

## N-Channel Enhancement Mode Power MOSFET

# MTN18N50CE3

|                                                                |                    |
|----------------------------------------------------------------|--------------------|
| <b>BV<sub>DSS</sub></b>                                        | <b>500V</b>        |
| <b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=25°C</b>    | <b>18A</b>         |
| <b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=10V, I<sub>D</sub>=9A</b> | <b>211mΩ (typ)</b> |

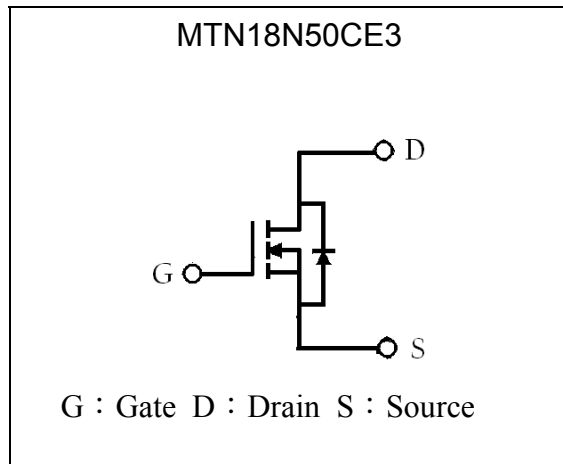
### Features

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

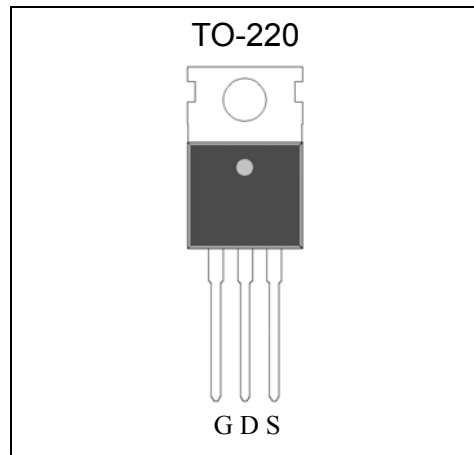
### Applications

- Power Factor Correction
- Flat Panel Power
- Full and Half Bridge Power Supplies
- Two-Transistor Forward Power Supplies

### Symbol

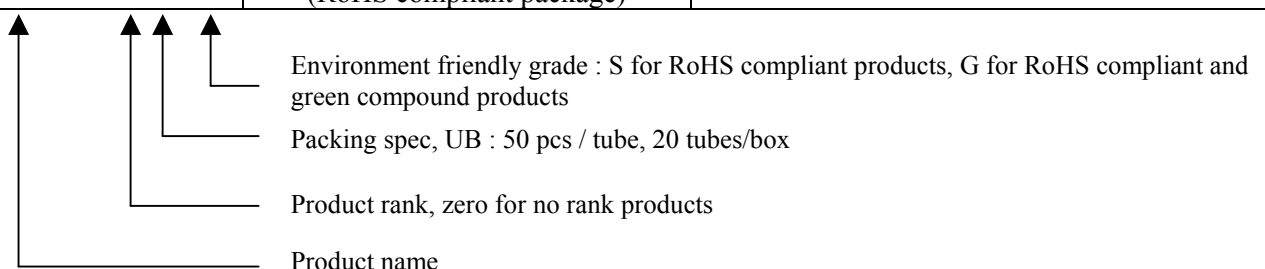


### Outline



### Ordering Information

| Device            | Package                            | Shipping                                    |
|-------------------|------------------------------------|---------------------------------------------|
| MTN18N50E3-0-UB-X | TO-220<br>(RoHS compliant package) | 50 pcs/tube, 20 tubes/box, 4 boxes / carton |



**Absolute Maximum Ratings** ( $T_C=25^{\circ}\text{C}$ )

| Parameter                                                                              | Symbol         | Limits   | Unit                  |
|----------------------------------------------------------------------------------------|----------------|----------|-----------------------|
| Drain-Source Voltage (Note 1)                                                          | $V_{DS}$       | 500      | V                     |
| Gate-Source Voltage                                                                    | $V_{GS}$       | $\pm 30$ |                       |
| Continuous Drain Current @ $T_C=25^{\circ}\text{C}$ , $V_{GS}=10\text{V}$              | $I_D$          | 18*      | A                     |
| Continuous Drain Current @ $T_C=100^{\circ}\text{C}$ , $V_{GS}=10\text{V}$             |                | 11.4*    |                       |
| Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 2)                                    | $I_{DM}$       | 72*      |                       |
| Single Pulse Avalanche Energy (Note 4)                                                 | $E_{AS}$       | 112      | mJ                    |
| Avalanche Current (Note 2)                                                             | $I_{AS}$       | 18       | A                     |
| Repetitive Avalanche Energy (Note 2)                                                   | $E_{AR}$       | 21       | mJ                    |
| Peak Diode Recovery $dv/dt$ (Note 3)                                                   | $dv/dt$        | 4.5      | V/ns                  |
| Maximum Temperature for Soldering @ Lead at 0.125 in(3.175mm) from case for 10 seconds | $T_L$          | 300      | $^{\circ}\text{C}$    |
| Total Power Dissipation ( $T_C=25^{\circ}\text{C}$ )                                   | $P_D$          | 208      | W                     |
| Linear Derating Factor above $25^{\circ}\text{C}$                                      |                | 1.67     | W/ $^{\circ}\text{C}$ |
| Operating Junction and Storage Temperature                                             | $T_J, T_{stg}$ | -55~+150 | $^{\circ}\text{C}$    |

