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

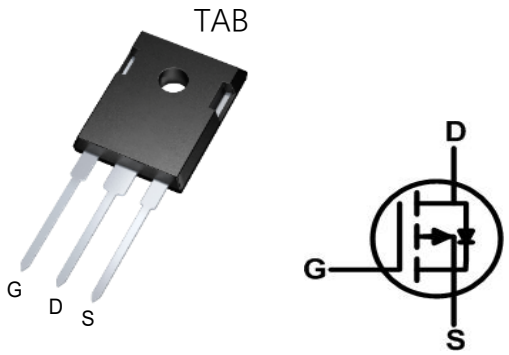
Green

BVDSS	RDSON	ID
-60V	3.5 mΩ	-150A

Applications

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

TO-247 Pin Configuration



Absolute Maximum Ratings (T_C= 25℃ unless otherwise specified):

Symbol	Parameter		Value	Units
V_{DSS}	Drain-to-Source Voltage		-60	V
I_D	Continuous Drain Current	T_C = 25 °C	-150	A
	Continuous Drain Current	T_C = 100 °C	-91.7	A
I_{DM}[a1]	Pulsed Drain Current		-580	A
V_{GS}	Gate-to-Source Voltage		±20	V
E_{AS}[a2]	Single pulse avalanche energy		2058	mJ
P_D	Power Dissipation		183	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range		150, –55 to 150	℃
T_L	Maximum Temperature for Soldering		260	℃

Thermal Characteristics:

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case	0.68	℃/W
$R_{\theta JA}$	Thermal Resistance,Junction-to-Ambient	60	℃/W

Electrical Characteristics (T_J= 25℃ 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=-250μA	-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=-250μA	-2	-2.4	-2.8	V
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=-10V,I_D=-20A	--	3.5	4.2	mΩ

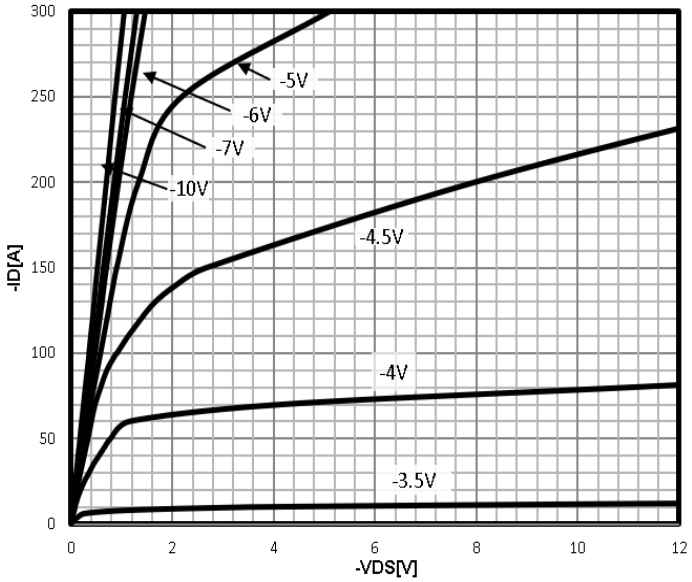
Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS}=0V V_{DS}=-30V f=1.0MHz	--	9123	--	pF
C_{oss}	Output Capacitance		--	1583	--	
C_{rss}	Reverse Transfer Capacitance		--	85.6	--	

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= 3Ω	--	70	--	ns
tr	Rise Time		--	45	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	165	--	
t_f	Fall Time		--	50	--	
Q_g	Total Gate Charge	V_{GS}=-10V V_{DS}=-30V I_D=-10A	--	135	--	nC
Q_{gs}	Gate Source Charge		--	28	--	
Q_{gd}	Gate Drain Charge		--	22.4	--	

