

P-Ch 60V Fast Switching MOSFETs



Features

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

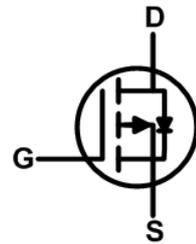
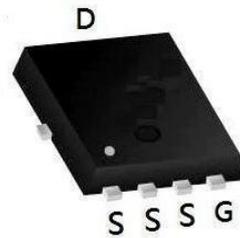
Product Summary

BVDSS	RDSON	ID
-60V	19mΩ	-40A

Applications

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

PDFN5060-8L 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, $V_{GS} @ 10V^{1,6}$	-40	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	-25	A
I_{DM}	Pulsed Drain Current ²	-150	A
EAS	Single Pulse Avalanche Energy ³	200	mJ
I_{AS}	Avalanche Current	---	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	114	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	60	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	1.32	$^\circ C/W$

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-60	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	---	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-20A	---	19	24	mΩ
		V _{GS} =-4.5V, I _D =-10A	---	24.5	31	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.3	-1.8	-2.3	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	---	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-60V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =-60V, V _{GS} =0V, T _J =55°C	---	---	100	
I _{GSS}	Gate-Source Leakage Current	V _{GS} = ±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-5A	---	20	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	8	---	Ω
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-30V, V _{GS} =-10V, I _D =-10A	---	22	---	nC
Q _{gs}	Gate-Source Charge		---	3.7	---	
Q _{gd}	Gate-Drain Charge		---	3	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-30V, V _{GS} =-10V, R _G =3Ω, I _D =-10A, R _L =3Ω	---	15	---	ns
T _r	Rise Time		---	17	---	
T _{d(off)}	Turn-Off Delay Time		---	40	---	
T _f	Fall Time		---	45	---	
C _{iss}	Input Capacitance	V _{DS} =-30V, V _{GS} =0V, f=1MHz	---	1500	---	pF
C _{oss}	Output Capacitance		---	248	---	
C _{rss}	Reverse Transfer Capacitance		---	12	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	-40	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-5A, T _J =25°C	---	---	-1.2	V
t _{rr}	Reverse Recovery Time	I _F =-10A, di/dt=100A/μs, T _J =25°C	---	60	---	nS
Q _{rr}	Reverse Recovery Charge		---	105	---	nC

Note :

1 The data is tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.

2 The data is tested by pulsed pulse width < 300us duty cycle < 2%

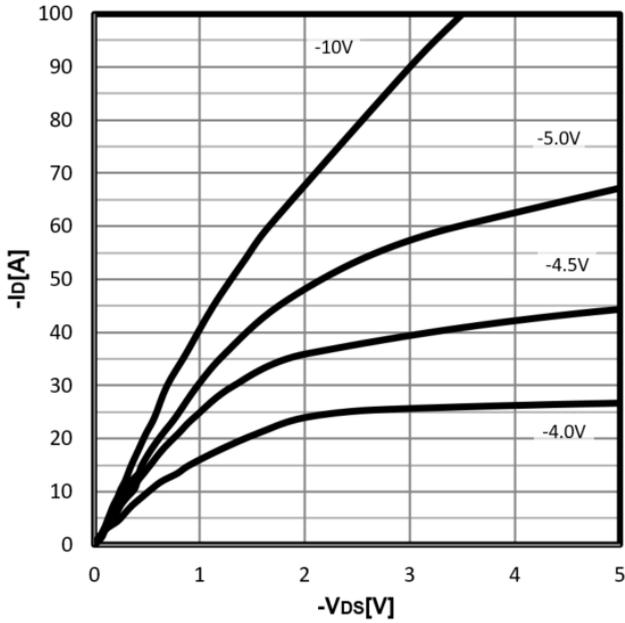
3 The EAS data shows Max. Rating at the test condition as V_{DD}=-30V, V_{GS}=-10V, L=1mH

