PSM20N50CT

PFC Device Corporation

20A 500V Single N-Channel Power MOSFET

Major ratings and characteristics

Characteristics	Values	Units
V_{DS}@T_J max	500	**V**
$R_{DS(ON)}$,V_{GS}=10V	0.190	**Ω**
I_D	20	**A**

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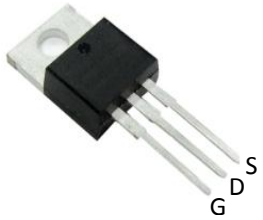
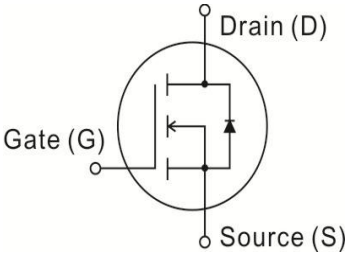


TO-220AB



General Description

PFC MLSJ (Multi-Layer Super Junction) MOSFET technology is the ideal choice for the PFC and PWM application. PFC device provides practical advantages of higher pressure-resistance, lower on-resistance to achieve the ideal balance between the switching speed and on-resistance.

Typical Applications

PFC stages, hard switching PWM stages and resonant switching stages for PC, Adapter, LCD & PDP TV, Lighting, Server, Telecom and UPS.

Please note: For MOSFET paralleling the use of ferrite beads on the gate or separate totem poles is generally recommended.

Features

- Advanced High Voltage Technology
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Extreme dv/dt rated
- Lead Free Finish, RoHS Compliant

1. Characteristics

Maximum Ratings Characteristics (T_A = 25 °C unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-Source Voltage	500	V
I_D	Drain Current – Continuous (T_C=25°C)	20	A
	Drain Current – Continuous (T_C=100°C)	13	A
I_D pulsed	Pulsed Drain Current tp limited by T_J max (Note 1)	60	A
E_{AS}	Single Pulse Avalanche Energy (Noted 2)	690	mJ
E_{AR}	Avalanche Energy, repetitive t_{AR} limited by Tjmax (Note 3) I_D=20A , V_{DD}=50V	5.0	mJ
I_{AR}	Avalanche Current, repetitive t_{AR} limited by Tjmax	18	A
V_{GS}	Gate-Source Voltage Static	±20	V
V_{GS}	Gate-Source Voltage AC (f>1Hz)	±30	V
P_{tot}	Power Dissipation	204	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C
dv/dt	Peak Diode Recovery dv/dt (Note 4)	15	V/nS

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	°C/W
$R_{\theta JC}$	Thermal Resistance Junction to case (Drain)	---	0.61	°C/W

Electrical Characteristics (T_J = 25 °C unless otherwise specified)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	500	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=500V,V_{GS}=0V, T_J=25℃	---	0.05	1	uA
		V_{DS}=500V,V_{GS}=0V, T_J=150℃	---	---	100	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±30V , V_{DS}=0V	---	---	±100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V ,I_D=13.1A, T_J=25℃	---	0.145	0.190	Ω
		TJ=150℃	---	0.45	---	
$V_{GS(th)}$	Gate-Source Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	2.8	3.2	3.9	V
R_G	Gate input resistance	f=1MHz, open Drain	---	0.54	---	Ω

Dynamic and switching Characteristics

Q_{gs}	Gate-Source Charge	V_{DD}=380V, I_D=20A, V_{GS}=0 to 10V	---	13	---	nC
Q_{gd}	Gate-Drain Charge		---	33	---	
Q_g	Gate charge total		---	75	---	
$V_{(plateau)}$	Gate plateau voltage		---	5.5	---	V
gfs	Transconductance	VDS≧2*ID*RDS(on)max,	---	22	---	S
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS} =25V f=1 MHz	---	2340	---	pF
C_{oss}	Output Capacitance		---	1400	---	
C_{rss}	Reverse Transfer Capacitance		---	85	---	

Drain-Source Diode Characteristics and Maximum ratings

V_{SD}	Inverse diode forward voltage	I_S = 20A, V_{GS} = 0V	---	0.8	1.4	V
t_{rr}	Reverse Recovery Time	V_R=380V, I_F=I_S, di_F/dt=100A/uS	---	420	---	nS
Q_{rr}	Reverse Recovery Charge		---	8	---	uC
I_{rrm}	Peak reverse recovery current		---	39	---	A

Note :
1. Repetitive Rating: Pulsed width limited by maximum junction temperature.
2. V_{DD}=50V,I_D=10A,Starting T_J=25℃.
3. Repetitive avalanche cause additional power lose that can be calculated as P_{AV}=E_{AR}*f.
4. ISD<=ID, di/dt<=400A/us, Tj<Tj,max

2. Characteristics Curves

Ratings and Characteristics Curves (T_A = 25℃ unless otherwise specified)

