SLD50R290SJ,SLU50R290SJ,SLP50R290SJ
SLF50R290SJ, SLB50R290SJ, SLI50R290SJ
500V N-Channel MOSFET

General Description

This Power MOSFET is produced using Maple semi's Advanced Super-Junction technology.

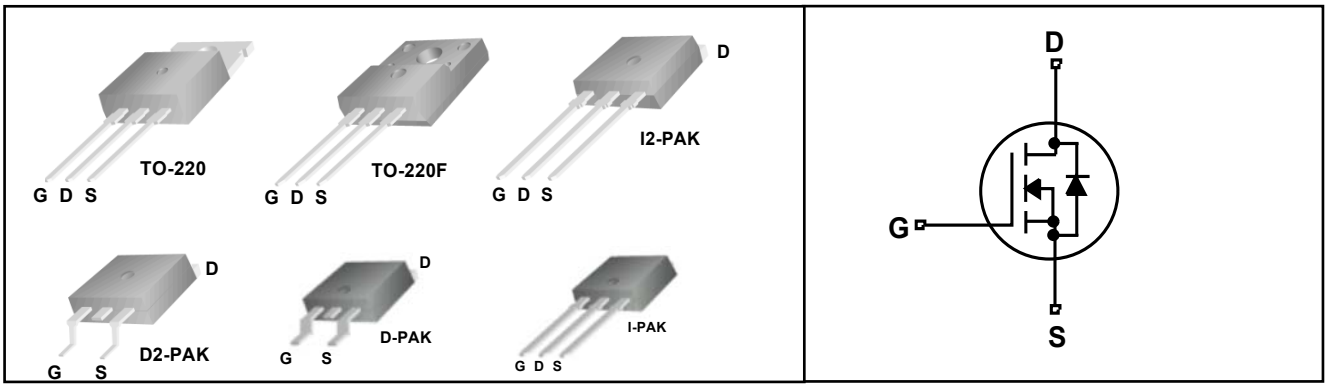
This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for AC/DC power conversion

Features

-14A, 500V, RDS(on) typ.= 0.27Ω@VGS = 10 V

- Low gate charge (typical 38nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

TC = 25°C unless otherwise noted

Symbol	Parameter		D2-PAK/D-PAK I2-PAK / I-PAK/ TO-220	TO-220F	Units
VDSS	Drain-Source Voltage		500		V
ID	Drain Current	- Continuous (TC = 25℃)	14	14*	A
		- Continuous (TC = 100℃)	9	9*	A
IDM	Drain Current - Pulsed	(Note 1)	30	30*	A
VGSS	Gate-Source Voltage		±30		V
EAS	Single Pulsed Avalanche Energy	(Note 2)	132		mJ
IAR	Avalanche Current	(Note 1)	2.1		A
EAR	Repetitive Avalanche Energ	(Note 1)	65		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.0		V/ns
PD	Power Dissipation (TC = 25℃)		83	31	W
		- Derate above 25℃	0.67	0.25	W/℃
TJ, TSTG	Operating and Storage Temperature Range		-55 to +150		℃
TL	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300		℃

*Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value						Units
		DPAK	IPAK	TO220	D2PAK	I2PAK	TO220F	
RθJC	Thermal Resistance, Junction-to-Case	1.6	1.6	1.5	1.5	1.5	4.0	℃/W
RθJS	Thermal Resistance, Case-to-Sink Typ.	-	-	0.5	0.5	0.5	-	℃/W
RθJA	Thermal Resistance, Junction-to-Ambient	100	100	62	62	62	80	℃/W

Electrical Characteristics (TC = 25 °C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS = 0V,ID = 250uA, TJ=25℃	500	-	-	V
		VGS = 0V,ID = 250uA, TJ=150℃	-	550	-	V
ΔBVDSS ΔTJ	Breakdown Voltage Temperature coefficient	ID = 250uA, referenced to 25°C	-	0.6	-	V/°C
IDSS	Drain-Source Leakage Current	VDS =500V, VGS = 0V	-	-	1	uA
		VDS = 400V, TC = 125 °C	-	-	10	uA
IGSS	Gate-Source Leakage, Forward	VGS = 30V, VDS = 0V	-	-	100	nA
	Gate-source Leakage, Reverse	VGS = -30V, VDS = 0V	-	-	-100	nA
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS = VGS, ID = 250uA	2.5	-	4.5	V
RDS(ON)	Static Drain-Source On-state Resistance	VGS =10 V, ID = 7A	-	0.27	0.29	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VGS =0 V, VDS =25V, f = 1MHz	-	680	-	pF
Coss	Output Capacitance		-	140	-	
Crss	Reverse Transfer Capacitance		-	5	-	
Dynamic Characteristics						
td(on)	Turn-on Delay Time	VDD =250V, ID =14A, RG =25Ω	`	26	-	nS
tr	Rise Time		-	60	-	
td(off)	Turn-off Delay Time		-	75	-	
tf	Fall Time		-	44	-	
Qg	Total Gate Charge	VDS =400V, VGS =10V, ID =14A	-	38	-	nC
Qgs	Gate-Source Charge		-	4	-	
Qgd	Gate-Drain Charge(Miller Charge)		-	4.4	-	