\*Drain current limited by maximum junction temperature

Note : 1.  $T_J=+25^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ .

2. Repetitive rating; pulse width limited by maximum junction temperature.

3.  $I_{SD}=18\text{A}$ ,  $dI/dt < 100\text{A}/\mu\text{s}$ ,  $V_{DD} < BV_{DSS}$ ,  $T_J=+150^{\circ}\text{C}$ .4.  $I_{AS}=15\text{A}$ ,  $V_{DD}=30\text{V}$ ,  $L=1\text{mH}$ ,  $R_G=25\Omega$ , starting  $T_J=+25^{\circ}\text{C}$ . 100% tested by condition of  $L=0.1\text{mH}$ ,  $I_{AS}=12\text{A}$ ,  $V_{DD}=30\text{V}$ ,  $V_{GS}=10\text{V}$ **Thermal Data**

| Parameter                                    | Symbol       | Value | Unit                        |
|----------------------------------------------|--------------|-------|-----------------------------|
| Thermal Resistance, Junction-to-case, max    | $R_{th,j-c}$ | 0.6   | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-ambient, max | $R_{th,j-a}$ | 62.5  |                             |

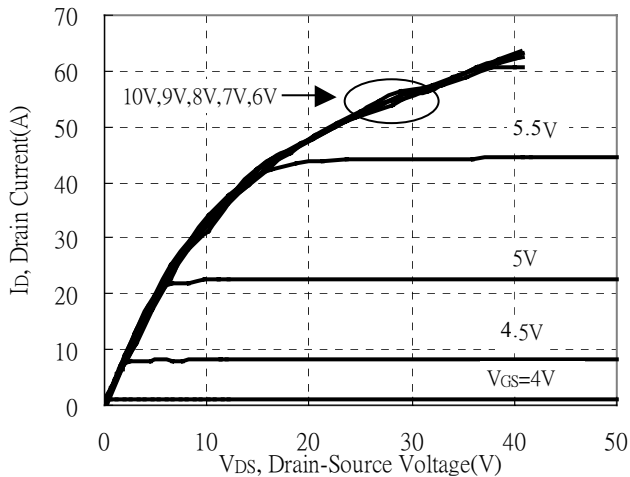
**Characteristics (Tj=25°C, unless otherwise specified)**

| Symbol                              | Min. | Typ. | Max. | Unit | Test Conditions                                                                           |
|-------------------------------------|------|------|------|------|-------------------------------------------------------------------------------------------|
| Static                              |      |      |      |      |                                                                                           |
| BV <sub>DSS</sub>                   | 500  | -    | -    | V    | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                |
| ΔBV <sub>DSS</sub> /ΔT <sub>j</sub> | -    | 0.5  | -    | V/°C | Reference to 25°C, I <sub>D</sub> =250μA                                                  |
| V <sub>GS(th)</sub>                 | 2.0  | -    | 4.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA                                 |
| *G <sub>FS</sub>                    | -    | 24   | -    | S    | V <sub>DS</sub> =15V, I <sub>D</sub> =9A                                                  |
| I <sub>GSS</sub>                    | -    | -    | ±100 | nA   | V <sub>GS</sub> =±30V                                                                     |
| I <sub>DSS</sub>                    | -    | -    | 1    | μA   | V <sub>DS</sub> =500V, V <sub>GS</sub> =0V                                                |
|                                     | -    | -    | 25   |      | V <sub>DS</sub> =400V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C                         |
| *R <sub>DS(ON)</sub>                | -    | 211  | 265  | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =9A                                                  |
| Dynamic                             |      |      |      |      |                                                                                           |
| *Q <sub>g</sub>                     | -    | 70.5 | -    | nC   | I <sub>D</sub> =18A, V <sub>DD</sub> =400V, V <sub>GS</sub> =10V                          |
| *Q <sub>gs</sub>                    | -    | 13.5 | -    |      |                                                                                           |
| *Q <sub>gd</sub>                    | -    | 20.9 | -    |      |                                                                                           |
| *t <sub>d(ON)</sub>                 | -    | 31   | -    | ns   | V <sub>DD</sub> =250V, I <sub>D</sub> =18A, V <sub>GS</sub> =10V,<br>R <sub>G</sub> =25 Ω |
| *t <sub>r</sub>                     | -    | 61   | -    |      |                                                                                           |
| *t <sub>d(OFF)</sub>                | -    | 239  | -    |      |                                                                                           |
| *t <sub>f</sub>                     | -    | 88   | -    |      |                                                                                           |
| C <sub>iss</sub>                    | -    | 3074 | -    | pF   | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz                                         |
| C <sub>oss</sub>                    | -    | 281  | -    |      |                                                                                           |
| C <sub>rss</sub>                    | -    | 48   | -    |      |                                                                                           |
| Source-Drain Diode                  |      |      |      |      |                                                                                           |
| *I <sub>S</sub>                     | -    | -    | 18   | A    |                                                                                           |
| *I <sub>SM</sub>                    | -    | -    | 72   |      |                                                                                           |
| *V <sub>SD</sub>                    | -    | 0.84 | 1.2  | V    | I <sub>S</sub> =18A, V <sub>GS</sub> =0V                                                  |
| *t <sub>rr</sub>                    | -    | 350  | -    | ns   | V <sub>GS</sub> =0V, I <sub>F</sub> =18A, dI <sub>F</sub> /dt=100A/μs                     |
| *Q <sub>rr</sub>                    | -    | 4.1  | -    | μC   |                                                                                           |

