

N-Ch 120V Fast Switching MOSFETs

Features

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

Applications

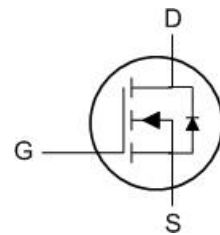
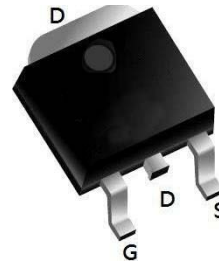
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Product Summary



BVDSS	RDSON	ID
120V	6.0 mΩ	120A

TO252 Pin Configuration



Absolute Maximum Ratings:

Symbol	Parameter		Value	Units
V_{DSS}	Drain-to-Source Voltage		120	V
I_D	Continuous Drain Current	$T_C = 25\text{ }^{\circ}\text{C}$	120	A
	Continuous Drain Current	$T_C = 100\text{ }^{\circ}\text{C}$	79	A
I_{DM}^{a1}	Pulsed Drain Current		500	A
E_{AS}^{a2}	Single pulse avalanche energy		326	mJ
V_{GS}	Gate-to-Source Voltage		± 20	V
P_D	Power Dissipation		227	W
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	0.55	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	60	$^{\circ}\text{C/W}$

Electrical Characteristics (T_c= 25°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 =250μA	120	--	--	V
I _{DSS}	Drain to Source Leakage Current	V _{DS} = 120V, 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	2.5	3	3.5	V
R _{DS(ON)}	Drain-to-Source On-Resistance	V _{GS} =10V, I _D =20A	--	6	7.5	mΩ

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 60V f = 1.0MHz	--	3614	--	pF
C _{oss}	Output Capacitance		--	423	--	
C _{rss}	Reverse Transfer Capacitance		--	12	--	
R _g	Gate resistance		--	0.84	--	Ω

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
t _{d(ON)}	Turn-on Delay Time	I _D =20A V _{DS} = 60V V _{GS} = 10V R _G = 5Ω	--	20	--	ns
t _r	Rise Time		--	65	--	
t _{d(OFF)}	Turn-Off Delay Time		--	32	--	
t _f	Fall Time		--	49	--	
Q _g	Total Gate Charge	V _{GS} =0~10V V _{DS} = 90V I _D =20A	--	60.8	--	nC
Q _{gs}	Gate Source Charge		--	18.8	--	
Q _{gd}	Gate Drain Charge		--	14.7	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
I _S	Diode Forward Current	T _C =25 °C	--	--	120	A
V _{SD}	Diode Forward Voltage	I _S =20A, V _{GS} =0V	--	0.83	1.2	V
t _{rr}	Reverse Recovery time	I _S =40A, dI/dt=100A/μs	--	70	--	ns
Q _{rr}	Reverse Recovery Charge		--	129	--	nC

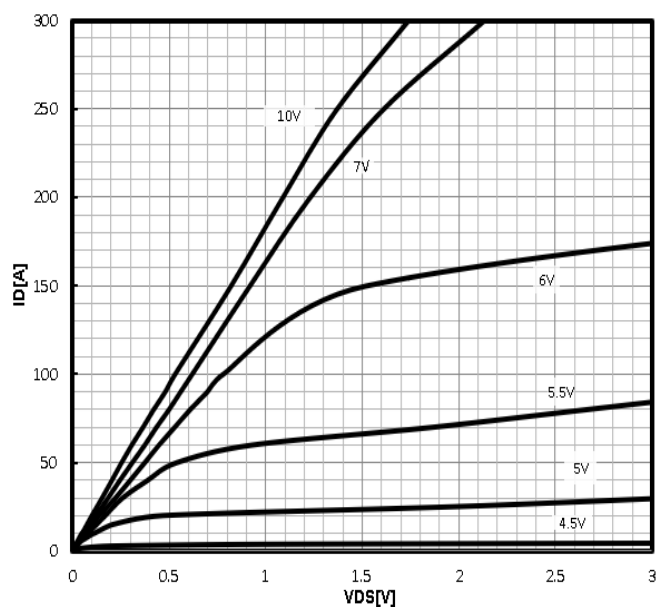
a1: Repetitive rating; pulse width limited by maximum junction temperature

a2: VDD=60V, L=0.5mH, R_g=25Ω, Starting T_J=25 °C

Characteristics Curve:

