } V_{GS}$$

Figure 3: Typ. transfer characteristics



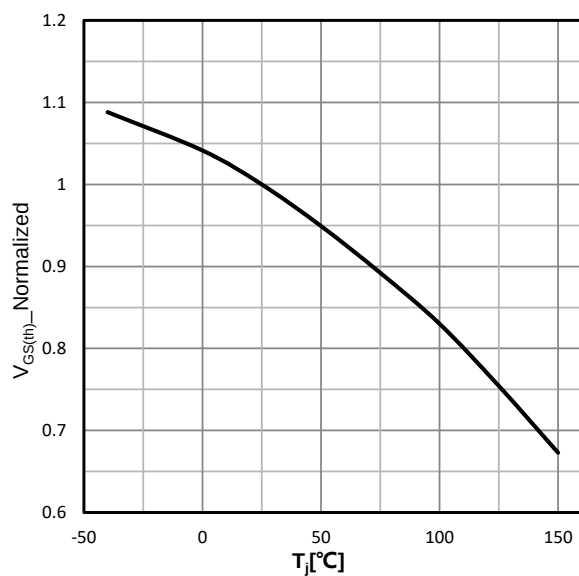
$$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max};$$

Figure 4: drain-source on resistance



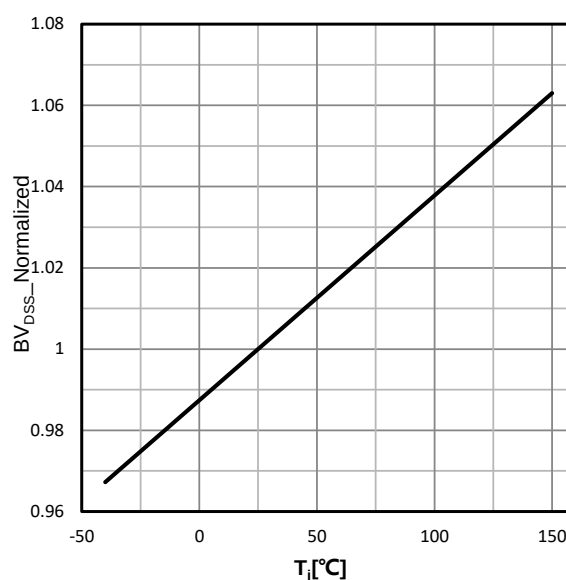
$$R_{DS(on)} = f(T_j), I_D = -10\text{A}, V_{GS} = -10\text{V};$$

Figure 5: Typ. gate threshold voltage



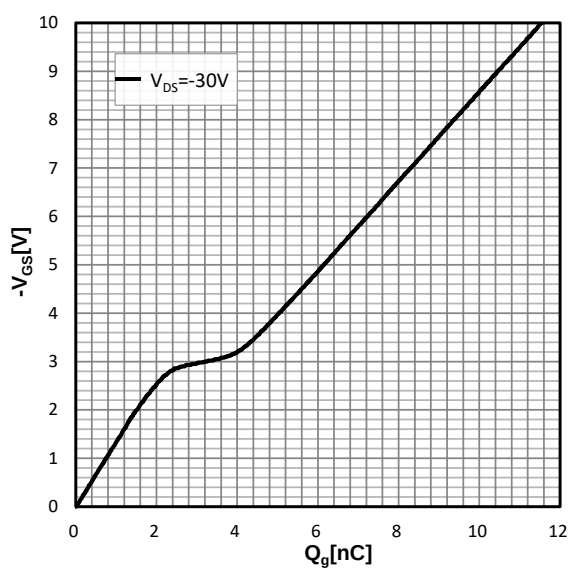
$$V_{GS}=f(T_j), V_{GS}=V_{DS}, I_D=-250\mu A;$$

