



PSM20N60PT

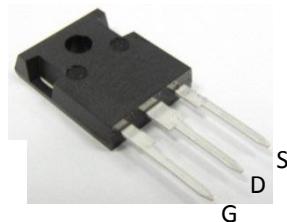
PFC Device Corporation

20A 600V Single N-Channel Power MOSFET

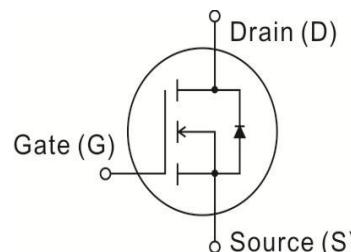
Major ratings and characteristics

Characteristics	Values	Units
$V_{DS}@T_J \text{ max}$	600	V
$R_{DS(\text{ON})}, V_{GS}=10\text{V}$	0.19	Ω
I_D	20	A

PSM20N60PT



TO-247AB



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

($T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current – Continuous ($T_C=25^\circ\text{C}$)	20	A
	Drain Current – Continuous ($T_C=100^\circ\text{C}$)	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 T_{jmax} (Note 3) $I_D=20\text{A}$, $V_{DD}=50\text{V}$	1	mJ
I_{AR}	Avalanche Current, repetitive t_{AR} limited by T_{jmax}	20	A
V_{GS}	Gate-Source Voltage Static	± 20	V
V_{GS}	Gate-Source Voltage AC ($f>1\text{Hz}$)	± 30	V
P_{tot}	Power Dissipation	204	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
dv/dt	MOSFET dvdt ruggedness, $V_{DS}=480\text{V}$	50	V/nS

Thermal Characteristics

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



Characteristics

PSM20N6OPT

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D=250\mu\text{A}$	600	---	---	V
I_{DSS}	Drain-Source Leakage Current	$V_{\text{DS}}=600\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$	---	0.05	1	μA
		$V_{\text{DS}}=600\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=150^\circ\text{C}$	---	---	100	μA
I_{GSS}	Gate-Source Leakage Current	$V_{\text{GS}}=\pm 30\text{V}$, $V_{\text{DS}}=0\text{V}$	---	---	± 100	nA

On Characteristics

$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}}=10\text{V}$, $I_D=13\text{A}$, $T_J=25^\circ\text{C}$	---	0.165	0.190	Ω
		$V_{\text{GS}}=10\text{V}$, $I_D=13\text{A}$, $T_J=150^\circ\text{C}$	---	0.45	---	Ω
$V_{\text{GS(th)}}$	Gate-Source Threshold Voltage	$V_{\text{GS}}=V_{\text{DS}}$, $I_D = 1000\mu\text{A}$	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	$V_{\text{DD}}=480\text{V}$, $I_D=20\text{A}$, $V_{\text{GS}}=0$ to 10V	---	13	---	nC
Q_{gd}	Gate-Drain Charge		---	33	---	
Q_g	Gate charge total		---	75	110	
$V_{\text{(plateau)}}$	Gate plateau voltage		---	5.9	---	V
g_{fs}	Transecondtance	$V_{\text{DS}} \geq 2^* I_D * R_{\text{DS(on)}} \text{max}$, $I_D=13\text{A}$	---	20.5	---	S
$T_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}}=380\text{V}$, $V_{\text{GS}}=0/13\text{V}$, $I_D=20\text{A}$, $R_g=3.6\Omega$, $T_J=25^\circ\text{C}$	---	8	---	nS
T_r	Rise Time		---	34	---	
$T_{\text{d(off)}}$	Turn-Off Delay Time		---	42	---	
T_f	Fall Time		---	58	---	
C_{iss}	Input Capacitance	$V_{\text{GS}}=0\text{V}$, $V_{\text{DS}}=100\text{V}$ f=1 MHz	---	2400	---	pF
C_{oss}	Output Capacitance		---	81	---	
C_{rss}	Reverse Transfer Capacitance		---	32	---	