4 The power dissipation is limited by 150°C junction temperature

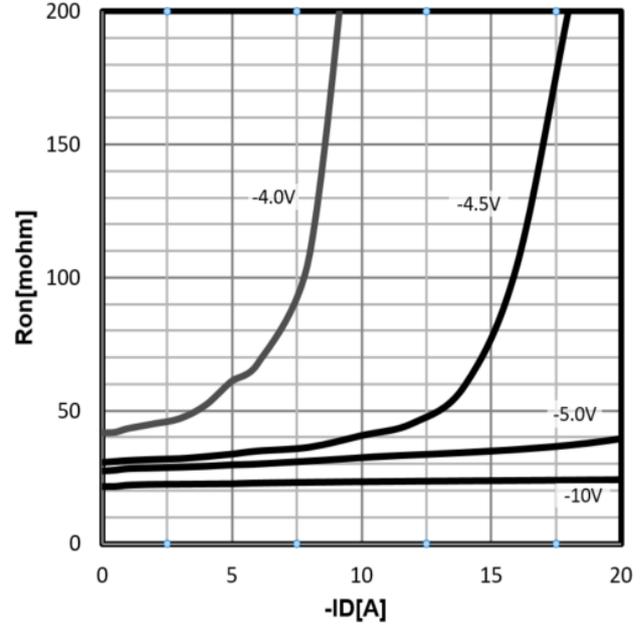
5 The data is theoretically the same as I_{DM} and I_{DM} in real applications should be limited by total power dissipation.

Characteristics Curve:

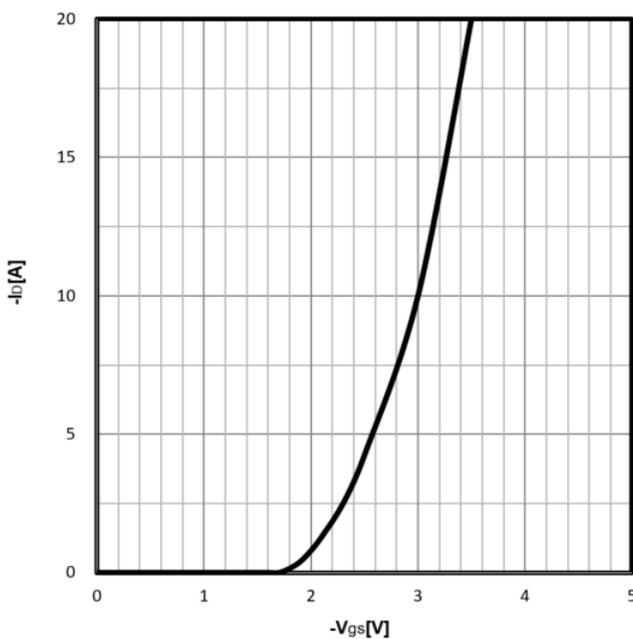
Typ. output characteristics
 $-I_D = f(-V_{DS})$



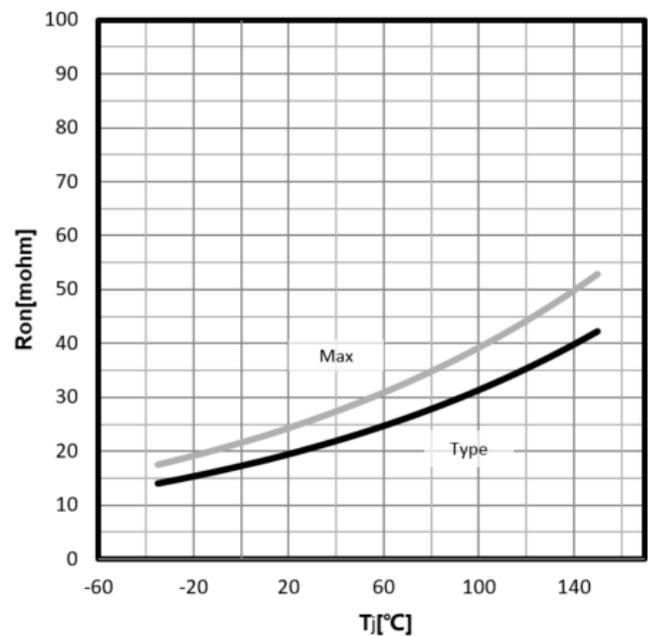
Typ. drain-source on resistance
 $R_{DS(on)} = f(-I_D)$