Source-Drain Diode Ratings and Characteristics

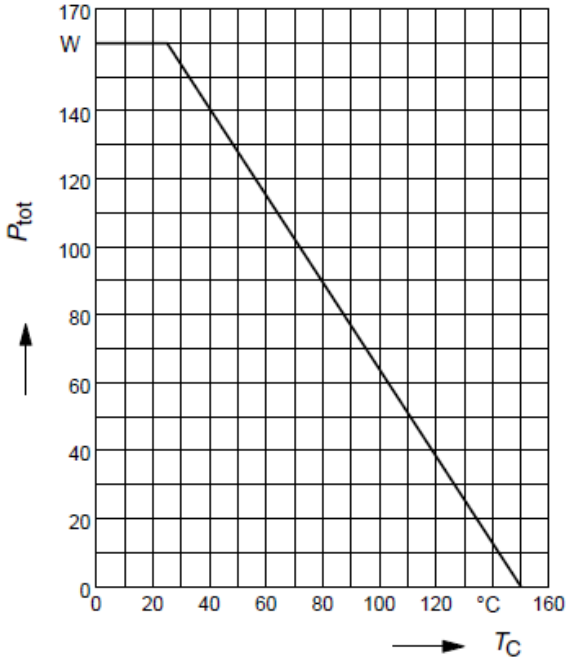
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	14	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		-	-	30	
VSD	Diode Forward Voltage	IS =14A, VGS =0V	-	-	1.5	V
trr	Reverse Recovery Time	IS =14A, VGS=0V, dIF/dt=100A/us	-	270	-	nS
Qrr	Reverse Recovery Charge		-	3.3	-	uC

NOTES

1. Repeativity rating : pulse width limited by junction temperature
2. L =60mH, IAS = 4.4A, VDD = 150V, RG = 25Ω, Starting TJ = 25°C
3. ISD ≤ 10A, di/dt ≤ 200A/us, VDD ≤ BVDSS, Starting TJ = 25°C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially independent of operating temperature.

