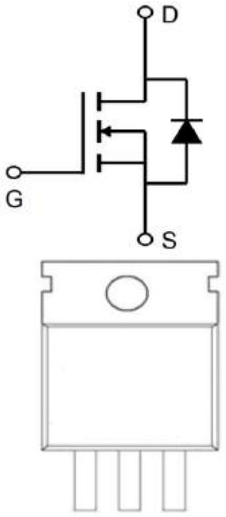
# 11N60

## 600V N-Channel Enhancement Mode MOSFET

### Description

The 11N60 is silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency.




### General Features

VDS =600V,ID =11A

RDS(ON) <620mΩ@ VGS=10V

### Application

Uninterruptible Power Supply(UPS)

Power Factor Correction (PFC)

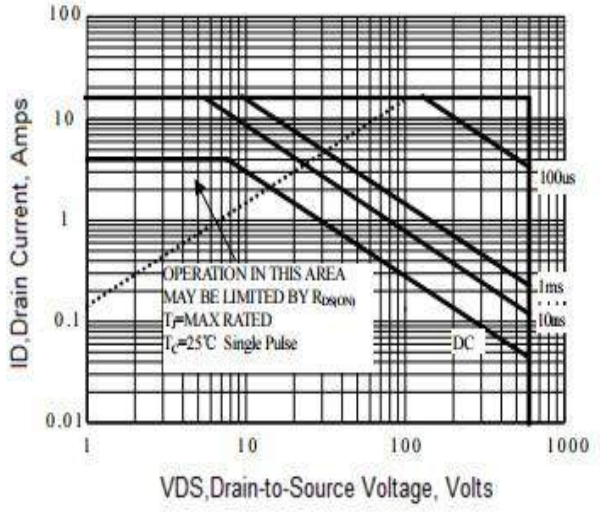
### Absolute Maximum Ratings $T_C$ = 25ºC, unless otherwise noted

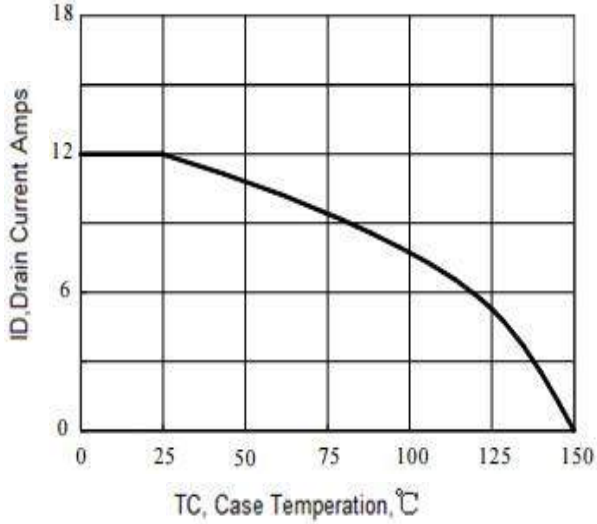
| Symbol | Characteristics | Value | | Unit |
|---|---|---|---|---|
| | | TO-220F | TO-220 | |
| $V_{DS}$ | Drain-Source Voltage | 600 | | V |
| $V_{GS}$ | Gate-Source Voltage | ±30 | | V |
| $I_D$ | Continue Drain Current | 11 | | A |
| $I_{DM}$ | Pulsed Drain Current (Note1) | 48 | | A |
| $P_D$ | Power Dissipation | 55 | 140 | W |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note1) | 660 | | mJ |
| $T_J$ | Operating Temperature Range | 150 | | °C |
| $T_{STG}$ | Storage Temperature Range | -55 to +150 | | °C |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 2.27 | 0.89 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 100 | 62 | °C/W |