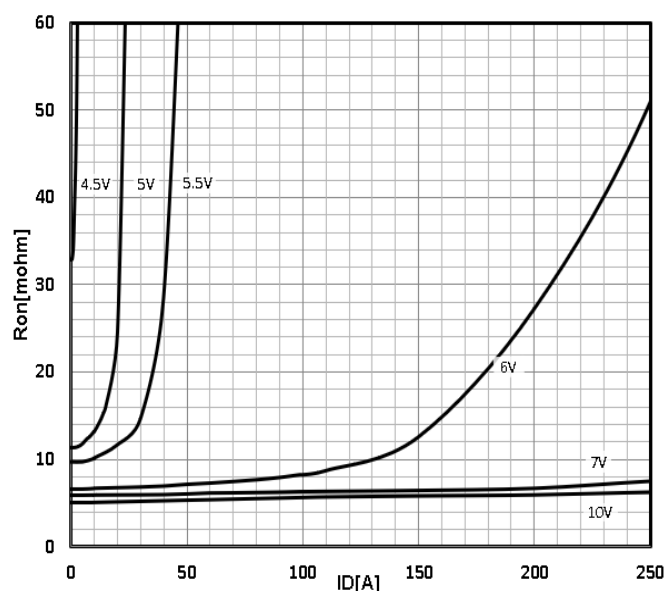
Typ. output characteristics

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



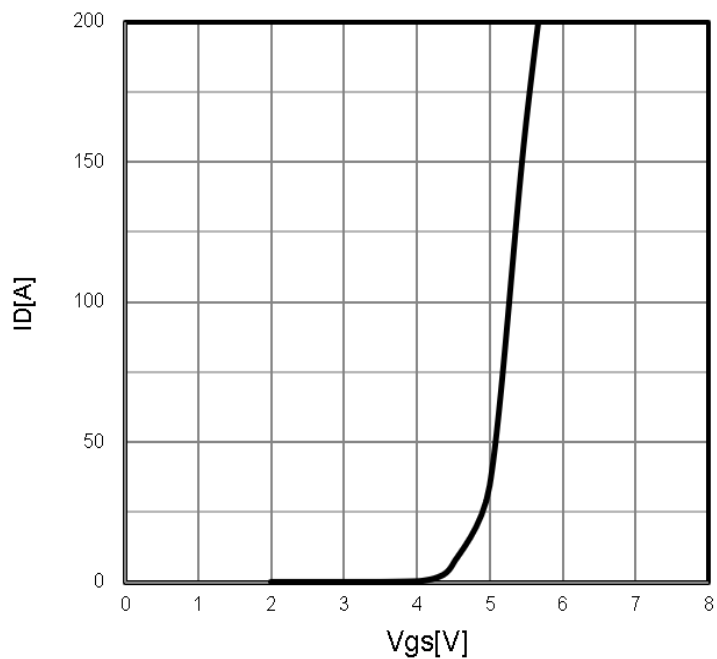
Typ. drain-source on resistance

$$R_{DS(on)} = f(I_D)$$



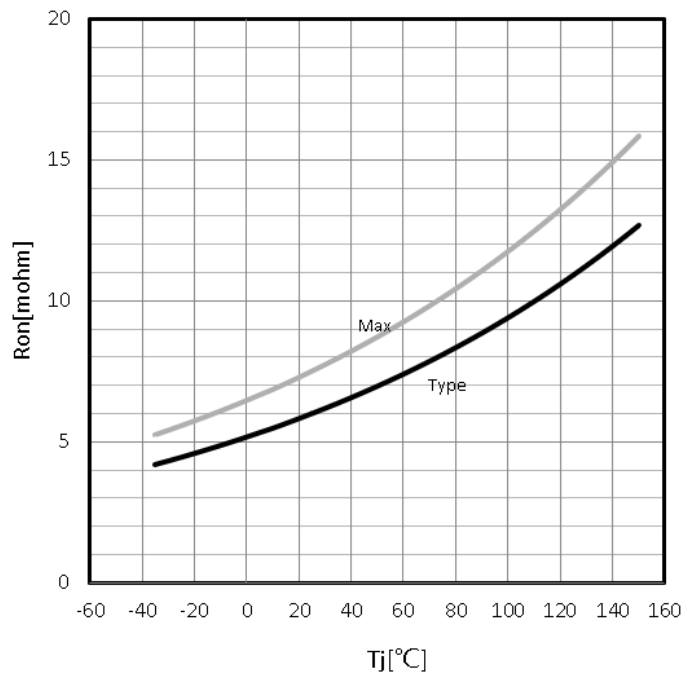
