

**N-Channel Enhancement Mode Power MOSFET**

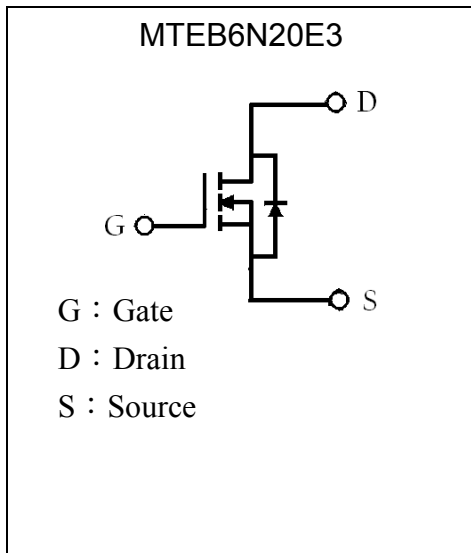
# MTEB6N20E3

|                                   |             |
|-----------------------------------|-------------|
| $BV_{DSS}$                        | 200V        |
| $I_D@V_{GS}=10V, T_C=25^\circ C$  | 9A          |
| $R_{DS(ON)}@V_{GS}=10V, I_D=5.4A$ | 308mΩ (typ) |

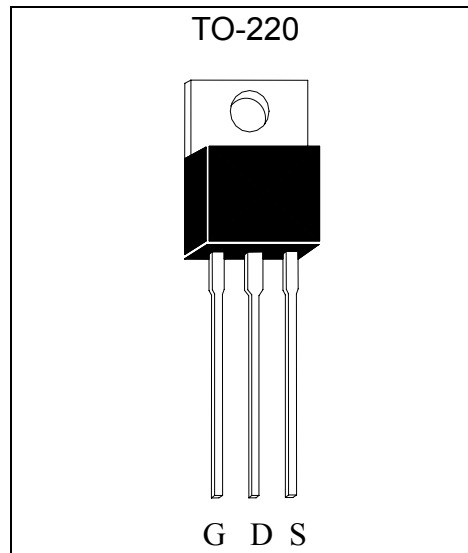
**Features**

- Low Gate Charge
- Simple Drive Requirement
- Repetitive Avalanche Rated
- Fast Switching Characteristic
- Pb-free lead plating and RoHS compliant package

**Symbol**

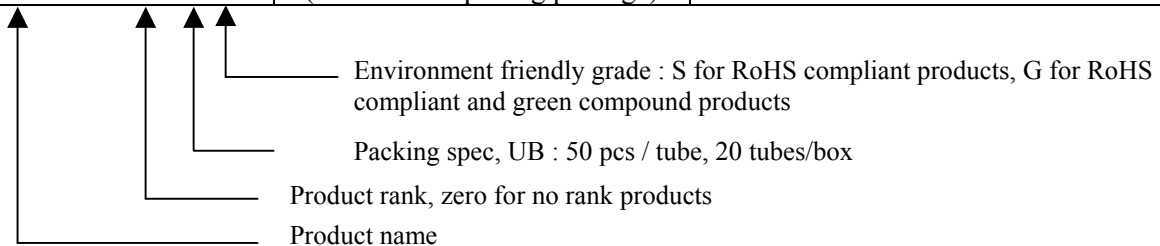


**Outline**



**Ordering Information**

| Device            | Package                                  | Shipping                                    |
|-------------------|--|---|
| MTEB6N20E3-0-UB-X | TO-220<br>(Pb-free lead plating package) | 50 pcs/tube, 20 tubes/box, 4 boxes / carton |