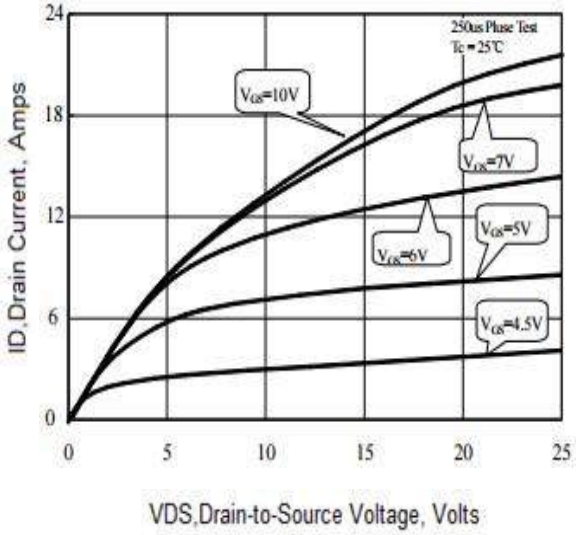
## Electrical Characteristics ($T_A$=25℃unless otherwise noted)

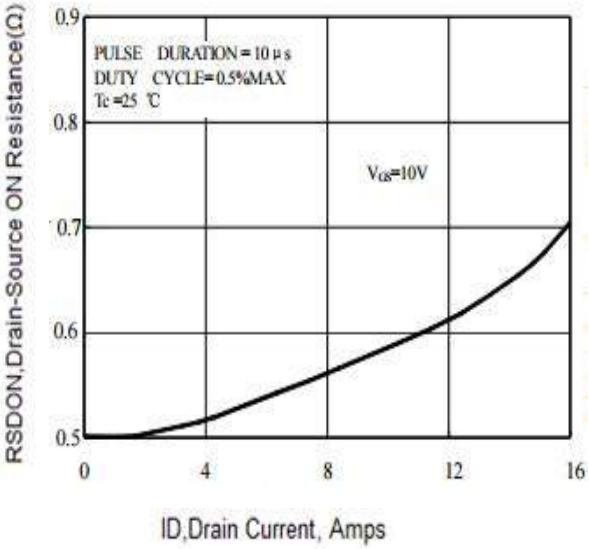
| Symbol | Characteristics | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V,$I_D$ = 250 μA | 600 | - | - | V |
| IDSS | Drain-Source Leakage Current | $V_{DS}$ = 600 V, $V_{GS}$ = 0 V | - | - | 1 | μA |
| IGSS | Gate Leakage Current | $V_{GS}$ = ± 30 V, $V_{DS}$ = 0 V | - | - | ± 100 | nA |
| VGS(th) | Gate-Source Threshold Voltage | $V_{DS}$ = $V_{GS}$ , $I_D$ = 250 μA | 2 | - | 4 | V |
| RDS(on) | Drain-Source On-State Resistance | $V_{GS}$ = 10 V, $I_D$ = 6 A | - | 510 | 620 | mΩ |
| gfs | Forward Transconductance | $V_{DS}$ = 15 V, $I_D$ = 6 A | - | 12 | - | S |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | - | 1540 | - | pF |
| Coss | Output Capacitance | | - | 180 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 8 | - | pF |
| td(ON) | Turn-on Delay Time(Note2) | $I_D$ = 12 A, $V_{DD}$ = 300 V, $R_G$= 10 Ω | - | 16 | - | ns |
| $t_r$ | Rise Time(Note2) | | - | 26 | - | ns |
| td(OFF) | Turn-Off Delay Time(Note2) | | - | 65 | - | ns |
| $t_f$ | Fall Time(Note2) | | - | 40 | - | ns |
| $Q_G$ | Total Gate Charge(Note2) | $I_D$ = 12 A, $V_{DD}$ = 480 V, $V_{GS}$ = 10 V | - | 44 | - | nC |
| $Q_{GS}$ | Gate to Source Charge(Note2) | | - | 10 | - | nC |
| $Q_{GD}$ | Gate to Drain Charge(Note2) | | - | 16 | - | nC |
| IS | Maximun Body-Diode Continuous Current | | - | - | 12 | A |
| ISM | Maximun Body-Diode Pulsed Current(Note2) | | - | - | 48 | A |
| VSD | Drain-Source Diode Forward Voltage | $I_{SD}$ = 12 A | - | - | 1.5 | V |
| trr | Reverse Recovery Time(Note2) | $I_{SD}$ = 12 A, $V_{GS}$ = 0 V, $dI_F$ / dt = 100 A/μs | - | 324 | - | ns |
| Qrr | Reverse Recovery Charge(Note2) | | - | 2.5 | - | μC |