Drain-Source Diode Characteristics and Maximum ratings

V_{SD}	Inverse diode forward voltage	$I_S=20\text{A}$, $V_{\text{GS}}=0\text{V}$	---	0.91	1.2	V
t_{rr}	Reverse Recovery Time	$V_R=480\text{V}$, $I_F=I_S$, $dI_F/dt=100\text{A}/\mu\text{s}$	---	491	800	nS
Q_{rr}	Reverse Recovery Charge		---	10	---	μC
I_{rrm}	Peak reverse recovery current		---	42	---	A

Note :

- Repetitive Rating: Pulsed width limited by maximum junction temperature.
- $V_{\text{DD}}=50\text{V}$, $I_D=10\text{A}$, Starting $T_J=25^\circ\text{C}$.
- Repetitive avalanche cause additional power lose that can be calculated as $P_{\text{AV}}=E_{\text{AR}}*f$.

2. Characteristics Curves



Ratings and Characteristics Curves

($T_A = 25^\circ\text{C}$ unless otherwise specified)

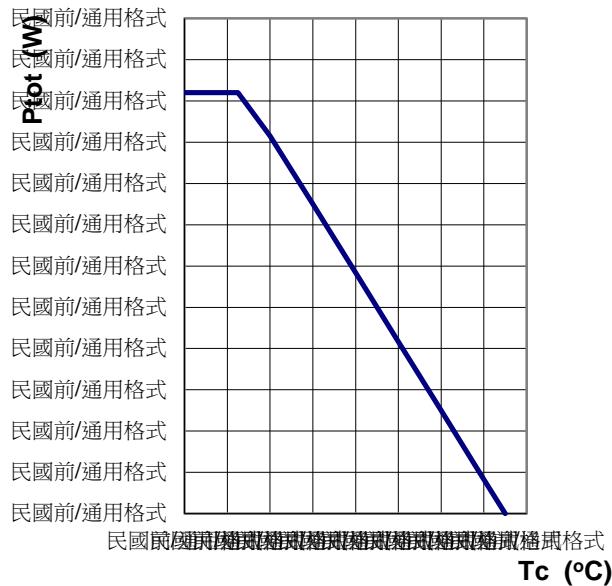


Figure 1: Power Dissipation

