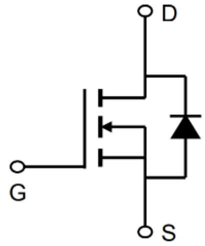
APM
A Power Microelectronics

# APG120N12P/T

## 120V N-Channel Enhancement Mode MOSFET

### Description

The APG120N12P/T uses advanced **SGT II** technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.





### General Features

$V_{DS}$ = 120V $I_D$ =120A

$R_{DS(ON)}$ < 6.8mΩ @ $V_{GS}$=10V **（Type：6.0mΩ）**

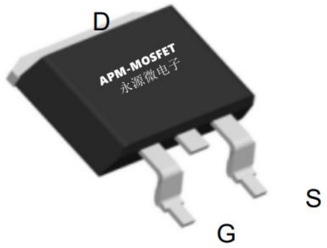
### Application

Mobile phone fast charging

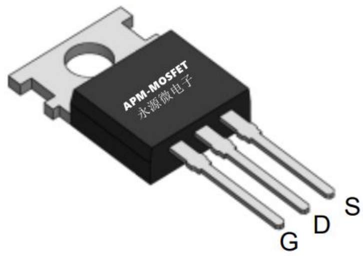
Brushless motor

Home appliance control board

TO-263
D²PAK




TO-220




### Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| APG120N12P | TO-220-3L | APG120N12P XXX YYYY | 1000 |
| APG120N12T | TO-263-3L | APG120N12T XXX YYYY | 800 |

### Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| VDSS | Drain-to-Source Voltage | 120 | V |
| $I_D$@$T_A$=25℃ | Continuous Drain Current[1] | 120 | A |
| $I_D$@$T_A$=100℃ | Continuous Drain Current[1] | 60 | A |
| IDM[a1] | Pulsed Drain Current | 320 | A |
| EASa2 | Single pulse avalanche energy | 240 | mJ |
| IAR | Single pulse avalanche current | 40 | A |
| VGS | Gate-to-Source Voltage | ±20 | V |
| $P_D$ | Power Dissipation | 125 | W |
| TJ，Tstg | Operating Junction and Storage Temperature Range | -55 to 150 | ℃ |
| $T_L$ | Maximum Temperature for Soldering | 300 | ℃ |
| RθJC | Thermal Resistance, Junction-to-Case | 1.0 | ℃/W |
| RθJA | Thermal Resistance, Junction-to-Ambient | 50 | ℃/W |

**Electrical Characteristics ($T_J$=25℃, unless otherwise noted)**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| VDSS | Drain to Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 120 | 135 | -- | V |
| IDSS | Drain to Source Leakage Current | $V_{DS}$ = 120V, $V_{GS}$= 0V | -- | -- | 1 | μA |
| IGSS(F) | Gate to Source Forward Leakage | $V_{GS}$ =+20V | -- | -- | 100 | nA |
| IGSS(R) | Gate to Source Reverse Leakage | $V_{GS}$ =-20V | -- | -- | -100 | nA |
| VGS(TH) | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$ = 250μA | 1.2 | 1.8 | 3.0 | V |
| RDS(ON)1 | Drain-to-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | -- | 6.0 | 6.8 | mΩ |
| RDS(ON)1 | Drain-to-Source On-Resistance | $V_{GS}$=4.5V, $I_D$=10A | -- | 8.5 | 10 | mΩ |
| gFS | Forward Transconductance | $V_{DS}$=5V, $I_D$=50A | | 130 | -- | S |
| Ciss | Input Capacitance | $V_{GS}$ = 0V $V_{DS}$ = 50V f = 1.0MHz | -- | 4282 | -- | pF |
| Coss | Output Capacitance | | -- | 429 | -- | pF |
| Crss | Reverse Transfer Capacitance | | -- | 17 | -- | pF |
| $R_g$ | Gate resistance | | -- | 2.5 | -- | Ω |
| td(ON) | Turn-on Delay Time | $I_D$ =20A<br>$V_{DS}$ = 50V<br>$V_{GS}$ = 10V<br>$R_G$ = 5Ω | -- | 20 | -- | ns |
| tr | Rise Time | | -- | 11 | -- | ns |
| td(OFF) | Turn-Off Delay Time | | -- | 55 | -- | ns |
| tf | Fall Time | | -- | 28 | -- | ns |
| $Q_g$ | Total Gate Charge | $V_{GS}$ =0~10V<br>$V_{DS}$ = 50V<br>$I_D$ =20A | -- | 61.4 | -- | nC |
| Qgs | Gate Source Charge | | -- | 17.4 | -- | nC |
| Qgd | Gate Drain Charge | | -- | 14.1 | -- | nC |
| IS | Diode Forward Current | $T_C$ =25 °C | -- | -- | 100 | A |
| ISM | Diode Pulse Current | | -- | -- | 320 | A |
| VSD | Diode Forward Voltage | $I_S$=6.0A, $V_{GS}$=0V | -- | -- | 1.2 | V |
| trr | Reverse Recovery time | $I_S$=20A, $V_{DD}$=50V<br>$dI_F/dt$=100A/μs | -- | 100 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 250 | -- | nC |