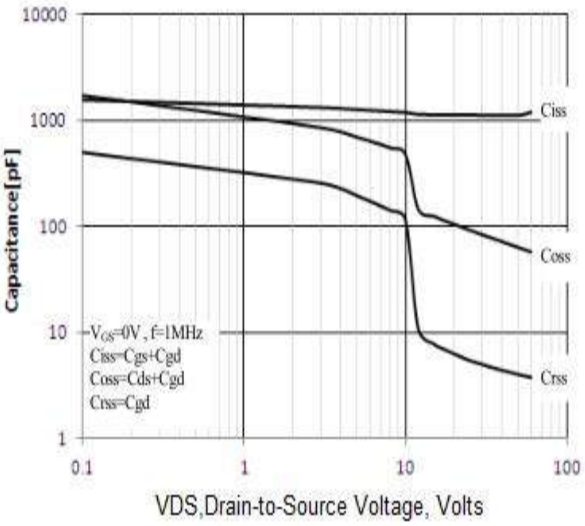
Note2:Pulse test: 300 μs pulse width, 2 % duty cycle

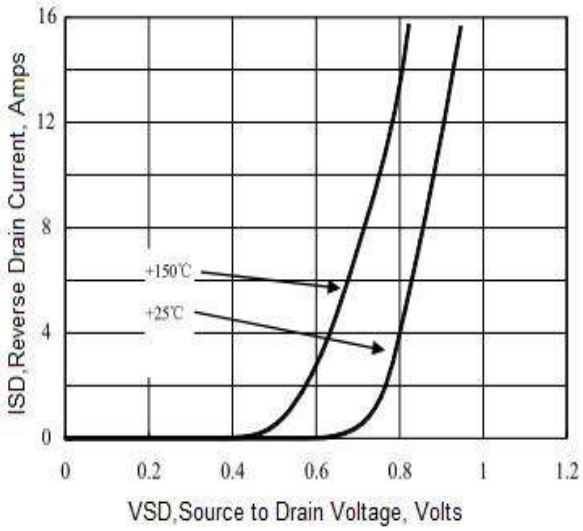

ID,Drain Current, Amps
VDS,Drain-to-Source Voltage, Volts
OPERATION IN THIS AREA
MAY BE LIMITED BY RDS(ON)
TJ=MAX RATED
TC=25℃ Single Pulse
100us
1ms
10ms
DC


ID,Drain Current Amps
TC, Case Temperation,℃

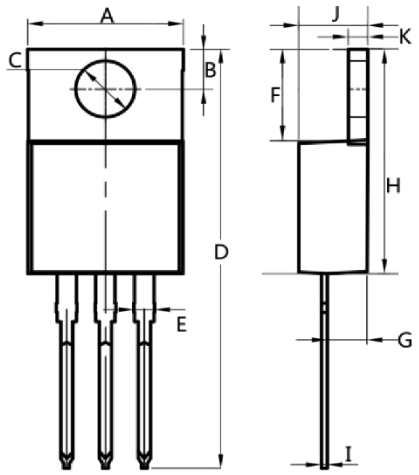

ID,Drain Current, Amps
VDS,Drain-to-Source Voltage, Volts
250us Pluse Test
Tc = 25℃
VGS=10V
VGS=7V
VGS=6V
VGS=5V
VGS=4.5V