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

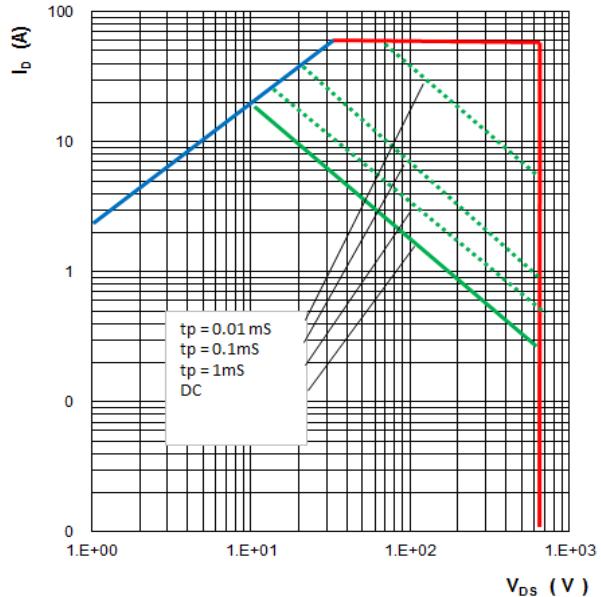


Figure 2: Safe operating area

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

parameter : D = 0, $T_c=25^\circ\text{C}$

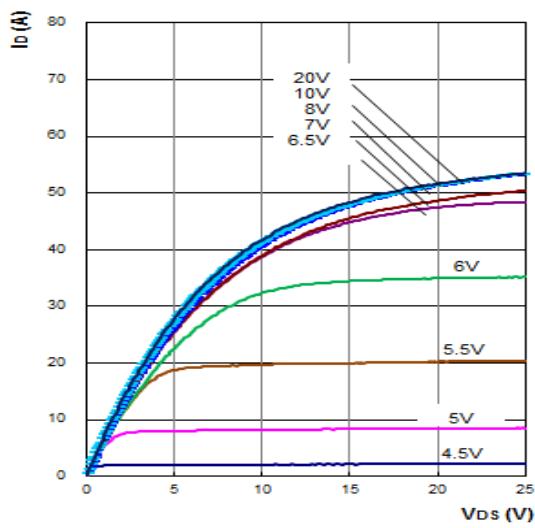


Figure 3: Typ. Output Characteristics

$$I_D = f(V_{DS}) ; T_j = 25^\circ\text{C}$$

parameter : $t_p = 100\mu\text{s}$, V_{GS}

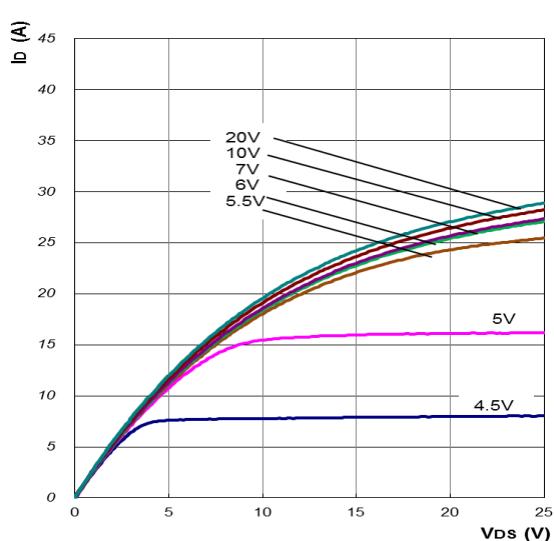


Figure 4: Typ. Output Characteristics

$$I_D = f(V_{DS}) ; T_j = 150^\circ\text{C}$$

parameter : $t_p = 100\mu\text{s}$, V_{GS}

Ratings and Characteristics Curves

($T_A = 25^\circ\text{C}$ unless otherwise specified)



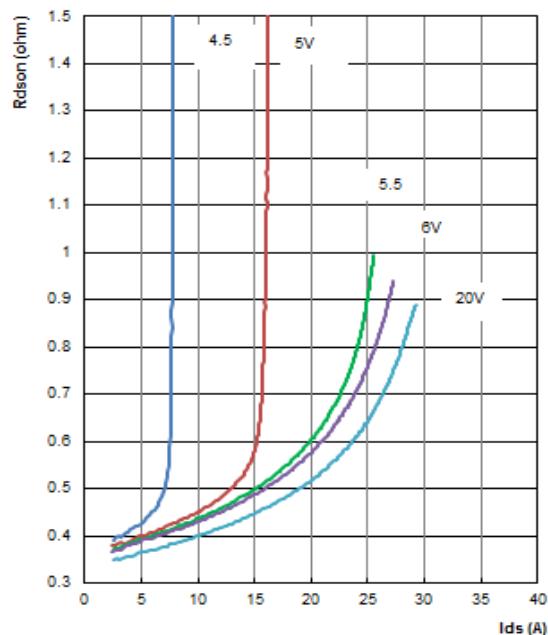


Figure 5: Typ. Drain Source On-Resistance
 $R_{DS(on)} = f(I_D)$
parameter : $t_p = 100\mu S$, $T_J = 150^\circ C$, $V_{GS} = 10V$

