

N-Channel Enhancement Mode Power MOSFET

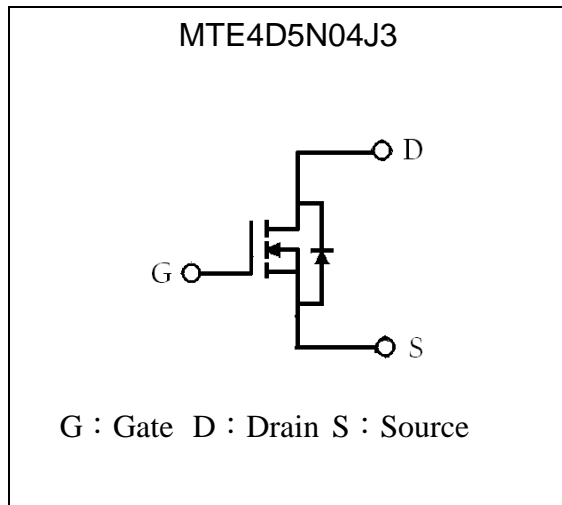
MTE4D5N04J3

| | |
|---|---------------------------|
| BV_{DSS} | 40V |
| I_D@V_{GS}=10V, T_C=25°C | 86A(silicon limit) |
| I_D@V_{GS}=10V, T_C=25°C | 60A(package limit) |
| R_{DS(ON)}@V_{GS}=10V, I_D=50A | 3.8 mΩ (typ) |

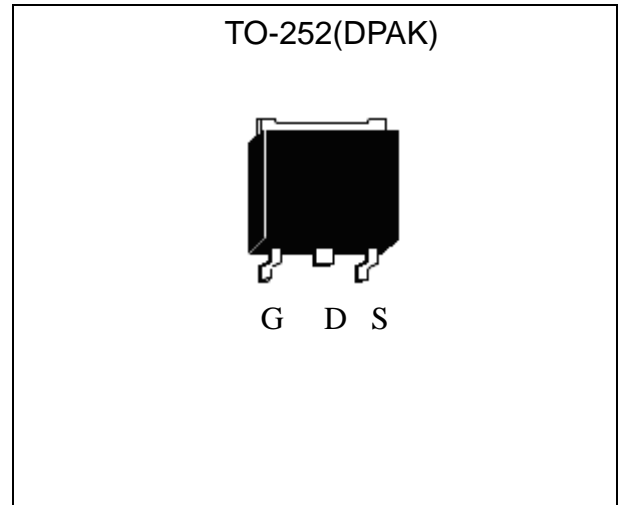
Features

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- Pb-free lead plating and halogen-free package

Symbol

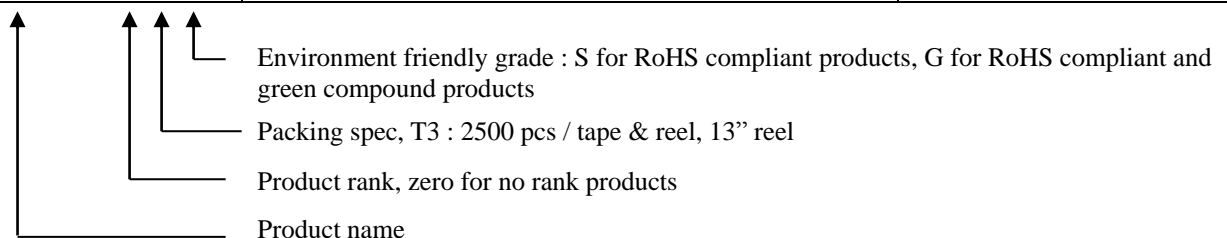


Outline



Ordering Information

| Device | Package | Shipping |
|--------------------|---|-----------------------|
| MTE4D5N04J3-0-T3-G | TO-252 (Pb-free lead plating and halogen-free package) | 2500 pcs / tape& reel |



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

| Parameter | Symbol | Limits | Unit | |
|---|----------------|------------------------------------|--------------------|---|
| Drain-Source Voltage (Note 1) | V_{DS} | 40 | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | | |
| Continuous Drain Current @ $T_C=25^{\circ}\text{C}$, $V_{GS}=10\text{V}$ (silicon limit) (Note 5) | I_D | 86 | A | |
| Continuous Drain Current @ $T_C=100^{\circ}\text{C}$, $V_{GS}=10\text{V}$ (silicon limit) (Note 5) | | 61 | | |
| Continuous Drain Current @ $T_C=25^{\circ}\text{C}$, $V_{GS}=10\text{V}$ (package limit) (Note 5) | | 60 | | |
| Continuous Drain Current @ $T_A=25^{\circ}\text{C}$, $V_{GS}=10\text{V}$ (Note 2) | I_{DSM} | 18 | | |
| Continuous Drain Current @ $T_A=70^{\circ}\text{C}$, $V_{GS}=10\text{V}$ (Note 2) | | 14.4 | | |
| Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 3) | I_{DM} | 344 | | |
| Avalanche Current @ $L=0.1\text{mH}$ | I_{AS} | 60 | | |
| Single Pulse Avalanche Energy @ $L=1\text{mH}$, $I_D=26\text{A}$, $V_{DD}=15\text{V}$ (Note 4) | E_{AS} | 338 | mJ | |
| Power Dissipation | P_D | $T_C=25^{\circ}\text{C}$ (Note 1) | 65 | W |
| | | $T_C=100^{\circ}\text{C}$ (Note 1) | 32.5 | |
| | P_{DSM} | $T_A=25^{\circ}\text{C}$ (Note 2) | 2.5 | |
| | | $T_A=70^{\circ}\text{C}$ (Note 2) | 1.6 | |
| Operating Junction and Storage Temperature | T_j, T_{stg} | $-55\sim+175$ | $^{\circ}\text{C}$ | |