**Note :**

1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3、The EAS data shows Max. rating . The test condition is VDD=50V, L=0.3mH, Rg=25Ω, Starting TJ=25 ℃
4、The power dissipation is limited by 150℃ junction temperature

## Typical Characteristics

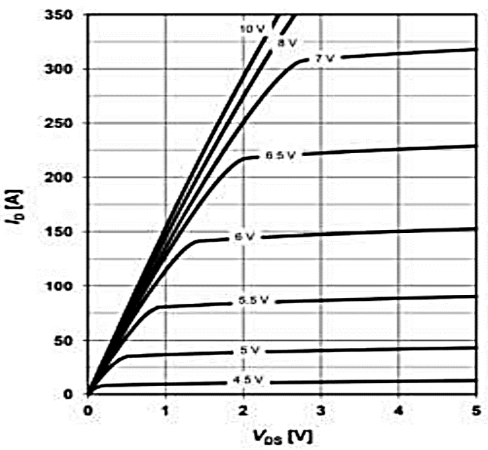



Figure1: output characteristics

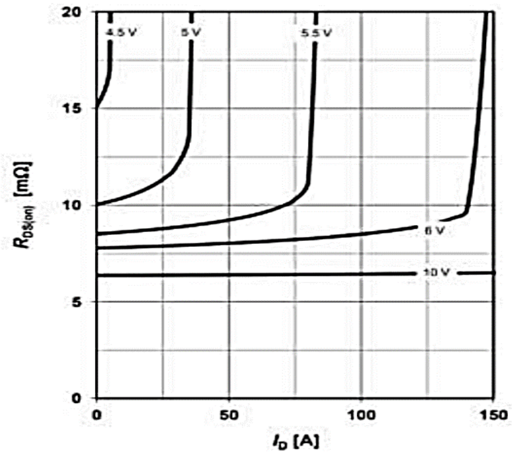



Figure2: Typcal drain-source on resistance

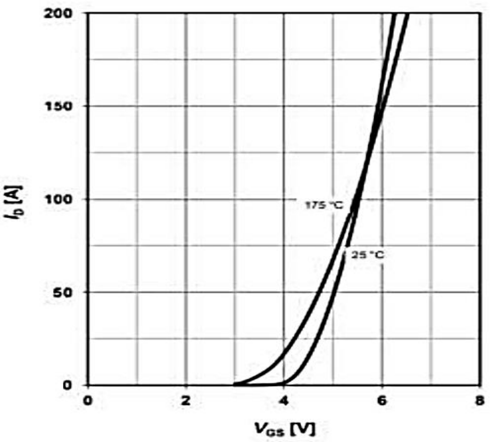



Figure3: transfer characteristics

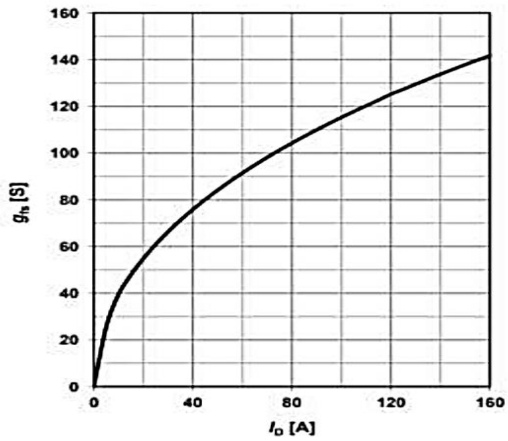



Figure4: forward transconductance

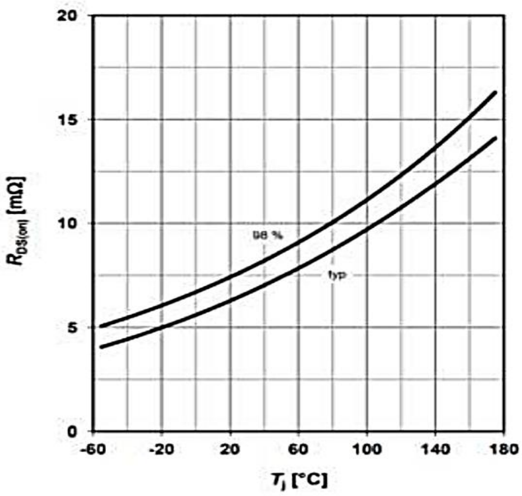



Figure5: Drain-source on-state resistance

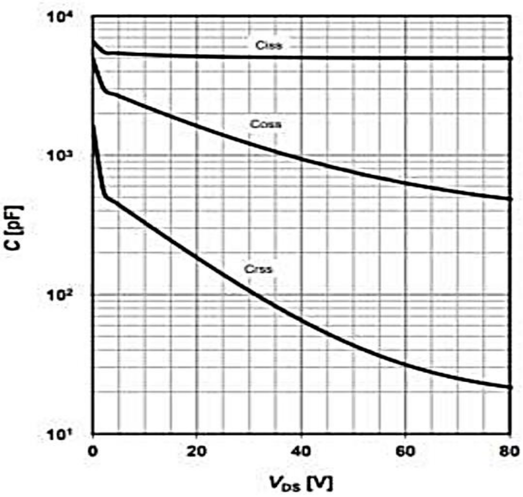