**Absolute Maximum Ratings** (Tc=25°C, unless otherwise noted)

| Parameter   | Symbol                            | Limits   | Unit |
|---|-----------------------------------|----------|------|
| Drain-Source Voltage  | V <sub>DS</sub>                   | 200      | V    |
| Gate-Source Voltage   | V <sub>GS</sub>                   | ±30      |      |
| Continuous Drain Current @V <sub>GS</sub> =10V, T <sub>C</sub> =25°C  | I <sub>D</sub>                    | 9        | A    |
| Continuous Drain Current @V <sub>GS</sub> =10V, T <sub>C</sub> =100°C |                                   | 5.7      |      |
| Pulsed Drain Current (Note 1)   | I <sub>DM</sub>                   | 20       |      |
| Avalanche Current   | I <sub>AS</sub>                   | 2.7      |      |
| Avalanche Energy @ L=2mH, I <sub>D</sub> =2.7A, V <sub>DD</sub> =50V  | E <sub>AS</sub>                   | 7.3      | mJ   |
| Repetitive Avalanche Energy@ L=0.05mH (Note 2)                        | E <sub>AR</sub>                   | 5        |      |
| Total Power Dissipation (T <sub>C</sub> =25°C)                        | P <sub>D</sub>                    | 57       | W    |
| Total Power Dissipation (T <sub>C</sub> =100°C)                       |                                   | 23       |      |
| Operating Junction and Storage Temperature                            | T <sub>j</sub> , T <sub>stg</sub> | -55~+150 | °C   |

\*100% UIS tested at condition of L=2mH, I<sub>AS</sub>=1A, V<sub>DD</sub>=50V.

Note : 1. Pulse width limited by maximum junction temperature  
 2. Duty cycle ≤ 1%

**Thermal Data**

| Parameter                                    | Symbol              | Value | Unit |
|--|---------------------|-------|------|
| Thermal Resistance, Junction-to-case, max    | R <sub>th,j-c</sub> | 2.2   | °C/W |
| Thermal Resistance, Junction-to-ambient, max | R <sub>th,j-a</sub> | 62.5  |      |

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

| Symbol                              | Min. | Typ. | Max. | Unit | Test Conditions  |
|-------------------------------------|------|------|------|------|--|
| <b>Static</b>                       |      |      |      |      |  |
| BV <sub>DSS</sub>                   | 200  | -    | -    | V    | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA   |
| ΔBV <sub>DSS</sub> /ΔT <sub>j</sub> | -    | 0.16 | -    | V/°C | Reference to 25°C, I <sub>D</sub> =250μA   |
| V <sub>GS(th)</sub>                 | 2    | -    | 4.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA                            |
| G <sub>FS</sub>                     | -    | 5.3  | -    | S    | V <sub>DS</sub> =15V, I <sub>D</sub> =5A   |
| I <sub>GSS</sub>                    | -    | -    | ±100 | nA   | V <sub>GS</sub> =±30V  |
| I <sub>DSS</sub>                    | -    | -    | 1    | μA   | V <sub>DS</sub> =200V, V <sub>GS</sub> =0V   |
|                                     | -    | -    | 25   |      | V <sub>DS</sub> =160V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C                    |
| *R <sub>DS(ON)</sub>                | -    | 308  | 400  | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =5.4A   |
| <b>Dynamic</b>                      |      |      |      |      |  |
| *Q <sub>g</sub>                     | -    | 10.6 | -    | nC   | I <sub>D</sub> =3A, V <sub>DS</sub> =160V, V <sub>GS</sub> =10V                      |
| *Q <sub>gs</sub>                    | -    | 2.3  | -    |      |  |
| *Q <sub>gd</sub>                    | -    | 3.9  | -    |      |  |
| *t <sub>d(ON)</sub>                 | -    | 8.8  | -    | ns   | V <sub>DS</sub> =100V, I <sub>D</sub> =3A, V <sub>GS</sub> =10V, R <sub>G</sub> =25Ω |
| *t <sub>r</sub>                     | -    | 16.8 | -    |      |  |
| *t <sub>d(OFF)</sub>                | -    | 21.2 | -    |      |  |
| *t <sub>f</sub>                     | -    | 19.6 | -    |      |  |
| C <sub>iss</sub>                    | -    | 395  | -    | pF   | V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz                                    |
| C <sub>oss</sub>                    | -    | 47   | -    |      |  |
| C <sub>rss</sub>                    | -    | 23   | -    |      |  |

