

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

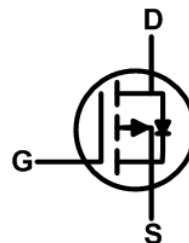
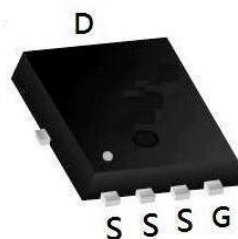
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Product Summary



BVDSS	RDSON	ID
-60V	19mΩ	-40A

PDFN5060-8L Pin Configuration

Absolute Maximum Ratings ($T_C = 25^\circ\text{C}$ unless otherwise specified):

Symbol	Parameter		Value	Units
V_{DSS}	Drain-to-Source Voltage		-60	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	-40	A
	Continuous Drain Current	$T_C = 100^\circ\text{C}$	-25	A
I_{DM}^{a1}	Pulsed Drain Current		-150	A
V_{GS}	Gate-to-Source Voltage		± 20	V
P_D	Power Dissipation		95	W
E_{AS}^{a2}	Single pulse avalanche energy		200	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	1.32	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	60	$^\circ\text{C/W}$

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Electrical Characteristics ($T_J = 25^\circ\text{C}$ 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	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	$V_{GS} = -20V$	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	$V_{GS} = +20V$	--	--	-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	$V_{GS}=-10V, I_D=-10A$	--	19.0	24.0	$m\Omega$
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	$V_{GS}=-4.5V, I_D=-8A$	--	24.5	31	$m\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5V, I_D=-5A$	--	20	--	S

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V$ $V_{DS}=-30V$ $f=1.0MHz$	--	1500	--	pF
C_{oss}	Output Capacitance		--	248	--	
C_{rss}	Reverse Transfer Capacitance		--	12	--	
R_g	Gate resistance	$V_{GS}=0V, V_{DS}$ Open	--	8.0	--	Ω

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D=-10A, R_L=3.0\Omega$ $V_{DS}= -30V$ $V_{GS}= -10V$ $R_G= 3\Omega$	--	15	--	ns
t_r	Rise Time		--	17	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	40	--	
t_f	Fall Time		--	45	--	
Q_g	Total Gate Charge	$V_{GS}=-10V$ $V_{DS}=-30V$ $I_D=-10A$	--	22	--	nC
Q_{gs}	Gate Source Charge		--	3.7	--	
Q_{gd}	Gate Drain Charge		--	3	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	$T_C=25^\circ\text{C}$	--	--	-40	A
I_{SM}	Diode Pulse Current		--	--	-150	A
V_{SD}	Diode Forward Voltage	$I_S=-5.0A, V_{GS}=0V$	--	--	-1.2	V

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t_{rr}	Reverse Recovery time	$I_S = -10A, V_{DD} = -30V$ $dI/dt = 100A/\mu s$	--	60	--	ns
Q_{rr}	Reverse Recovery Charge		--	105	--	nC

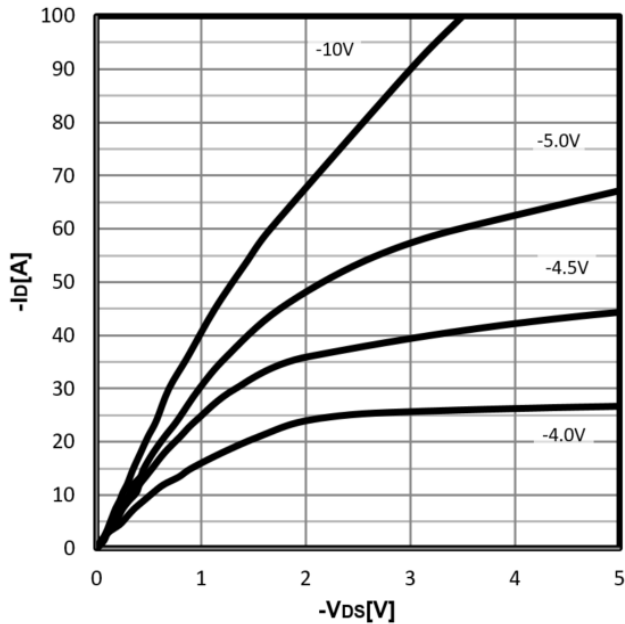
^{a1}: Repetitive rating; pulse width limited by maximum junction temperature

