

**650V / 2A**  
**N-Channel Enhancement Mode MOSFET**

650V,  $R_{DS(ON)}=4.6\Omega@V_{GS}=10V, I_D=1A$

### Features

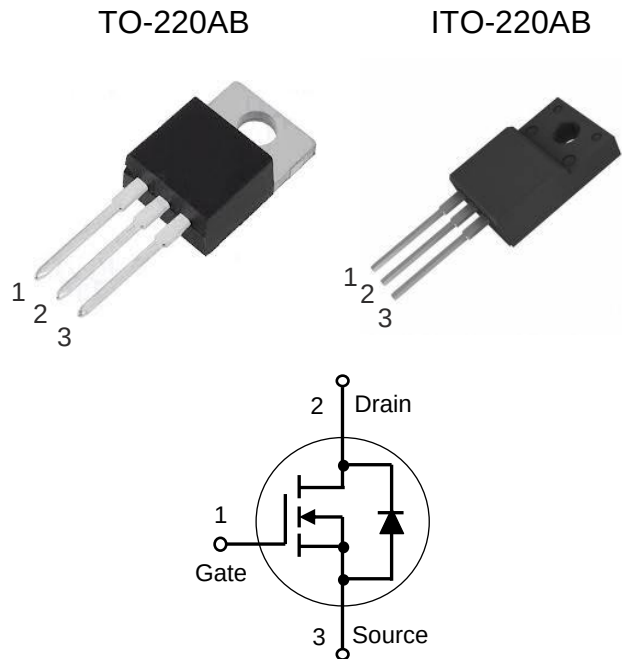
- Low On-State Resistance
- Fast Switching
- Low Gate Charge & Low  $C_{RSS}$
- Fully Characterized Avalanche Voltage and Current
- Specially Designed for AC Adapter, Battery Charger and SMPS
- In compliance with EU RoHs 2002/95/EC Directives

### Mechanical Information

- Case: TO-220AB / ITO-220AB Molded Plastic
- Terminals : Solderable per MIL-STD-750, Method 2026

### Marking & Ordering Information

| TYPE     | MARKING | PACKAGE   | PACKING    |
|----------|---------|-----------|------------|
| HY2N65T  | 2N65T   | TO-220AB  | 50PCS/TUBE |
| HY2N65FT | 2N65FT  | ITO-220AB | 50PCS/TUBE |



### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise specified )

| Parameter                                                             |                        | Symbol         | HY2N65T     | HY2N65FT | Units            |
|-----------------------------------------------------------------------|------------------------|----------------|-------------|----------|------------------|
| Drain-Source Voltage                                                  |                        | $V_{DS}$       | 650         |          | V                |
| Gate-Source Voltage                                                   |                        | $V_{GS}$       | $\pm 30$    |          | V                |
| Continuous Drain Current                                              | $T_c=25^\circ\text{C}$ | $I_D$          | 2           | 2        | A                |
| Pulsed Drain Current <sup>1)</sup>                                    |                        | $I_{DM}$       | 8           | 8        | A                |
| Maximum Power Dissipation                                             | $T_c=25^\circ\text{C}$ | $P_D$          | 44.5        | 19.2     | W                |
| Derating Factor                                                       |                        |                | 0.36        | 0.16     |                  |
| Avalanche Energy with Single Pulse<br>$I_{AS}=2A, V_{DD}=60V, L=50mH$ |                        | $E_{AS}$       | 100         |          | mJ               |
| Operating Junction and Storage Temperature Range                      |                        | $T_J, T_{STG}$ | -55 to +150 |          | $^\circ\text{C}$ |

Note : 1. Maximum DC current limited by the package

### Thermal Characteristics

| Parameter                           | Symbol          | HY2N65T | HY2N65FT | Units              |
|-------------------------------------|-----------------|---------|----------|--------------------|
| Junction-to-Case Thermal Resistance | $R_{\theta JC}$ | 2.8     | 6.5      | $^\circ\text{C/W}$ |
| Junction-to-Air Thermal Resistance  | $R_{\theta JA}$ | 50      | 110      | $^\circ\text{C/W}$ |