Stress exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Thermal Data

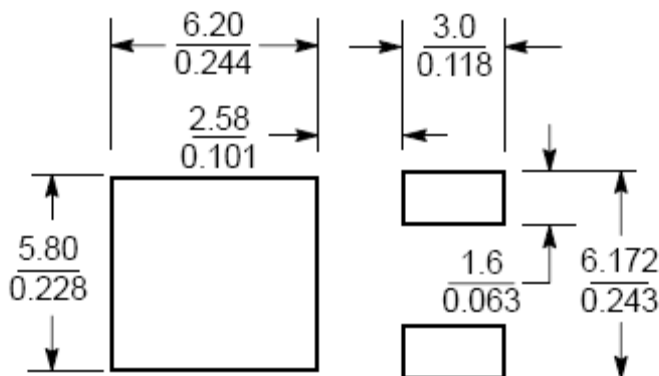
| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|-----------------------------|
| Thermal Resistance, Junction-to-case, max | $R_{\theta JC}$ | 2.3 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-ambient, max (Note 2) | $R_{\theta JA}$ | 50 | |

- Note : 1. The power dissipation P_D is based on $T_{J(MAX)}=175^{\circ}\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C .
3. Pulse width limited by junction temperature $T_{J(MAX)}=175^{\circ}\text{C}$. Ratings are based on low frequency and low duty cycles to keep initial $T_J=25^{\circ}\text{C}$.
4. 100% tested by conditions of $L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $I_{AS}=20\text{A}$, $V_{DD}=15\text{V}$
5. Calculated continuous current based on maximum allowable junction temperature. Guaranteed by design, not subject to 100% production test. Current is limited to 43A by course bond technology.

Characteristics (T_j=25°C, unless otherwise specified)

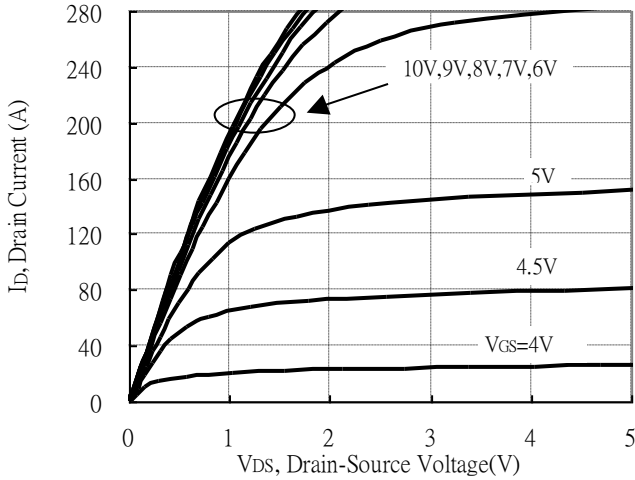
| Symbol | Min. | Typ. | Max. | Unit | Test Conditions |
|-------------------------------------|------|------|------|------|---|
| Static | | | | | |
| BV _{DSS} | 40 | - | - | V | V _{GS} =0V, I _D =250μA |
| ΔBV _{DSS} /ΔT _j | - | 0.03 | - | V/°C | Reference to 25°C, I _D =250μA |
| V _{GS(th)} | 2 | - | 4 | V | V _{DS} = V _{GS} , I _D =250μA |
| *G _{FS} | - | 18 | - | S | V _{DS} = 10V, I _D =10A |
| I _{GSS} | - | - | ±100 | nA | V _{GS} =±20V, V _{DS} =0V |
| I _{DSS} | - | - | 1 | μA | V _{DS} = 32V, V _{GS} = 0V |
| | - | - | 10 | | V _{DS} = 32V, V _{GS} = 0V, T _j =85°C |
| *R _{DS(ON)} | - | 3.8 | 5.2 | mΩ | V _{GS} = 10V, I _D =50A |
| Dynamic | | | | | |
| *Q _g | - | 52.2 | 68 | nC | V _{DS} =20V, V _{GS} =10V, I _D =30A |
| *Q _{gs} | - | 15 | 30 | | |
| *Q _{gd} | - | 11.1 | 22 | | |
| *t _{d(ON)} | - | 21 | - | ns | V _{DD} =20V, I _D =86A, V _{GS} =10V, R _G =3.5Ω |
| *t _r | - | 19 | - | | |
| *t _{d(OFF)} | - | 51.6 | - | | |
| *t _f | - | 13.4 | - | | |
| C _{iss} | - | 2582 | 3356 | pF | V _{GS} =0V, V _{DS} =25V, f=1MHz |
| C _{oss} | - | 261 | 339 | | |
| C _{rss} | - | 169 | 220 | | |
| R _g | - | 0.9 | - | Ω | f=1MHz |
| Source-Drain Diode | | | | | |
| *I _S | - | - | 86 | A | |
| *V _{SD} | - | 0.88 | 1.2 | V | I _S =50A, V _{GS} =0V |
| *t _{rr} | - | 14.9 | - | ns | V _{GS} =0V, I _F =50A, dI _F /dt=360A/μs |
| *Q _{rr} | - | 10.2 | - | nC | |