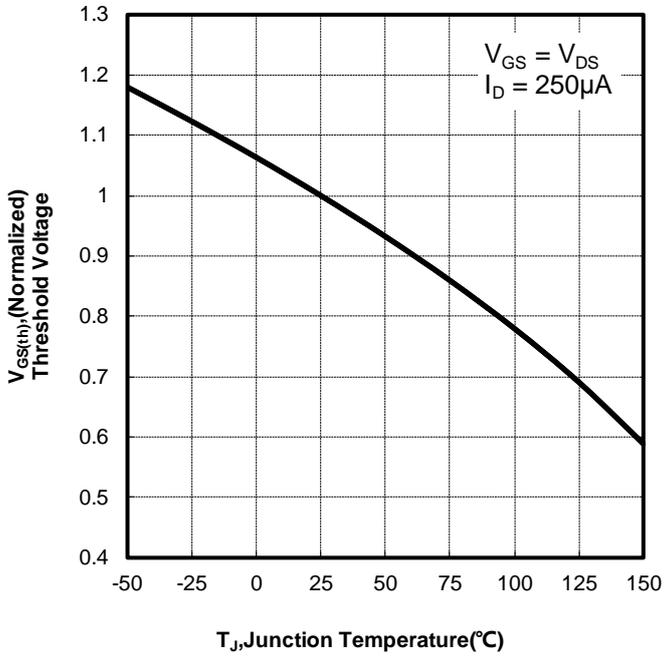
Typ. transfer characteristics
 $-I_D = f(-V_{GS})$



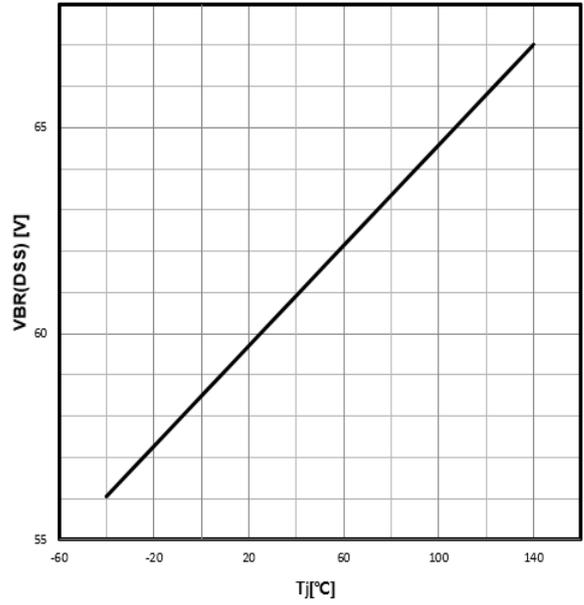
Drain-source on-state resistance
 $R_{DS(on)} = f(T_j); I_D = -10A; V_{GS} = -10V$



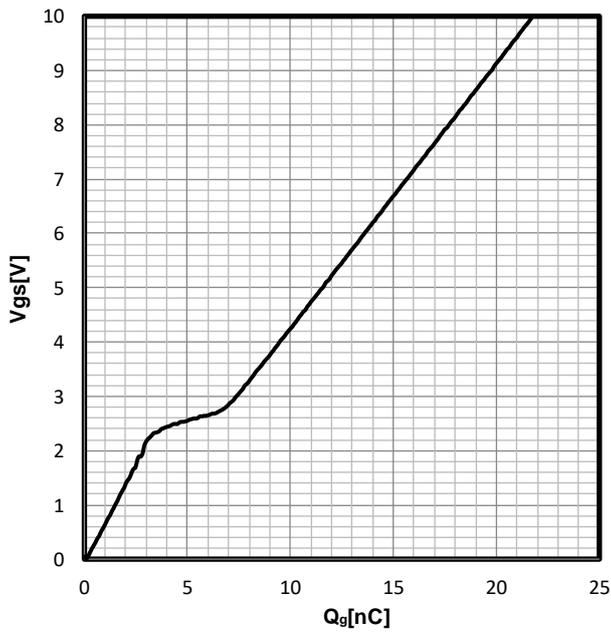
Gate Threshold Voltage
 $-V_{TH}=f(T_j); I_D=-250\mu A$