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**Electrical Characteristics (  $T_c=25^{\circ}\text{C}$  , Unless otherwise noted )**

| Paramter                         | Symbol              | Test Condition                                                                           | Min. | Typ. | Max. | Units |
|----------------------------------|---------------------|------------------------------------------------------------------------------------------|------|------|------|-------|
| Static                           |                     |                                                                                          |      |      |      |       |
| Drain-Source Breakdown Voltage   | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V 、 I <sub>D</sub> =250uA                                              | 650  | -    | -    | V     |
| Gate Threshold Voltage           | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> 、 I <sub>D</sub> =250uA                                 | 2.0  | -    | 4.0  | V     |
| Drain-Source On-State Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V 、 I <sub>D</sub> =1A                                                | -    | 4.1  | 4.6  | Ω     |
| Zero Gate Voltage Drain Current  | I <sub>DSS</sub>    | V <sub>DS</sub> =650V 、 V <sub>GS</sub> =0V                                              | -    | -    | 10   | uA    |
| Gate Body Leakage Current        | I <sub>GSS</sub>    | V <sub>GS</sub> =±30V 、 V <sub>DS</sub> =0V                                              | -    | -    | ±100 | nA    |
| Dynamic                          |                     |                                                                                          |      |      |      |       |
| Total Gate Charge                | Qg                  | V <sub>DS</sub> =520V , I <sub>D</sub> =2A<br>V <sub>GS</sub> =10V                       | -    | 6.4  | 8.6  | nC    |
| Gate-Source Charge               | Qgs                 |                                                                                          | -    | 1.8  | -    |       |
| Gate-Drain Charge                | Qgd                 |                                                                                          | -    | 2.1  | -    |       |
| Turn-On Delay Time               | t <sub>d(on)</sub>  | V <sub>DD</sub> =325V , I <sub>D</sub> =2A<br>V <sub>GS</sub> =10V , R <sub>G</sub> =25Ω | -    | 13.2 | 16   | ns    |
| Turn-On Rise Time                | t <sub>r</sub>      |                                                                                          | -    | 18.6 | 28   |       |
| Turn-Off Delay Time              | t <sub>d(off)</sub> |                                                                                          | -    | 22   | 38   |       |
| Turn-Off Fall Time               | t <sub>f</sub>      |                                                                                          | -    | 16.8 | 32   |       |
| Input Capacitance                | C <sub>iss</sub>    | V <sub>DS</sub> =25V , V <sub>GS</sub> =0V<br>f=1.0M <sub>HZ</sub>                       | -    | 265  | -    | pF    |
| Output Capacitance               | C <sub>oss</sub>    |                                                                                          | -    | 36   | -    |       |
| Reverse Transfer Capacitance     | C <sub>rss</sub>    |                                                                                          | -    | 1.5  | -    |       |
| Source-Drain Diode               |                     |                                                                                          |      |      |      |       |
| Max. Diode Forwad Voltage        | I <sub>S</sub>      | -                                                                                        | -    | -    | 2.0  | A     |
| Max. Pulsed Source Current       | I <sub>SM</sub>     | -                                                                                        | -    | -    | 8.0  | A     |
| Diode Forward Voltage            | V <sub>SD</sub>     | I <sub>S</sub> =2A 、 V <sub>GS</sub> =0V                                                 | -    | -    | 1.4  | V     |
| Reverse Recovery Time            | t <sub>rr</sub>     | V <sub>GS</sub> =0V 、 I <sub>S</sub> =2A<br>di/dt=100A/us                                | -    | 190  | -    | ns    |
| Reverse Recovery Charge          | Q <sub>rr</sub>     |                                                                                          | -    | 1.0  | -    | uC    |