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

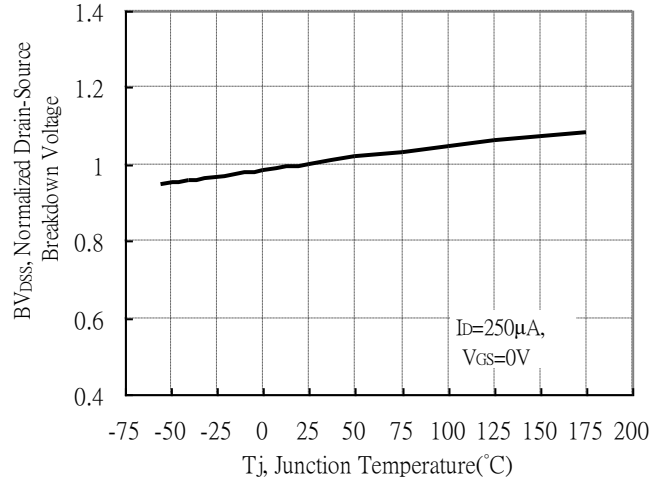
Recommended soldering footprint

 Unit ($\frac{\text{mm}}{\text{inch}}$)

Typical Characteristics

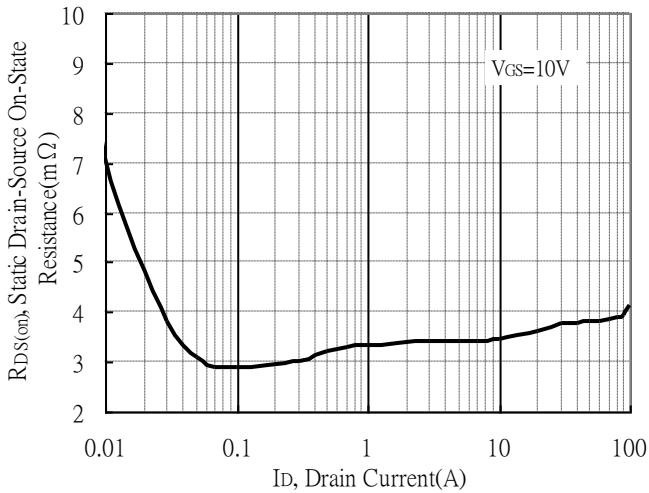
Typical Output Characteristics



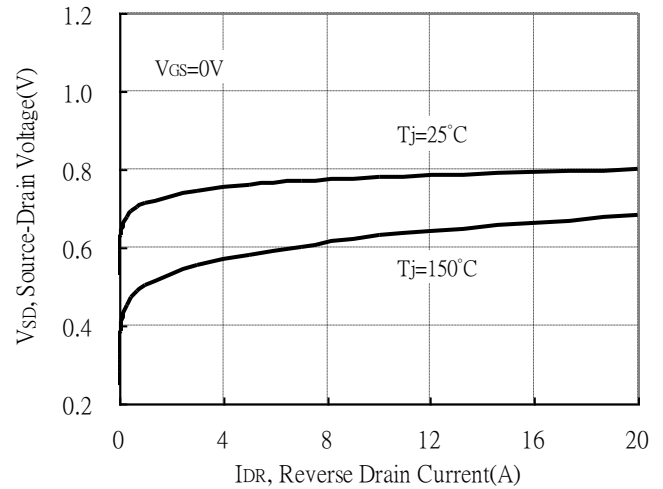
Brekdown Voltage vs Ambient Temperature



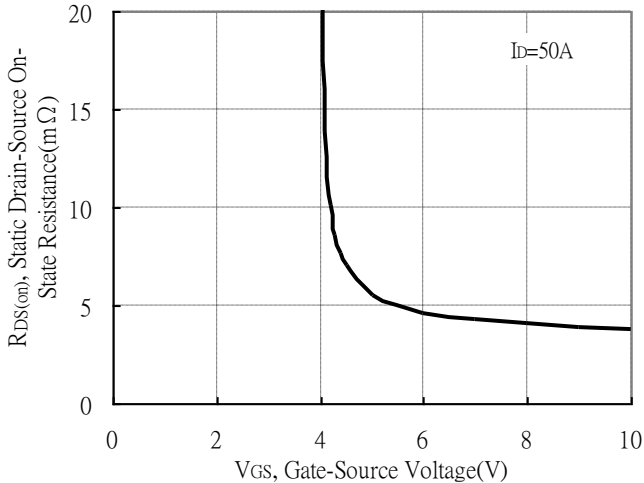
Static Drain-Source On-State resistance vs Drain Current



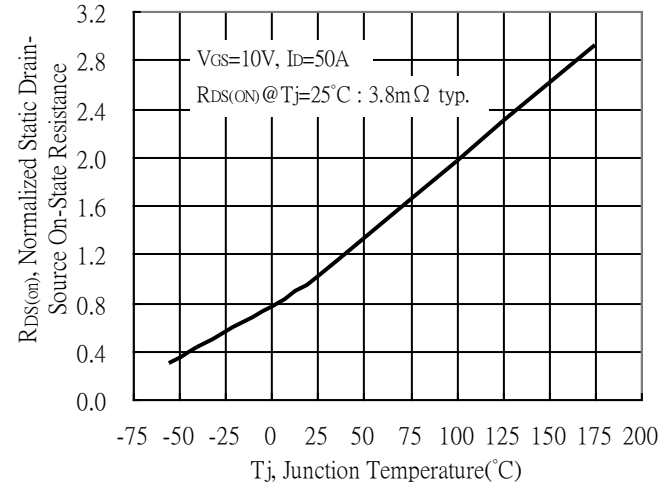
Reverse Drain Current vs Source-Drain Voltage