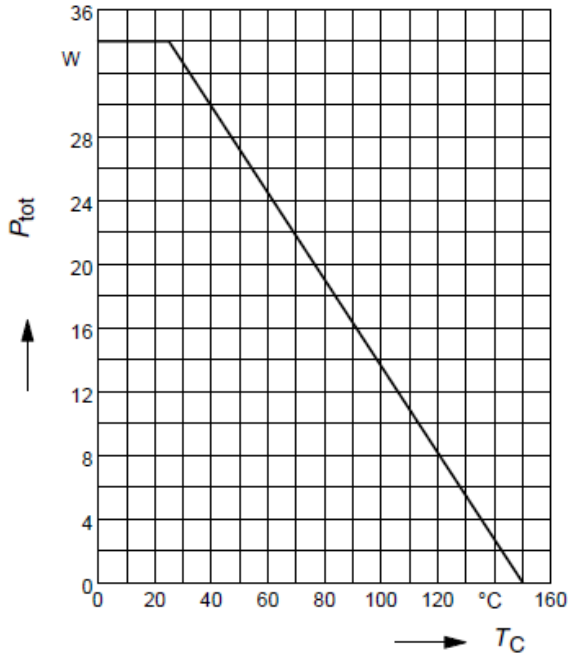
1 Power dissipation

$P_{tot} = f(T_C)$



2 Power dissipation FullPAK

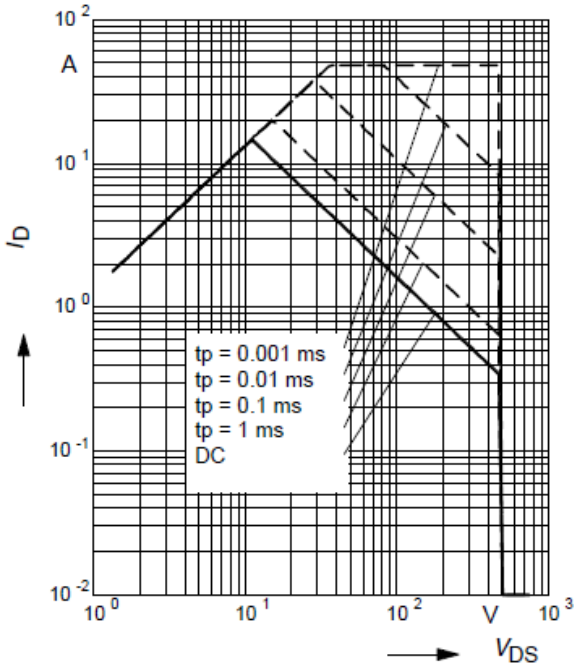
$P_{tot} = f(T_C)$



3 Safe operating area

$I_D = f(V_{DS})$

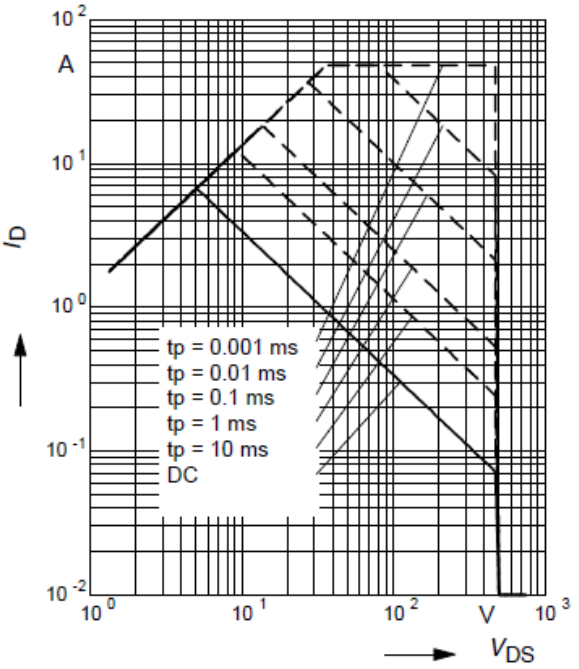
parameter : $D = 0$, T_C=25°C



4 Safe operating area FullPAK

$I_D = f(V_{DS})$

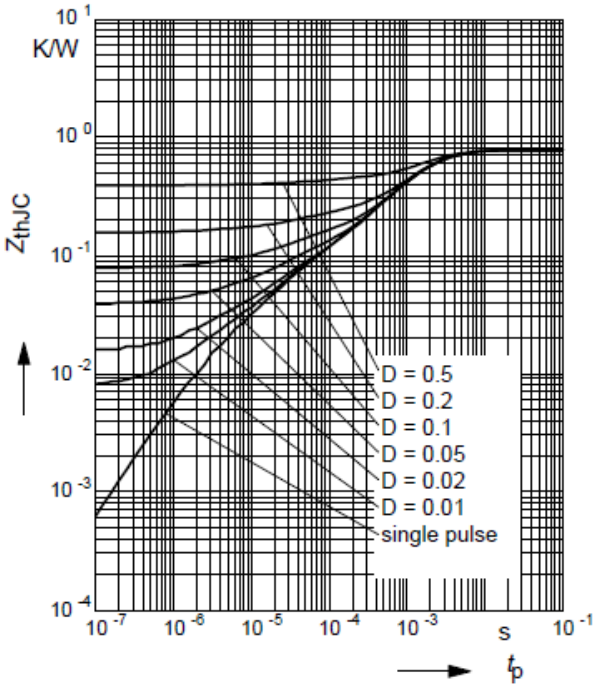
parameter: $D = 0$, T_C = 25°C



5 Transient thermal impedance

$Z_{thJC} = f(t_p)$