^{a2}: $V_{DD} = -30V$, $L = 1.0mH$, $R_G = 25\Omega$, Starting $T_j = 25^\circ C$

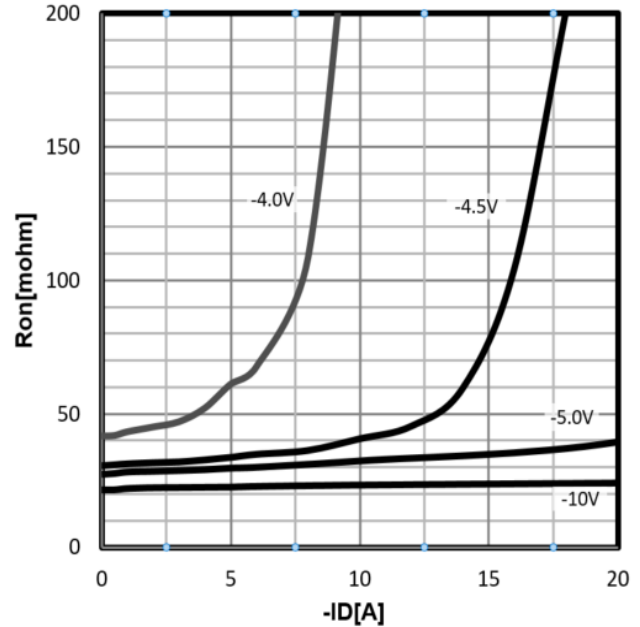
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Characteristics Curve:

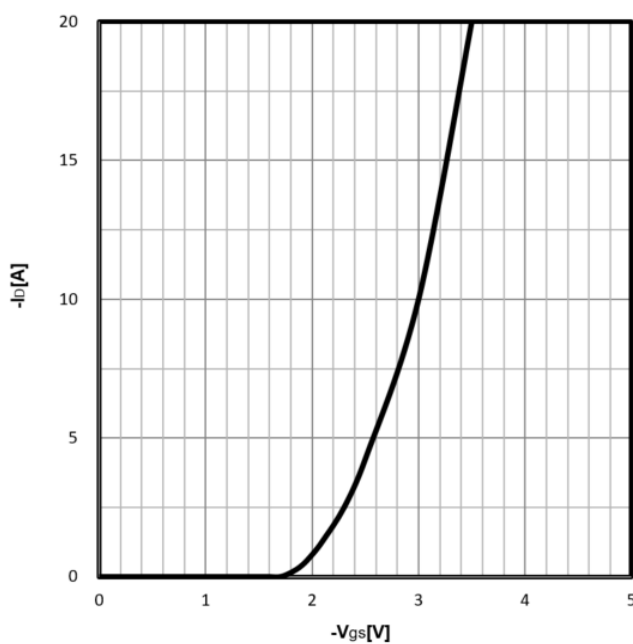
Typ. output characteristics
 $-I_D = f(-V_{DS})$



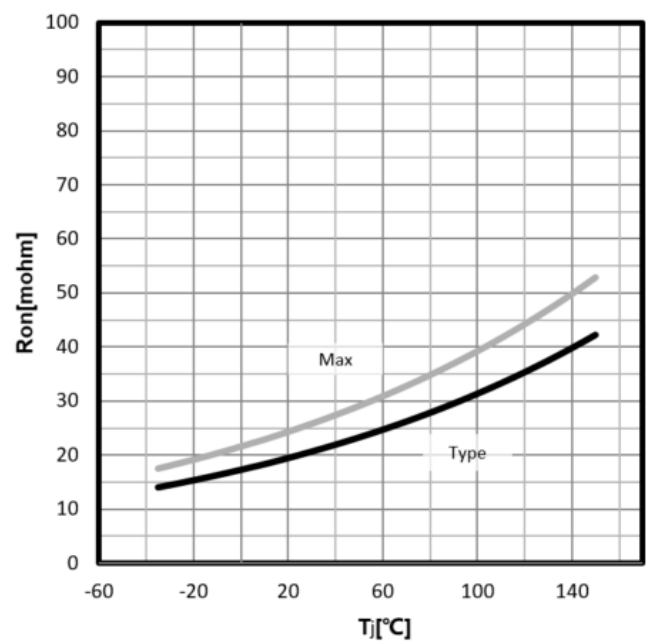
Typ. drain-source on resistance
 $R_{DS(on)} = f(-I_D)$