Typ. transfer characteristics

$$I_D = f(V_{GS})$$



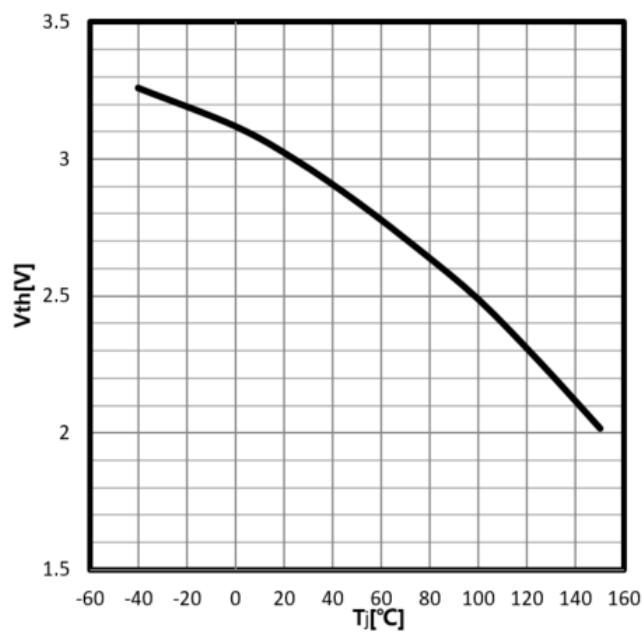
Drain-source on-state resistance

$$R_{DS(on)} = f(T_j); I_D = 20A; V_{GS} = 10V$$



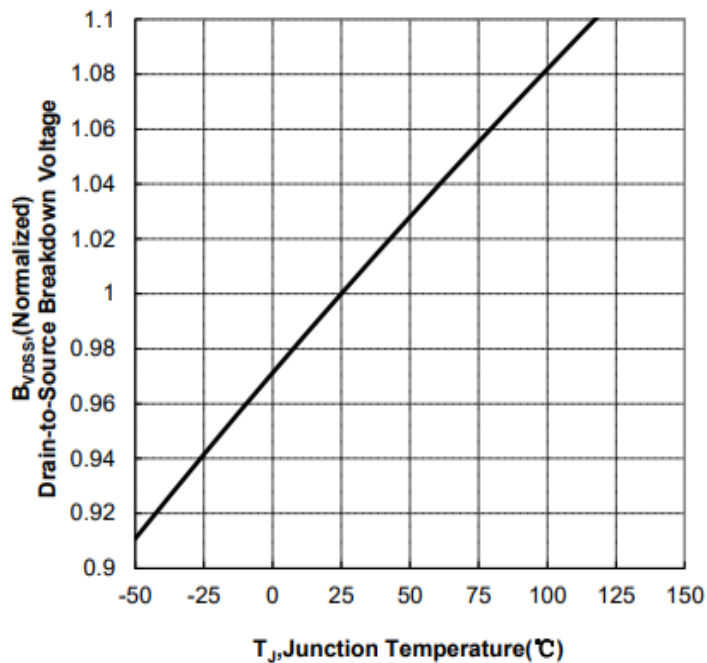
