

**AP86T02GH/J**

**Pb Free Plating Product**



**Advanced Power  
Electronics Corp.**

**N-CHANNEL ENHANCEMENT MODE**

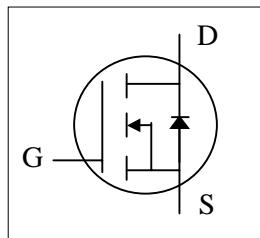
**POWER MOSFET**

▼ Simple Drive Requirement

▼ Low On-resistance

▼ Fast Switching Characteristic

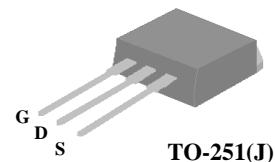
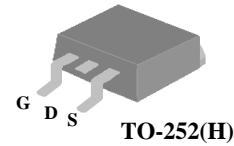
▼ RoHS Compliant



|              |     |
|--------------|-----|
| $BV_{DSS}$   | 25V |
| $R_{DS(ON)}$ | 6mΩ |
| $I_D$        | 75A |

## Description

The TO-252 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters. The through-hole version (AP86T02GJ) is available for low-profile applications.



## Absolute Maximum Ratings

| Symbol                    | Parameter                                  | Rating     | Units |
|---------------------------|--|------------|-------|
| $V_{DS}$                  | Drain-Source Voltage                       | 25         | V     |
| $V_{GS}$                  | Gate-Source Voltage                        | $\pm 20$   | V     |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^3$ | 75         | A     |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$   | 62         | A     |
| $I_{DM}$                  | Pulsed Drain Current <sup>1</sup>          | 300        | A     |
| $P_D @ T_C = 25^\circ C$  | Total Power Dissipation                    | 75         | W     |
|                           | Linear Derating Factor                     | 0.5        | W/°C  |
| $T_{STG}$                 | Storage Temperature Range                  | -55 to 175 | °C    |
| $T_J$                     | Operating Junction Temperature Range       | -55 to 175 | °C    |

## Thermal Data

| Symbol      | Parameter                           | Value | Units    |
|-------------|-------------------------------------|-------|----------|
| $R_{thj-c}$ | Thermal Resistance Junction-case    | Max.  | 2 °C/W   |
| $R_{thj-a}$ | Thermal Resistance Junction-ambient | Max.  | 110 °C/W |



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

| Symbol                                     | Parameter  | Test Conditions  | Min. | Typ. | Max.      | Units                     |
|--|--|--|------|------|-----------|---------------------------|
| $\text{BV}_{\text{DSS}}$                   | Drain-Source Breakdown Voltage                           | $V_{\text{GS}}=0\text{V}$ , $I_D=250\mu\text{A}$       | 25   | -    | -         | V                         |
| $\Delta \text{BV}_{\text{DSS}}/\Delta T_j$ | Breakdown Voltage Temperature Coefficient                | Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$     | -    | 0.02 | -         | $\text{V}/^\circ\text{C}$ |
| $R_{\text{DS(ON)}}$                        | Static Drain-Source On-Resistance <sup>2</sup>           | $V_{\text{GS}}=10\text{V}$ , $I_D=45\text{A}$          | -    | -    | 6         | $\text{m}\Omega$          |
|  |  | $V_{\text{GS}}=4.5\text{V}$ , $I_D=30\text{A}$         | -    | -    | 10        | $\text{m}\Omega$          |
| $V_{\text{GS(th)}}$                        | Gate Threshold Voltage                                   | $V_{\text{DS}}=V_{\text{GS}}$ , $I_D=250\mu\text{A}$   | 0.8  | -    | 3         | V                         |
| $g_{\text{fs}}$                            | Forward Transconductance                                 | $V_{\text{DS}}=10\text{V}$ , $I_D=30\text{A}$          | -    | 42   | -         | S                         |
| $I_{\text{DSS}}$                           | Drain-Source Leakage Current ( $T_j=25^\circ\text{C}$ )  | $V_{\text{DS}}=25\text{V}$ , $V_{\text{GS}}=0\text{V}$ | -    | -    | 1         | $\text{uA}$               |
|  | Drain-Source Leakage Current ( $T_j=175^\circ\text{C}$ ) | $V_{\text{DS}}=20\text{V}$ , $V_{\text{GS}}=0\text{V}$ | -    | -    | 250       | $\text{uA}$               |
| $I_{\text{GSS}}$                           | Gate-Source Leakage                                      | $V_{\text{GS}}=\pm 20\text{V}$                         | -    | -    | $\pm 100$ | $\text{nA}$               |
| $Q_g$                                      | Total Gate Charge <sup>2</sup>                           | $I_D=30\text{A}$                                       | -    | 23   | 37        | nC                        |
| $Q_{\text{gs}}$                            | Gate-Source Charge                                       | $V_{\text{DS}}=20\text{V}$                             | -    | 5    | -         | nC                        |
| $Q_{\text{gd}}$                            | Gate-Drain ("Miller") Charge                             | $V_{\text{GS}}=4.5\text{V}$                            | -    | 14   | -         | nC                        |
| $t_{\text{d(on)}}$                         | Turn-on Delay Time <sup>2</sup>                          | $V_{\text{DS}}=10\text{V}$                             | -    | 11   | -         | ns                        |
| $t_r$                                      | Rise Time  | $I_D=30\text{A}$                                       | -    | 105  | -         | ns                        |
| $t_{\text{d(off)}}$                        | Turn-off Delay Time                                      | $R_G=3.3\Omega$ , $V_{\text{GS}}=10\text{V}$           | -    | 32   | -         | ns                        |
| $t_f$                                      | Fall Time  | $R_D=0.3\Omega$  | -    | 8    | -         | ns                        |
| $C_{\text{iss}}$                           | Input Capacitance  | $V_{\text{GS}}=0\text{V}$                              | -    | 1830 | 2930      | pF                        |
| $C_{\text{oss}}$                           | Output Capacitance                                       | $V_{\text{DS}}=25\text{V}$                             | -    | 490  | -         | pF                        |
| $C_{\text{rss}}$                           | Reverse Transfer Capacitance                             | f=1.0MHz   | -    | 360  | -         | pF                        |
| $R_g$                                      | Gate Resistance  | f=1.0MHz   | -    | 1.1  | 1.6       | $\Omega$                  |