Figure 6: Drain-source breakdown voltage



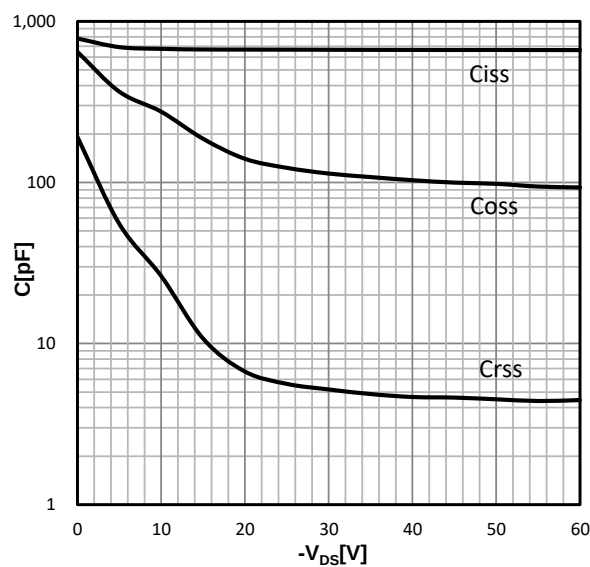
$$V_{BR(DSS)}=f(T_j); I_D=-250\mu A;$$

Figure 7: Typ. gate charge



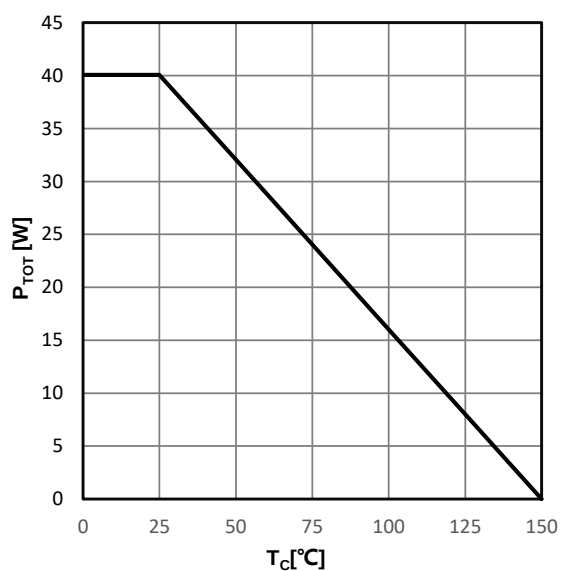
$$V_{GS}=f(Q_g), I_D=-10A, T_j=25^\circ C; \text{parameter: } V_{DS}$$

Figure 8: Typ. Capacitances



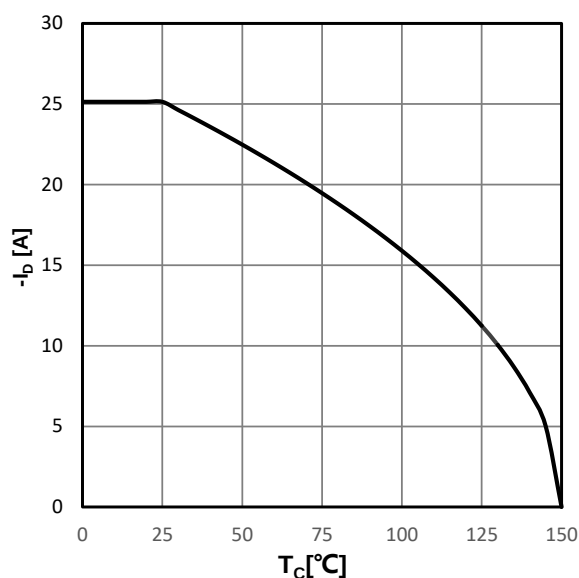
$$C=f(V_{DS}); V_{GS}=0V; f=1.0\text{ MHz};$$