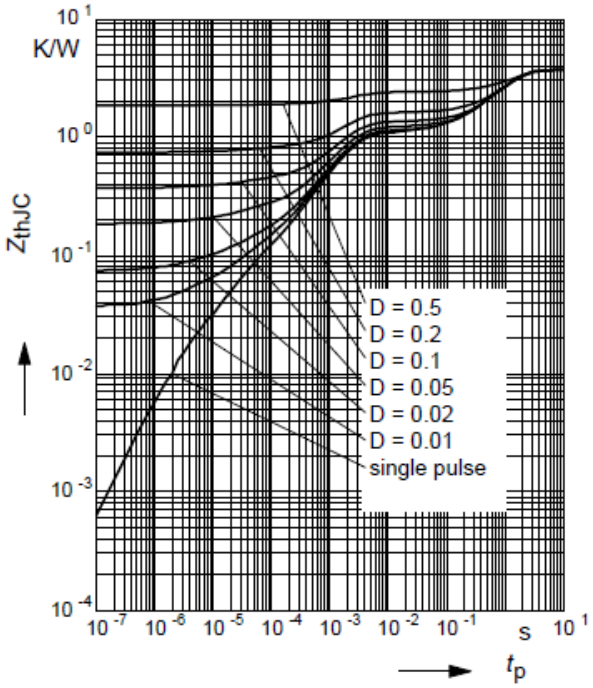
parameter: $D = t_p/T$



6 Transient thermal impedance FullPAK

$Z_{thJC} = f(t_p)$

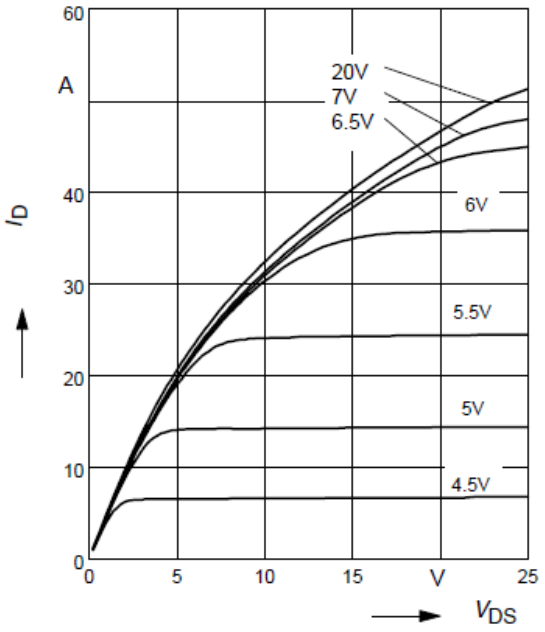
parameter: $D = t_p/t$



7 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

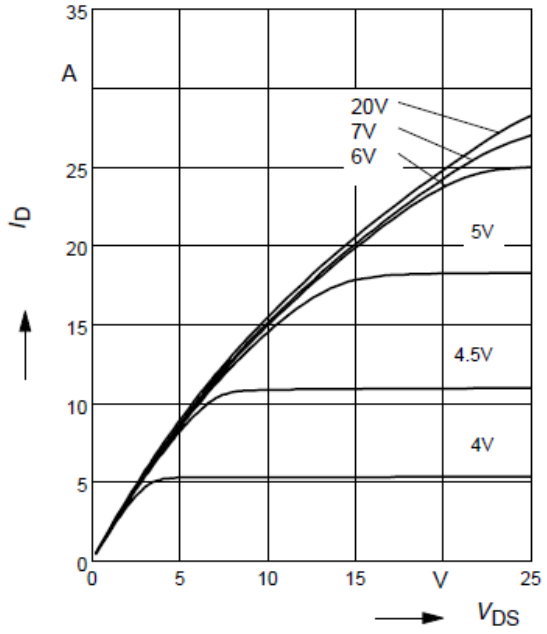
parameter: t_p = 10 µs, V_{GS}



8 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=150°C

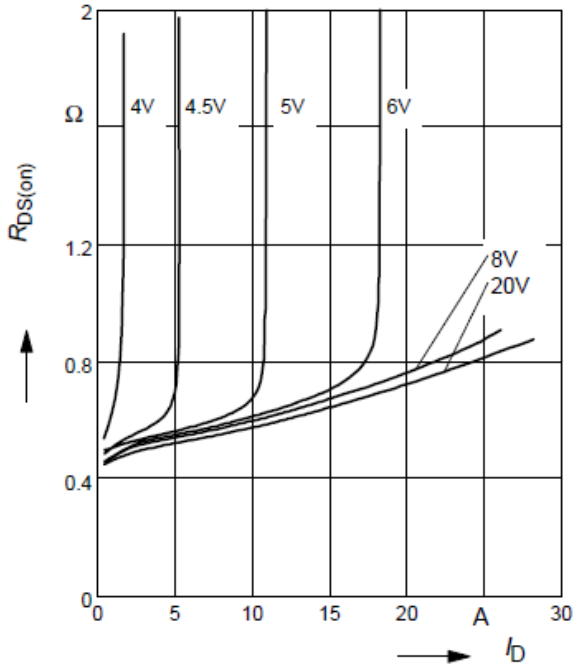
parameter: t_p = 10 µs, V_{GS}