## Source-Drain Diode

| Symbol          | Parameter                       | Test Conditions                                | Min. | Typ. | Max. | Units |
|-----------------|---------------------------------|--|------|------|------|-------|
| $V_{\text{SD}}$ | Forward On Voltage <sup>2</sup> | $I_S=45\text{A}$ , $V_{\text{GS}}=0\text{V}$   | -    | -    | 1.3  | V     |
| $t_{\text{rr}}$ | Reverse Recovery Time           | $I_S=20\text{A}$ , $V_{\text{GS}}=0\text{V}$ , | -    | 28   | -    | ns    |
| $Q_{\text{rr}}$ | Reverse Recovery Charge         | $dI/dt=100\text{A}/\mu\text{s}$                | -    | 15   | -    | nC    |

## Drain-Source Avalanche Ratings

| Symbol          | Parameter                                  | Test Conditions  | Min. | Typ. | Max. | Units |
|-----------------|--|--|------|------|------|-------|
| $E_{\text{AS}}$ | Drain-Source Avalanche Energy <sup>4</sup> | $I_D=24\text{A}$ , $V_{\text{DD}}=20\text{V}$ , $L=100\mu\text{H}$ | -    | -    | 29   | mJ    |

### Notes:

- 1.Pulse width limited by safe operating area.
- 2.Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- 3.Package limitation current is 75A .
- 4.Single Pulse Test.

