# PSM11N60CTF

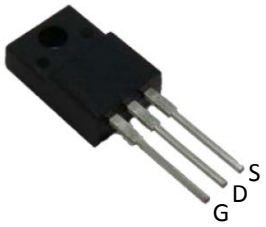
*PFC Device Corporation*

## 11A 600V Single N-Channel Power MOSFET

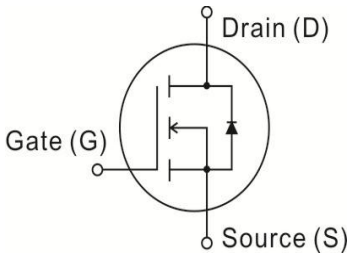
### Major ratings and characteristics

| Characteristics | Values | Units |
|---|---|---|
| $V_{DS}$@$T_J$ max | 600 | **V** |
| $R_{DS(ON)}$,$V_{GS}$=10V | 0.34 | **Ω** |
| $I_D$ | 11 | **A** |

**PSM11N60CTF**




**ITO-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
- 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 | 600 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25°C) | 11 | A |
| | Drain Current – Continuous ($T_C$=100°C) | 7 | A |
| $I_D$ pulsed | Pulsed Drain Current tp limited by $T_J$ max (Note 1) | 33 | A |
| $E_{AS}$ | Single Pulse Avalanche Energy (Noted 2) | 340 | mJ |
| $E_{AR}$ | Avalanche Energy, repetitive $t_{AR}$ limited by $T_J$ max (Note 3)<br>$I_D$=11A, $V_{DD}$=50V | 0.6 | mJ |
| $I_{AR}$ | Avalanche Current, repetitive $t_{AR}$ limited by $T_J$ max | 11 | A |
| $V_{GS}$ | Gate-Source Voltage Static | ±20 | V |
| $V_{GS}$ | Gate-Source Voltage AC (f>1Hz) | ±30 | V |
| $P_{tot}$ | Power Dissipation | 31 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | °C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | °C |

**Thermal Characteristics**

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 80 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to case (Drain) | --- | 4.0 | °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 | 600 | --- | --- | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=600V,$V_{GS}$=0V, $T_J$=25°C | --- | 0.1 | 1 | uA |
| | | $V_{DS}$=600V,$V_{GS}$=0V, $T_J$=150°C | --- | --- | 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 ,$I_D$=7A, $T_J$=25°C | --- | 0.29 | 0.34 | Ω |
| | | $V_{GS}$=10V ,$I_D$=7A, $T_J$=150°C | --- | 0.88 | --- | Ω |
| $V_{GS(th)}$ | Gate-Source Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =500uA | 2.1 | 3.0 | 3.9 | V |
| $R_G$ | Gate input resistance | f=1MHz, open Drain | --- | 0.7 | --- | Ω |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_{gs}$ | Gate-Source Charge | $V_{DD}$=480V, $I_D$=11A, $V_{GS}$=0 to 10V | --- | 8 | --- | nC |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 18 | --- | |
| $Q_g$ | Gate charge total | | --- | 40 | 60 | |
| V (plateau) | Gate plateau voltage | | --- | 6.0 | --- | V |
| gfs | Transconductance | $V_{DS}$≧2*$I_D$*$R_{DS(on)}$max, $I_D$=7A | --- | 11 | --- | S |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | --- | 1240 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 790 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 67 | --- | |

### Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{SD}$ | Inverse diode forward voltage | $I_S$=11A, $V_{GS}$=0V | --- | 0.86 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_R$=330V , $I_F$ = 11A, di $_F$/ dt = 100A / uS | --- | 366 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 6 | --- | uC |
| Irrm | Peak reverse recovery current | | --- | 31 | --- | A |

Note :
1. Repetitive Rating: Pulsed width limited by maximum junction temperature.
2. $V_{DD}$=50V, $I_D$=5.5A, Starting $T_J$=25℃.
3. Repetitive avalanche cause additional power loss that can be calculated as $P_{AV}$=$E_{AR}$*f.