Typ. transfer characteristics
 $-I_D = f(-V_{GS})$

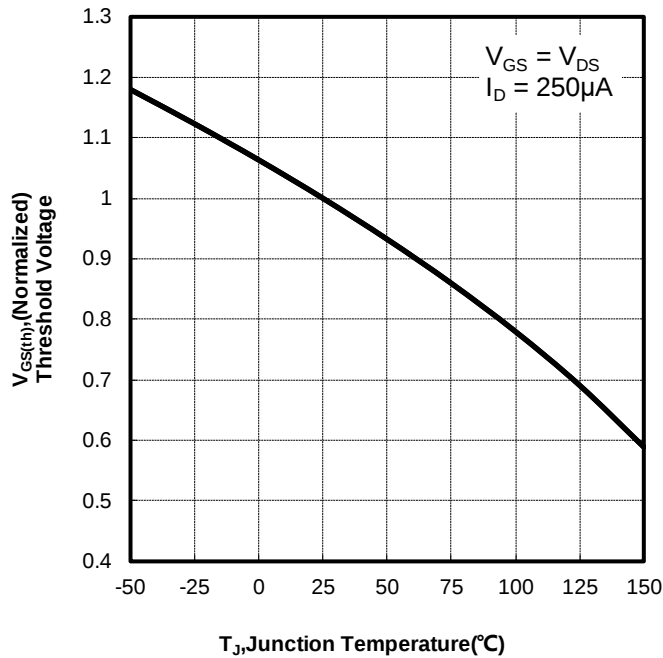


Drain-source on-state resistance
 $R_{DS(on)} = f(T_j); I_D = -10A; V_{GS} = -10V$