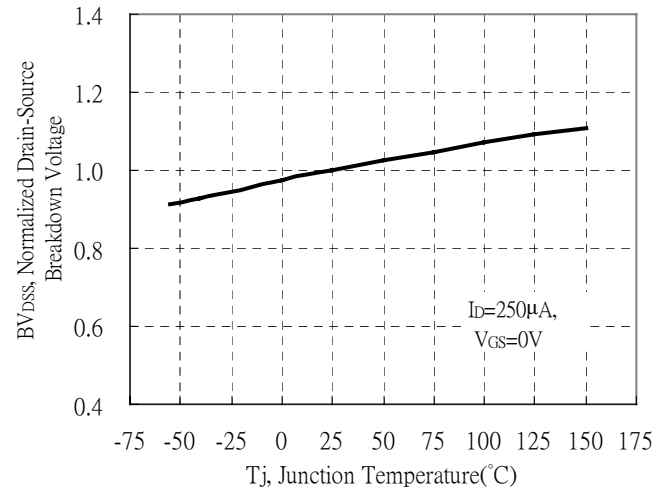
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

## Typical Characteristics

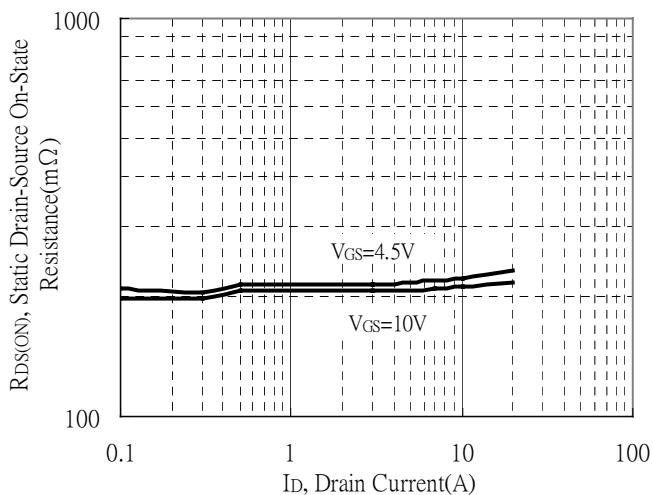
Typical Output Characteristics



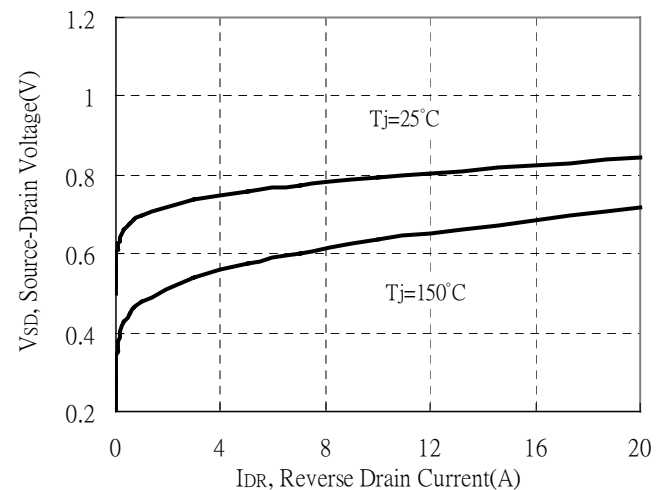
Breakdown Voltage vs Junction Temperature