**NOTE** : Pulse Test : Pulse Width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

### Typical Characteristics Curves ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

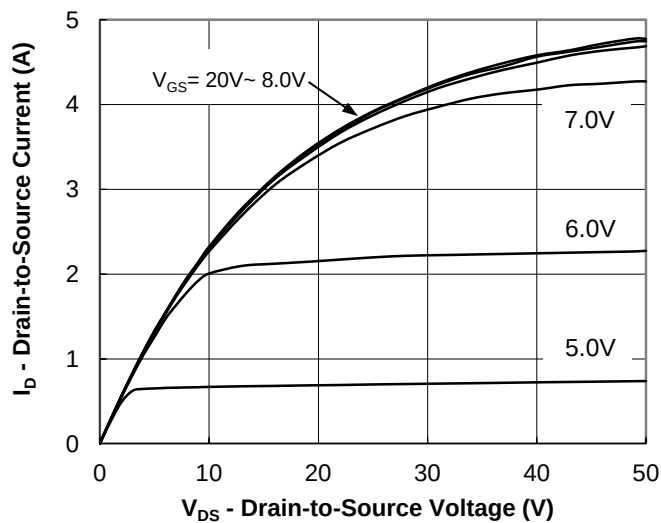


Fig.1 Output Characteristic

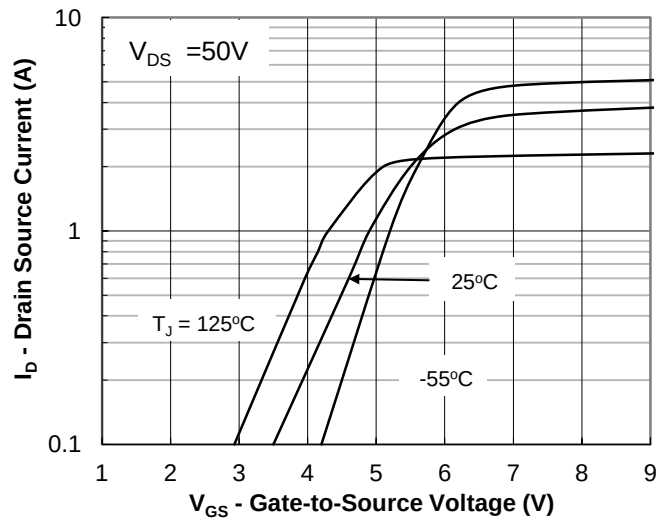


Fig.2 Transfer Characteristic

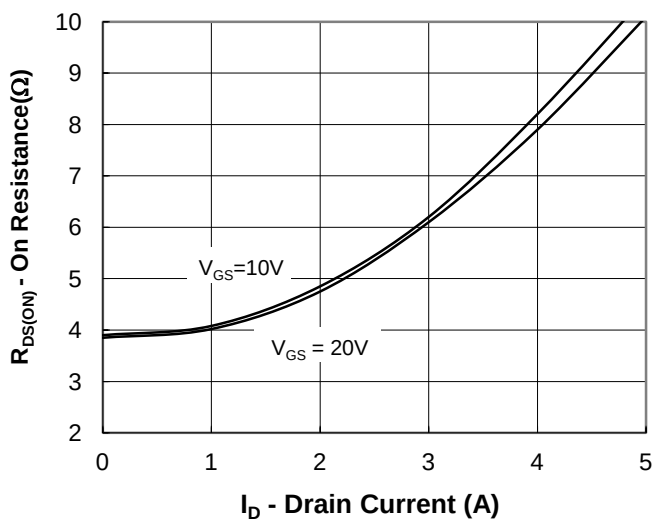


Fig.3 On-Resistance vs Drain Current

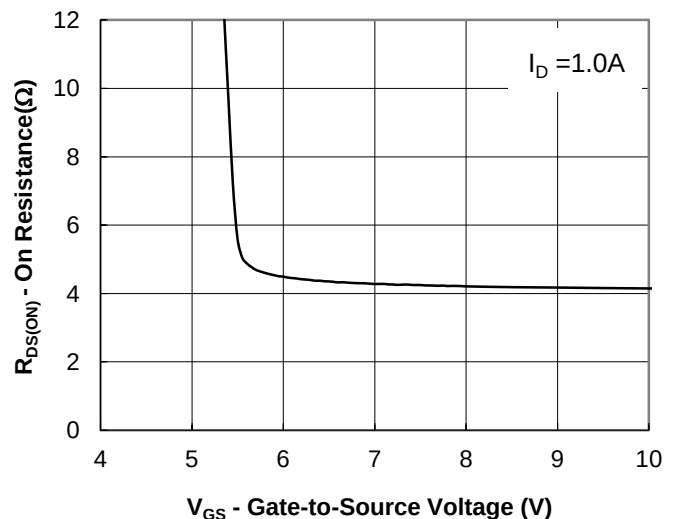


Fig.4 On-Resistance vs Gate to Source Voltage