Gate Threshold Voltage

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



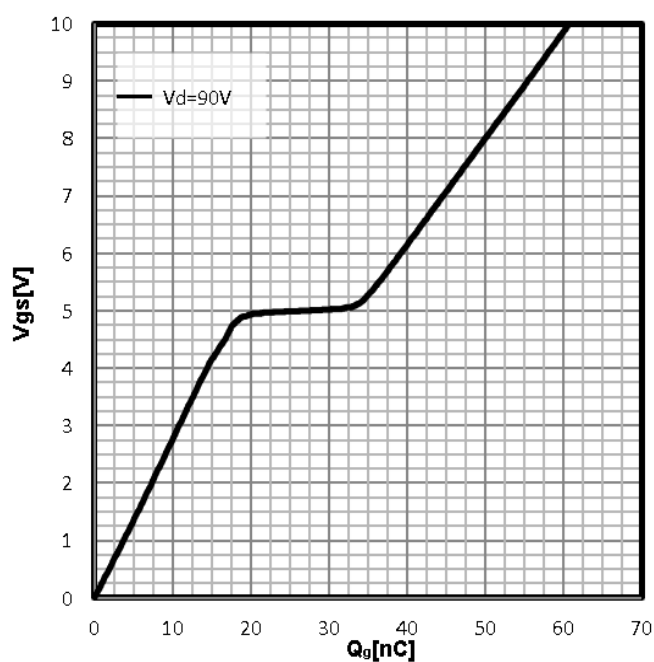
Drain-source breakdown voltage

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



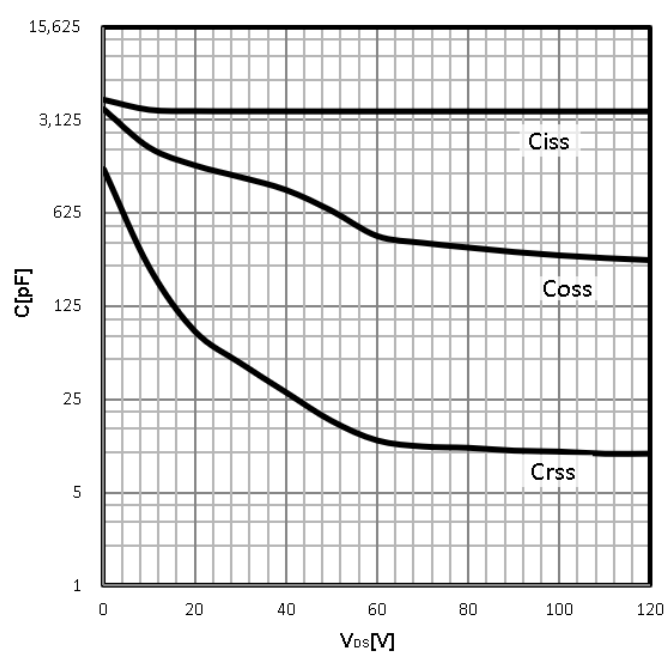