9 Typ. drain-source on resistance

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

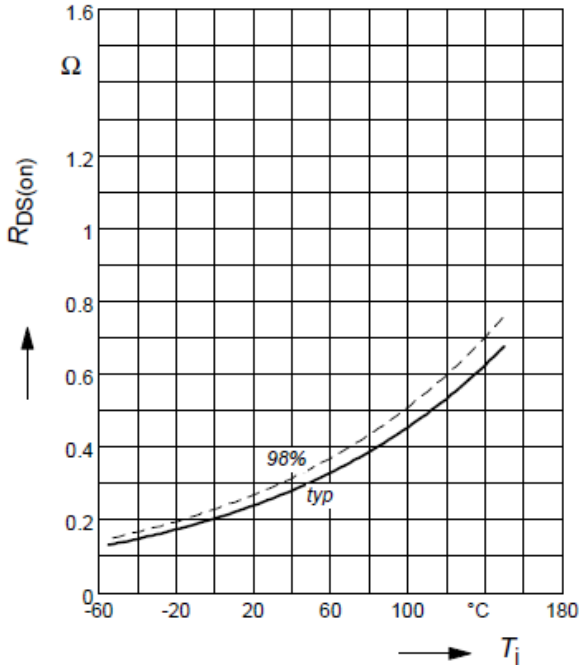
parameter: T_j=150°C, V_{GS}



10 Drain-source on-state resistance

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

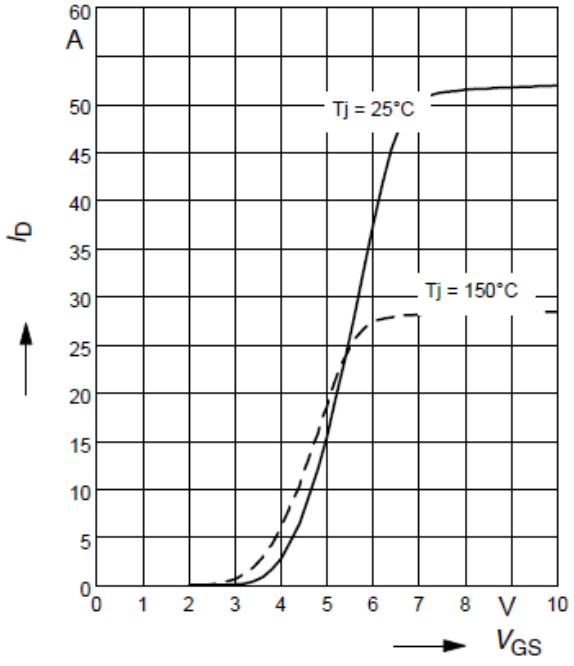
parameter : I_D = 10 A, V_{GS} = 10 V



11 Typ. transfer characteristics

$I_D = f(V_{GS})$; $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

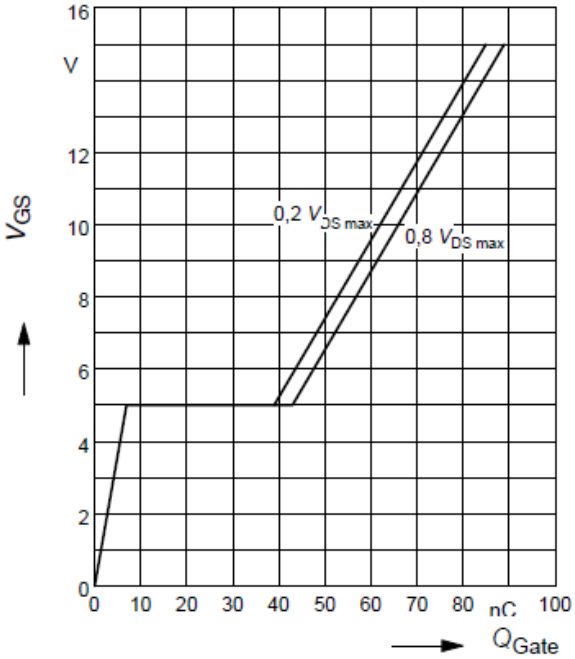