## 2. Characteristics Curves

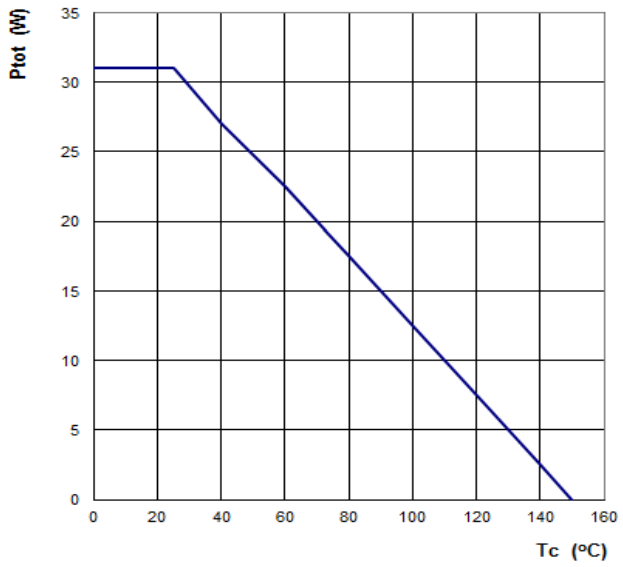



**Fig 1: Power Dissipation**

$P_{tot} = f(T_C)$

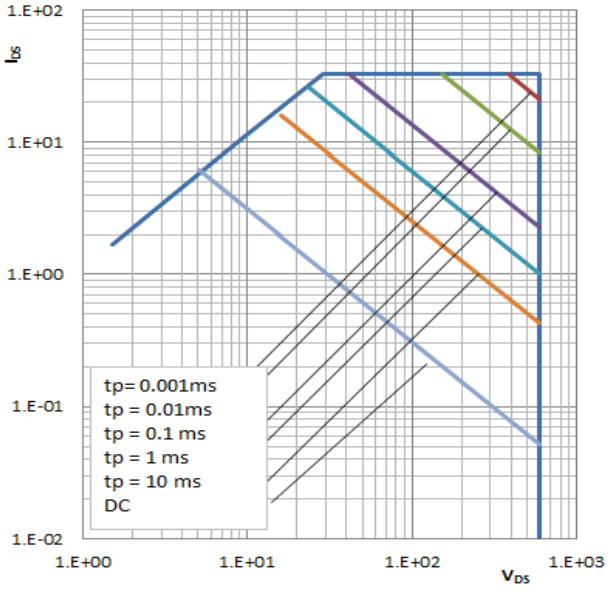



**Fig 2: Safe operating area**

$I_D = f(V_{DS})$

parameter : D = 0, $T_C$=25℃

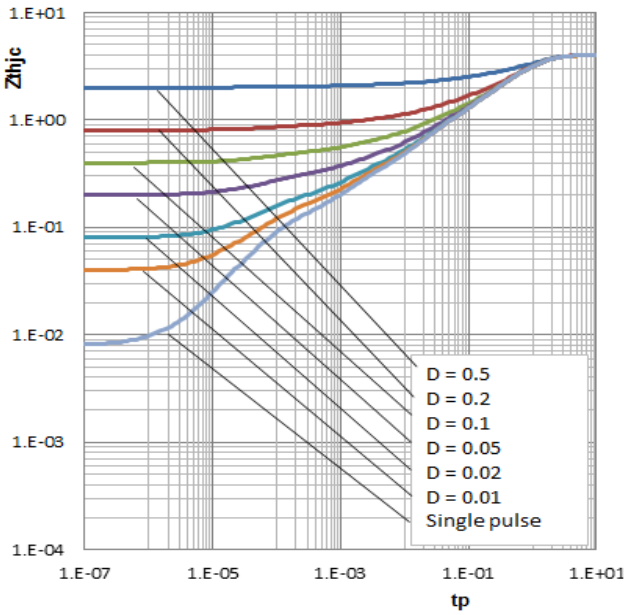



**Fig 3: Transient thermal impedance**

$Z_{thJC} = f(tp)$

parameter : D = tp / T

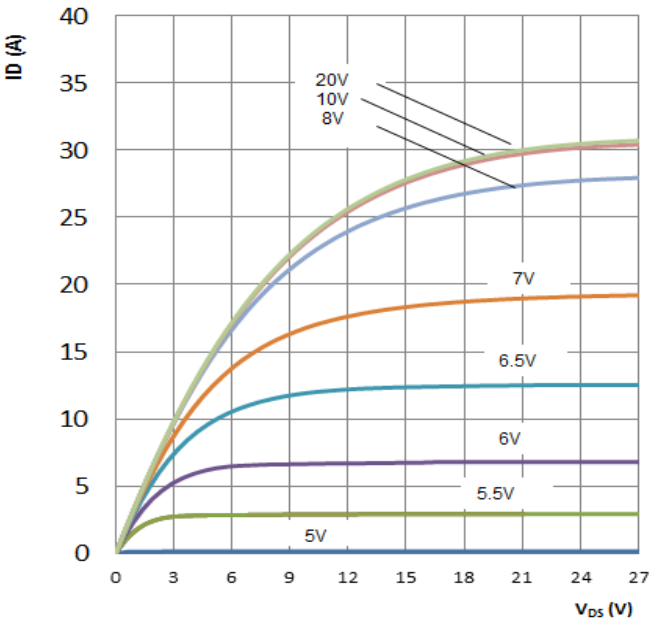



**Fig 4: Typ. Output Characteristics**

$I_D = f(V_{DS})$ ; Tj = 25℃

parameter : tp = 100uS, $V_{GS}$

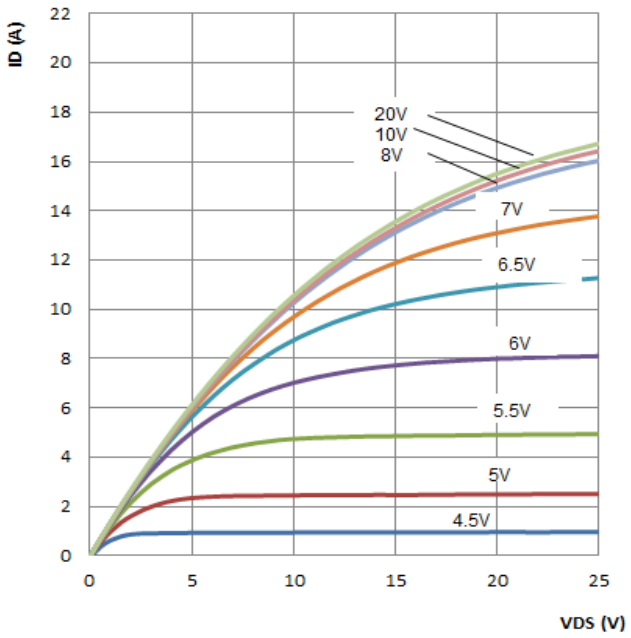



**Fig 5: Typ. Output Characteristics**

$I_D$ = f ($V_{DS}$) ; Tj = 150℃