Typ. gate charge

$$V_{GS}=f(Q_{gate})$$



Typ. capacitances

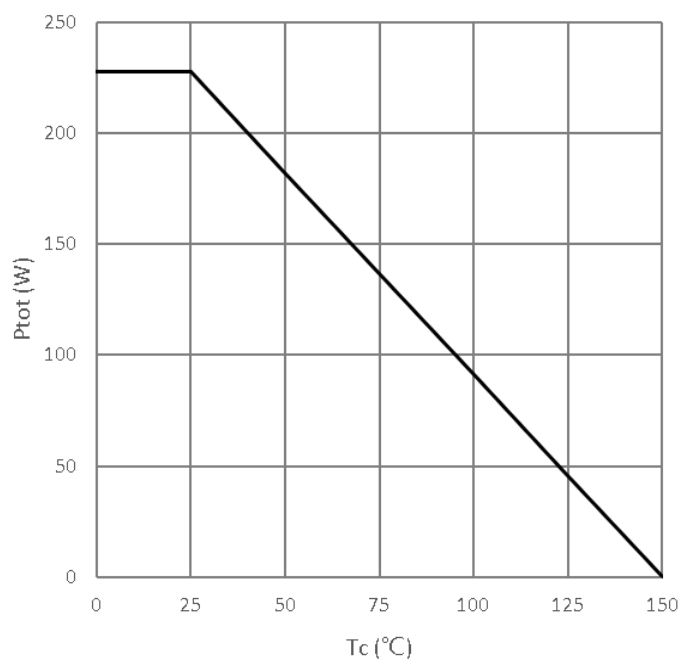
$$C=f(V_{DS}); V_{GS}=0V; f=1MHz$$



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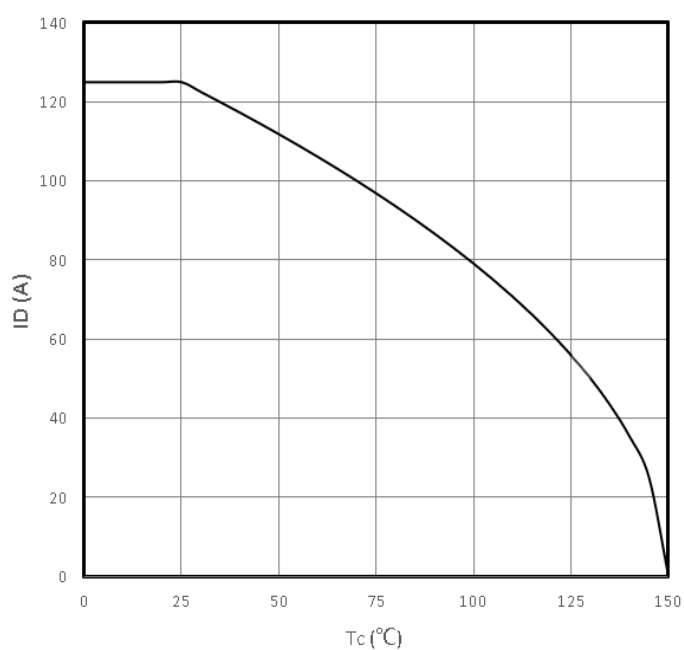
Power Dissipation