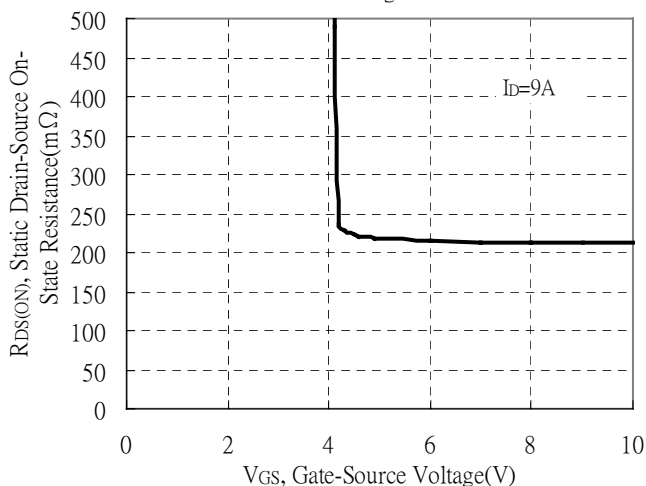
Static Drain-Source On-State resistance vs Drain Current



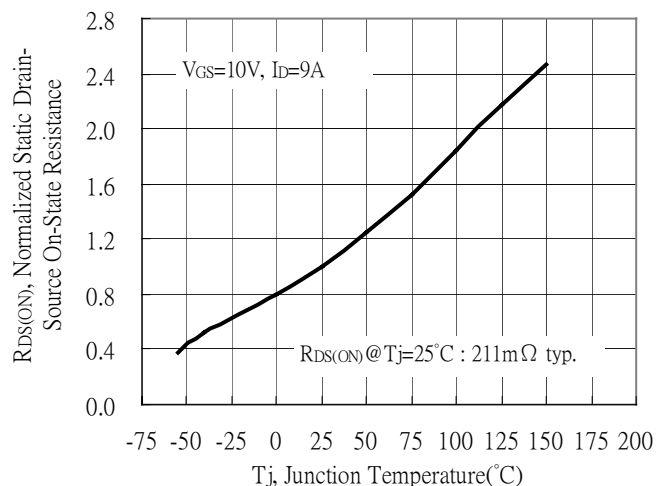
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