parameter: t_p = 10 µs



12 Typ. gate charge

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

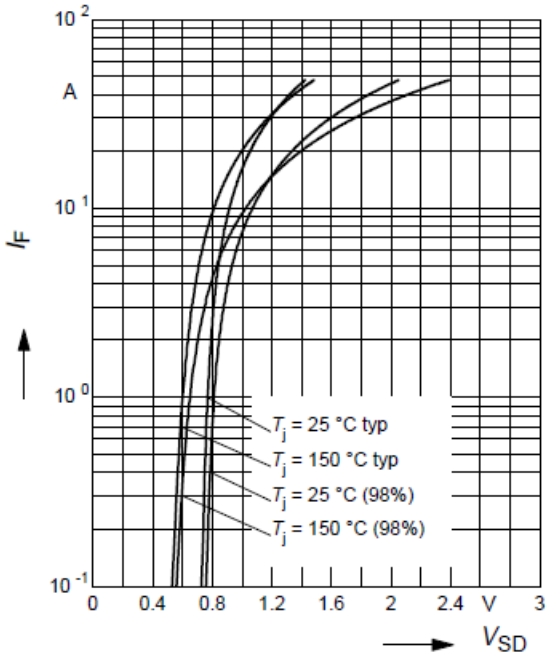
parameter: I_D = 14 A pulsed



13 Forward characteristics of body diode

$I_F = f(V_{SD})$

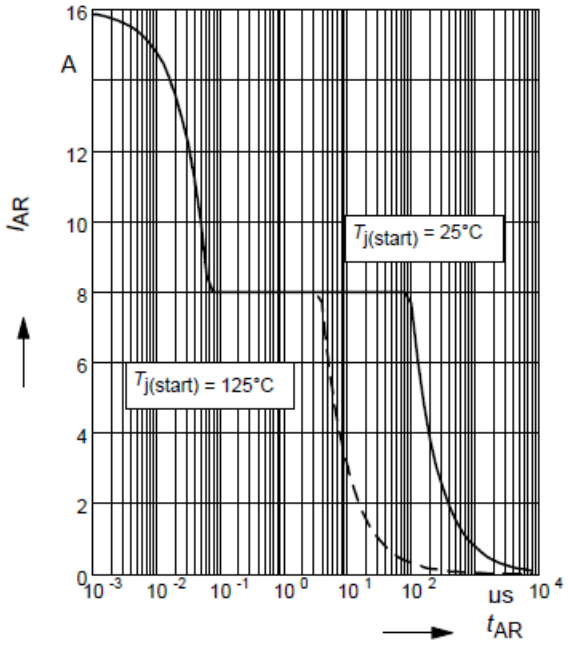
parameter: T_j , t_p = 10 µs



14 Avalanche SOA

$I_{AR} = f(t_{AR})$

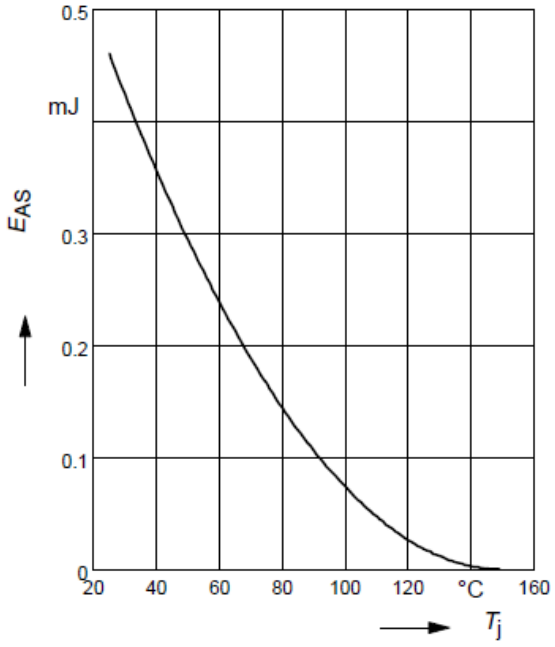
par.: $T_j \leq 150$ °C



15 Avalanche energy

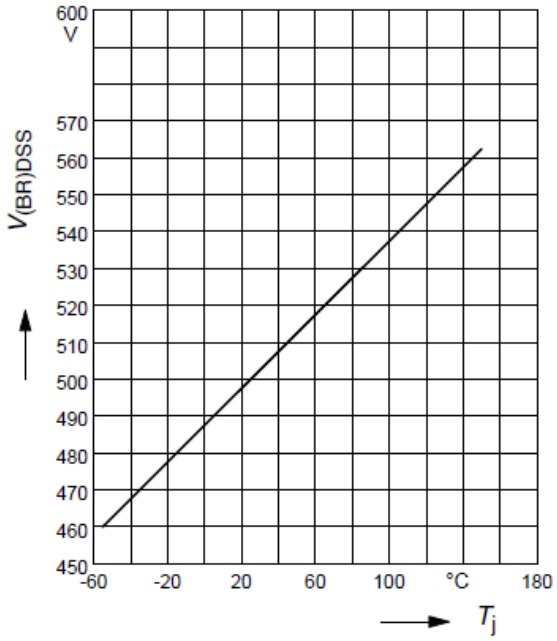