$$P_{\text{tot}} = f(T_j)$$



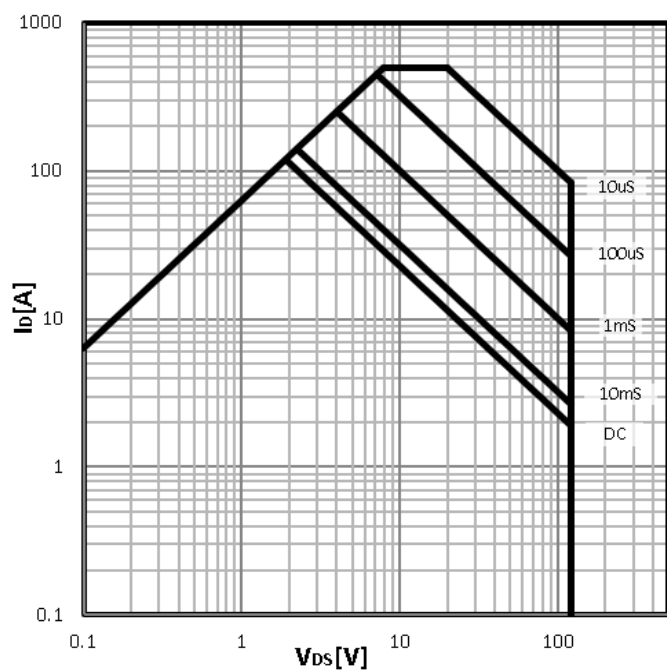
Maximum Drain Current

$$I_D = f(T_c)$$



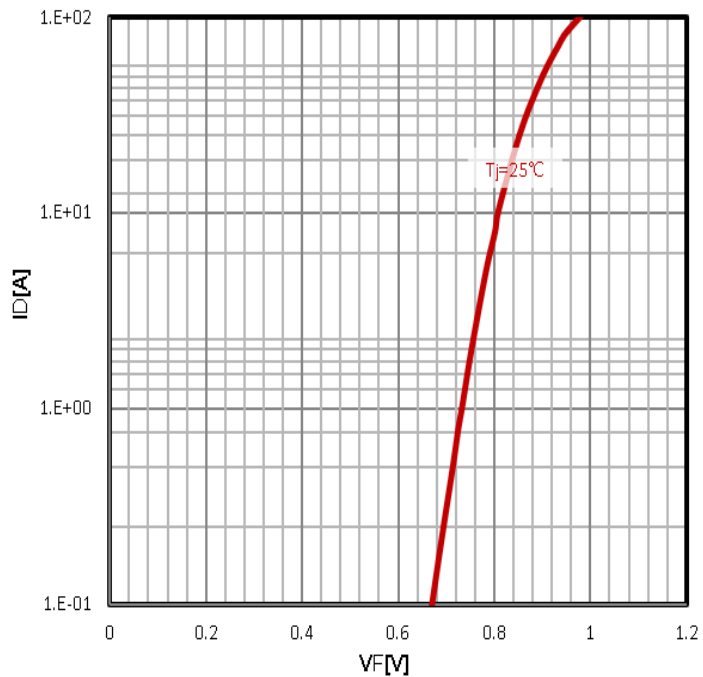
Safe operating area

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



Body Diode Forward Voltage Variation

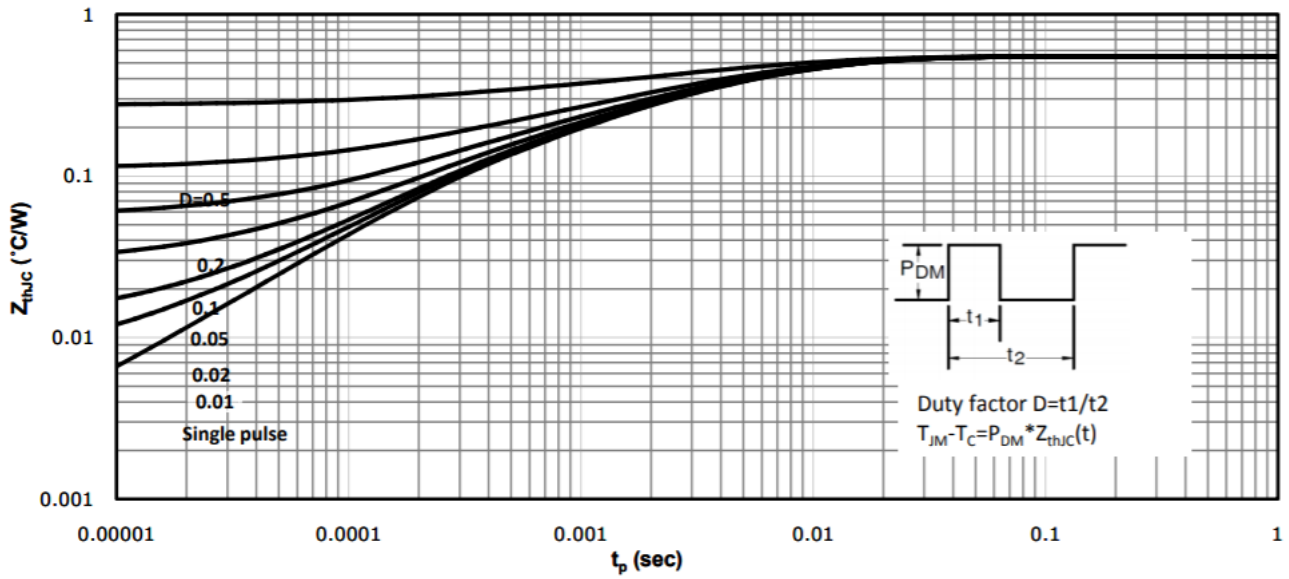
$$I_F = f(V_{GS})$$



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Max. transient thermal impedance