Figure 9: Power dissipation



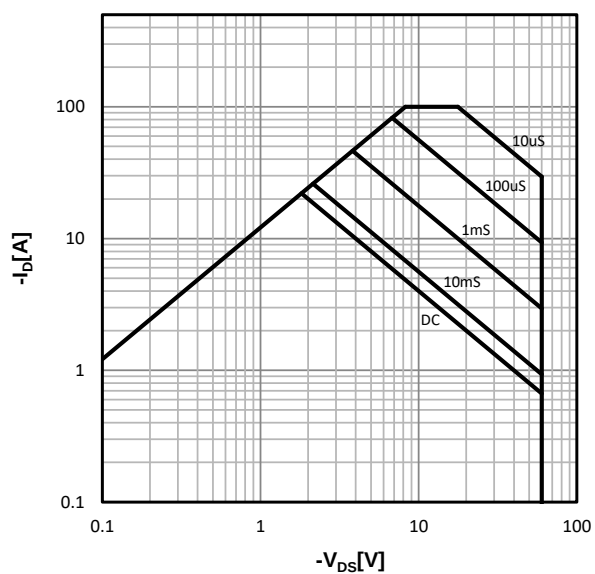
$$P_{tot}=f(T_C);$$

Figure 10: Drain current



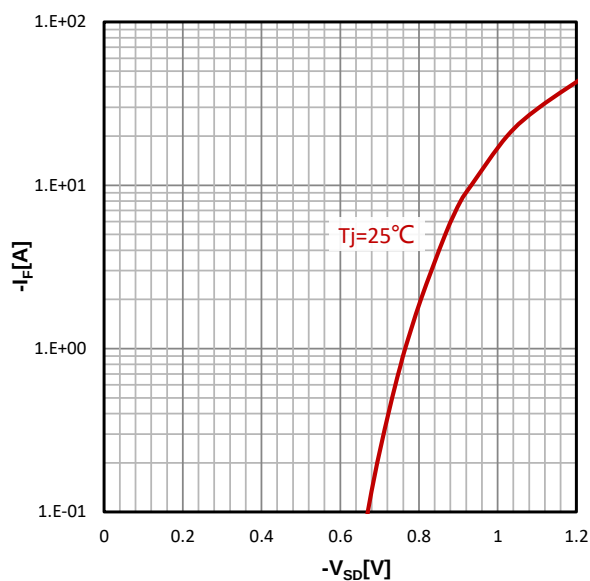
$$I_D=f(T_C);$$

Figure 11: Safe operating area



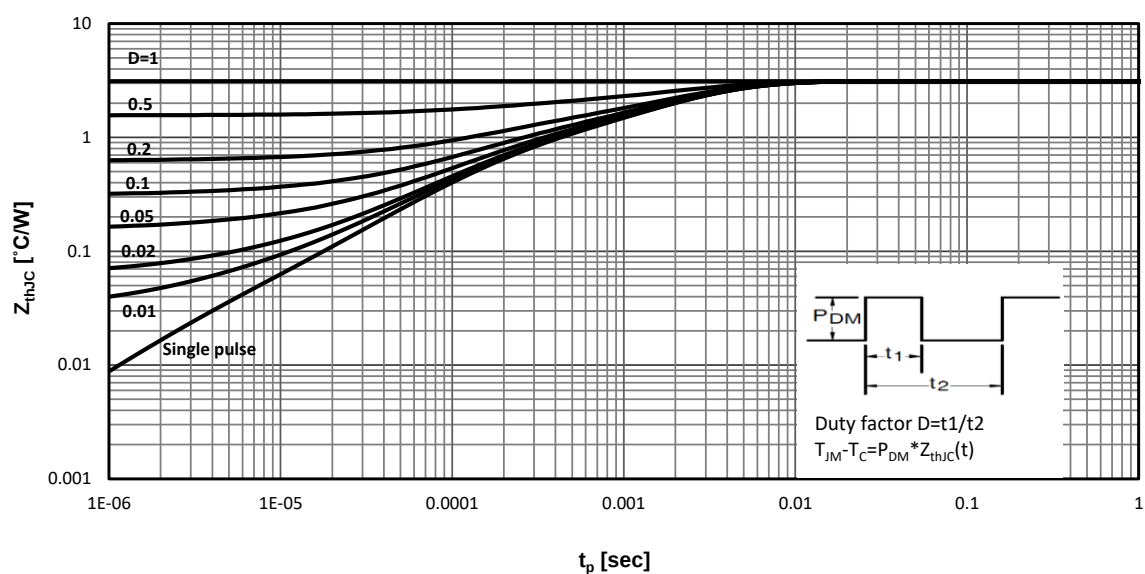
$$I_D=f(V_{DS}); T_C=25^\circ\text{C}; D=0; \text{parameter: tp}$$