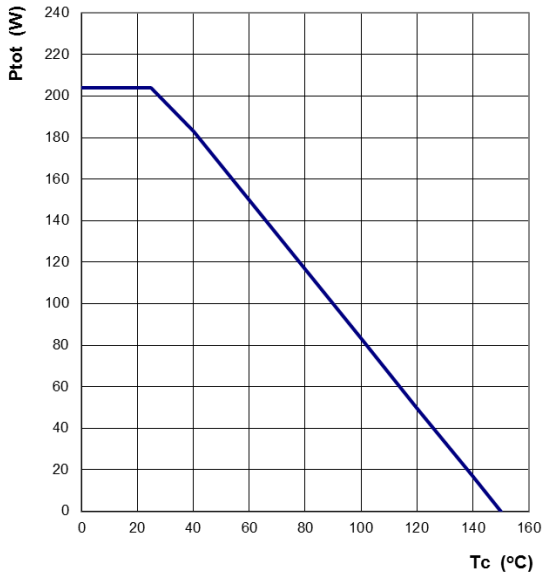


Figure 1: Power Dissipation
P_{tot} = f (T_C)

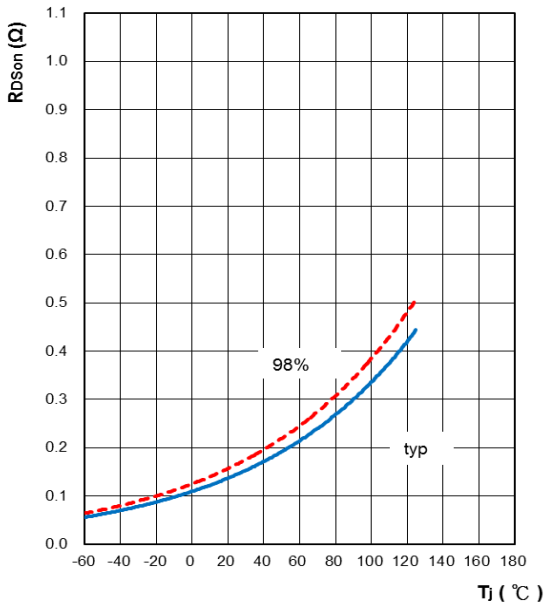


Figure 2: Drain-Source On-state Resistance
$R_{DS(on)}$=f (T_j)
parameter : I_D=13.1A, V_{GS}=10V

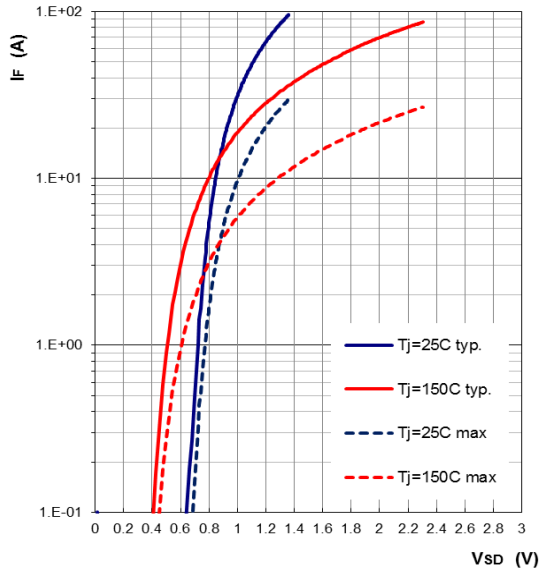


Figure 3: Forward characteristics of body diode
I_F=f (V_{SD}); parameter:T_j, tp=100uS

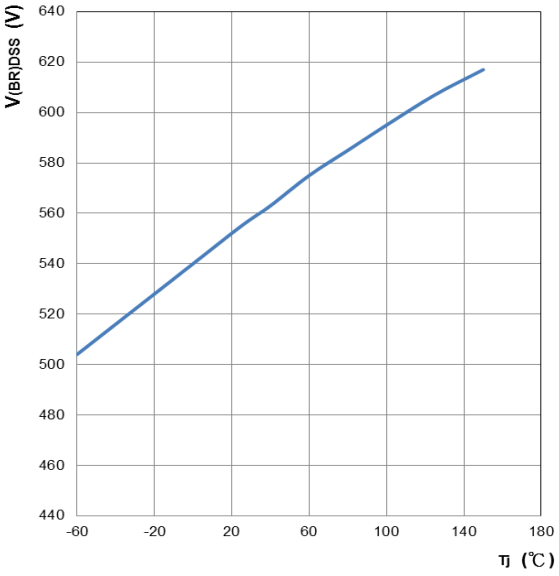


Figure 4: Drain-source breakdown voltage
$V_{(BR)DSS}$=f (T_j)