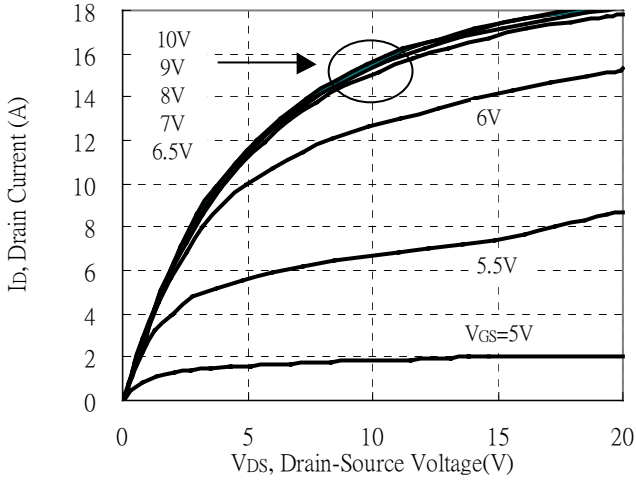


| Source-Drain Diode |   |    |     |    |  |
|--------------------|---|----|-----|----|--|
| *I <sub>S</sub>    | - | -  | 9   | A  |  |
| *I <sub>SM</sub>   | - | -  | 20  |    |  |
| *V <sub>SD</sub>   | - | -  | 1.3 | V  | I <sub>F</sub> =I <sub>S</sub> , V <sub>GS</sub> =0V                 |
| *trr               | - | 50 | -   | ns | I <sub>F</sub> =3A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs |
| *Q <sub>rr</sub>   | - | 86 | -   | nC |  |

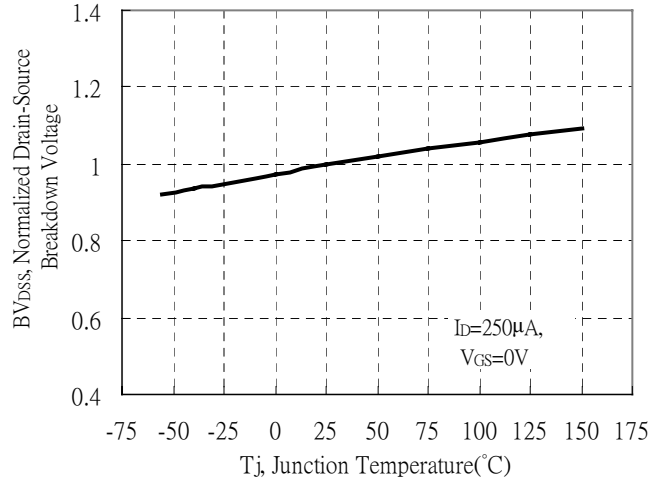
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