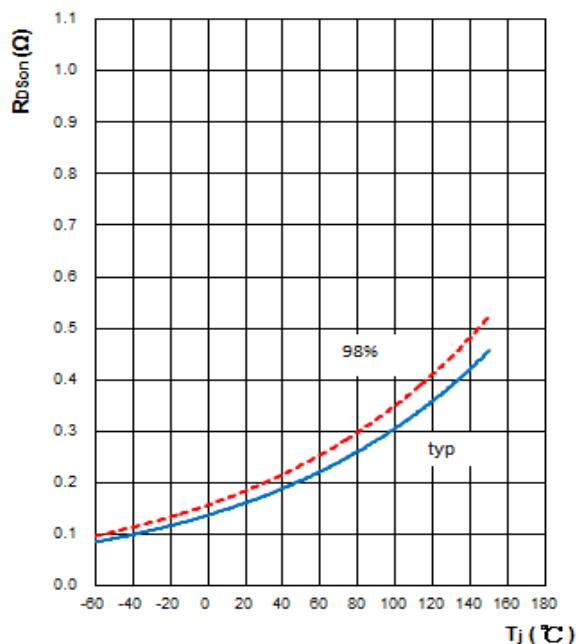


Figure 6: Drain-Source On-state Resistance
 $R_{DS(on)} = f(T_J)$
parameter : $I_D = 13A$, $V_{GS} = 10V$

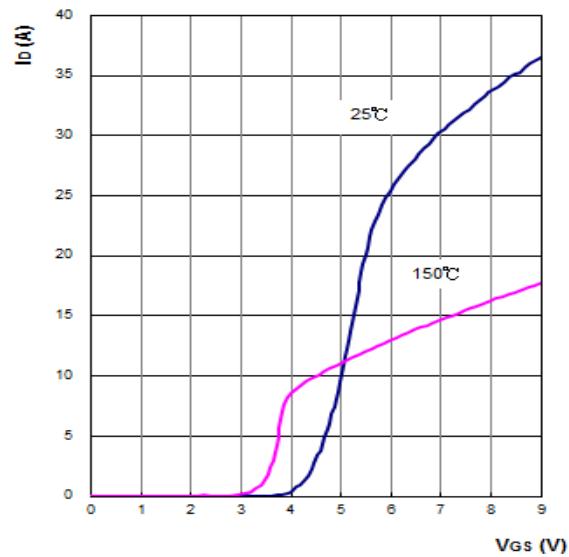


Figure 7: Typ. Transfer Characteristics
 $I_D = f(V_{GS})$; $V_{DS} \geq 2 \times I_D \times R_{DS(on)} \text{ max}$
parameter : $t_p=100 \mu S$