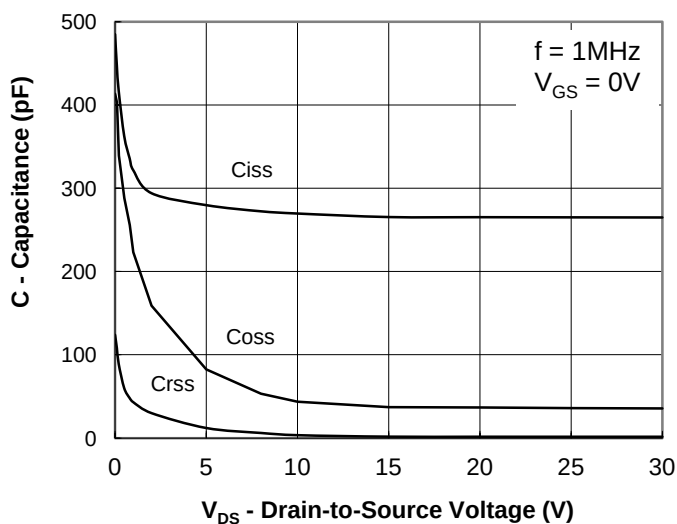


Fig.5 Capacitance Characteristic

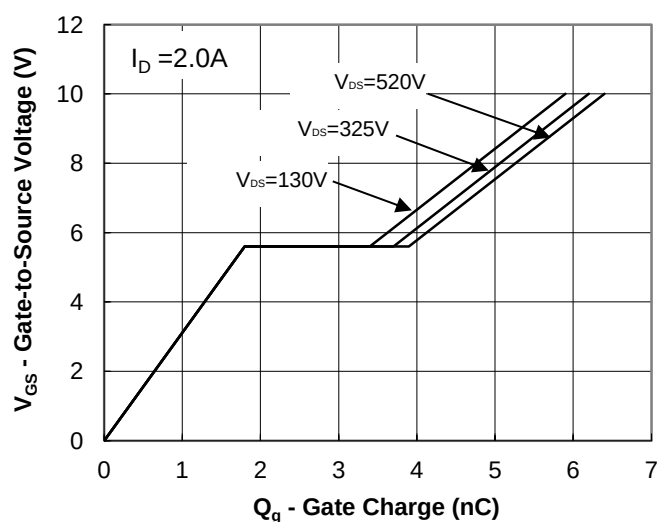


Fig.6 Gate Charge Characteristic

### Typical Characteristics Curves ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

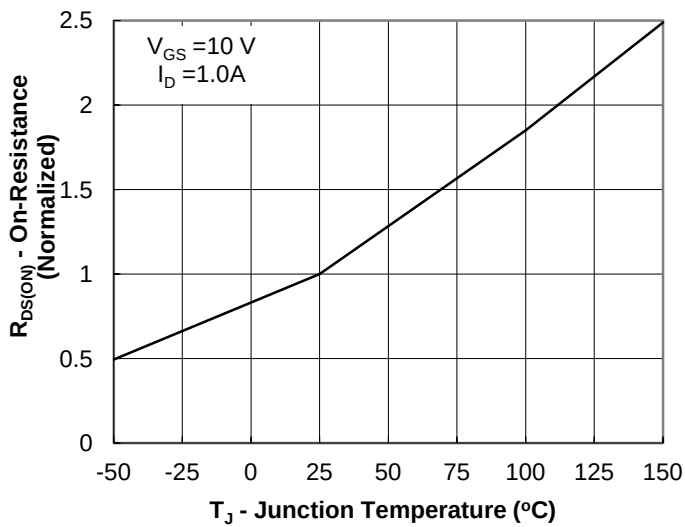


Fig.7 On-Resistance vs Junction Temperature

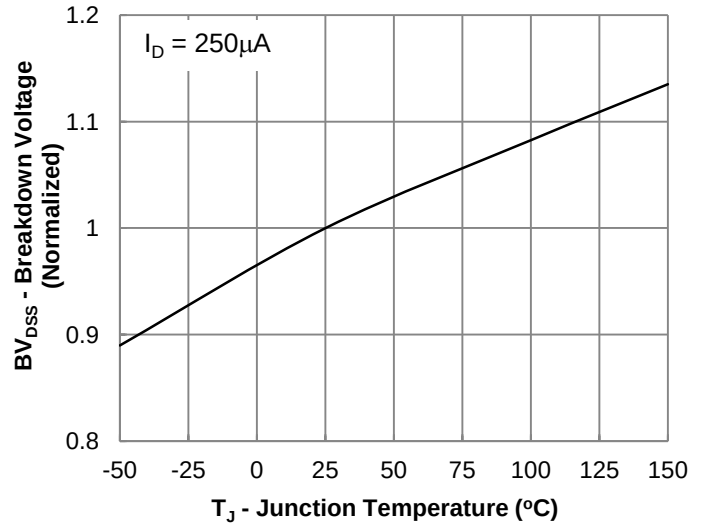


Fig.8 Breakdown Voltage vs Junction Temperature

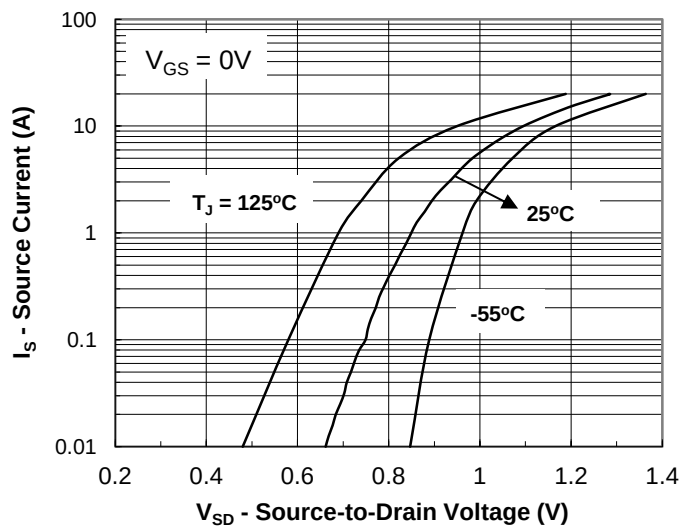


Fig.9 Body Diode Forward Voltage Characteristic