parameter : tp = 100uS, $V_{GS}$

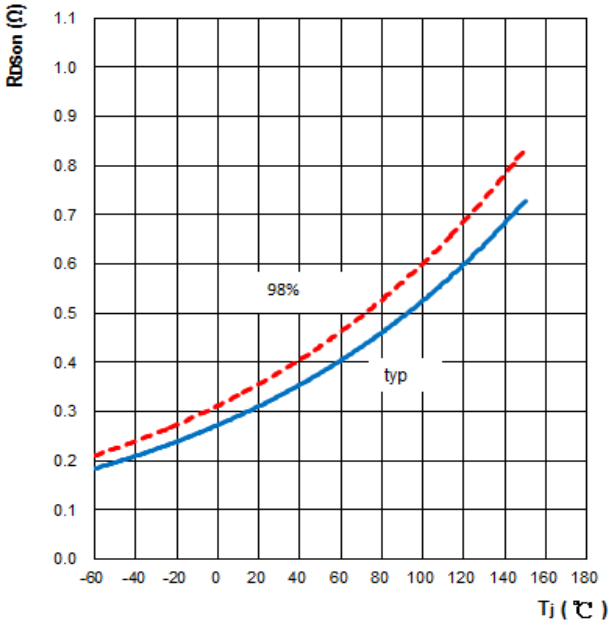



**Fig 6: Drain-Source On-state Resistance**

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

parameter : $I_D$ =7A, $V_{GS}$ = 10V

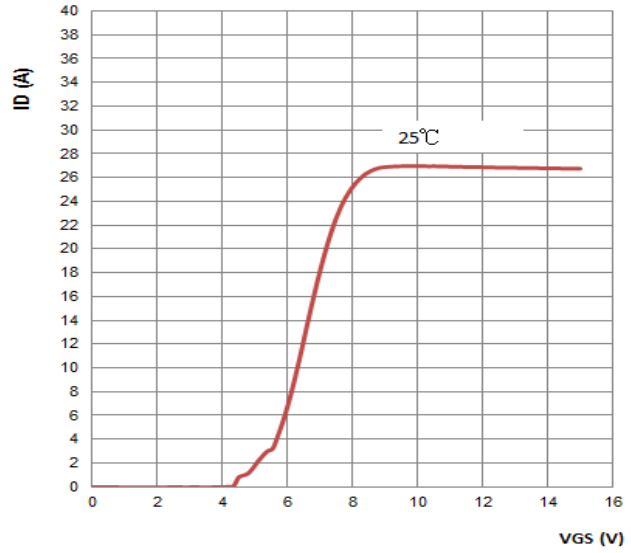



**Fig 7: Typ. Transfer Characteristics**

$I_D$ = f (VGS); VDS ≧2 X ID X RDS(on) max

parameter : tp = 100 uS

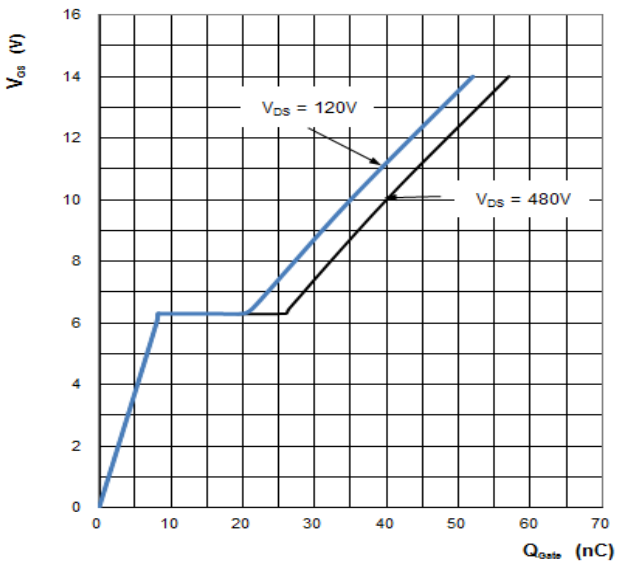



**Fig 8: Typ. Gate Charge**

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

parameter : $I_D$ = 11A pulsed

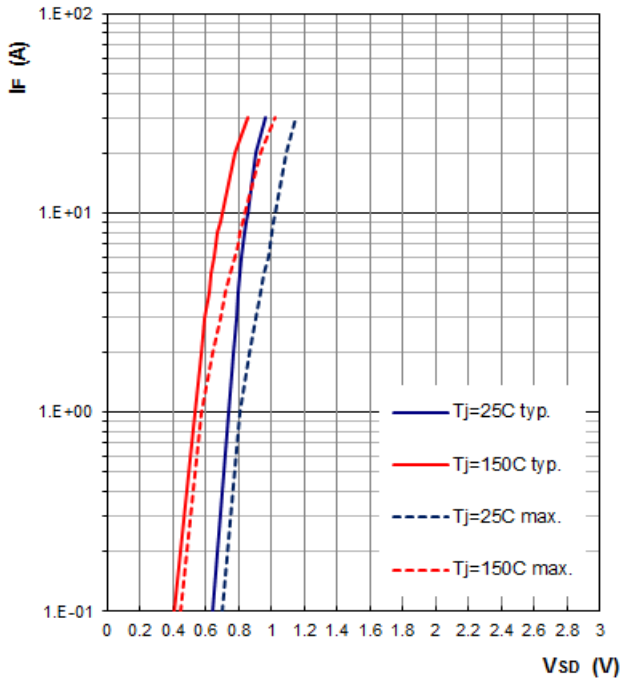