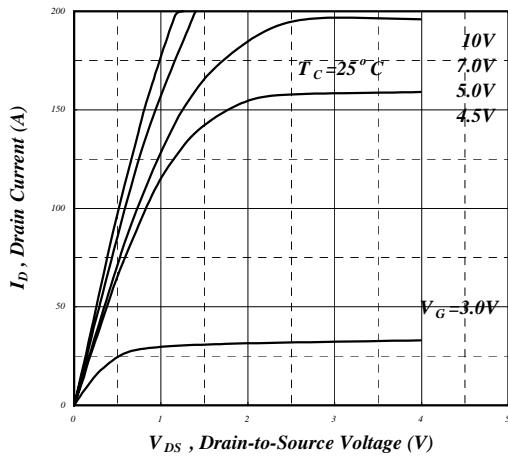


Fig 1. Typical Output Characteristics

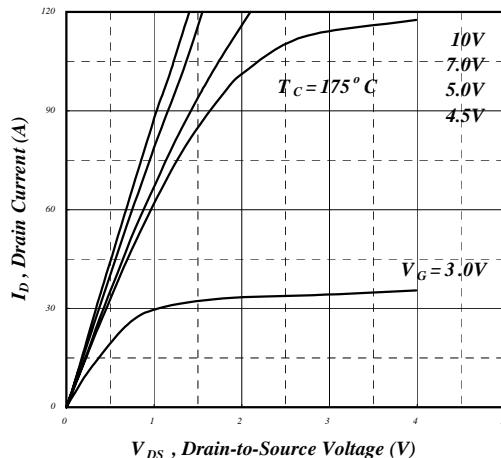


Fig 2. Typical Output Characteristics

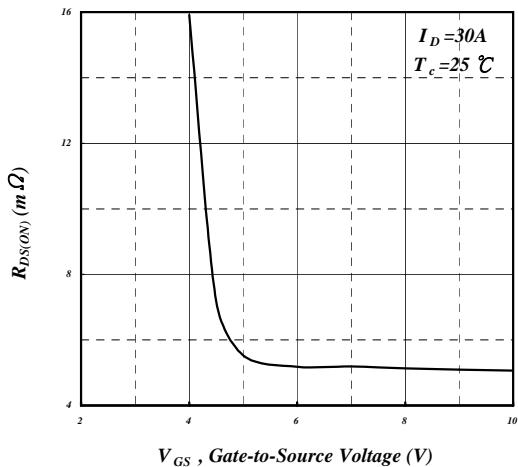


Fig 3. On-Resistance v.s. Gate Voltage

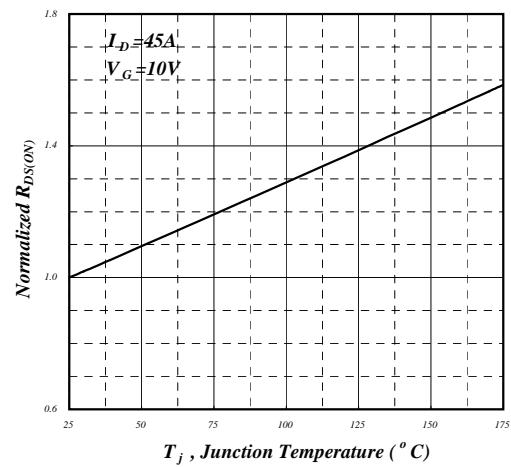


Fig 4. Normalized On-Resistance v.s. Junction Temperature

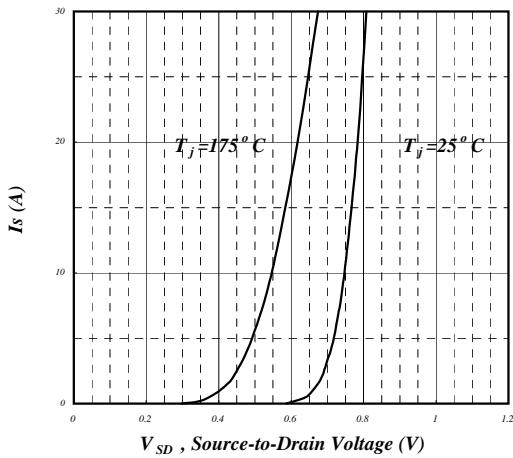


Fig 5. Forward Characteristic of Reverse Diode

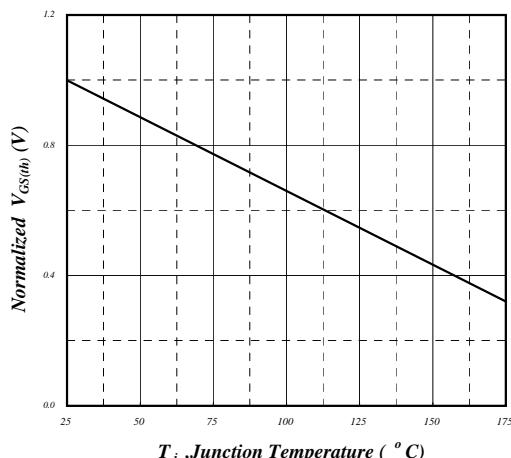
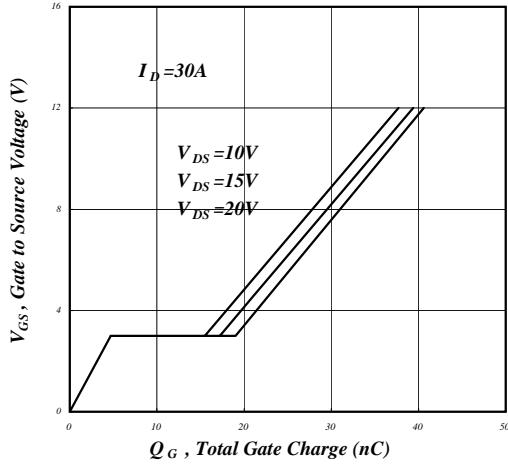
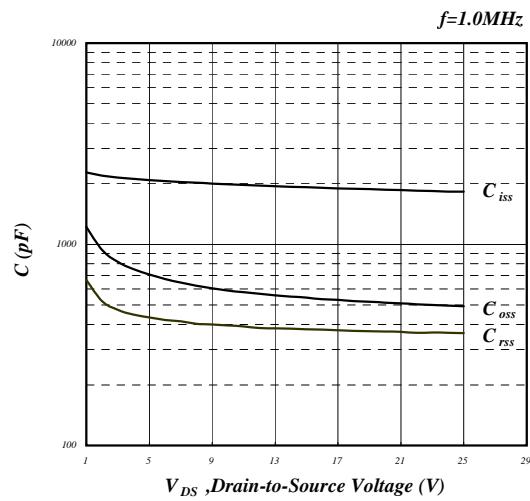