**Typical Characteristics**

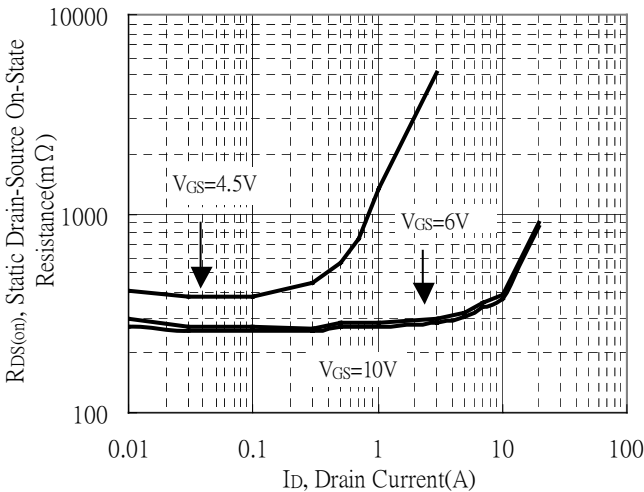
Typical Output Characteristics



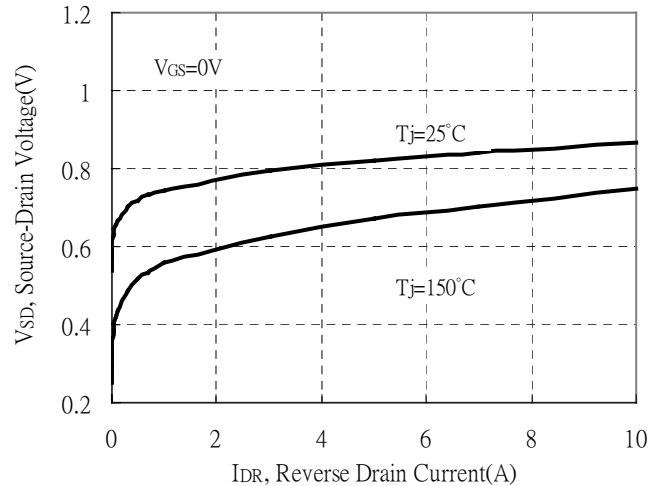
Brekdown Voltage vs Ambient Temperature



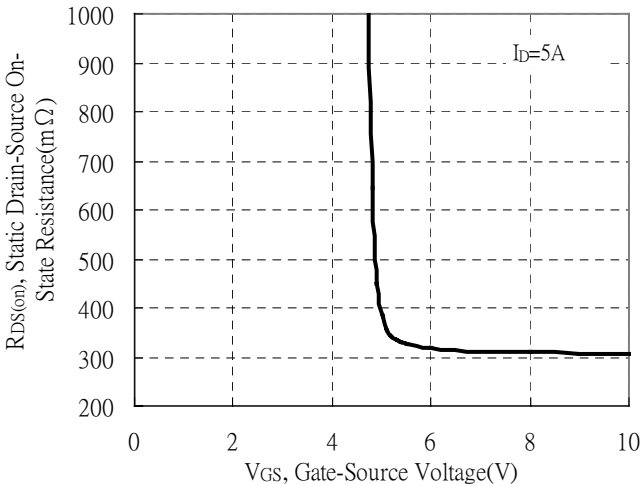
Static Drain-Source On-State resistance vs Drain Current



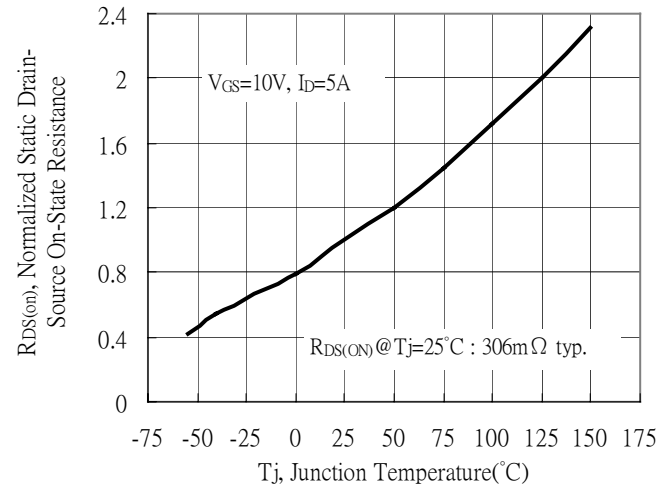
Reverse Drain Current vs Source-Drain Voltage