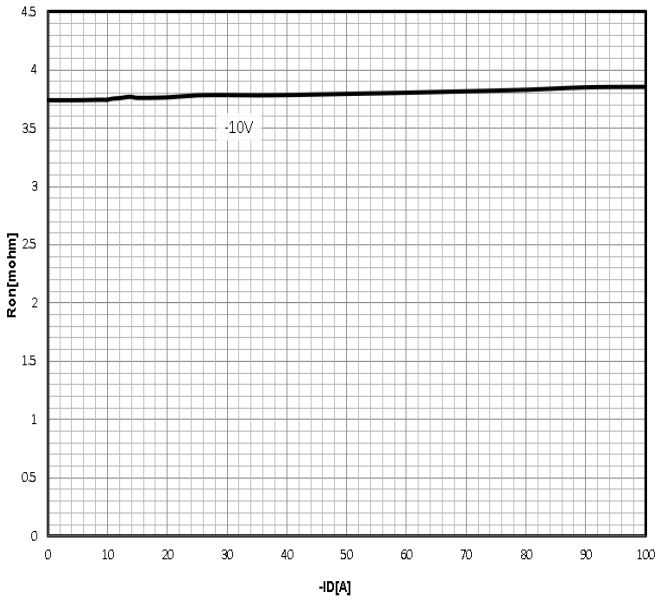
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current	T_C=25 ℃	--	--	-150	A
V_{SD}	Diode Forward Voltage	I_S=-20A,V_{GS}=0V	--	--	-1.2	V
t_{rr}	Reverse Recovery time	I_S=-10A,V_{DD}=-30V dI/dt=100A/μs	--	45	--	ns
Q_{rr}	Reverse Recovery Charge		--	100	--	nC

Characteristics Curve:

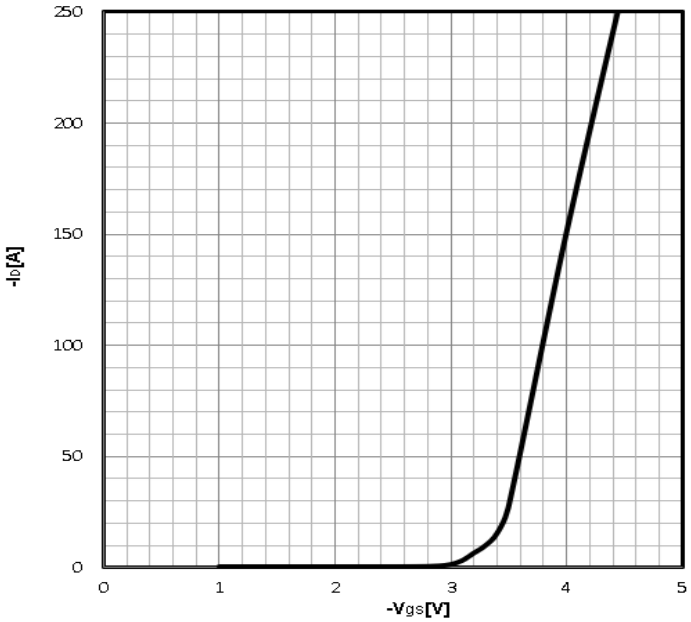
Typ. output characteristics
$I_D=f(V_{DS})$



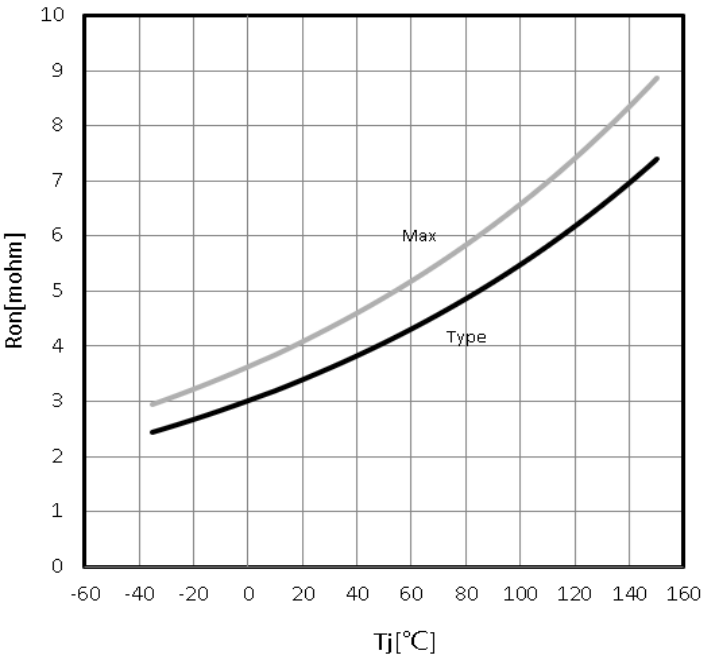
Typ. drain-source on resistance
$R_{DS(on)}=f(I_D)$