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



Test Circuit

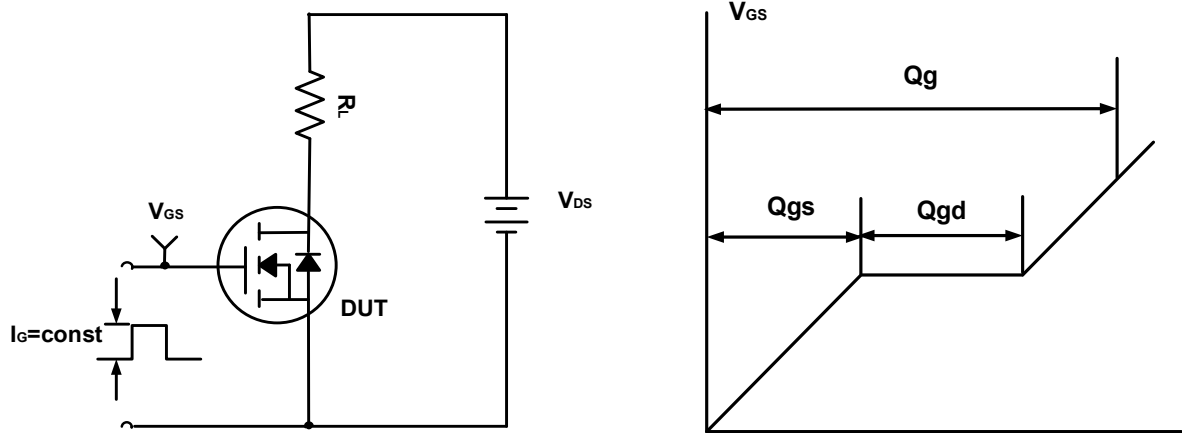


Figure A. Gate Charge Test Circuit & Waveforms

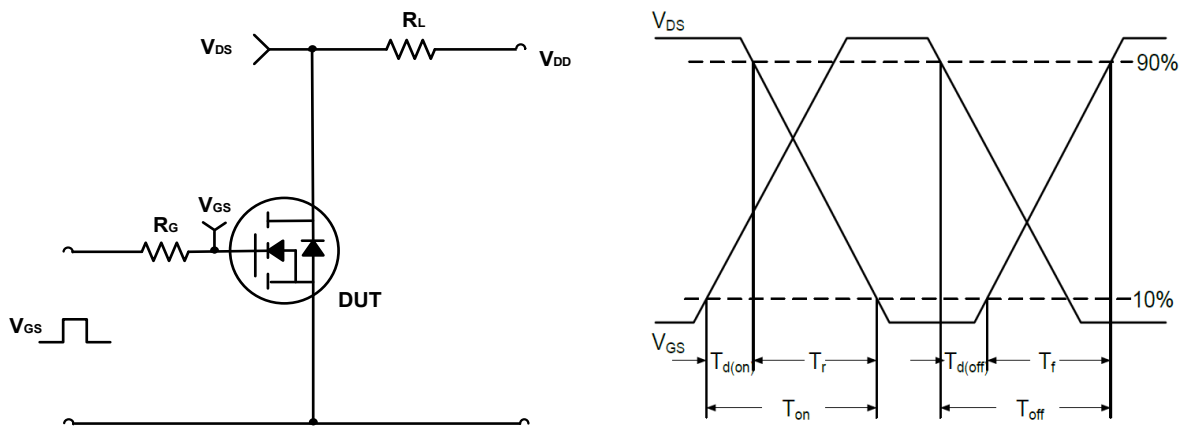


Figure B. Switching Test Circuit & Waveforms

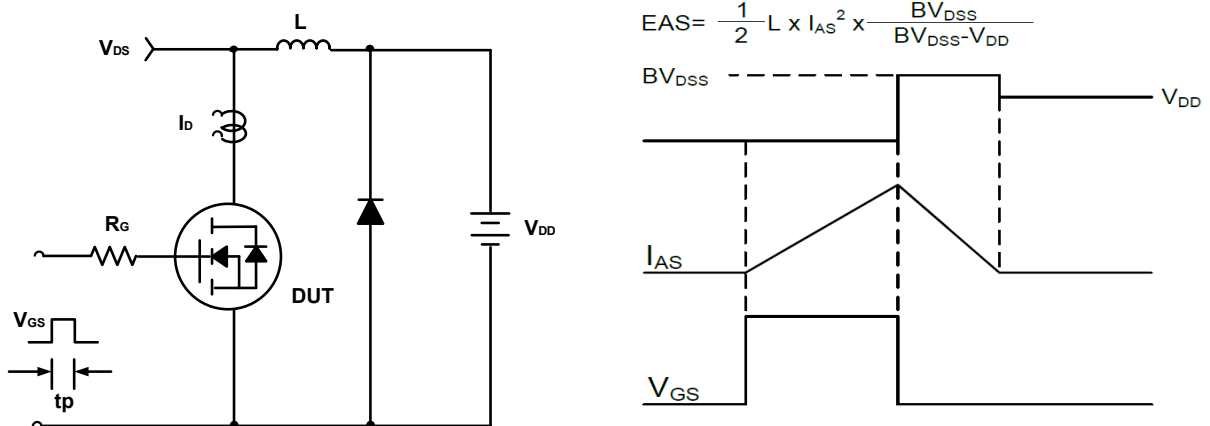