RSDON,Drain-Source ON Resistance(Ω)
ID,Drain Current, Amps
PULSE DURATION = 10 μs
DUTY CYCLE=0.5%MAX
Tc =25 ℃
VGS=10V


Capacitance[pF]
VDS,Drain-to-Source Voltage, Volts
Ciss
Coss
Crss
VGS=0V , f=1MHz
Ciss=Cgs+Cgd
Coss=Cds+Cgd
Crss=Cgd

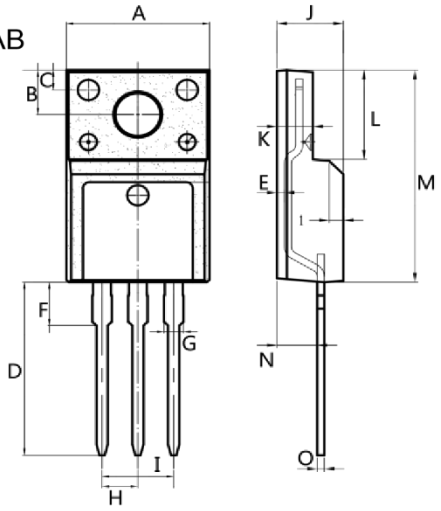

ISD,Reverse Drain Current, Amps
VSD,Source to Drain Voltage, Volts
+150℃
+25℃

TO-220AB




| Dim. | Min. | Max. |
|---|---|---|
| A | 10.0 | 10.4 |
| B | 2.5 | 3.0 |
| C | 3.5 | 4.0 |
| D | 28.0 | 30.0 |
| E | 1.1 | 1.5 |
| F | 6.2 | 6.6 |
| G | 2.9 | 3.3 |
| H | 15.0 | 16.0 |
| I | 0.35 | 0.45 |
| J | 4.3 | 4.7 |
| K | 1.2 | 1.4 |
| All Dimensions in millimeter | | |

ITO-220AB




| Dim. | Min. | Max. |
|---|---|---|
| A | 9.9 | 10.3 |
| B | 2.9 | 3.5 |
| C | 1.15 | 1.45 |
| D | 12.75 | 13.25 |
| E | 0.55 | 0.75 |
| F | 3.1 | 3.5 |
| G | 1.25 | 1.45 |
| H | Typ 2.54 | |
| I | Typ 5.08 | |
| J | 4.55 | 4.75 |
| K | 2.4 | 2. 7 |
| L | 6.35 | 6.75 |
| M | 15.0 | 16.0 |
| N | 2.75 | 3.15 |
| O | 0.45 | 0.60 |
| All Dimensions in millimeter | | |

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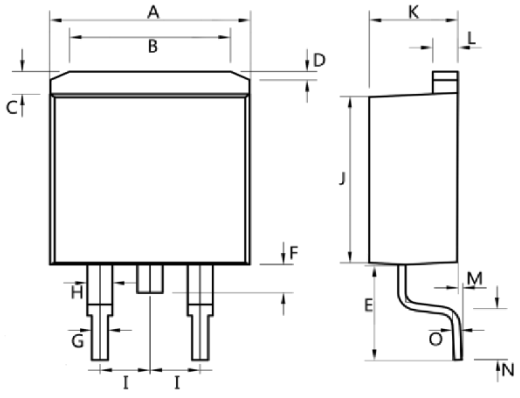


| Dim. | Min. | Max. |
|---|---|---|
| A | 10.0 | 10. 5 |
| B | 7.25 | 7.75 |
| C | 1.3 | 1.5 |
| D | 0.55 | 0.75 |
| E | 5.0 | 6.0 |
| F | 1.4 | 1.6 |
| G | 0.75 | 0.95 |
| H | 1.15 | 1.35 |
| I | Typ 2.54 | |
| J | 8.4 | 8.6 |
| K | 4.4 | 4.6 |
| L | 1.25 | 1.45 |
| M | 0.02 | 0.1 |
| N | 2.4 | 2.8 |
| O | 0.35 | 0.45 |
| All Dimensions in millimeter | | |