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

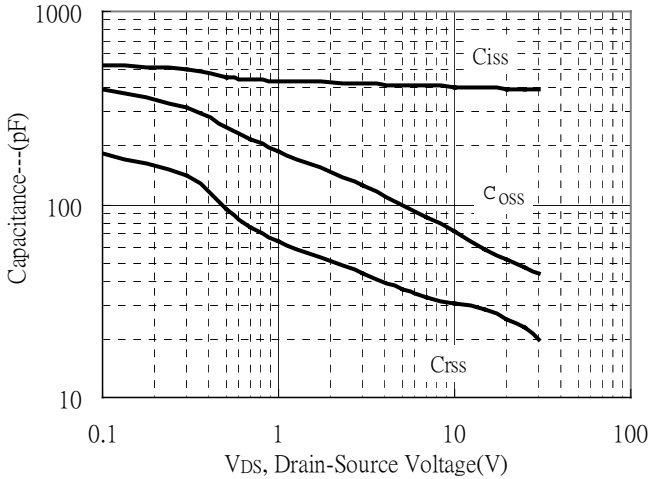


Drain-Source On-State Resistance vs Junction Temperature

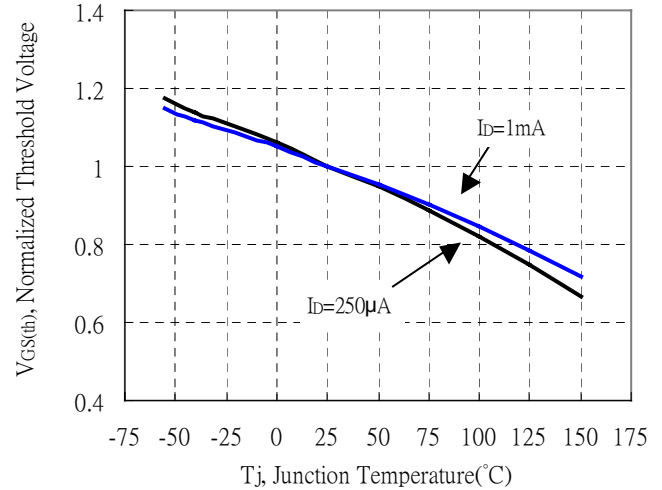


**Typical Characteristics(Cont.)**

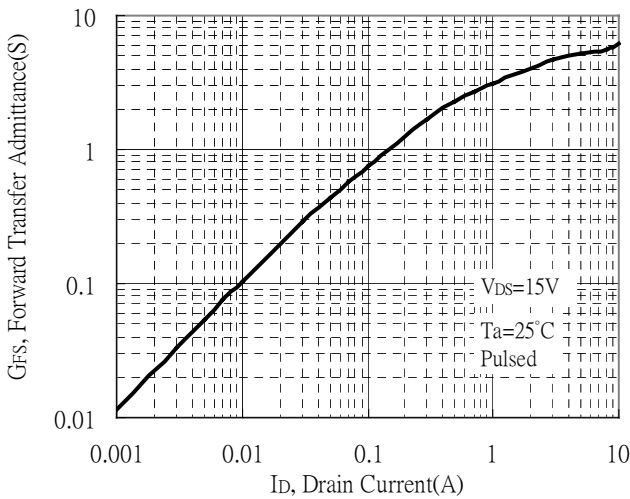
Capacitance vs Drain-to-Source Voltage



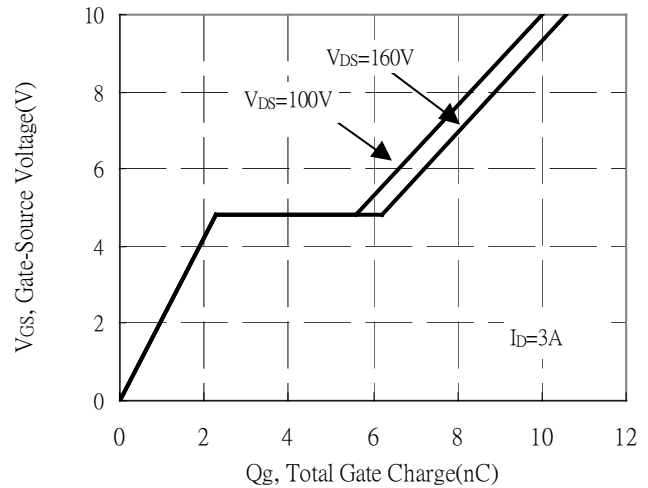
Threshold Voltage vs Junction Temperature



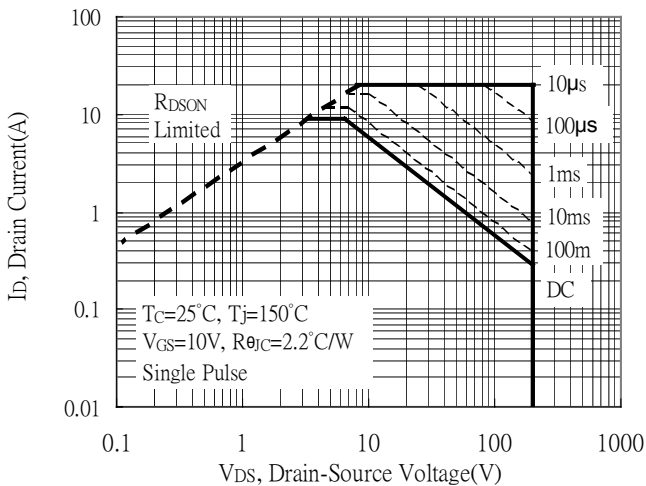
Forward Transfer Admittance vs Drain Current