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

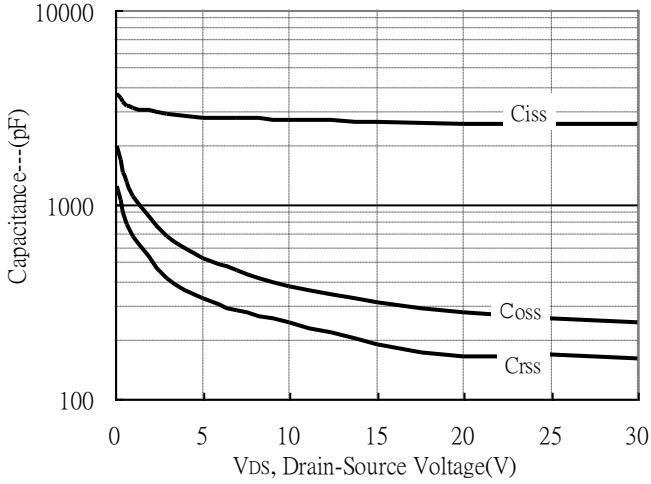


Drain-Source On-State Resistance vs Junction Temperature

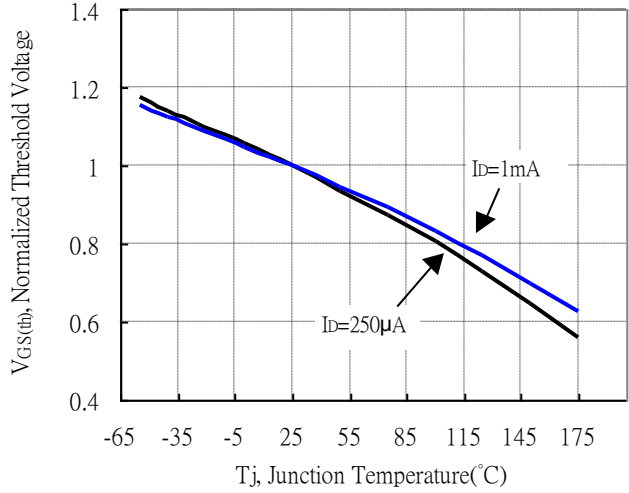


Typical Characteristics(Cont.)

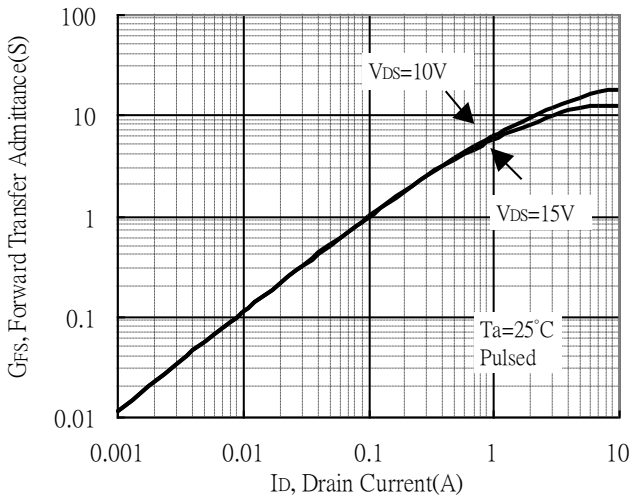
Capacitance vs Drain-to-Source Voltage



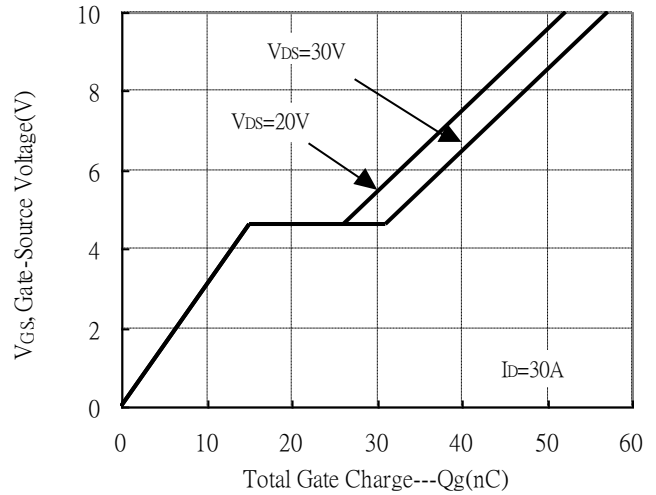
Threshold Voltage vs Junction Temperature



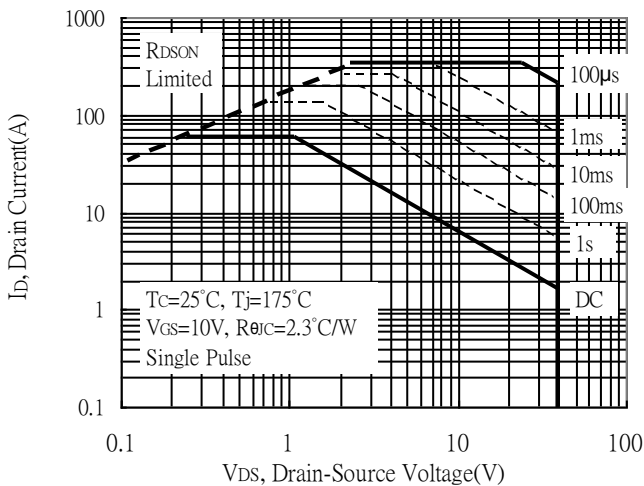
Forward Transfer Admittance vs Drain Current