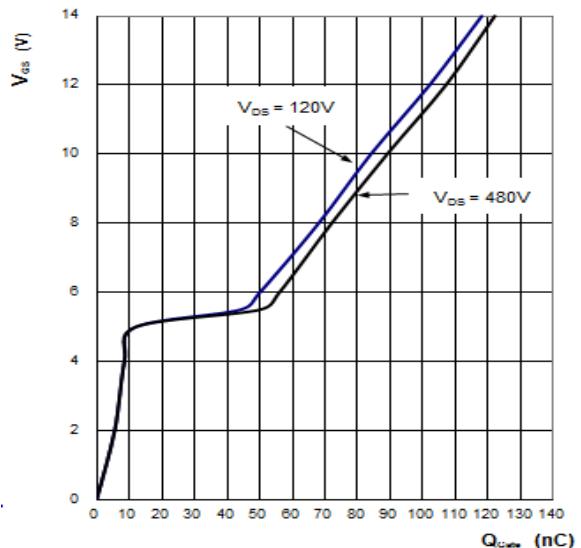


Figure 8: Typ. Gate Charge
 $V_{GS} = f(Q_{GATE})$
parameter : $I_D=20A$ pulsed



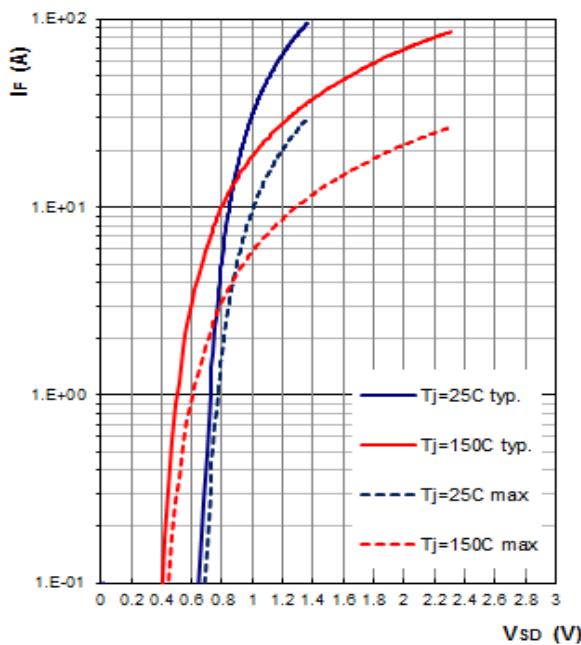


Figure 9: Forward characteristics of body diode
 $I_F = f(V_{SD})$
parameter : $T_J, t_p=100\mu\text{s}$

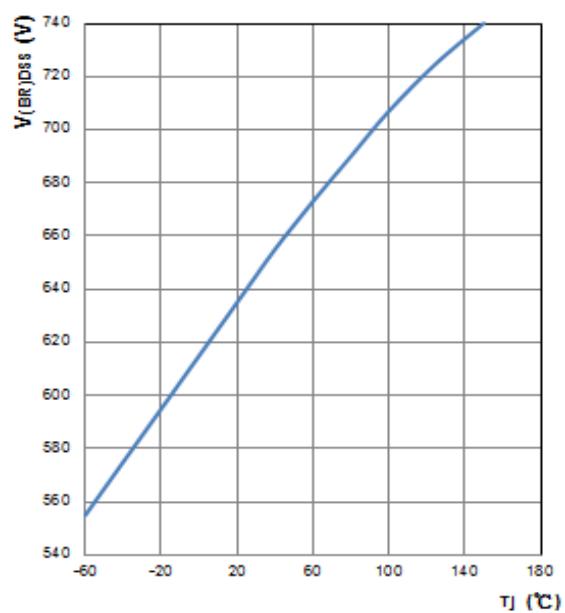


Figure 10: Drain-source breakdown voltage
 $V_{(BR)DSS} = f(T_J)$

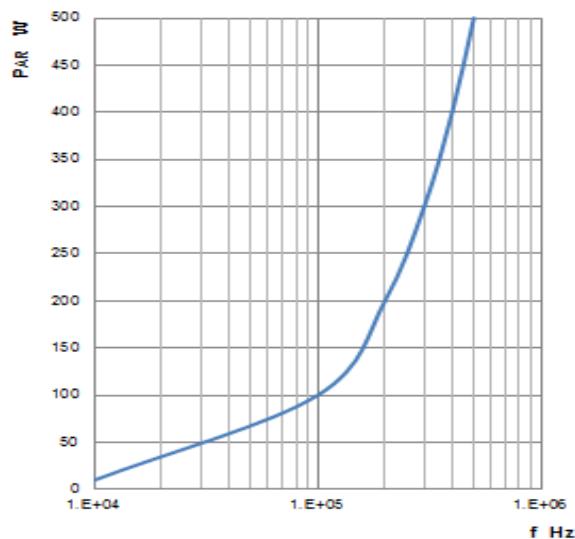


Figure 11: Avalanche power losses
 $P_{AR} = f(f)$
parameter : $E_{AR}=1\text{mJ}$

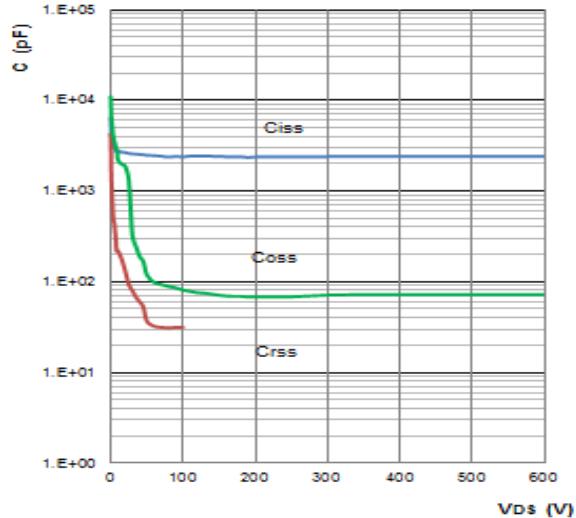


Figure 12: Typ. Capacitances
 $C = f(V_{DS})$
parameter : $V_{GS}=0\text{V}, f=1\text{MHz}$