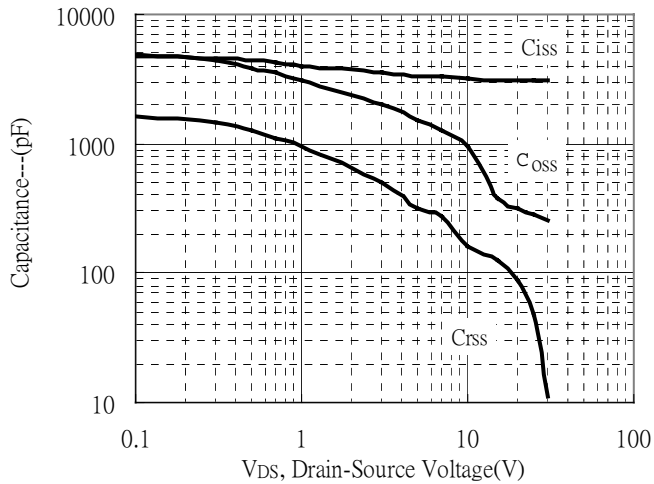


Drain-Source On-State Resistance vs Junction Temperature

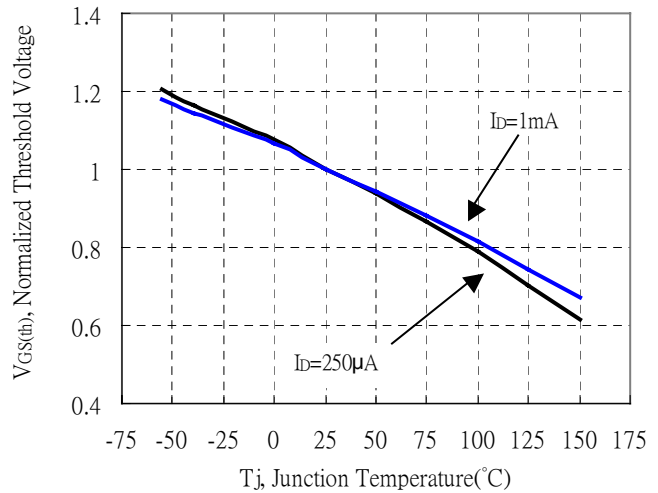


## Typical Characteristics(Cont.)

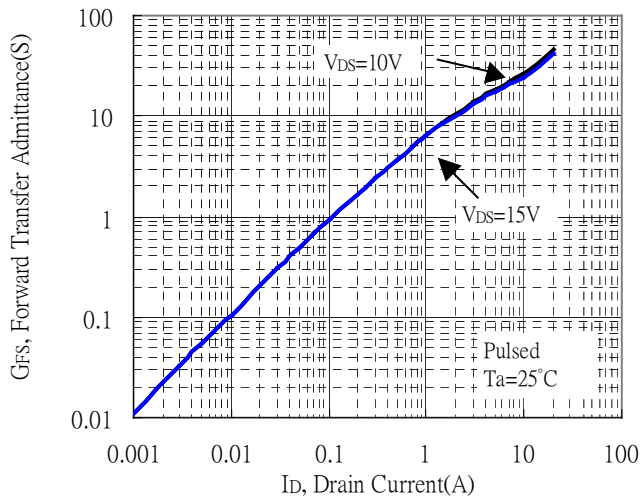
Capacitance vs Drain-to-Source Voltage



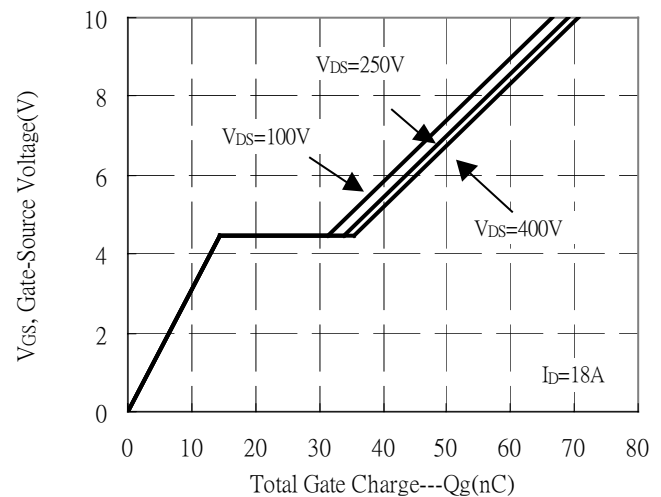
Threshold Voltage vs Junction Temperature



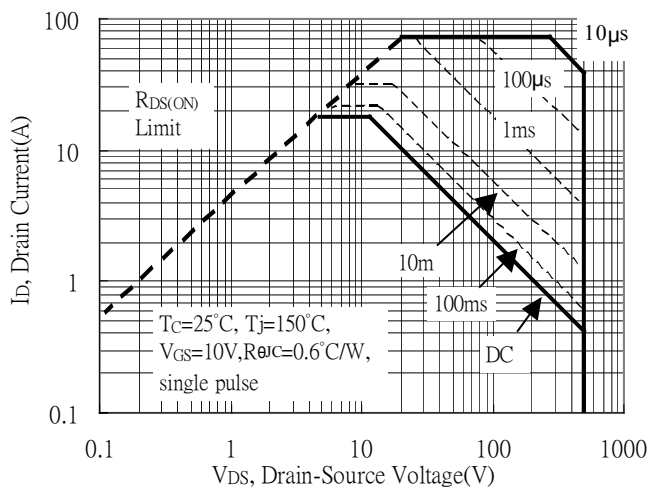
Forward Transfer Admittance vs Drain Current