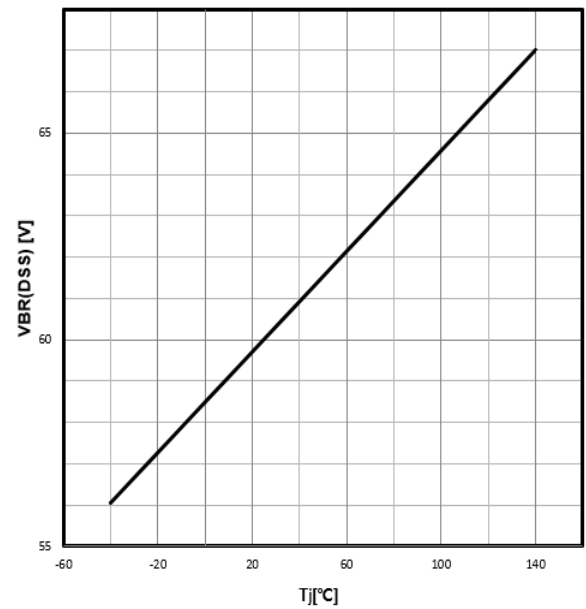
Gate Threshold Voltage

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



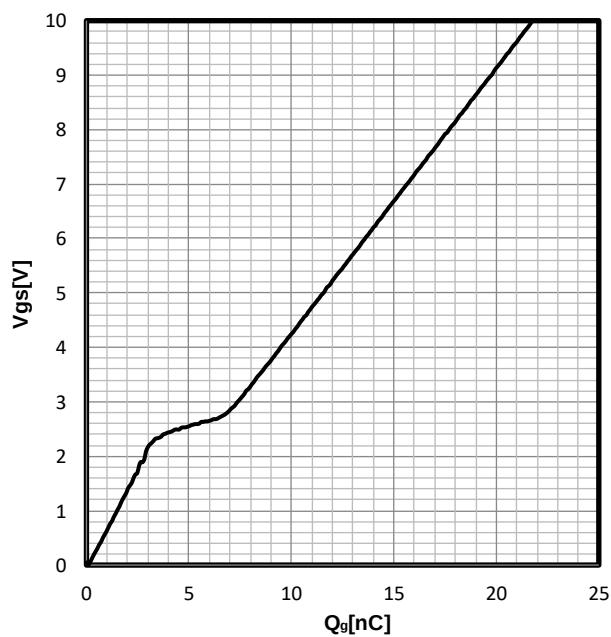
Drain-source breakdown voltage

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



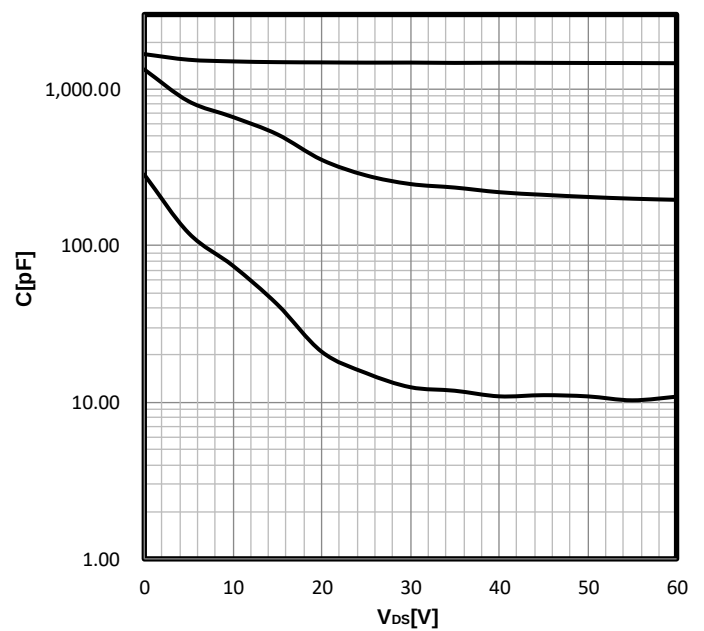
Typ. gate charge