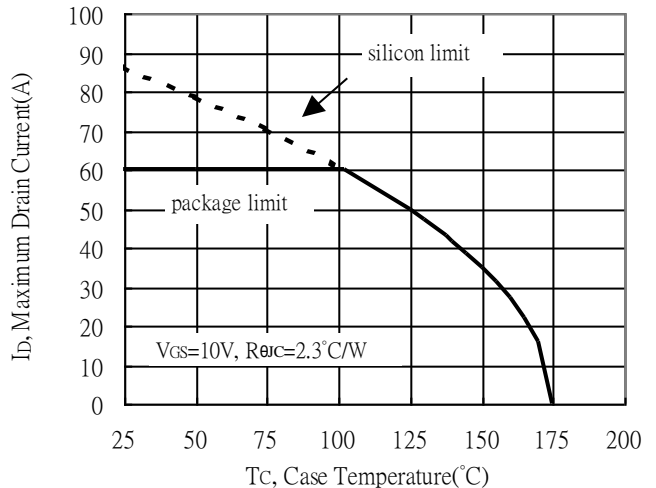
Gate Charge Characteristics



Maximum Safe Operating Area

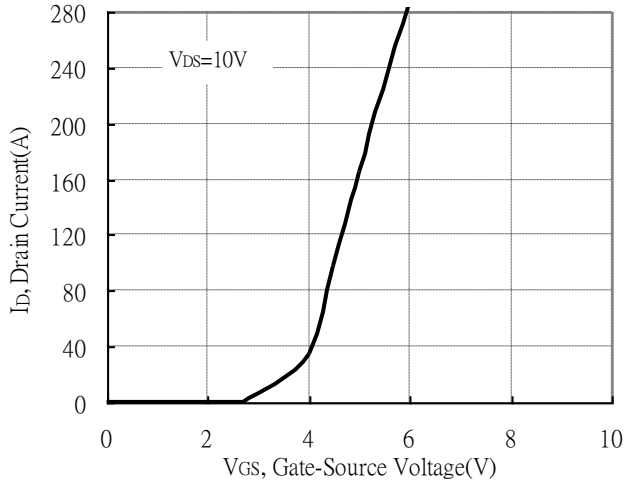


Maximum Drain Current vs Case Temperature

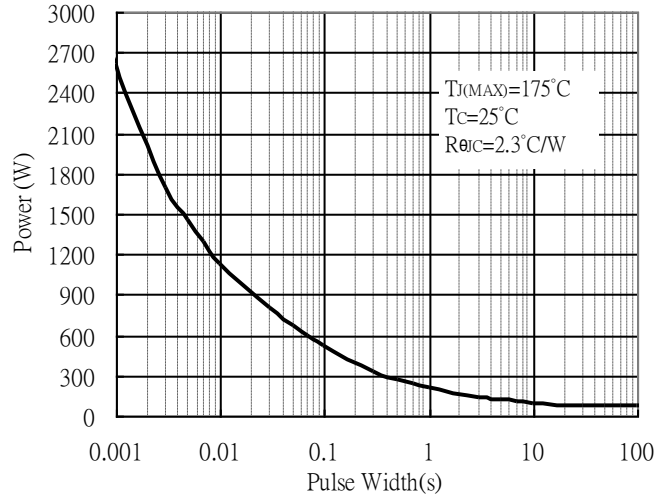


Typical Characteristics(Cont.)