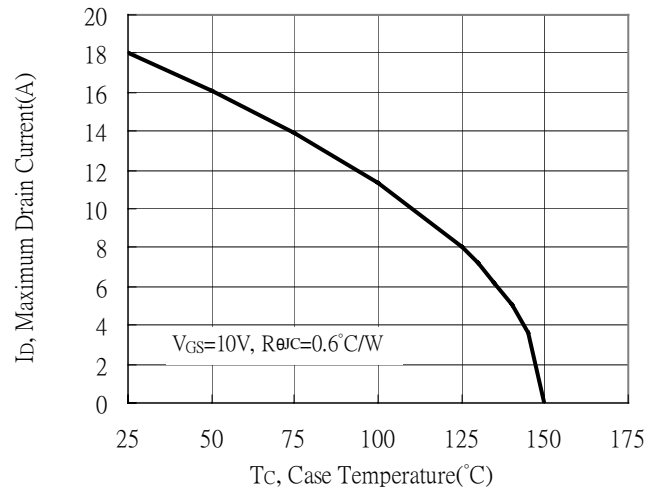
Gate Charge Characteristics



Maximum Safe Operating Area

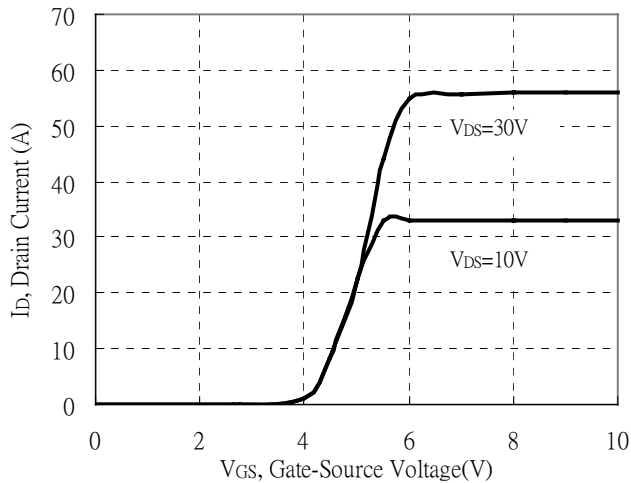


Maximum Drain Current vs Case Temperature

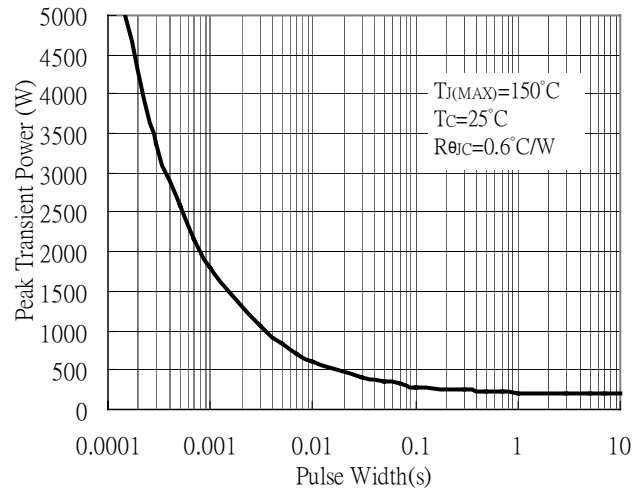


## Typical Characteristics(Cont.)

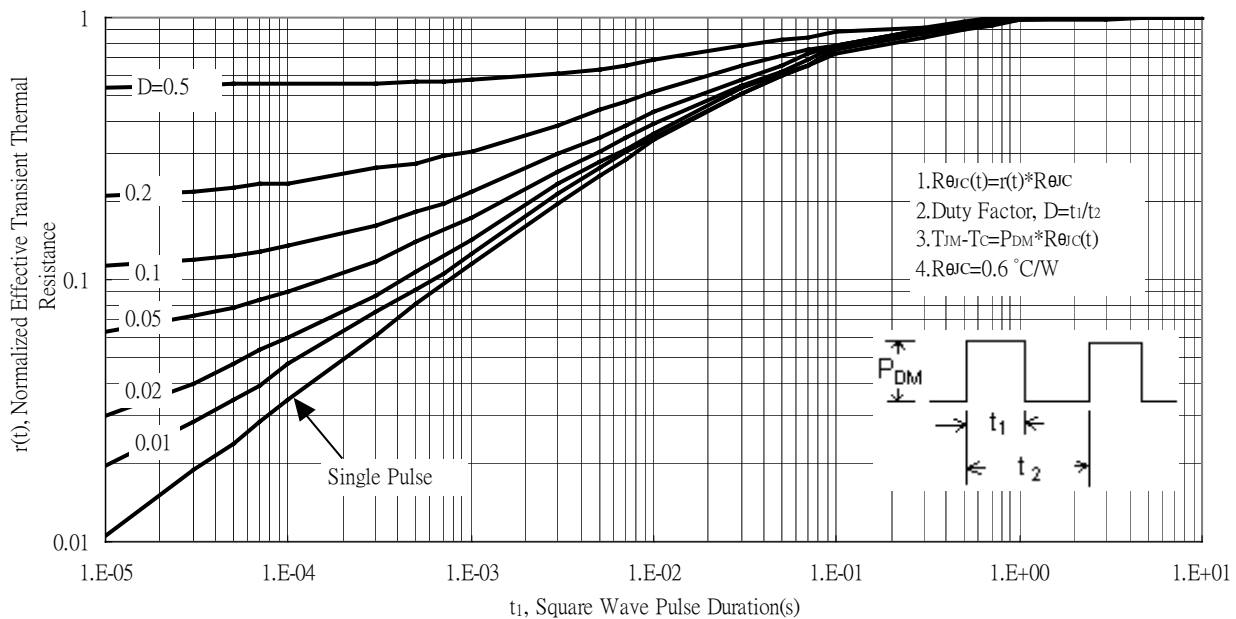
Typical Transfer Characteristics