Ratings and Characteristics Curves (T_A = 25℃ unless otherwise specified)

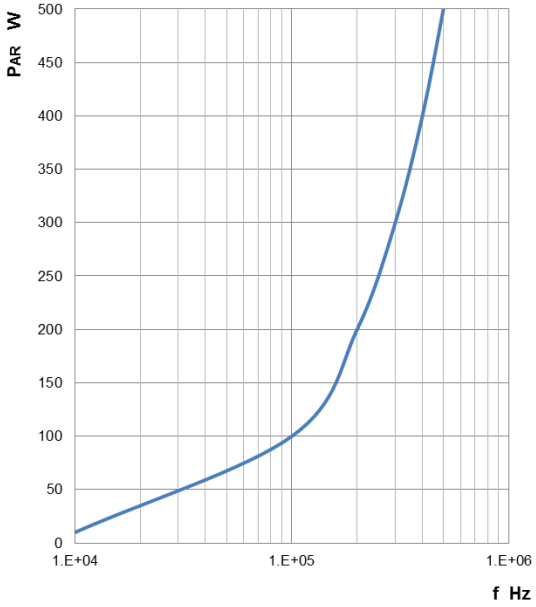


Figure 5: Avalanche power losses

P_{AR}=f (f)

parameter : E_{AR}=1mJ

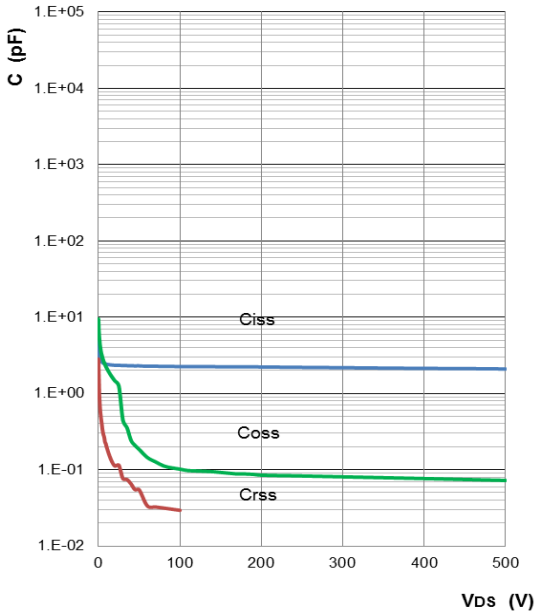


Figure 6: Typ. Capacitances

C = f (V_{DS})