$V_{GS}=f(Q_{gate})$; $I_D=-5A$



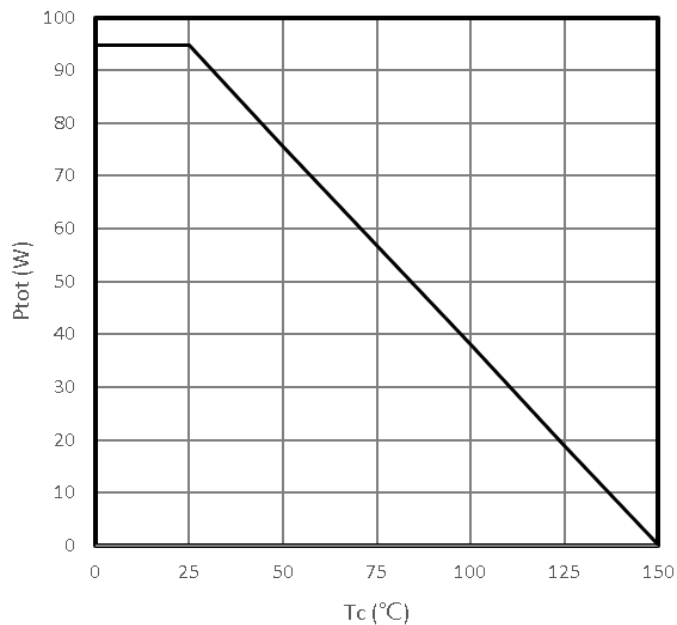
Typ. Capacitances

$C=f(-V_{DS})$; $V_{GS}=0V$; $f=1MHz$



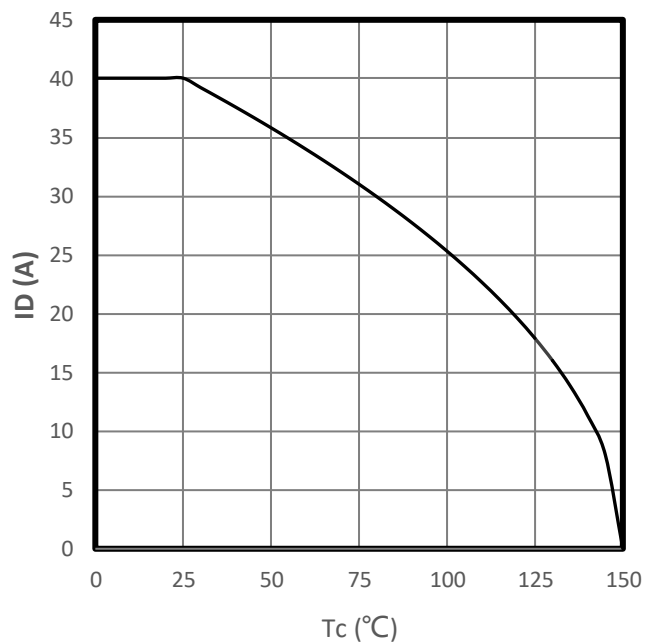
Power Dissipation

$$P_{tot}=f(T_c)$$



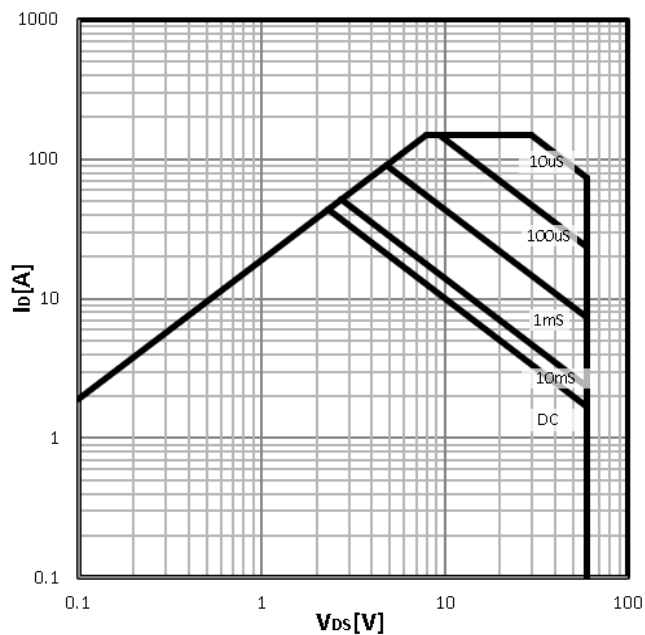
Maximum Drain Current

$$-I_D=f(T_c)$$



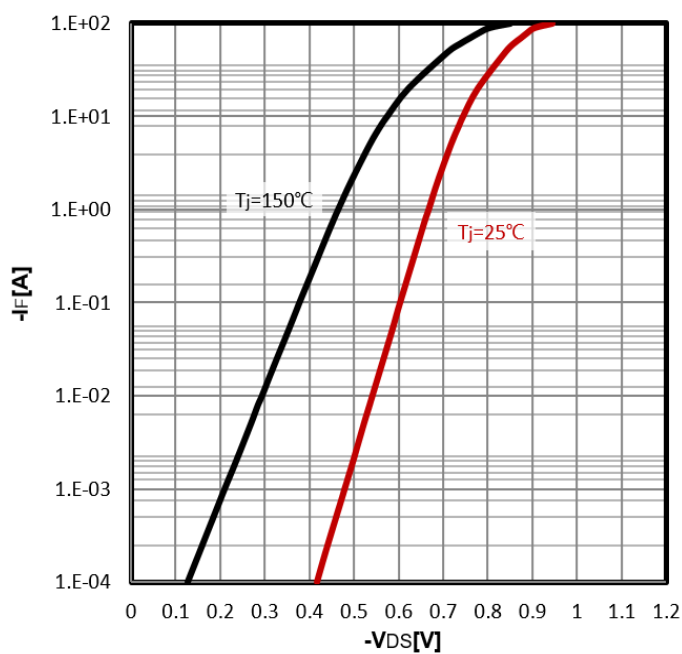