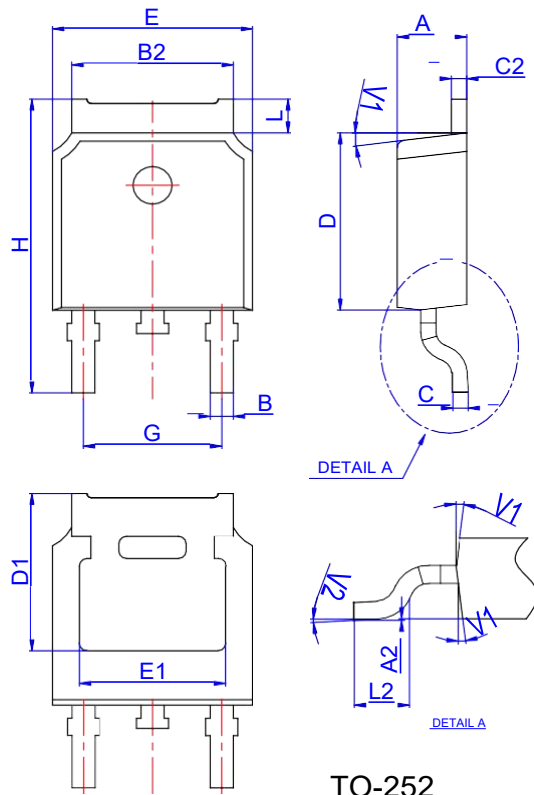


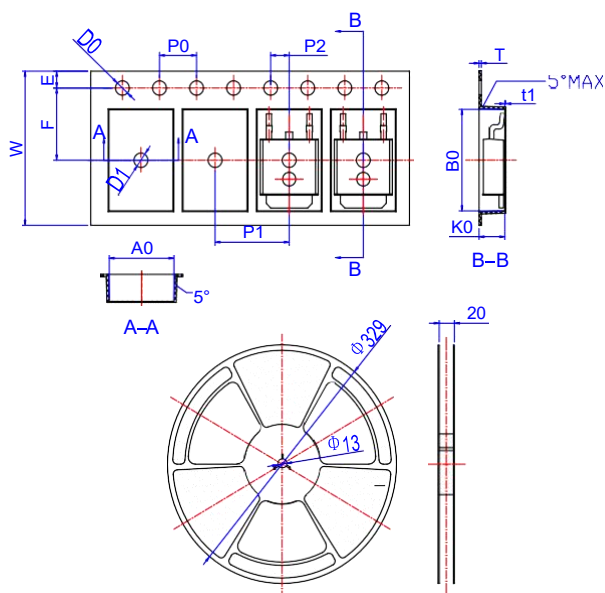
Figure C. Unclamped Inductive Switching Circuit & Waveforms

Package Mechanical Data TO 252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Reel Specification-TO-252-4R



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583