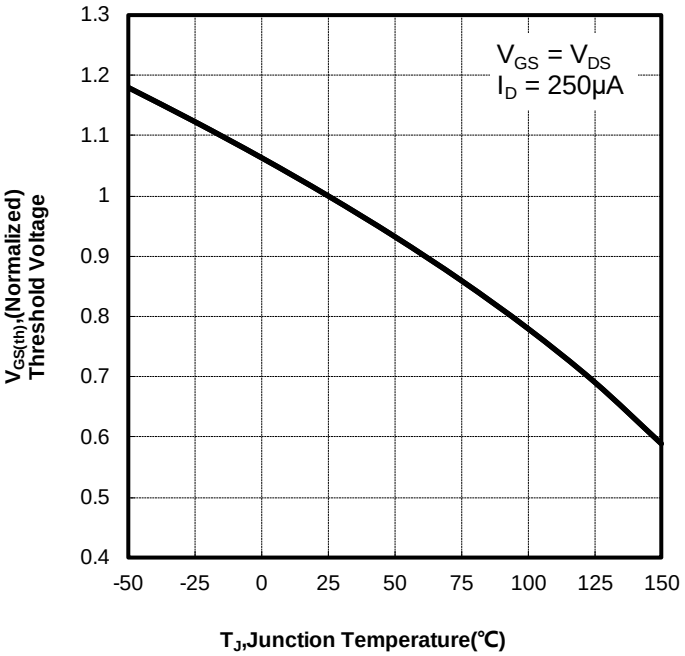
Typ. transfer characteristics
$I_D=f(V_{GS})$



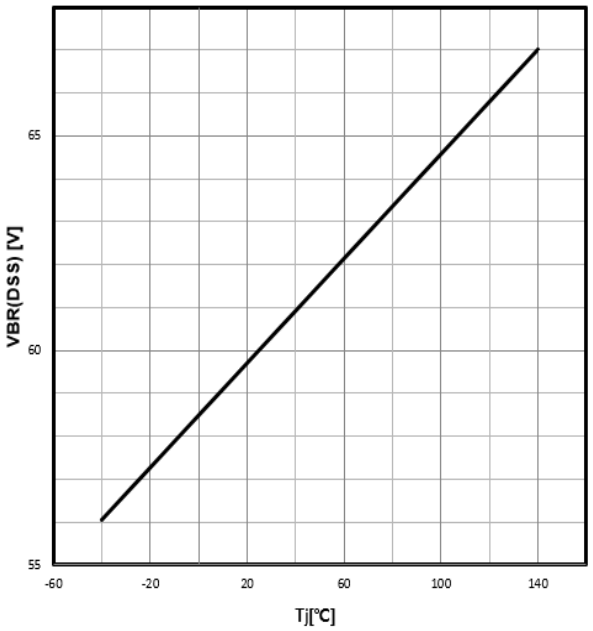
Drain-source on-state resistance
$R_{DS(on)}=f(T_j)$;I_D=-20A; V_{GS}=-10V



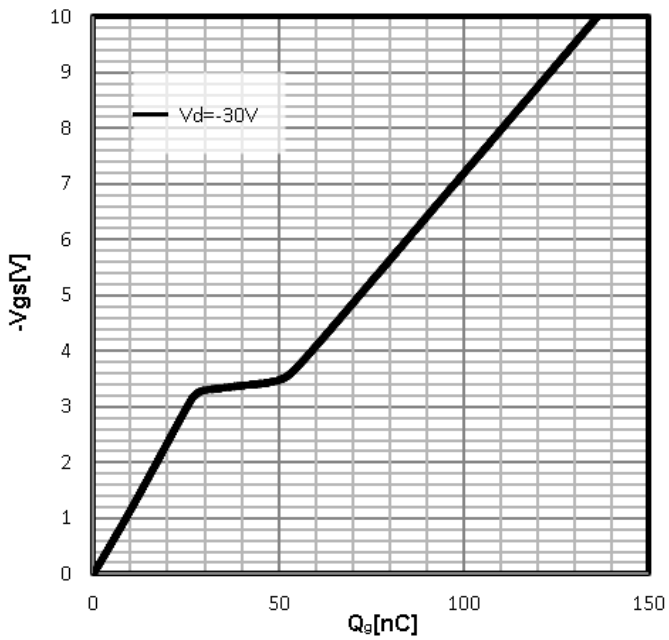
Gate Threshold Voltage
$-V_{TH}=f(T_j)$; I_D=-250uA