Safe operating area

$$-I_D=f(-V_{DS})$$



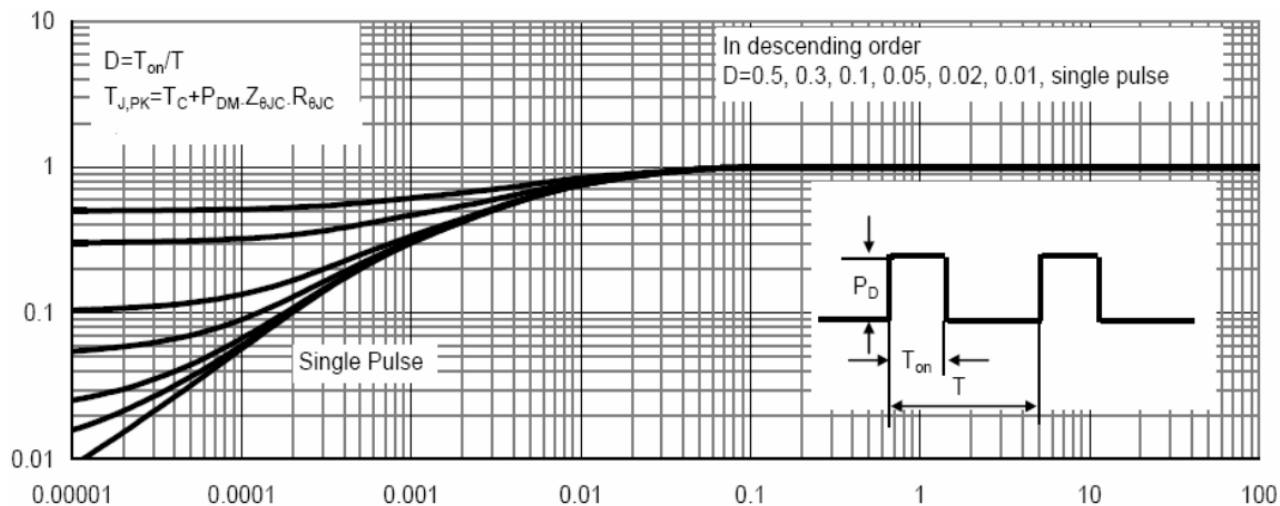
Body Diode Forward Voltage Variation

$$-I_F=f(-V_{DS})$$

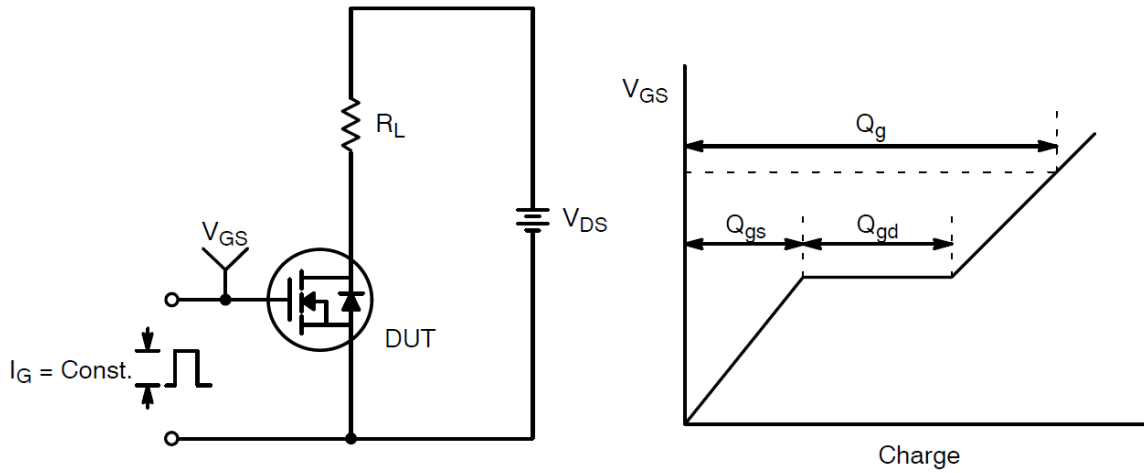


Max. transient thermal impedance

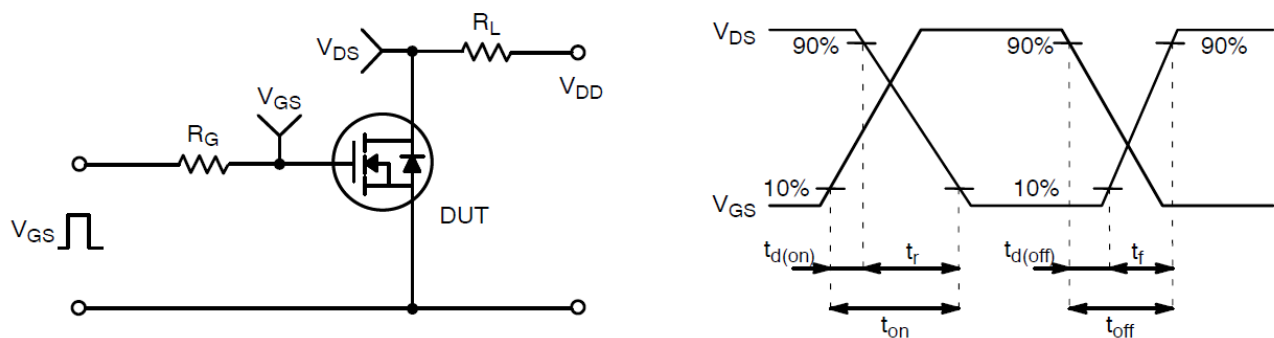
$$Z_{thJC}=f(t_p)$$