Figure6: Typ. capacitances

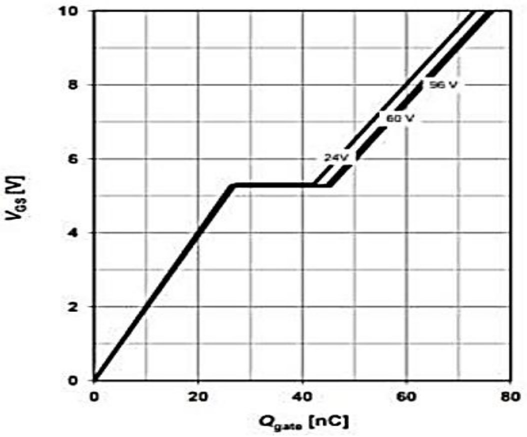



Figure7： Typ. gate charge

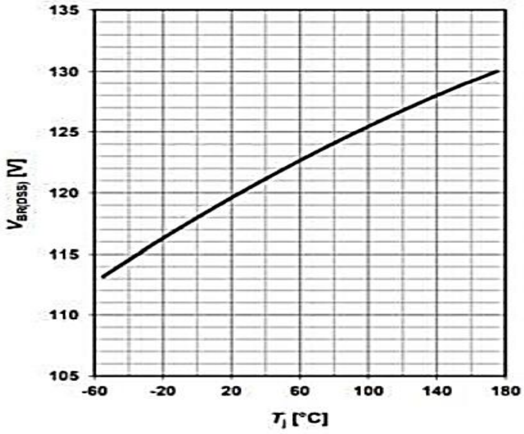



Figure8： Drain-source breakdown voltage

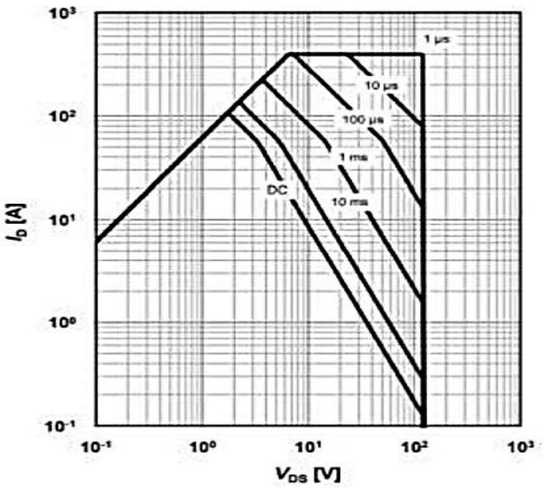



Figure9： Safe operating area

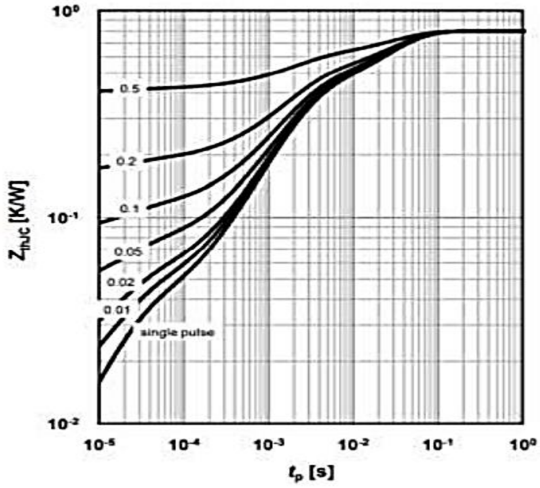
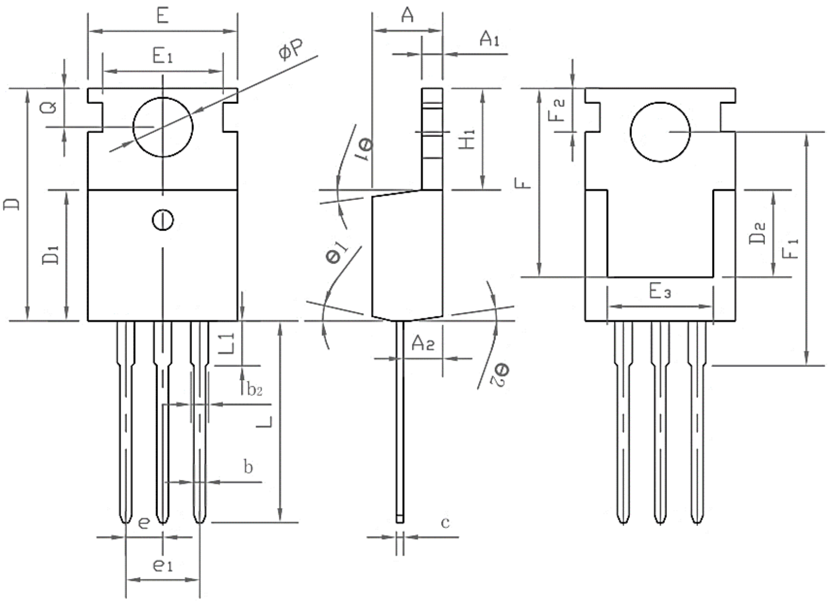