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

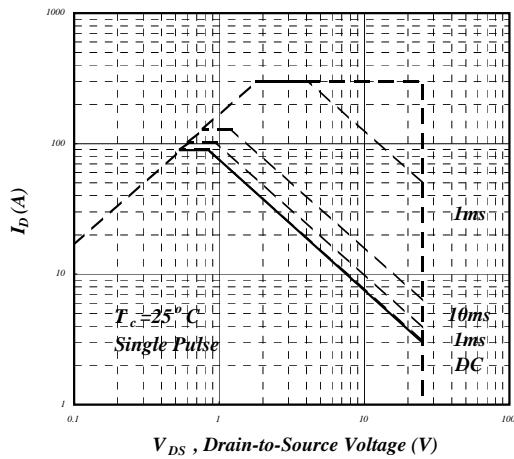
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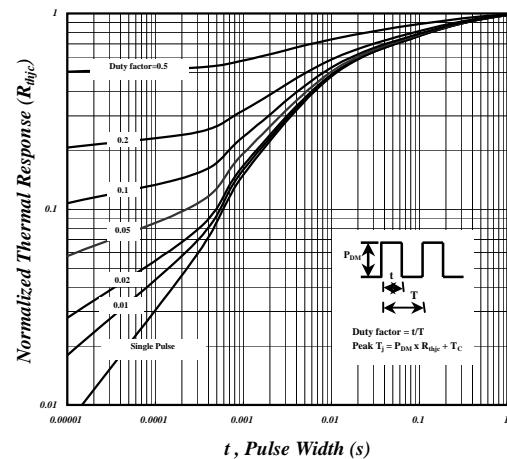
**Fig 7. Gate Charge Characteristics**



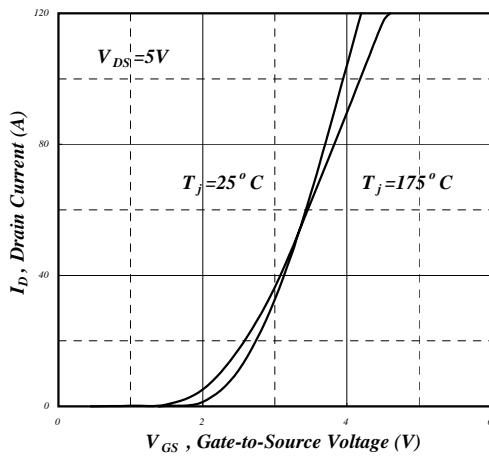
**Fig 8. Typical Capacitance Characteristics**



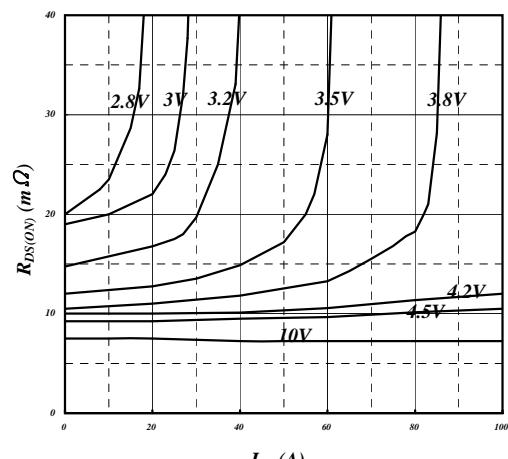
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Transfer Characteristics**



**Fig 12. Drain-Source On Resistance**