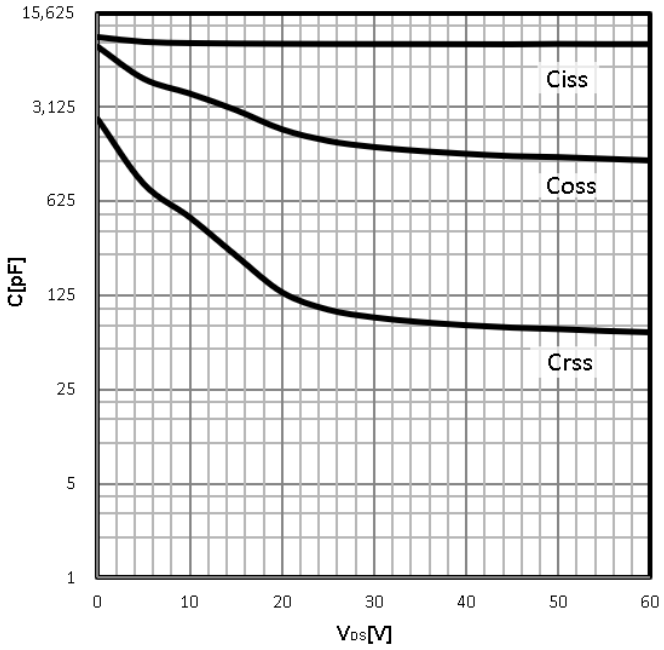
Drain-source breakdown voltage
$V_{BR(DSS)}=f(T_j)$; I_D=-250uA



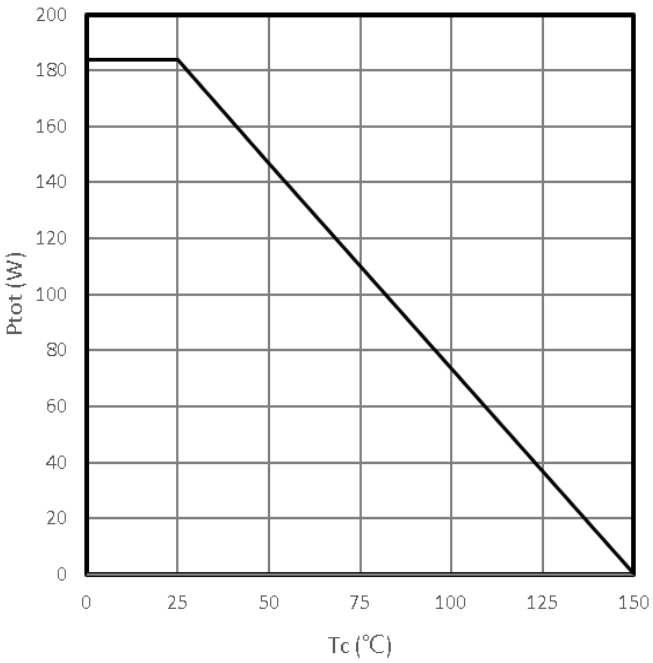
Typ. gate charge
$V_{GS}=f(Q_{gate})$; I_D=-10A



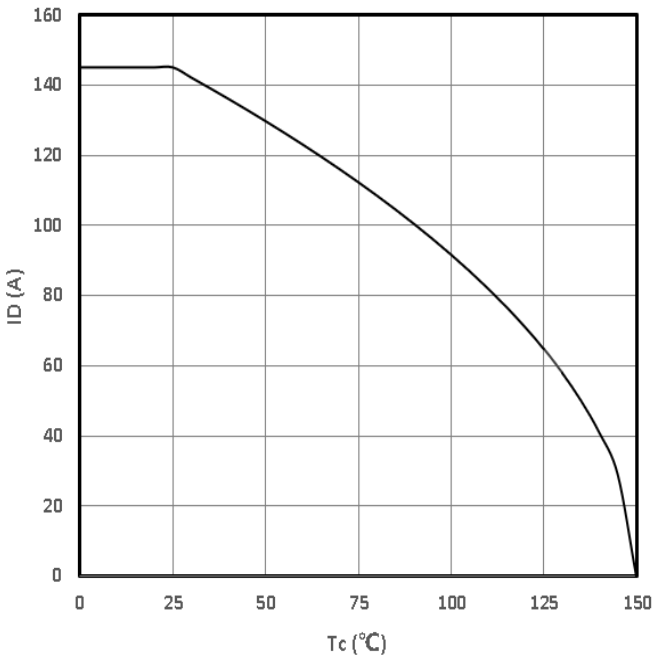
Typ. capacitances
$C=f(V_{DS})$; V_{GS}=0V; f =1MHz