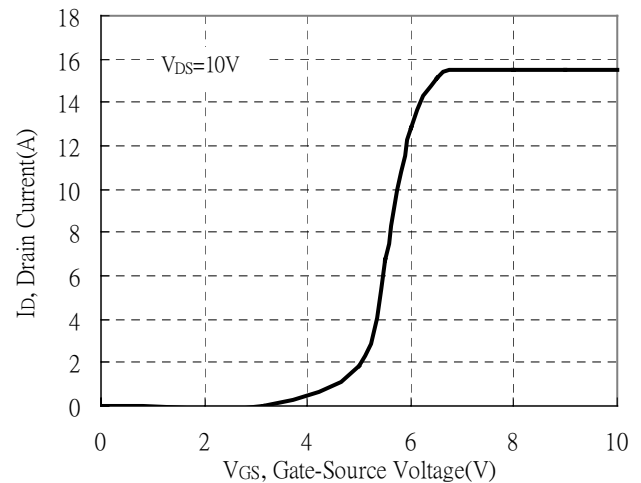
Gate Charge Characteristics



Maximum Safe Operating Area



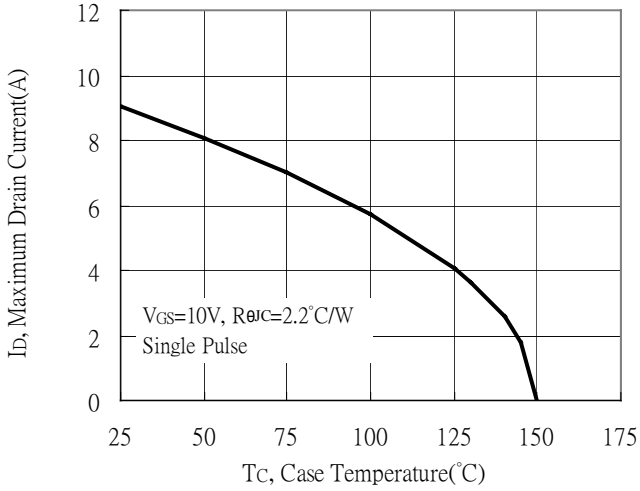
Typical Transfer Characteristics



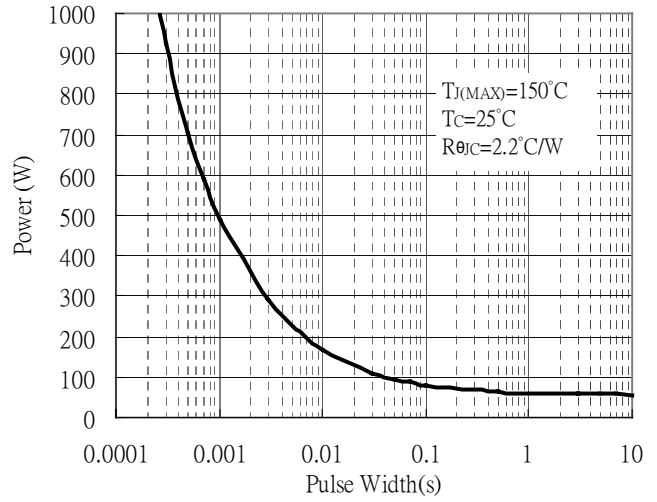


**Typical Characteristics(Cont.)**

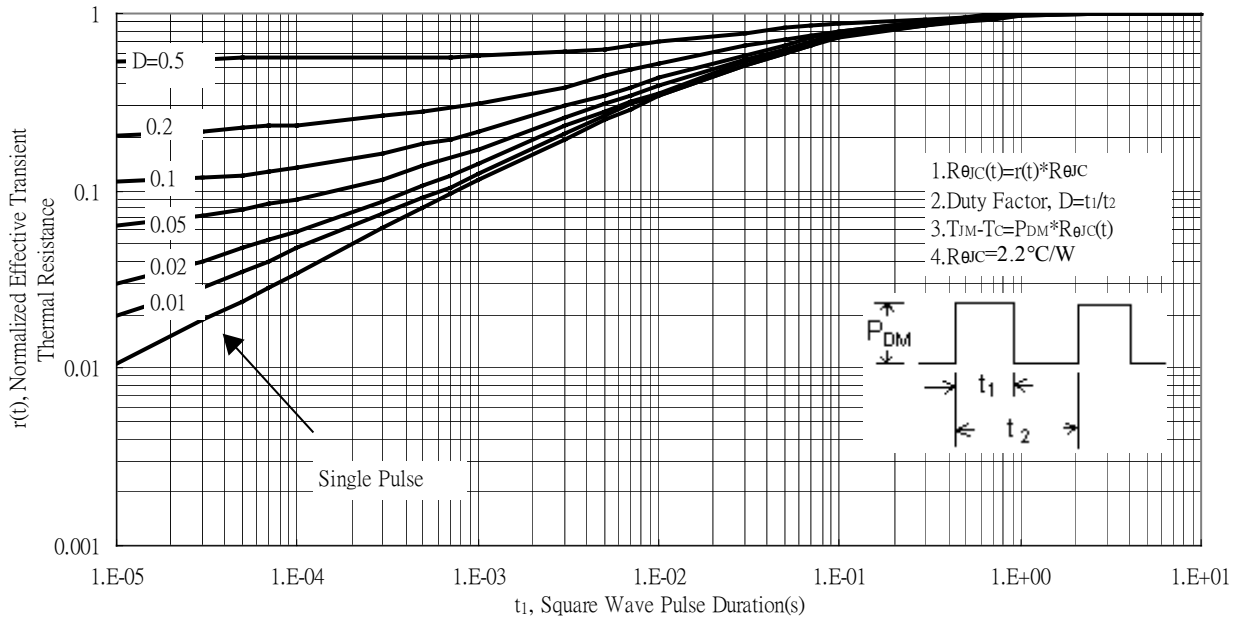
Maximum Drain Current vs Case Temperature