Single Pulse Maximum Power Dissipation



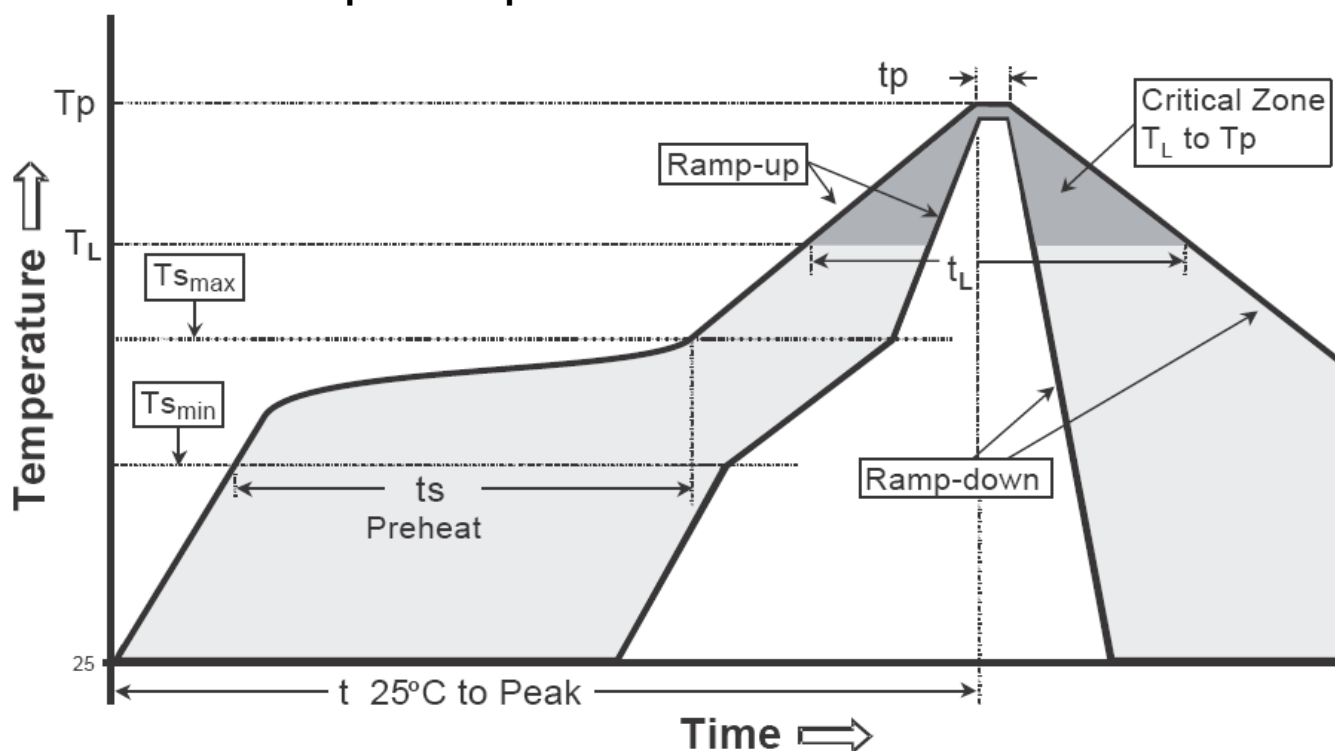
Transient Thermal Response Curves



### Recommended wave soldering condition

| Product         | Peak Temperature | Soldering Time  |
|-----------------|------------------|-----------------|
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