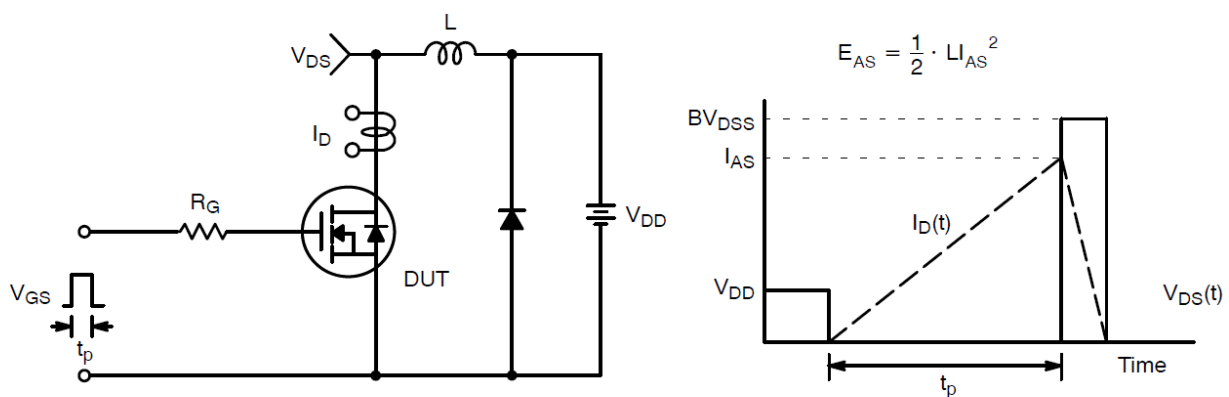
Test Circuit and Waveform:



Gate Charge Test Circuit & Waveform

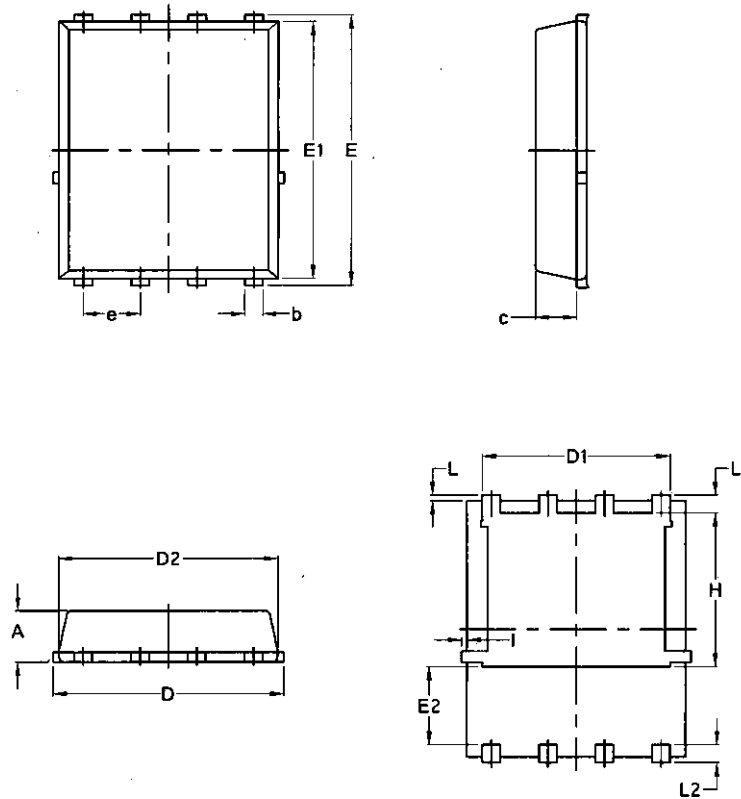


Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Package Mechanical Data-PDFN5060-8L-Single



Symbol	Common			
	mm		Inch	
	Mim	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