Single Pulse Power Rating, Junction to Case

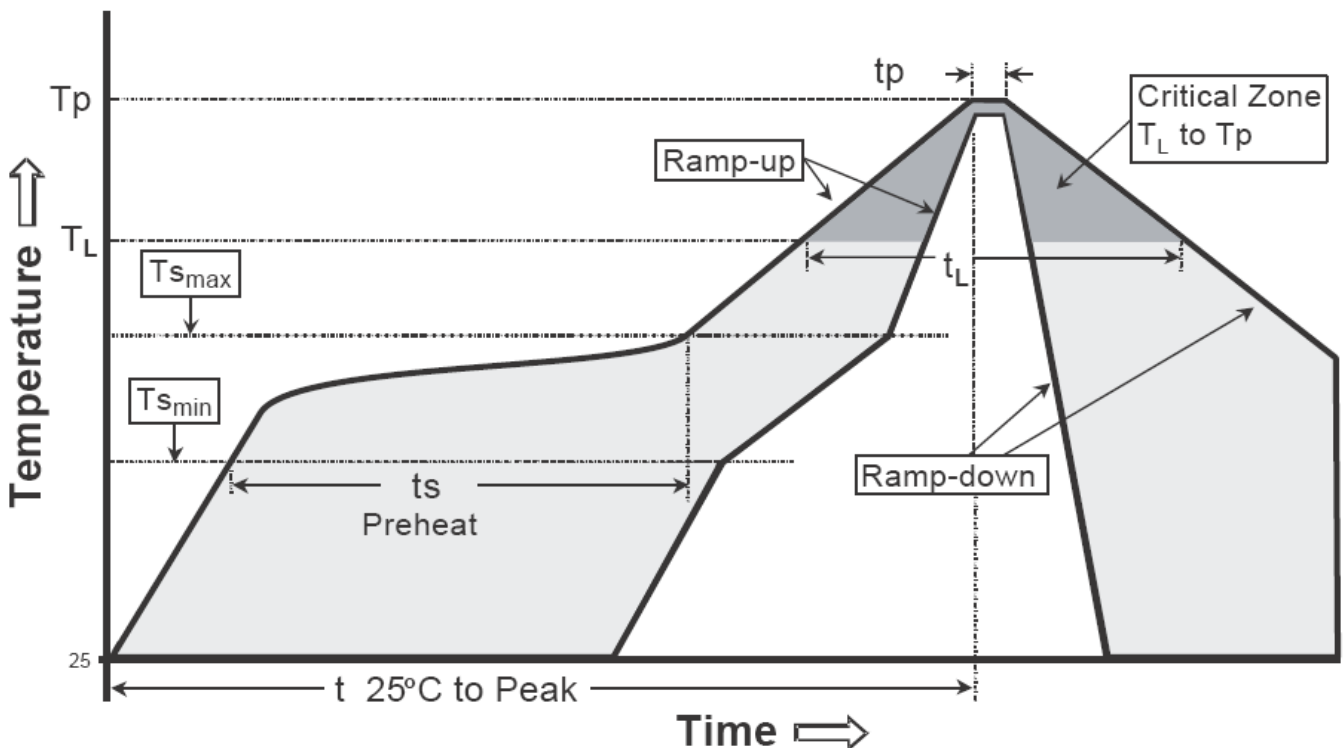


Transient Thermal Response Curves



**Recommended wave soldering condition**

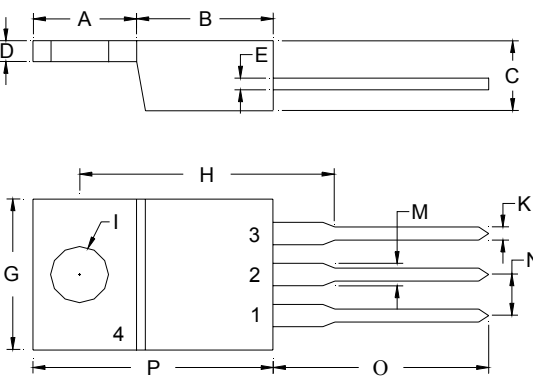
|                 |                  |                 |
|-----------------|------------------|-----------------|
| Product         | Peak Temperature | Soldering Time  |
| Pb-free devices | 260 +0/-5 °C     | 5 +1/-1 seconds |

**Recommended temperature profile for IR reflow**


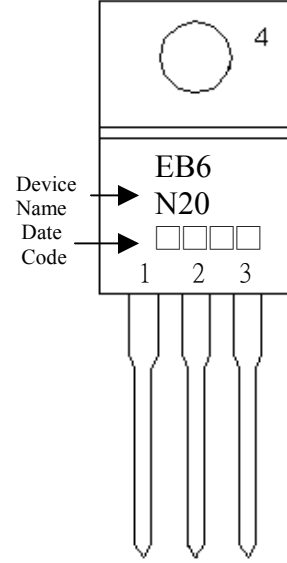
| Profile feature                                | Sn-Pb eutectic Assembly | Pb-free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp)             | 3°C/second max.         | 3°C/second max.  |
| Preheat  |                         |                  |
| -Temperature Min(Ts min)                       | 100°C                   | 150°C            |
| -Temperature Max(Ts max)                       | 150°C                   | 200°C            |
| -Time(ts min to ts max)                        | 60-120 seconds          | 60-180 seconds   |
| Time maintained above:                         |                         |                  |
| -Temperature (Tl)                              | 183°C                   | 217°C            |
| - Time (tl)                                    | 60-150 seconds          | 60-150 seconds   |