Ratings and Characteristics Curves

($T_A = 25^\circ\text{C}$ unless otherwise specified)

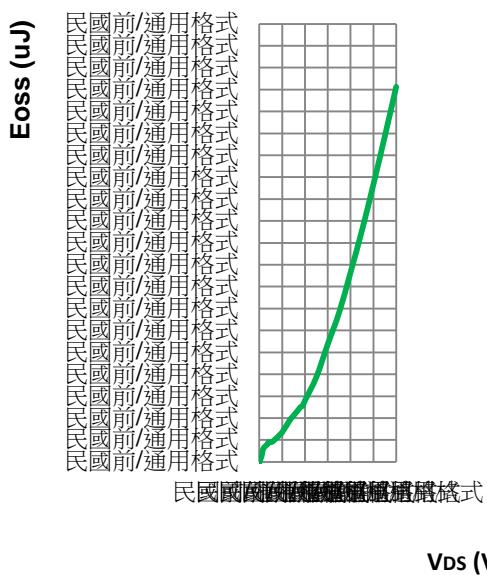


Figure 13: Typ. C_{oss} stored energy
 $E_{oss}=f(V_{DS})$



3. Test Circuits and Waveforms

Test Circuits and Waveforms

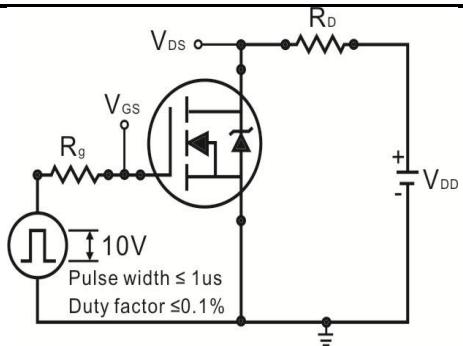


Figure 1: Switching times test circuit

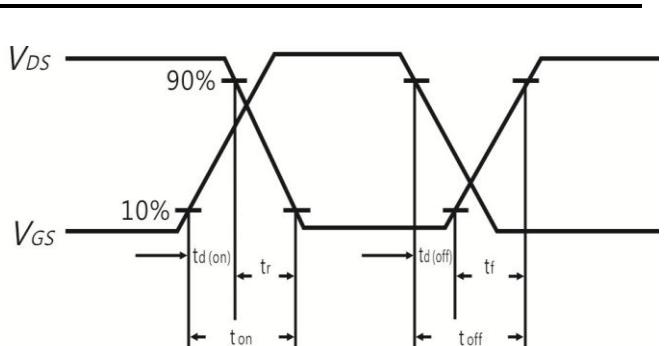


Figure 2: Switching time waveform

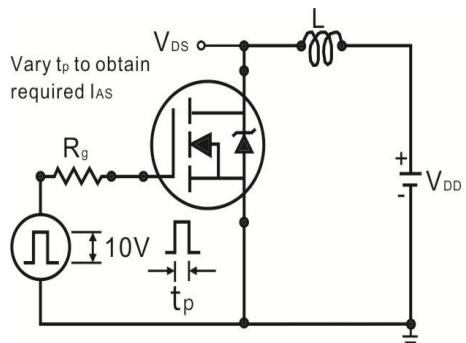


Figure 3: Unclamped test circuit

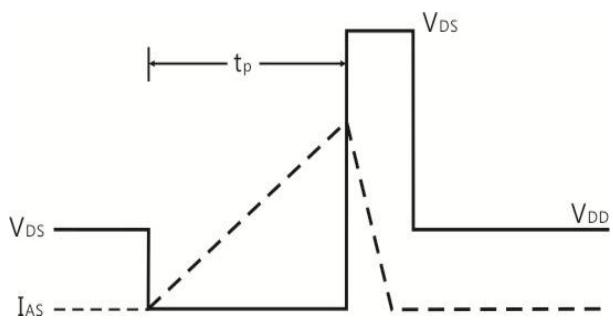


Figure 4: Unclamped test waveform

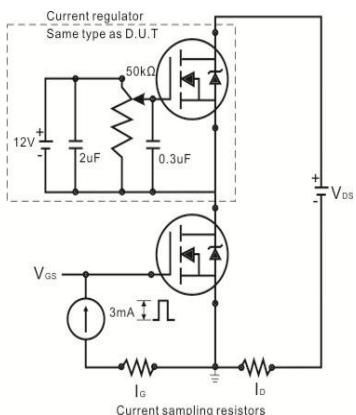


Figure 5: Gate charge test circuit