$E_{AS} = f(T_j)$

par.: I_D = 8 , V_{DD} = 50 V



16 Drain-source breakdown voltage

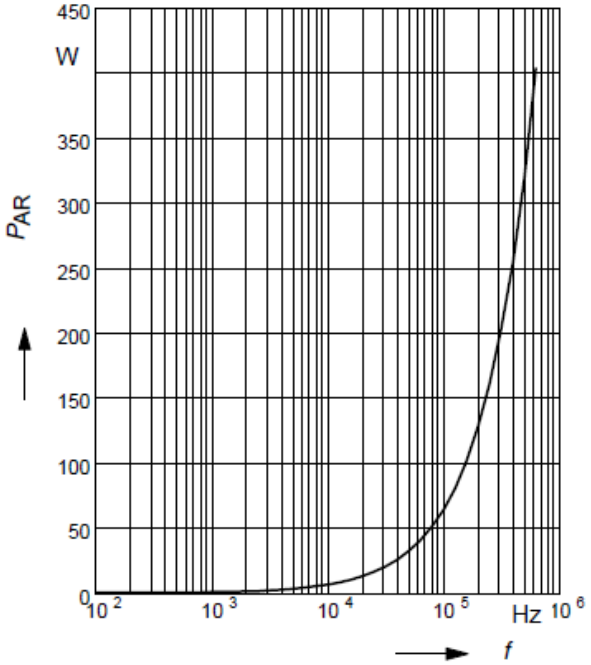
$V_{(BR)DSS} = f(T_j)$



17 Avalanche power losses

$P_{AR} = f(f)$

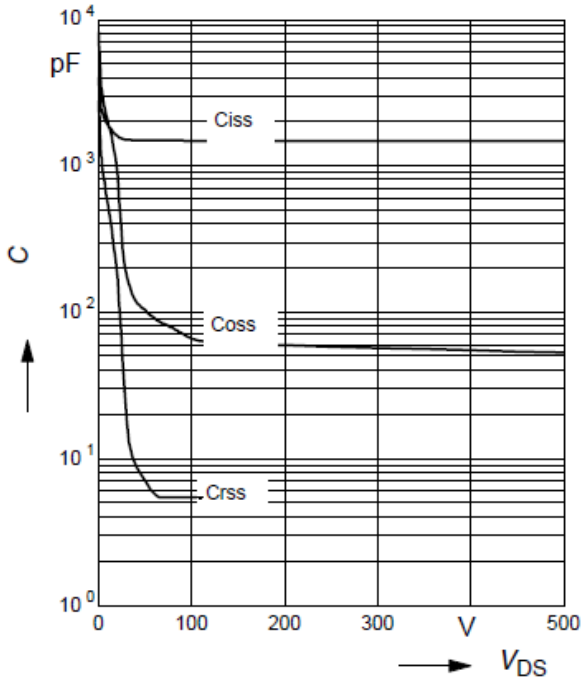
parameter: E_{AR}=0.64mJ



18 Typ. capacitances

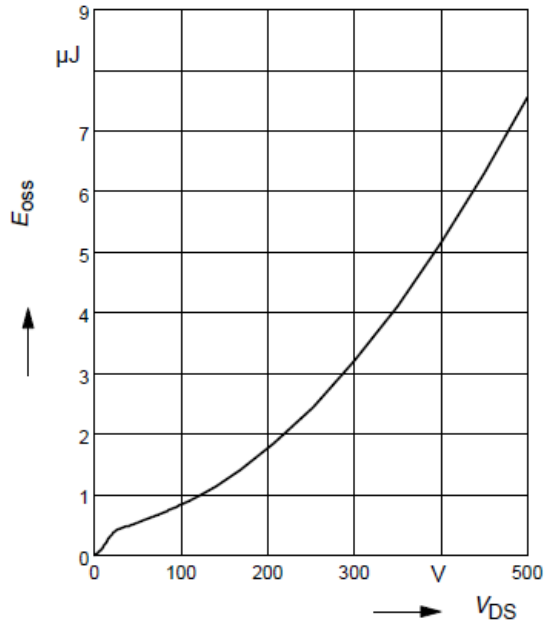
$C = f(V_{DS})$

parameter: V_{GS}=0V, f=1 MHz

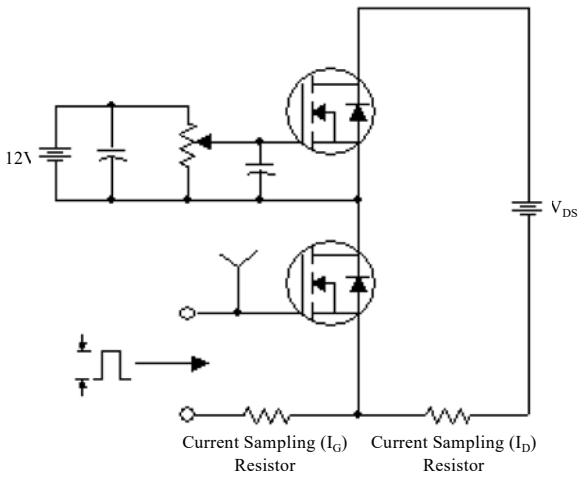


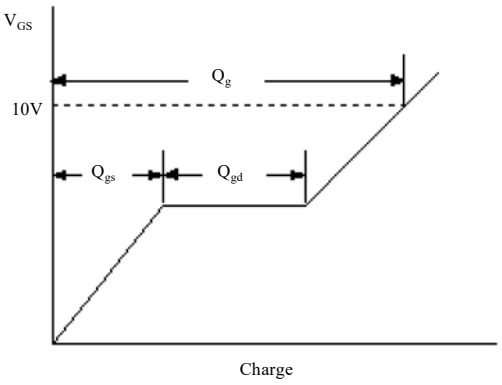