| Peak Temperature(TP)                           | 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**



Marking:



3-Lead TO-220 Plastic Package  
 CYStek Package Code: E3

Style: Pin 1.Gate 2.Drain 3.Source  
 4.Drain

\*: Typical

| DIM | Inches |         | Millimeters |        | DIM | Inches |         | Millimeters |       |
|-----|--------|---------|-------------|--------|-----|--------|---------|-------------|-------|
|     | Min.   | Max.    | Min.        | Max.   |     | Min.   | Max.    | Min.        | Max.  |
| A   | 0.2441 | 0.2598  | 6.20        | 6.60   | I   | -      | *0.1508 | -           | *3.83 |
| B   | 0.3386 | 0.3543  | 8.60        | 9.00   | K   | 0.0299 | 0.0394  | 0.76        | 1.00  |
| C   | 0.1732 | 0.1890  | 4.40        | 4.80   | M   | 0.0461 | 0.0579  | 1.17        | 1.47  |
| D   | 0.0492 | 0.0571  | 1.25        | 1.45   | N   | -      | *0.1000 | -           | *2.54 |
| E   | 0.0142 | 0.0197  | 0.36        | 0.50   | O   | 0.5217 | 0.5610  | 13.25       | 14.25 |
| G   | 0.3858 | 0.4094  | 9.80        | 10.40  | P   | 0.5787 | 0.6024  | 14.70       | 15.30 |
| H   | -      | *0.6398 | -           | *16.25 |     |        |         |             |       |

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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