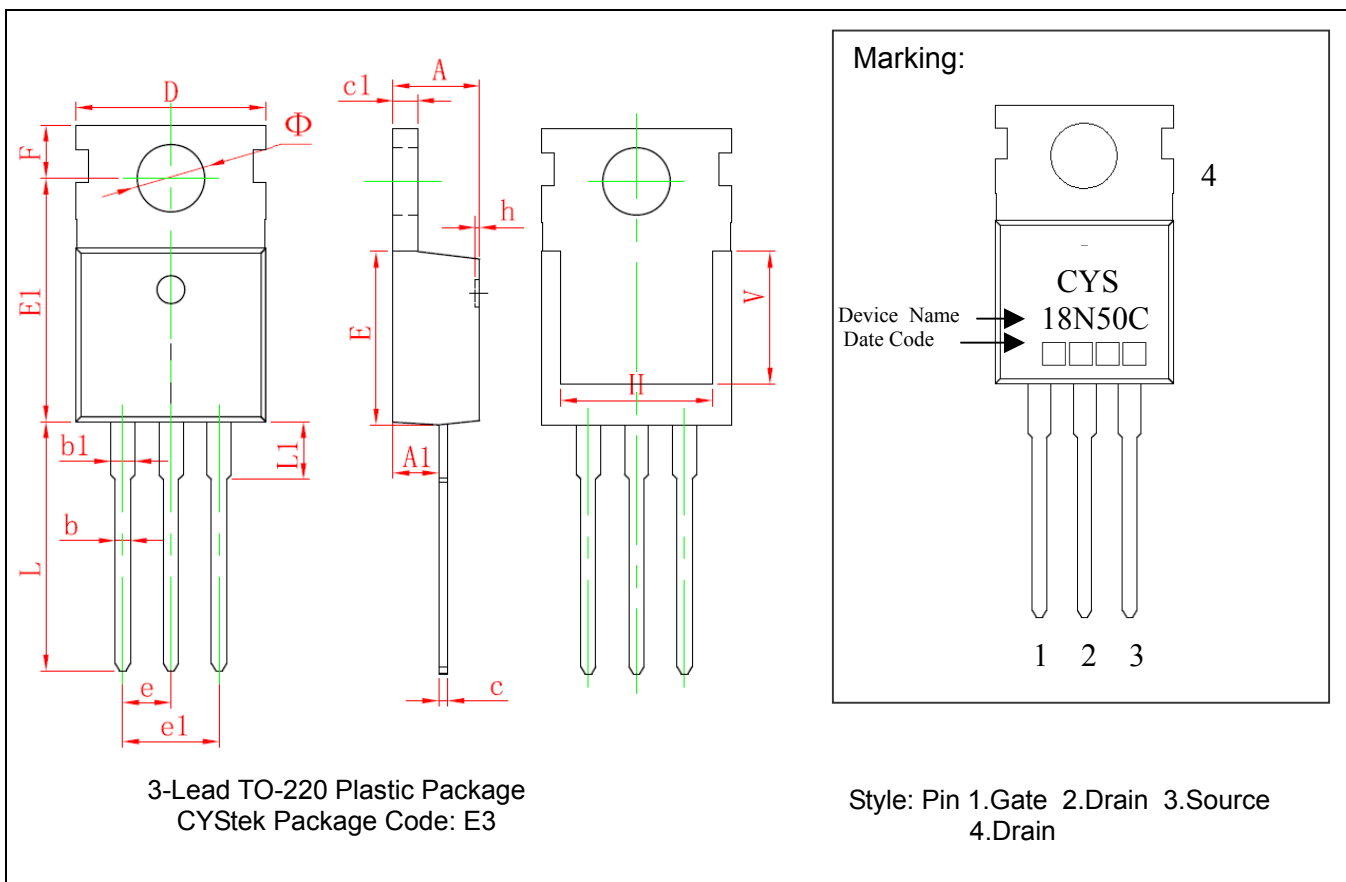
### Recommended temperature profile for IR reflow



| Profile feature                                             | Sn-Pb eutectic Assembly | Pb-free Assembly |
|-------------------------------------------------------------|-------------------------|------------------|
| Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> ) | 3°C/second max.         | 3°C/second max.  |
| Preheat                                                     |                         |                  |
| –Temperature Min(T <sub>s min</sub> )                       | 100°C                   | 150°C            |
| –Temperature Max(T <sub>s max</sub> )                       | 150°C                   | 200°C            |
| –Time(ts min to ts max)                                     | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                                      |                         |                  |
| –Temperature (T <sub>L</sub> )                              | 183°C                   | 217°C            |
| – Time (t <sub>L</sub> )                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature(T <sub>p</sub> )                           | 240 +0/-5 °C            | 260 +0/-5 °C     |
| Time within 5°C of actual peak temperature(tp)              | 10-30 seconds           | 20-40 seconds    |
| Ramp down rate                                              | 6°C/second max.         | 6°C/second max.  |
| Time 25 °C to peak temperature                              | 6 minutes max.          | 8 minutes max.   |

Note : All temperatures refer to topside of the package, measured on the package body surface.

## TO-220 Dimension



\*: Typical

| DIM | Millimeters |        | Inches |       | DIM | Millimeters |        | Inches |       |
|-----|-------------|--------|--------|-------|-----|-------------|--------|--------|-------|
|     | Min.        | Max.   | Min.   | Max.  |     | Min.        | Max.   | Min.   | Max.  |
| A   | 4.400       | 4.600  | 0.173  | 0.181 | e   | 2.540*      |        | 0.100* |       |
| A1  | 2.250       | 2.550  | 0.089  | 0.100 | e1  | 4.980       | 5.180  | 0.196  | 0.204 |
| b   | 0.710       | 0.910  | 0.028  | 0.036 | F   | 2.650       | 2.950  | 0.104  | 0.116 |
| b1  | 1.170       | 1.370  | 0.046  | 0.054 | H   | 7.900       | 8.100  | 0.311  | 0.319 |
| c   | 0.330       | 0.650  | 0.013  | 0.026 | h   | 0.000       | 0.300  | 0.000  | 0.012 |
| c1  | 1.200       | 1.400  | 0.047  | 0.055 | L   | 12.900      | 13.400 | 0.508  | 0.528 |
| D   | 9.910       | 10.250 | 0.390  | 0.404 | L1  | 2.850       | 3.250  | 0.112  | 0.128 |
| E   | 8.950       | 9.750  | 0.352  | 0.384 | V   | 7/500       | REF    | 0.295  | REF   |
| E1  | 12.650      | 12.950 | 0.498  | 0.510 | Φ   | 3.400       | 3.800  | 0.134  | 0.150 |

Notes: 1.Controlling dimension: millimeters.

2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.

3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

### Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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