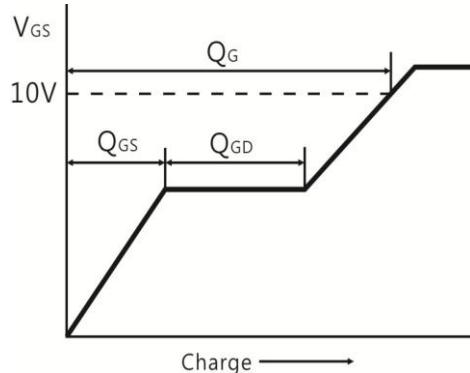


Figure 6: Basic gate charge waveform



4. Marking information

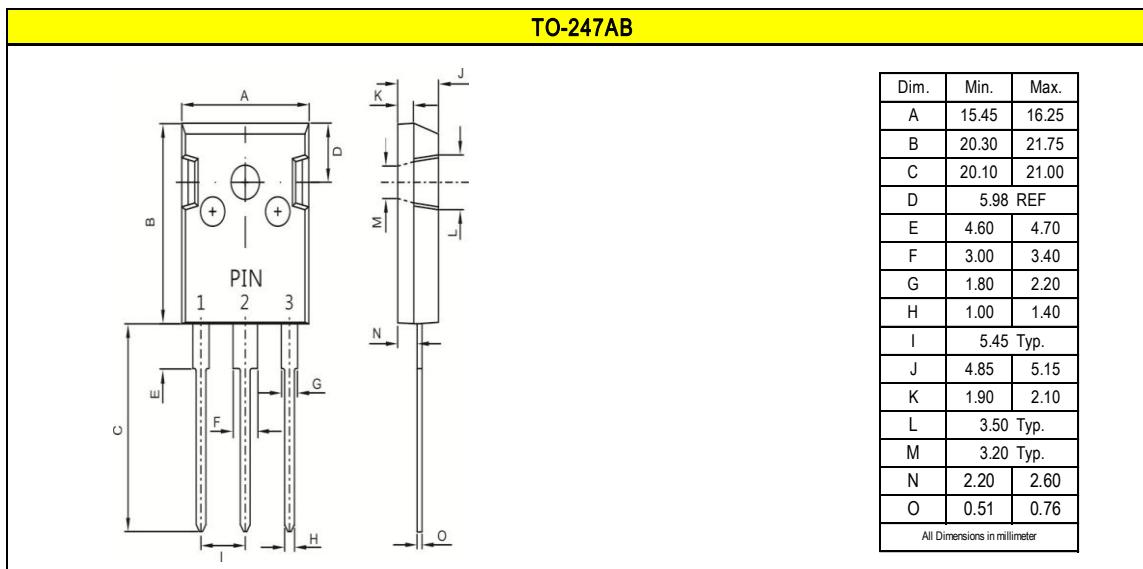
Top Marking Rule

PFC PSM
20N60PT
YYWW ABSH

PSM20N60PT = 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



6. Ordering information

Part Number	Package	Delivery mode
PSM20N60PT	TO-247AB	30 pieces / tube

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

Mechanical

- Case: TO-247AB
- Molder Plastic: UL Flammability Classification Rating 94V-0
- Device Weight : 0.197 ounces (5.6grams)
- Mounting Torque : 10 in-lbs maximum.

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