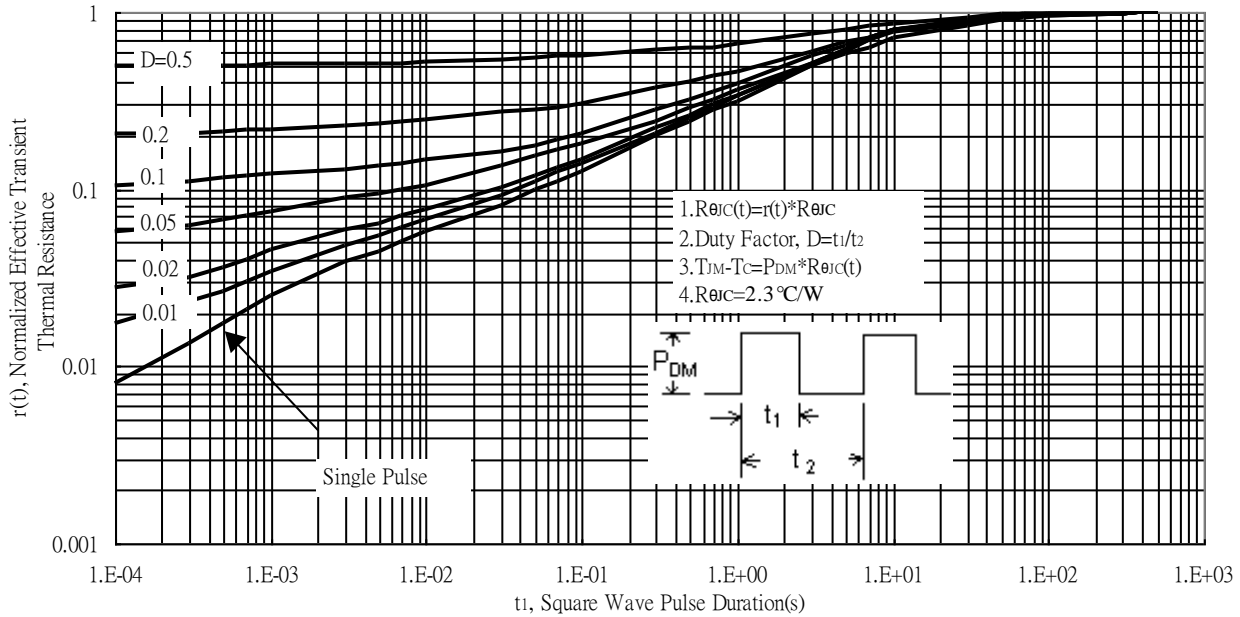
Typical Transfer Characteristics



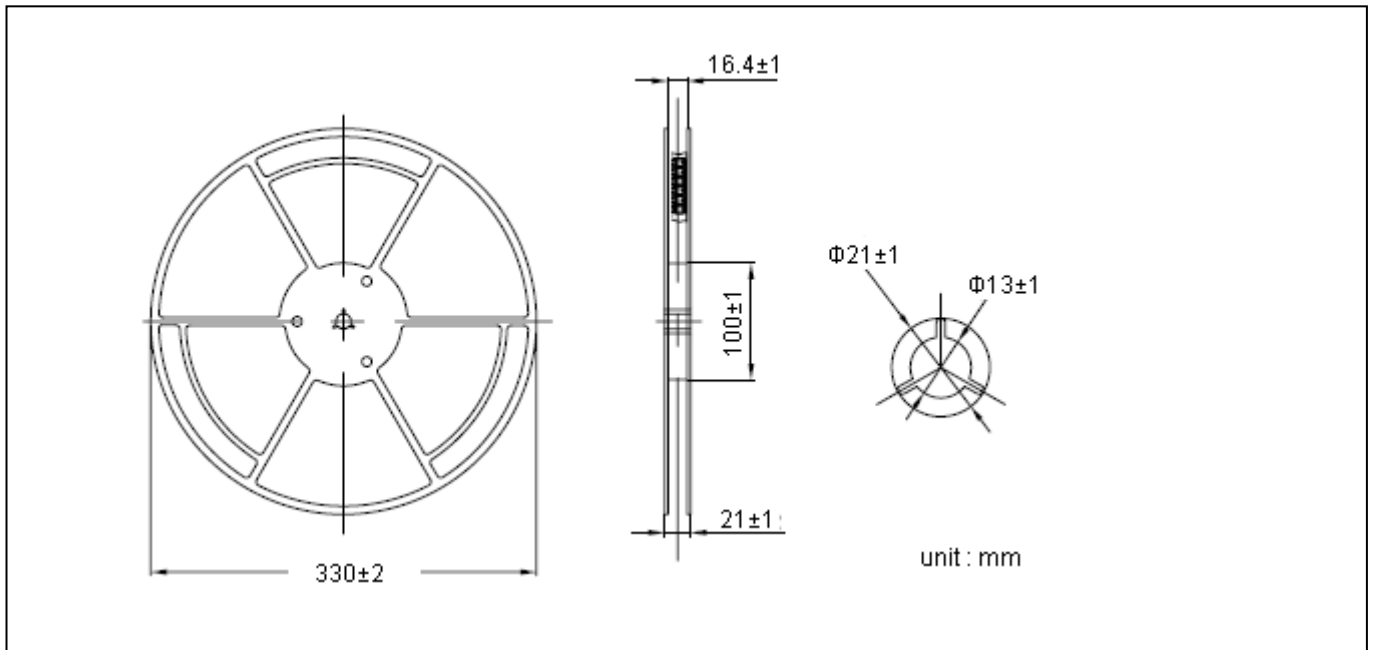
Single Pulse Power Rating, Junction to Case