**Fig 9: Forward characteristics of body diode**

$I_F = f(V_{SD})$

parameter : Tj , tp =100us

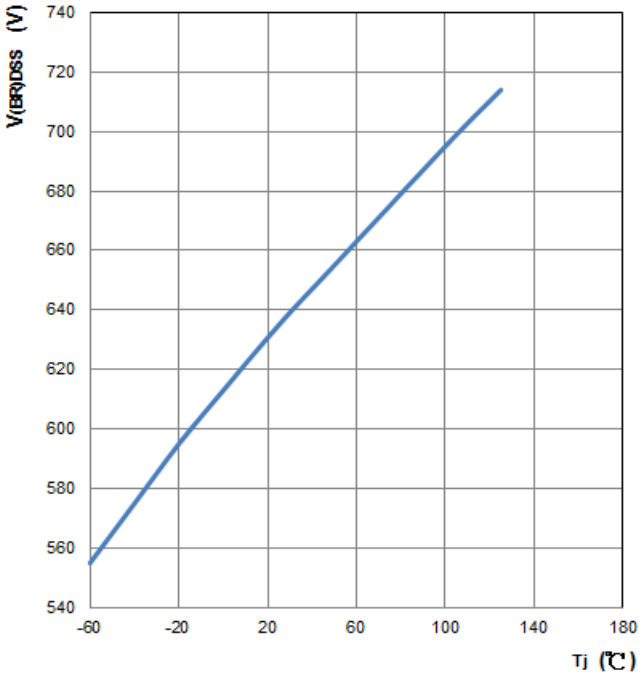



**Fig 10: Drain-source breakdown voltage**

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

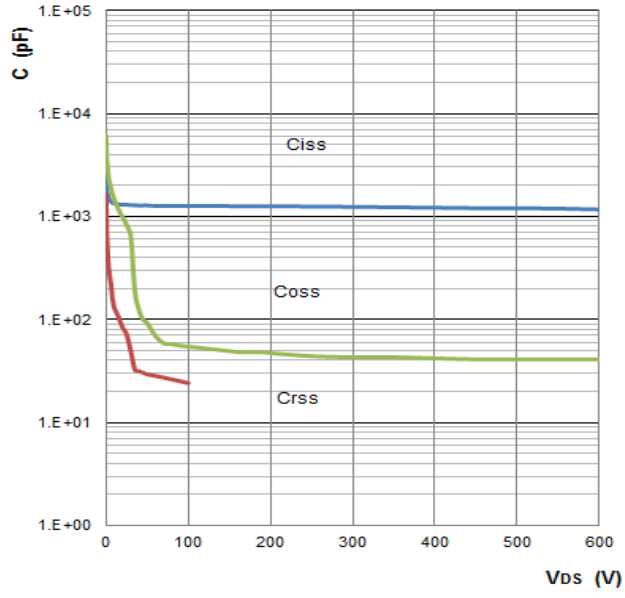



**Fig 11: Typ. Capacitances**

$C = f(V_{DS})$

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

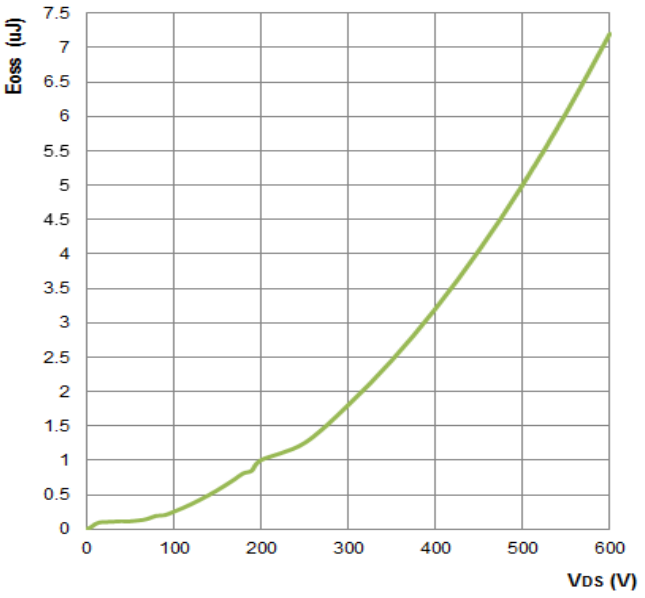



**Fig 12: Typ. $C_{oss}$ stored energy**

## 3. Test Circuits and Waveforms

**Test Circuits and Waveforms**

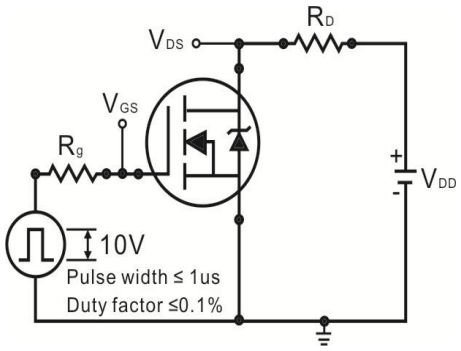



**Figure 1: Switching times test circuit**

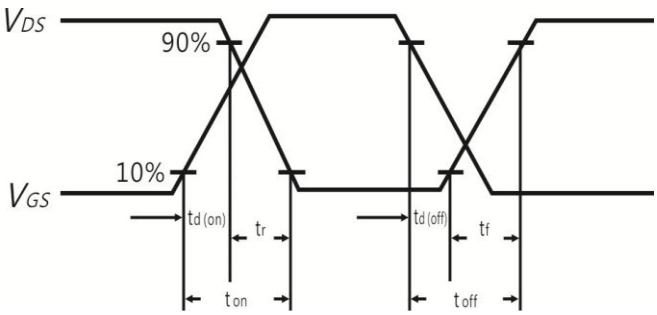