Figure 12: Typ. forward characteristics



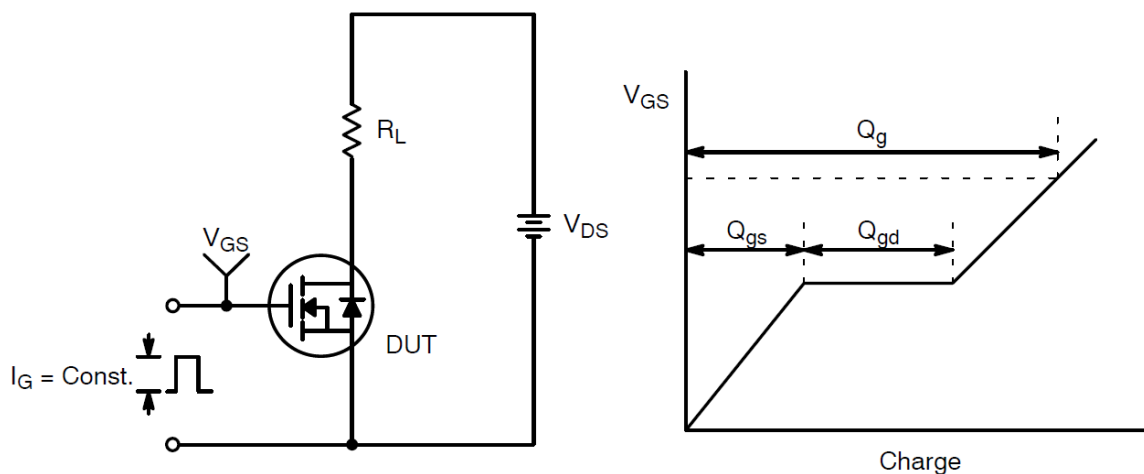
$$I_F=f(V_{SB});$$

Figure 13: Max. Transient Thermal Impedance

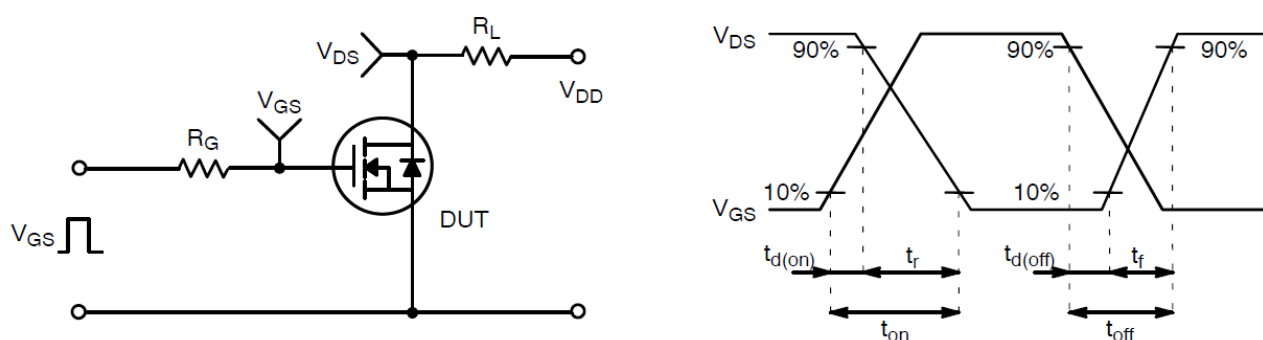


$$Z_{thJC} = f(t_p); \text{ parameter: } D$$

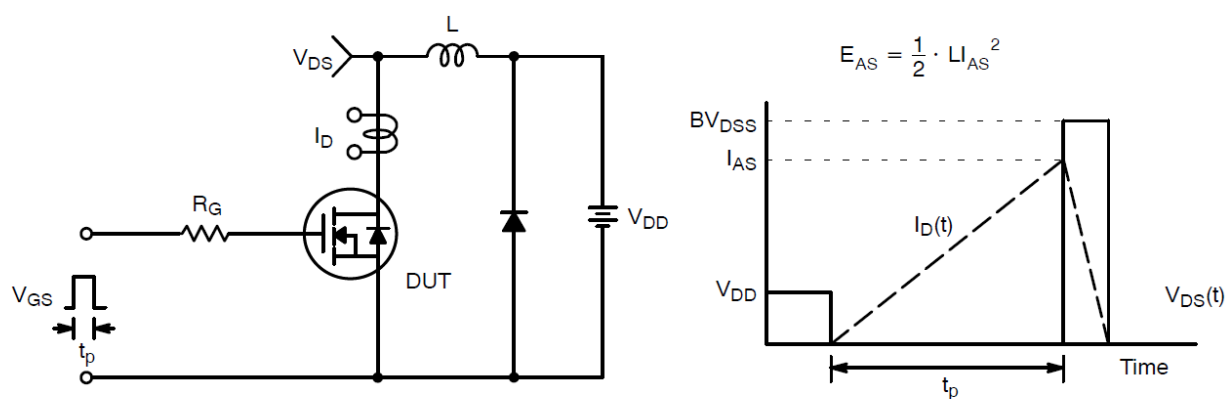
Test Circuit and Waveform:



Gate Charge Test Circuit & Waveform