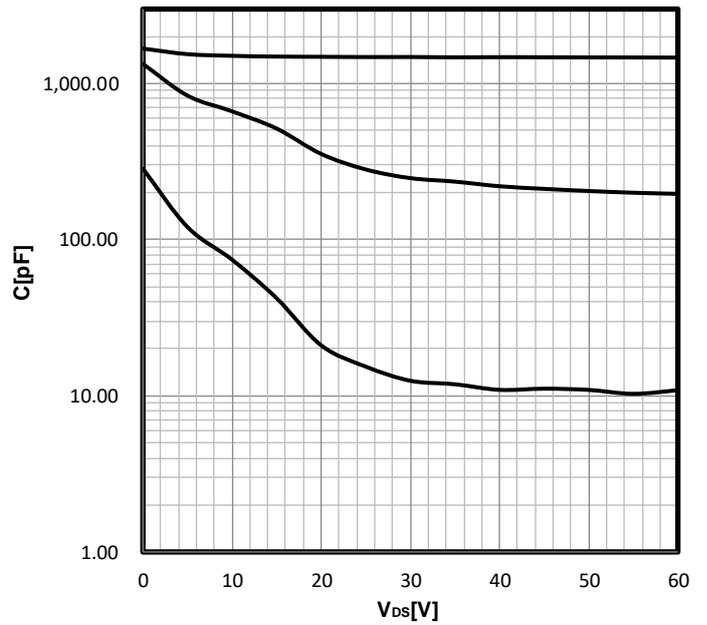
Drain-source breakdown voltage
 $-V_{BR(DSS)}=f(T_j); I_D=-250\mu A$



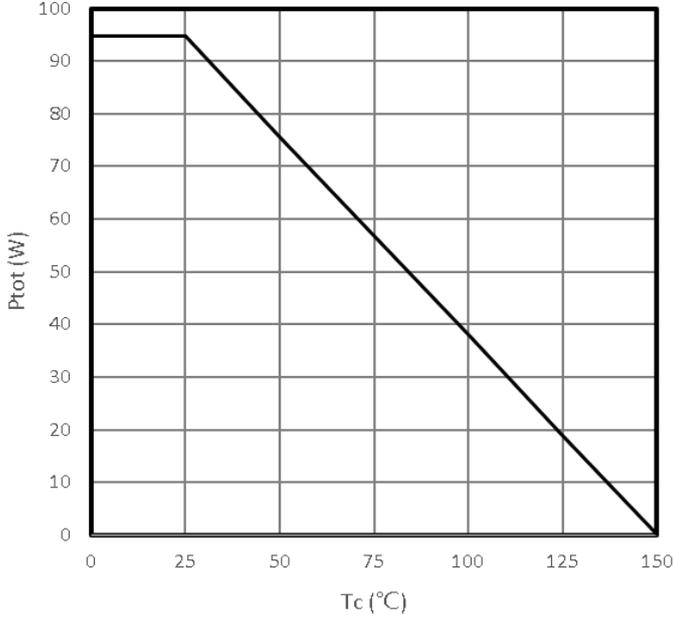
Typ. gate charge
 $V_{GS}=f(Q_{gate}); I_D=-5A$



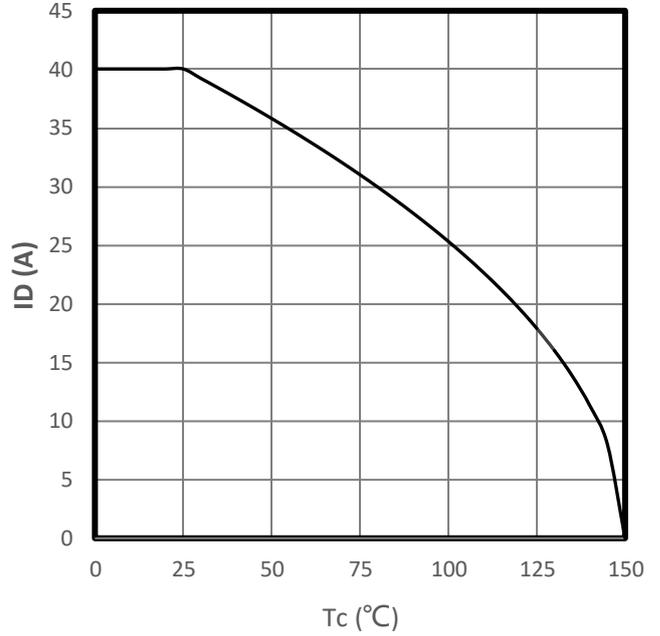
Typ. Capacitances
 $C=f(-V_{DS}); V_{GS}=0V; f=1MHz$