**Figure 2: Switching time waveform**

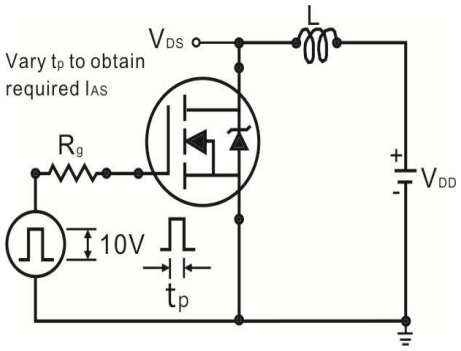



**Figure 3:Unclamped test circuit**

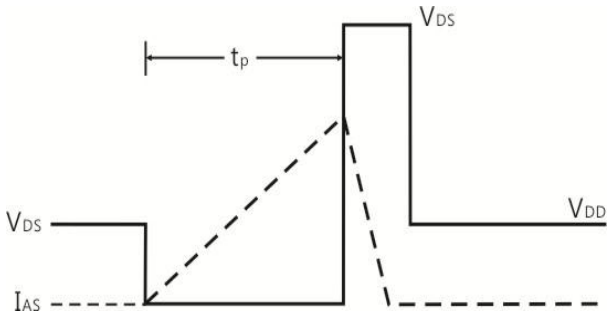



**Figure 4: Unclamped test waveform**

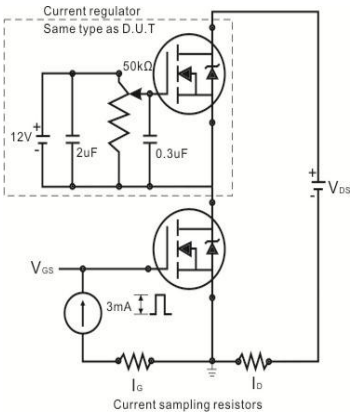



**Figure 5:Gate charge test circuit**

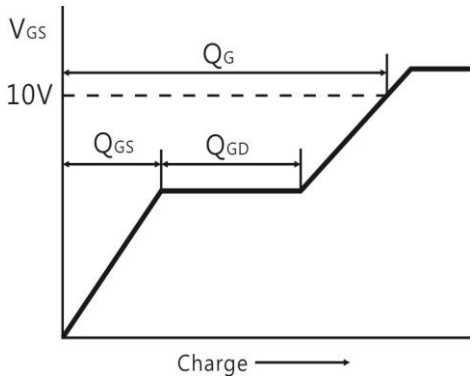



**Figure 6: Basic gate charge waveform**

## 4. Marking information

**Top Marking Rule**

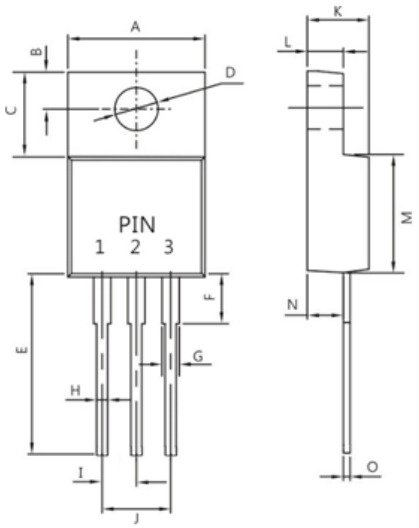
| |
|---|
| **PFC PSM** |
| **11N60CTF** |
| **YYWW ABSH** |

PSM11N60CTF = 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**

**ITO-220AB**




| Dim. | Min. | Max. |
|---|---|---|
| A | ----- | 10.50 |
| B | 2.60 | 3.00 |
| C | 6.70 | 7.10 |
| D | 2.90 | 3.50 |
| E | 13.10 | 13.90 |
| F | ----- | 4.00 |
| G | 1.11 | 1.45 |
| H | 0.40 | 0.80 |
| I | 2.40 | 2.80 |
| J | 5.00 | 5.40 |
| K | 4.30 | 4.70 |
| L | 2.90 | 3.30 |
| M | 8.20 | 9.00 |
| N | 2.50 | 2.90 |
| O | 0.40 | 0.80 |
| All Dimensions in millimeter | | |

## 6. Ordering information

| Part Number | Package | Delivery mode |
|---|---|---|
| PSM11N60CTF | ITO-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 : 0.06 ounces (1.74grams) – ITO-220AB
- Mounting Torque : Recommended 10 in-lbs maximum