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

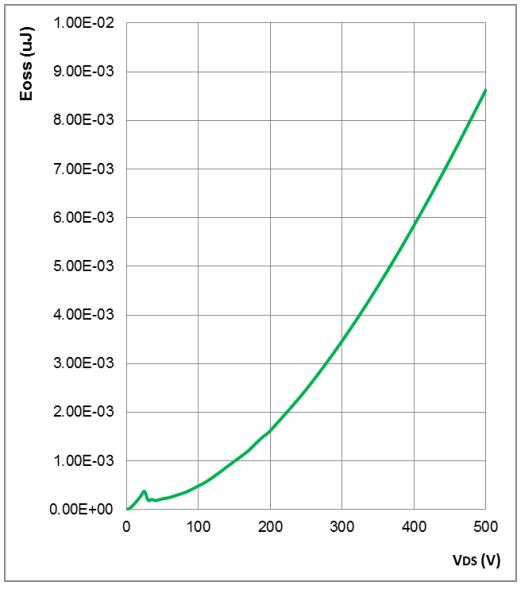


Figure 7: Typ. Coss stored energy

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

3. Test Circuits and Waveforms

Test Circuits and Waveforms

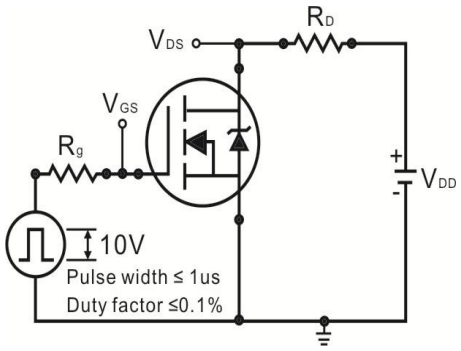


Figure 1: Switching times test circuit

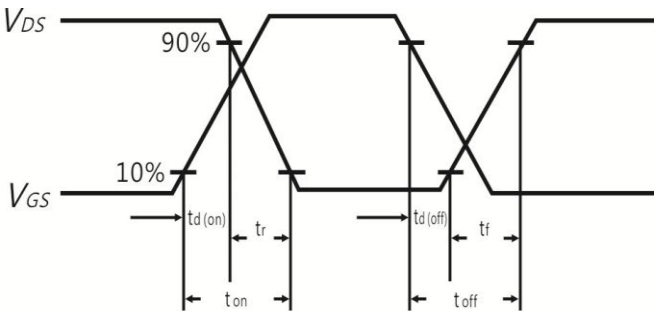


Figure 2: Switching time waveform

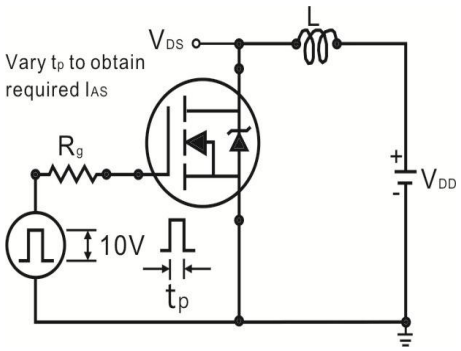


Figure 3:Unclamped test circuit

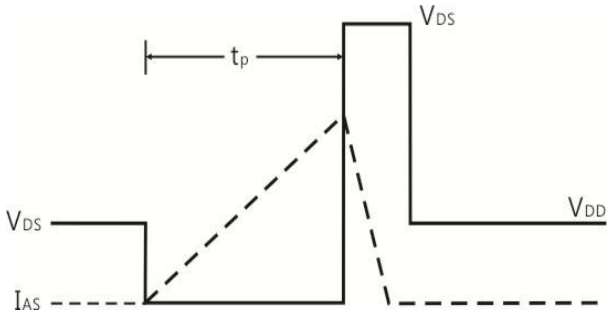


Figure 4: Unclamped test waveform

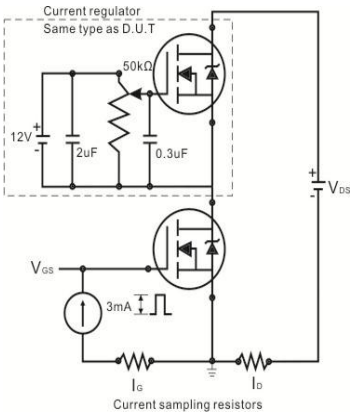


Figure 5:Gate charge test circuit

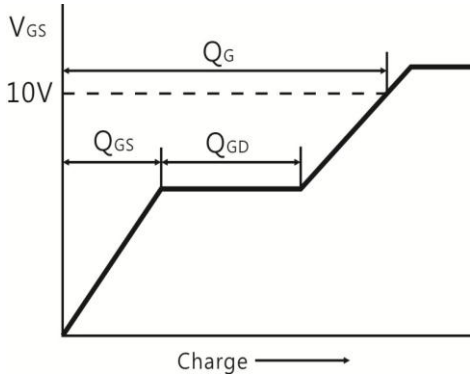


Figure 6: Basic gate charge waveform

4. Marking information

Top Marking Rule

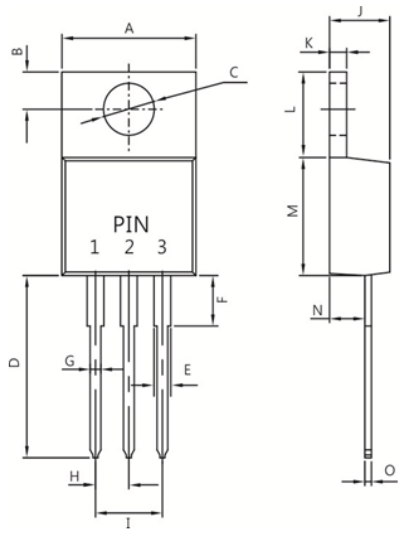
PFC PSM
20N50CT
YYWW ABSH

PSM20N50CT = Product Type Marking Code
YY = Last two digits of year
WW = Week code
ABS = Assembly code
H = Halogen Free (N/A = common molding compound)

5. Package information

Package Outline Dimensions millimeters

TO-220AB



Dim.	Min.	Max.
A	-----	10.50
B	2.50	3.50
C	3.50	4.10
D	13.10	13.90
E	1.15	1.49
F	-----	6.35
G	0.65	0.95
H	2.29	2.79
I	4.80	5.30
J	4.40	4.80
K	1.14	1.40
L	5.84	6.86
M	8.50	9.60
N	2.03	2.92
O	0.30	0.64
All Dimensions in millimeter		

6. Ordering information

Part Number	Package	Delivery mode
PSM20N50CT	TO-220AB	50 pieces / tube

Note: For Halogen Free molding compound, add "H" suffix to part number above.

Mechanical

- Molder Plastic: UL Flammability Classification Rating 94V-0
- Device Weight : 0.07 ounces (1.96grams) – TO-220AB
- Mounting Torque : Recommended 10 in-lbs maximum

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