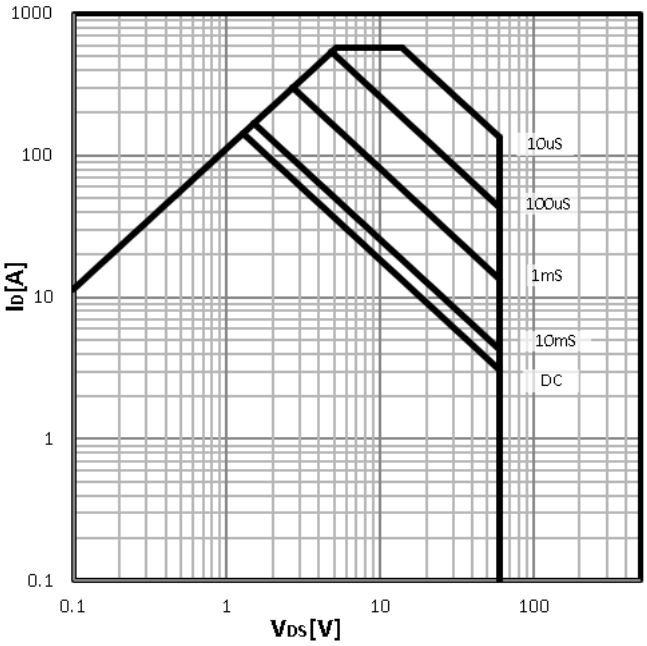
Power Dissipation
$P_{tot}=f(T_C)$



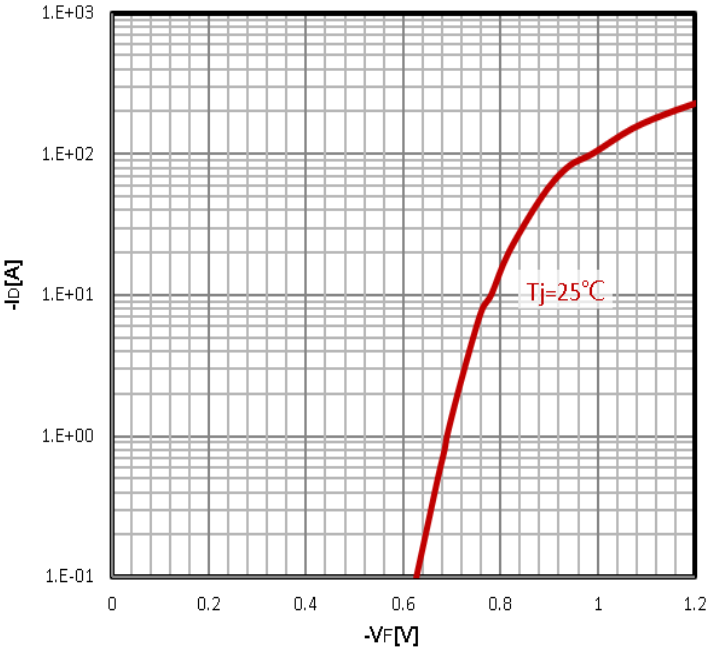
Maximum Drain Current
$-I_D=f(T_C)$



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

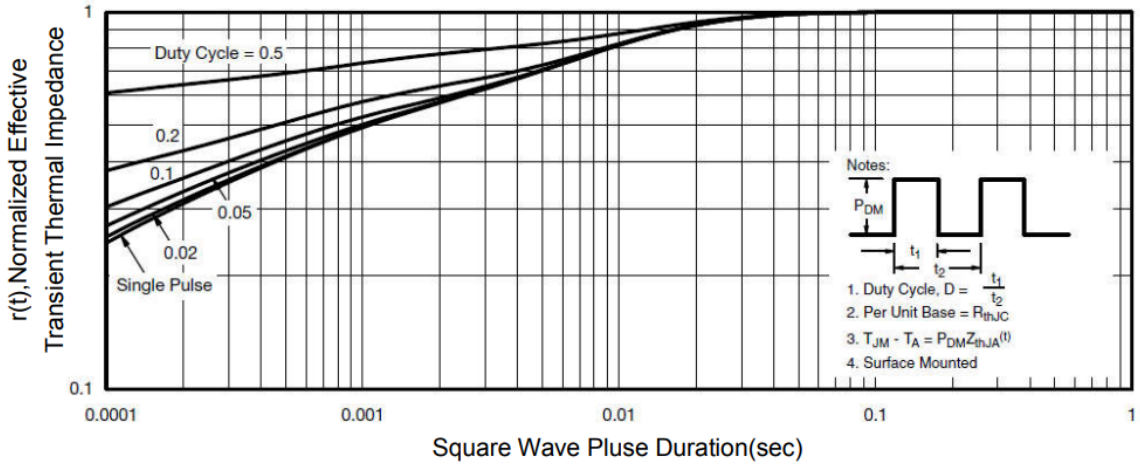


Body Diode Forward Voltage Variation
$-I_F=f(-V_{DS})$