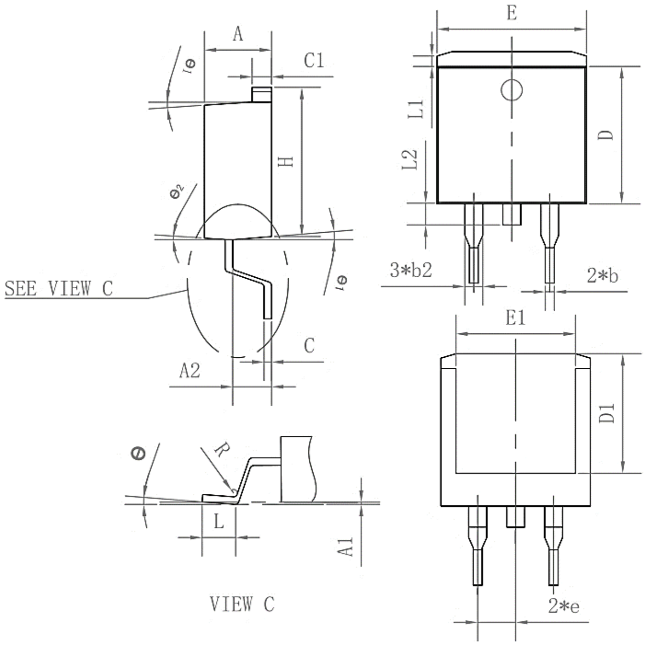

Figure10： Max. transient thermal impedance

## Package Mechanical Data-TO-220-3L-SLK




| Symbol | Common | | |
|---|---|---|---|
| | mm | | |
| | Mim | Nom | Max |
| A | 4.27 | 4.57 | 4.87 |
| A1 | 1.15 | 1.30 | 1.45 |
| A2 | 2.10 | 2.40 | 2.70 |
| b | 0.70 | 0.80 | 1.00 |
| b2 | 1.17 | 1.27 | 1.50 |
| D | 0.40 | 0.50 | 0.65 |
| D1 | 8.80 | 9.10 | 9.40 |
| D2 | 5.70 | 6.70 | 7.00 |
| E | 9.70 | 10.00 | 10.30 |
| E1 | - | 8.70 | - |
| E2 | 9.63 | 10.00 | 10.35 |
| E3 | 7.00 | 8.00 | 8.40 |
| e | 0.37 | | |
| e1 | 0.10 | | |
| H1 | 6.00 | 6.50 | 6.85 |
| L | 12.75 | 13.50 | 13.90 |
| L1 | - | 3.10 | 3.40 |
| Φp | 3.45 | 3.60 | 3.75 |
| Q | 2.60 | 2.80 | 3.00 |
| θ1 | 4° | 7° | 10° |
| θ2 | 0° | 3° | 6° |
| F | 13.30 | 13.50 | 13.70 |
| F1 | 15.50 | 15.90 | 16.30 |
| F2 | 2.80 | 3.00 | 3.20 |

## Package Mechanical Data-TO-263-3L-SLK




| Symbol | Common | | |
|---|---|---|---|
| | mm | | |
| | Mim | Nom | Max |
| A | 4.35 | 4.47 | 4.60 |
| A1 | 0.09 | 0.10 | 0.11 |
| A2 | 2.30 | 2.40 | 2.70 |
| b | 0.70 | 0.80 | 1.00 |
| b2 | 1.25 | 1.36 | 1.50 |
| C | 0.45 | 0.50 | 0.65 |
| C1 | 1.29 | 1.30 | 9.40 |
| D | 9.10 | 9.20 | 9.30 |
| D1 | 7.90 | 8.00 | 8.10 |
| E | 9.85 | 10.00 | 10.20 |
| E1 | 7.90 | 8.00 | 8.10 |
| H | 15.30 | 15.50 | 15.70 |
| e | - | 2.54 | - |
| L | 2.34 | 2.54 | 2.74 |
| L1 | 1.00 | 1.10 | 1.20 |
| L2 | 1.30 | 1.40 | 1.50 |
| R | 0.24 | 0.25 | 0.26 |
| θ | 0° | 4° | 8° |
| Θ1 | 4° | 7° | 10° |
| Θ2 | 0° | 3° | 6° |

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