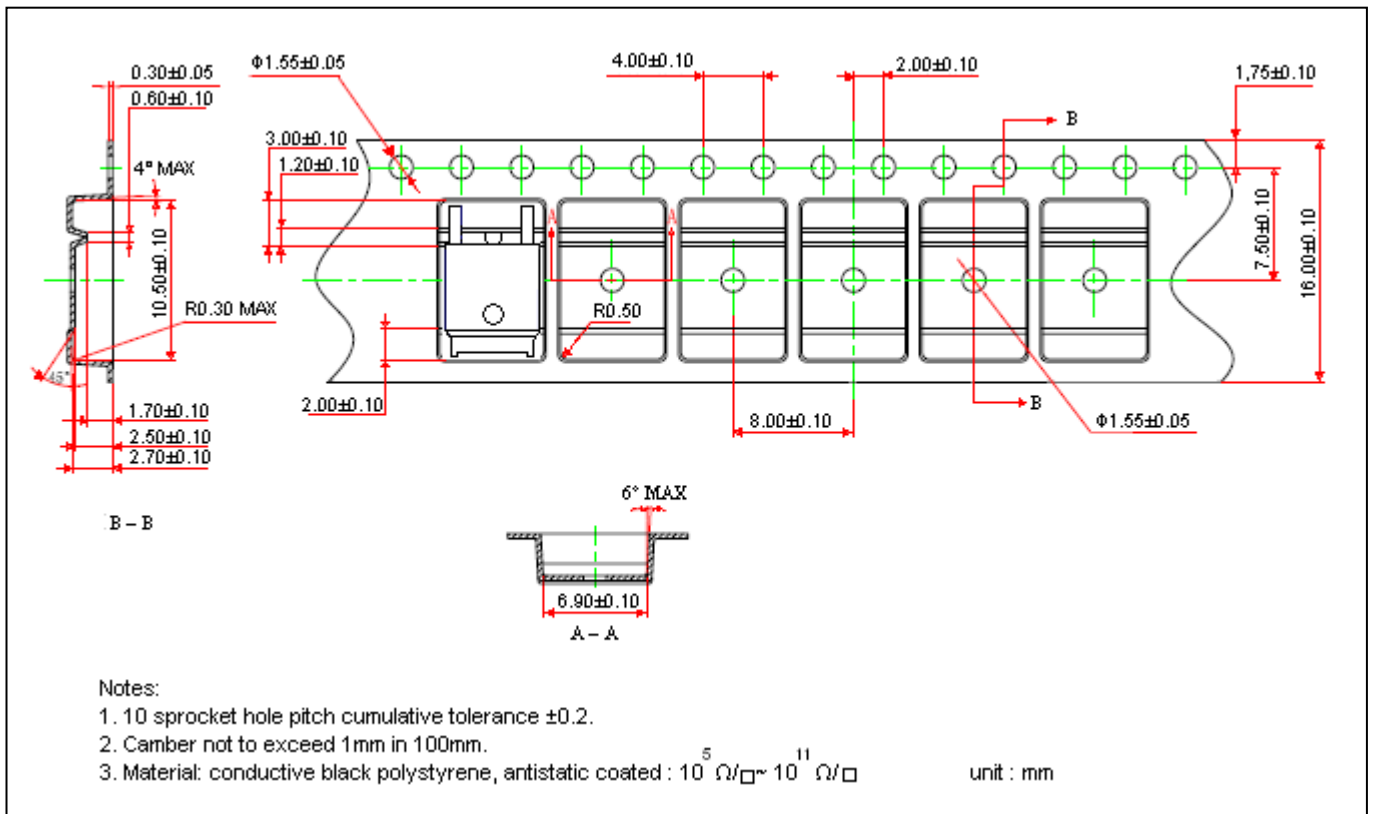
Transient Thermal Response Curves



Reel Dimension



Carrier Tape Dimension



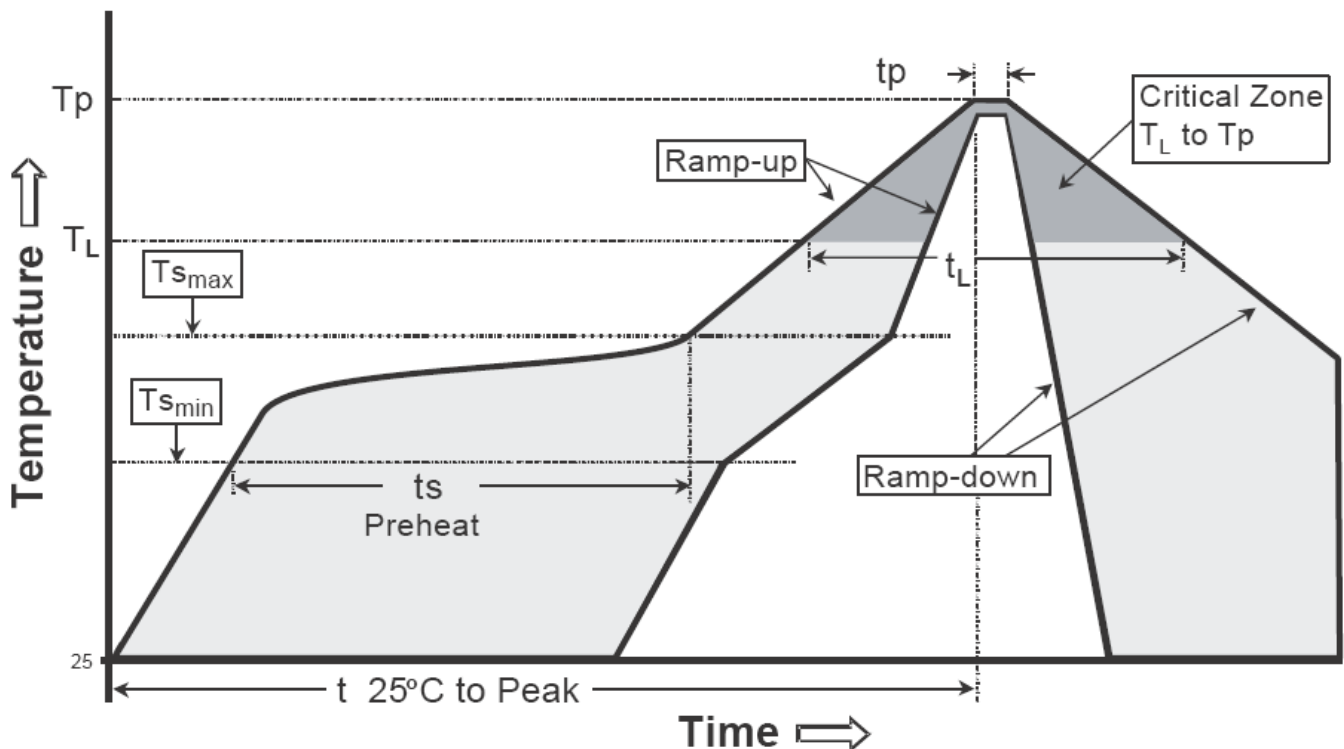
Notes:

1. 10 sprocket hole pitch cumulative tolerance ± 0.2 .
2. Camber not to exceed 1mm in 100mm.
3. Material: conductive black polystyrene, antistatic coated : $10^5 \Omega/\square \sim 10^{11} \Omega/\square$

unit : mm

Recommended wave soldering condition

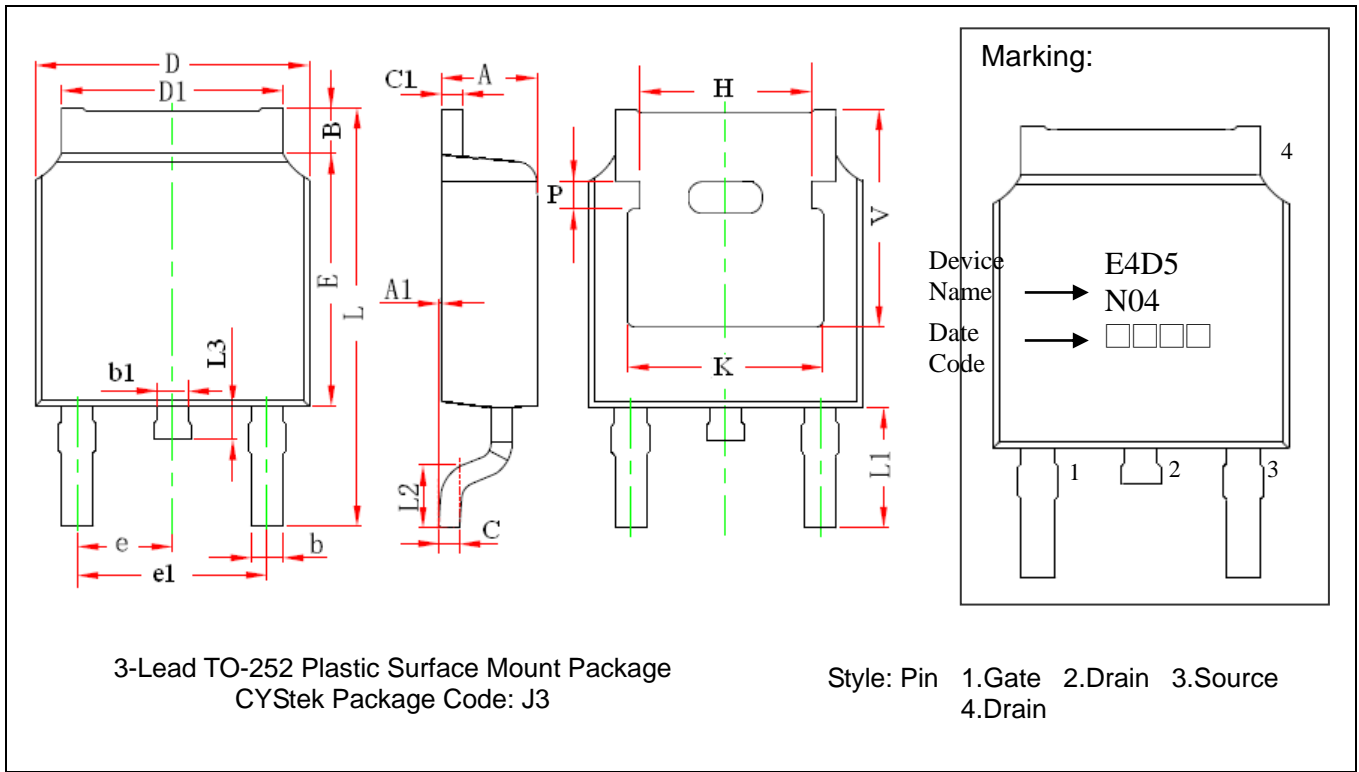
| | | |
|-----------------|------------------|-----------------|
| Product | Peak Temperature | Soldering Time |
| Pb-free devices | 260 +0/-5 °C | 5 +1/-1 seconds |

Recommended temperature profile for IR reflow


| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|---|-------------------------|------------------|
| Average ramp-up rate (T _{smax} to T _p) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| -Temperature Min(T _{s min}) | 100°C | 150°C |
| -Temperature Max(T _{s max}) | 150°C | 200°C |
| -Time(t _{s min} to t _{s max}) | 60-120 seconds | 60-180 seconds |
| Time maintained above: | | |
| -Temperature (T _L) | 183°C | 217°C |
| - Time (t _L) | 60-150 seconds | 60-150 seconds |
| Peak Temperature(T _p) | 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-252 Dimension



| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|-------|-----|--------|-------|-------------|--------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.087 | 0.094 | 2.200 | 2.400 | e | 0.086 | 0.094 | 2.186 | 2.386 |
| A1 | 0.000 | 0.005 | 0.000 | 0.127 | e1 | 0.172 | 0.188 | 4.372 | 4.772 |
| B | 0.039 | 0.048 | 0.990 | 1.210 | H | 0.163 | REF | 4.140 | REF |
| b | 0.026 | 0.034 | 0.660 | 0.860 | K | 0.190 | REF | 4.830 | REF |
| b1 | 0.026 | 0.034 | 0.660 | 0.860 | L | 0.386 | 0.409 | 9.800 | 10.400 |
| C | 0.018 | 0.023 | 0.460 | 0.580 | L1 | 0.114 | REF | 2.900 | REF |
| C1 | 0.018 | 0.023 | 0.460 | 0.580 | L2 | 0.055 | 0.067 | 1.400 | 1.700 |
| D | 0.256 | 0.264 | 6.500 | 6.700 | L3 | 0.024 | 0.039 | 0.600 | 1.000 |
| D1 | 0.201 | 0.215 | 5.100 | 5.460 | P | 0.026 | REF | 0.650 | REF |
| E | 0.236 | 0.244 | 6.000 | 6.200 | V | 0.211 | REF | 5.350 | REF |

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.

Important Notice:

- All rights are reserved. Reproduction in whole or in part is prohibited without the prior written approval of CYStek.
- CYStek reserves the right to make changes to its products without notice.
- CYStek **semiconductor products are not warranted to be suitable for use in Life-Support Applications, or systems.**
- CYStek assumes no liability for any consequence of customer product design, infringement of patents, or application assistance.