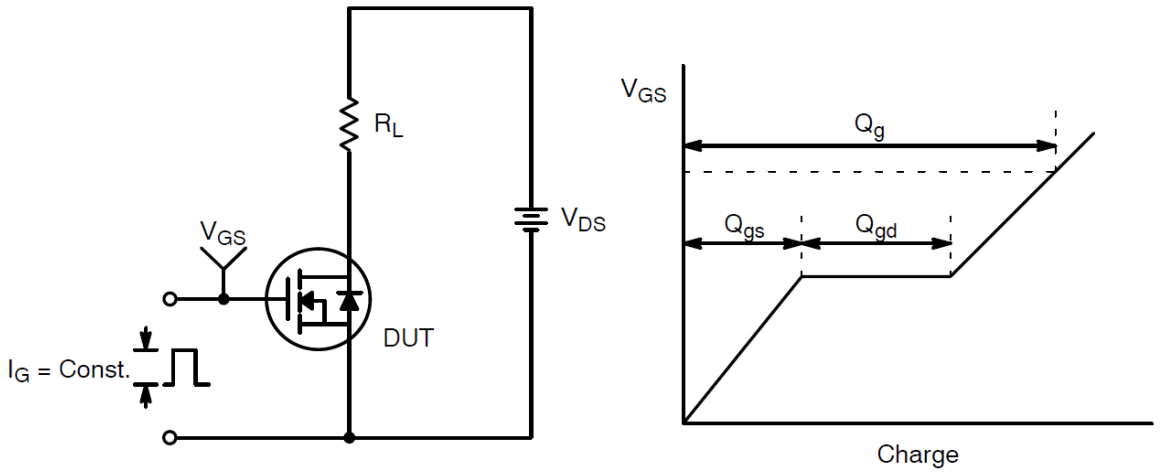


Max. transient thermal impedance

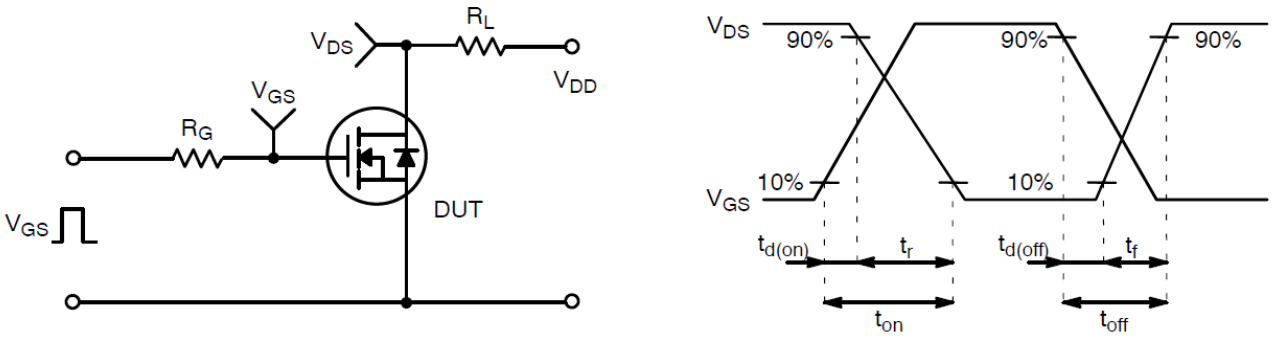
$Z_{thJC}=f(t_p)$



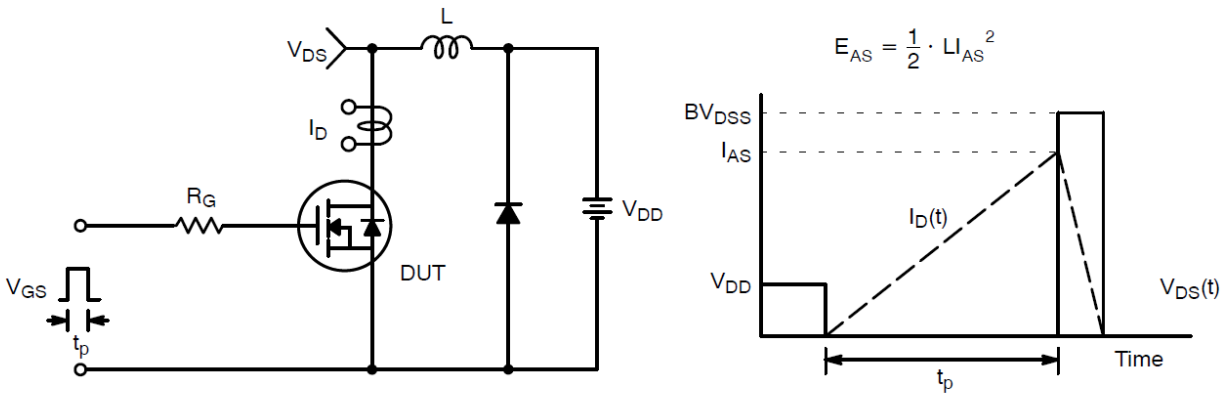
Test Circuit and Waveform:



Gate Charge Test Circuit & Waveform

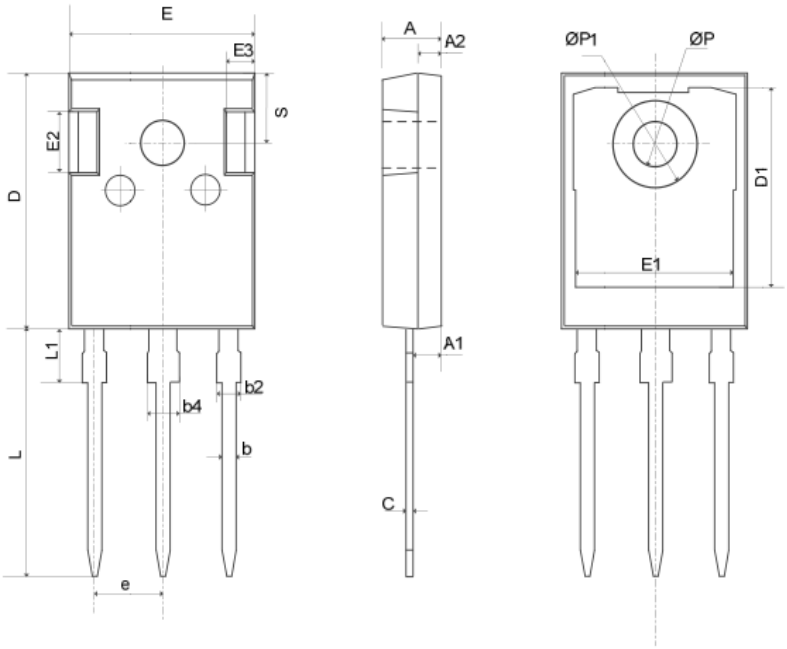


Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Mechanical Dimensions for TO-247



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.11	1.36
b2	1.91	2.21
b4	2.91	3.21
c	0.51	0.75
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.00	13.60
E2	4.80	5.20
E3	2.30	2.70
e	5.44BSC	
L	19.62	20.22
L1	—	4.30
ØP	3.40	3.80
ØP1	—	7.30
S	6.15BSC	