19 Typ. C_{oss} stored energy

E_{oss}=f(V_{DS})

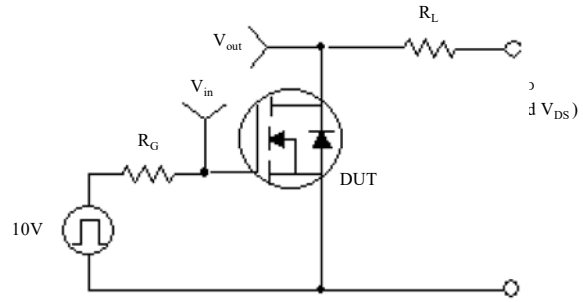


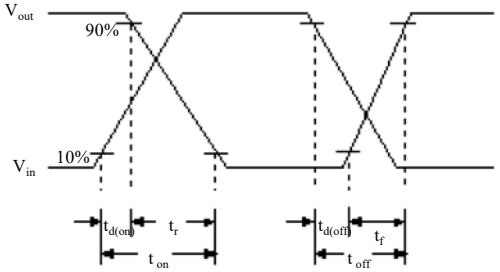
Gate Charge Test Circuit & Waveform



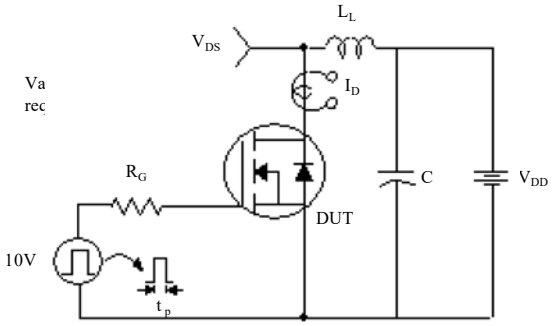


Resistive Switching Test Circuit & Waveforms

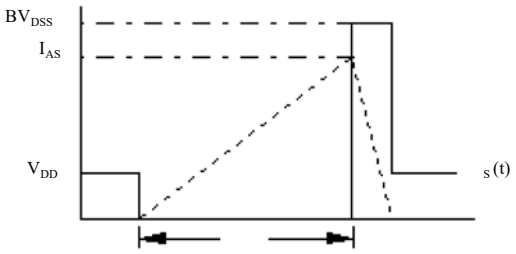




Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L_L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



Peak Diode Recovery dv/dt Test Circuit & Waveforms