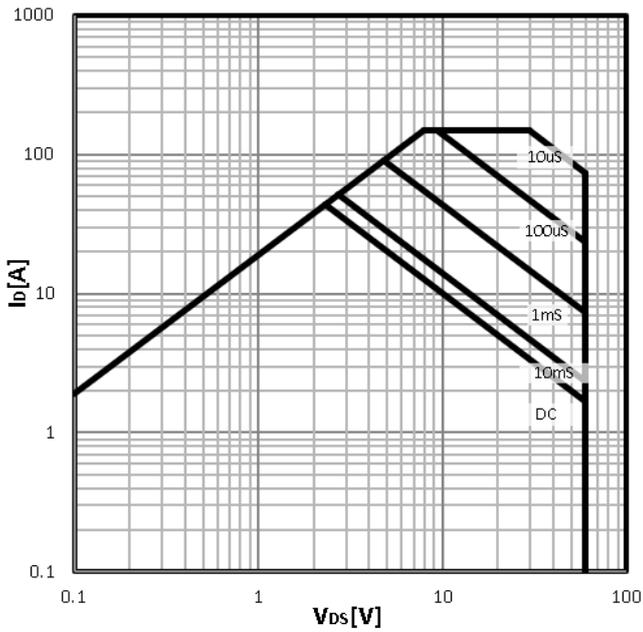
Power Dissipation
 $P_{tot}=f(T_c)$



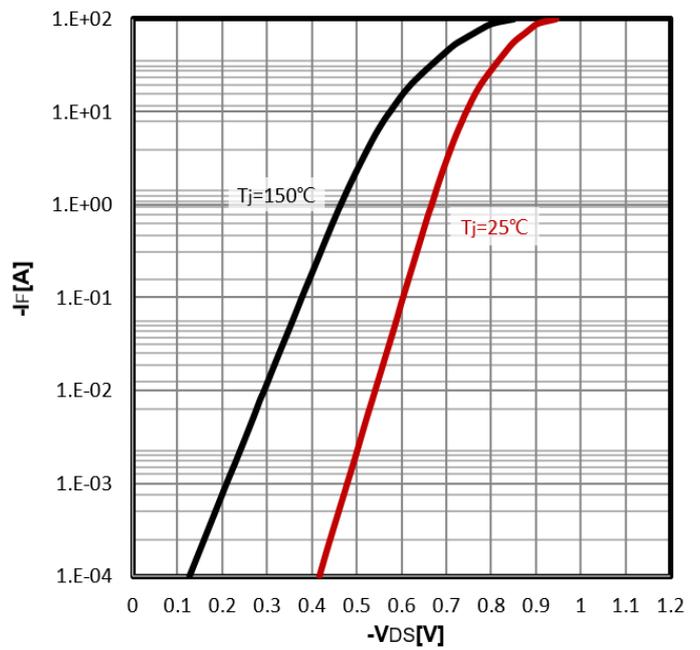
Maximum Drain Current
 $-I_D=f(T_c)$



Safe operating area
 $-I_D=f(-V_{DS})$

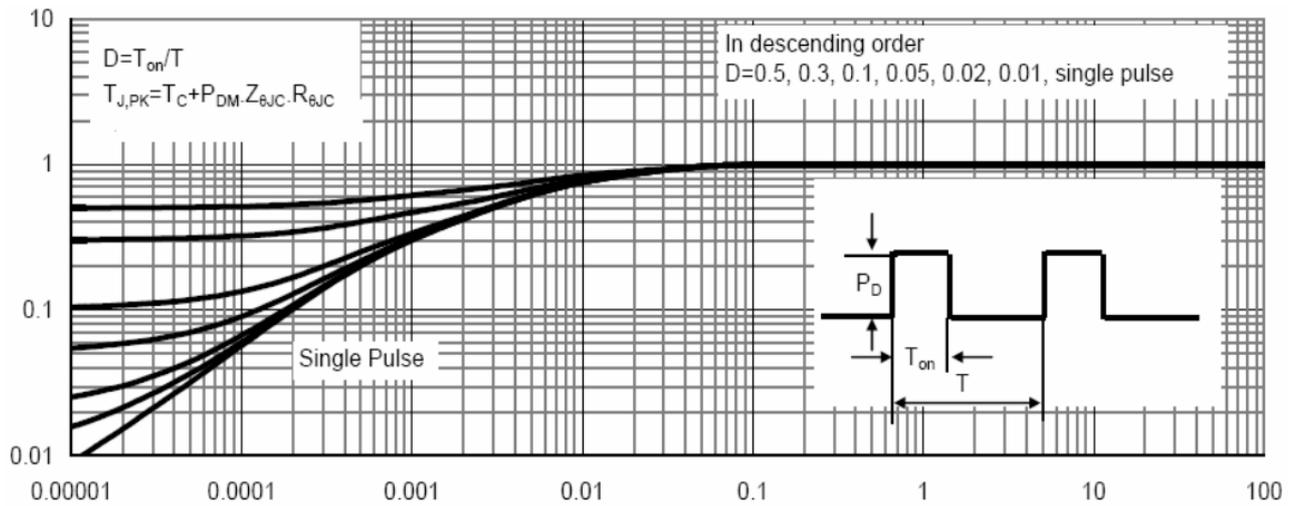