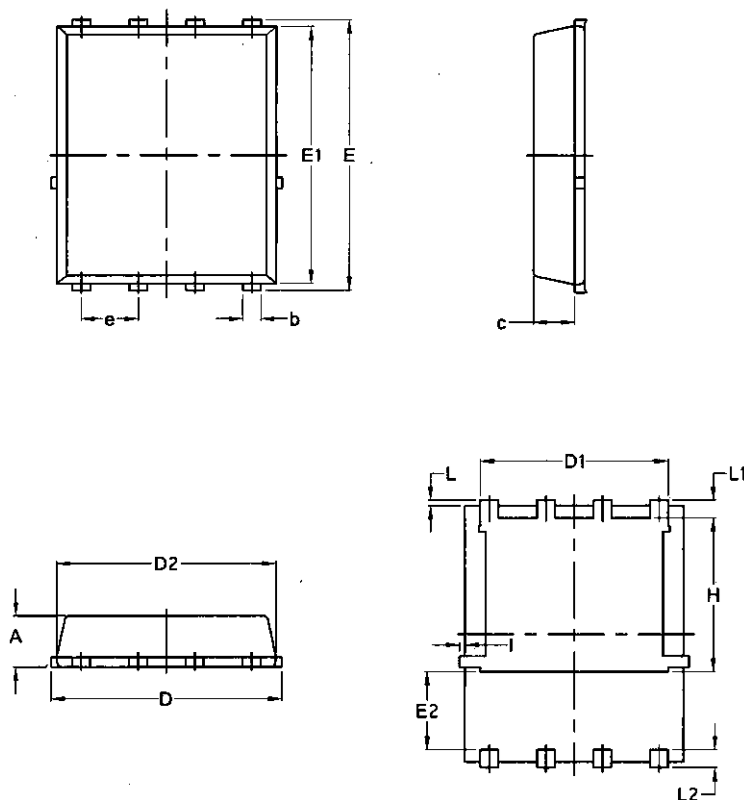


Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Package Mechanical Data-PDFN5060-8L-Single



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	0.824	0.0970	0.0324	0.082
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.60	/	0.0630	/
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
H	3.30	3.50	0.1299	0.1378
I	/	0.18	/	0.0070