Body Diode Forward Voltage Variation
 $-I_F=f(-V_{DS})$

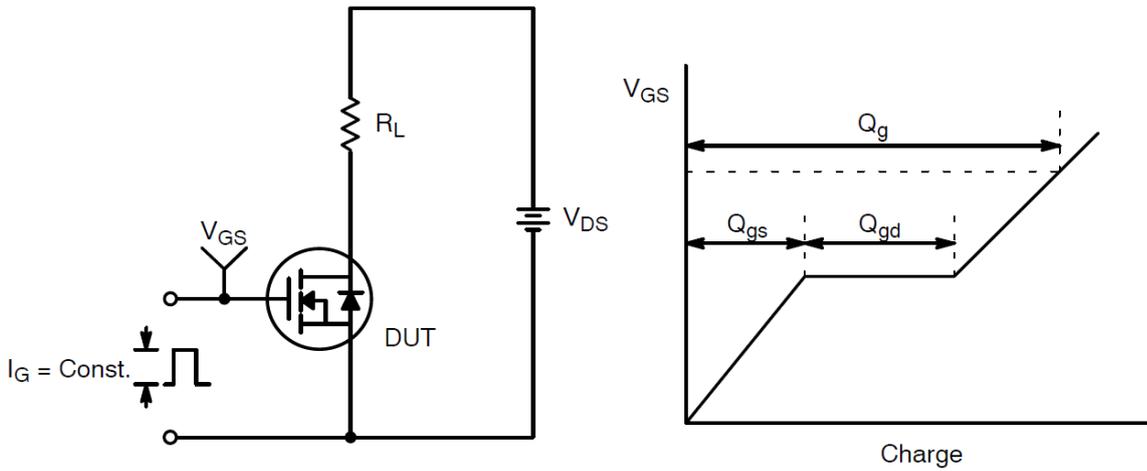


Max. transient thermal impedance

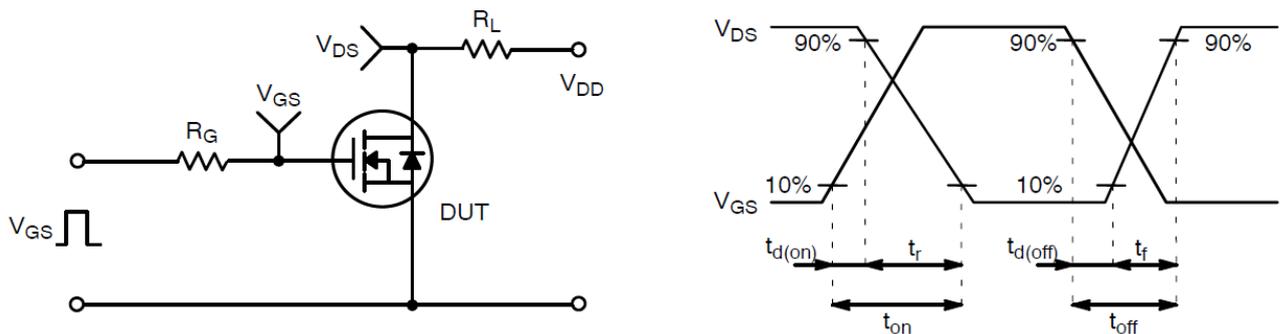
$$Z_{thJC} = f(t_p)$$



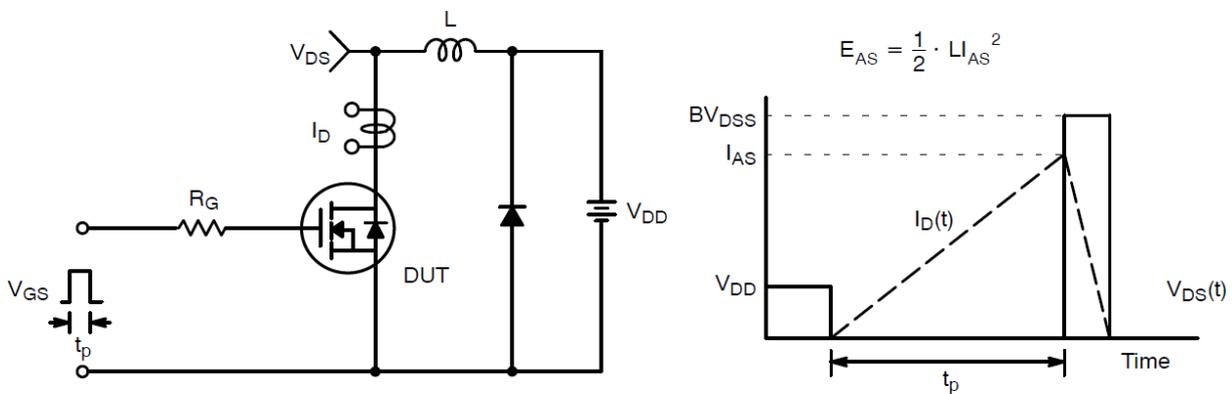
Test Circuit and Waveform:



Gate Charge Test Circuit & Waveform

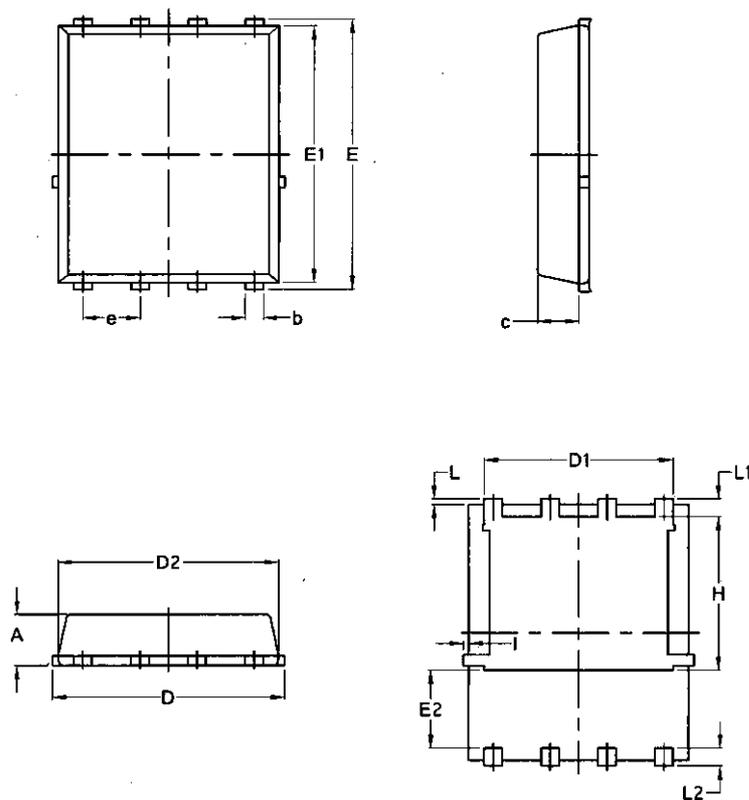


Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Package Mechanical Data-PDFN5060-8L-Single



Symbol	Common			
	mm		Inch	
	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