Ordering number : ENA1967A

# WPH4003

## N-Channel Power MOSFET
## 1700V, 3A, 10.5Ω, TO-3PF-3L

ON Semiconductor®
http://onsemi.com

### Features

- ON-resistance RDS (on) =8.2Ω (typ.)
- Input Capacitance Ciss=850pF (typ.)
- 10V drive

### Specifications

#### Absolute Maximum Ratings at Ta=25°C

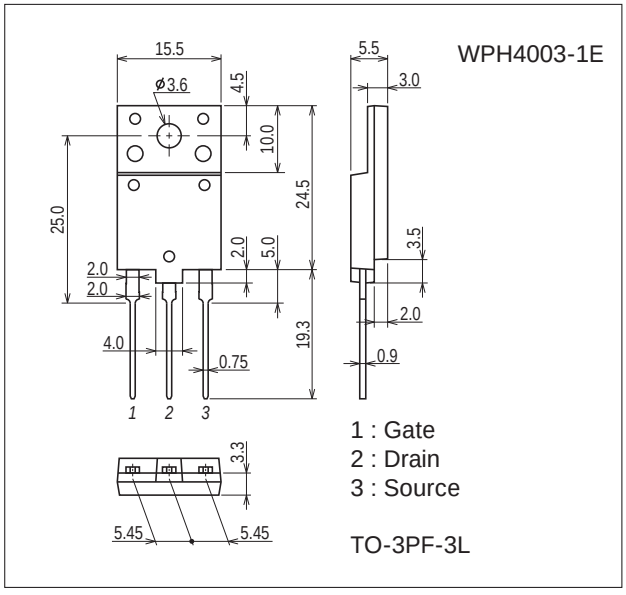
| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Drain-to-Source Voltage | $V_{DSS}$ | | 1700 | V |
| Gate-to-Source Voltage | $V_{GSS}$ | | ±30 | V |
| Drain Current (DC) | $I_{Dc}$*1 | Limited only maximum temperature Tch=150°C | 3 | A |
| | $I_{Dpack}$*2 | Tc=25°C (Our ideal heat dissipation condition) *3 | 2.5 | A |
| Drain Current (Pulse) | $I_{DP}$ | PW≤10μs, duty cycle≤1% | 6 | A |
| Allowable Power Dissipation | $P_D$ | | 3.0 | W |
| | | Tc=25°C | 55 | W |
| Channel Temperature | Tch | | 150 | °C |
| Storage Temperature | Tstg | | −55 to +150 | °C |
| Avalanche Energy (Single Pulse) *4 | $E_{AS}$ | | 49 | mJ |
| Avalanche Current *5 | $I_{AV}$ | | 3 | A |

Note :*1 Shows chip capability
*2 Package limited
*3 Our condition is radiation from backside.
The method is applying silicone grease to the backside of the device and attaching the device to water-cooled radiator made of aluminium.
*4 $V_{DD}$=50V, L=10mH, $I_{AV}$=3A (Fig.1)
*5 L≤10mH, single pulse

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### Package Dimensions

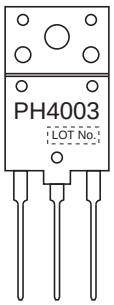
unit : mm (typ)
7538A-002



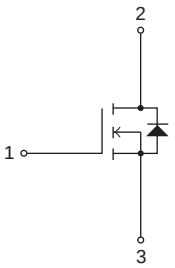

### Product & Package Information

- Package : TO-3PF-3L
- JEITA, JEDEC : SC-96
- Minimum Packing Quantity : 30 pcs./magazine

### Marking




### Electrical Connection

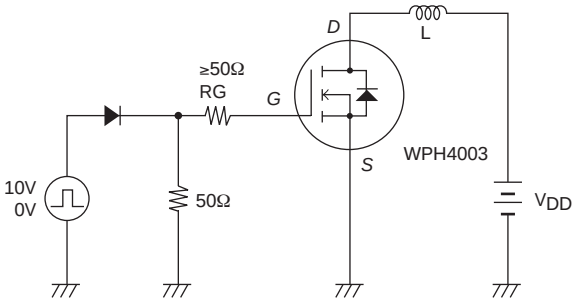



Semiconductor Components Industries, LLC, 2013

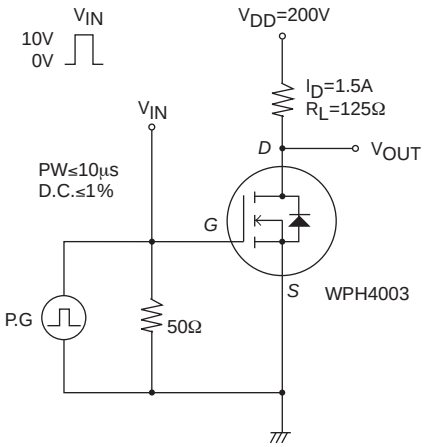
## Electrical Characteristics at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=10mA, $V_{GS}$=0V | 1700 | | | V |
| Zero-Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=1360V, $V_{GS}$=0V | | | 1 | mA |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V, $V_{DS}$=0V | | | ±100 | nA |
| Cutoff Voltage | $V_{GS}$(off) | $V_{DS}$=10V, $I_D$=1mA | 2 | | 4 | V |
| Forward Transfer Admittance | \| yfs \| | $V_{DS}$=20V, $I_D$=1.5A | 1.2 | 2.4 | | S |
| Static Drain-to-Source On-State Resistance | $R_{DS}$(on) | $I_D$=1.5A, $V_{GS}$=10V | | 8.2 | 10.5 | Ω |
| Input Capacitance | Ciss | $V_{DS}$=30V, f=1MHz | | 850 | | pF |
| Output Capacitance | Coss | | | 90 | | pF |
| Reverse Transfer Capacitance | Crss | | | 27 | | pF |
| Turn-ON Delay Time | $t_d$(on) | See Fig.2 | | 19 | | ns |
| Rise Time | $t_r$ | | | 21 | | ns |
| Turn-OFF Delay Time | $t_d$(off) | | | 200 | | ns |
| Fall Time | $t_f$ | | | 55 | | ns |
| Total Gate Charge | Qg | $V_{DS}$=200V, $V_{GS}$=10V, $I_D$=3A | | 48 | | nC |
| Gate-to-Source Charge | Qgs | | | 6 | | nC |
| Gate-to-Drain “Miller” Charge | Qgd | | | 22 | | nC |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=3A, $V_{GS}$=0V | | 0.8 | 1.5 | V |
| Reverse Recovery Time | $t_{rr}$ | See Fig.3 | | 410 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | $I_S$=3A, $V_{GS}$=0V, di/dt=100A/μs | | 3000 | | nC |

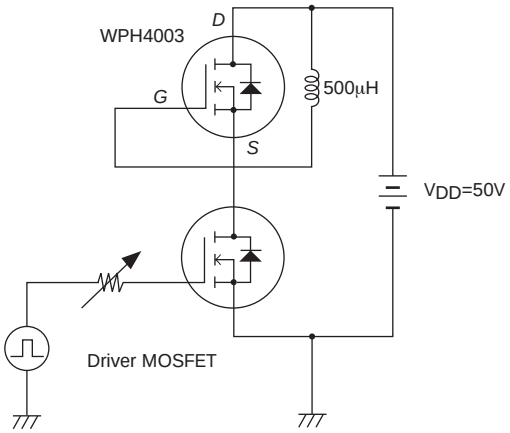
### Fig.1 Unclamped Inductive Switching Test Circuit




### Fig.2 Switching Time Test Circuit

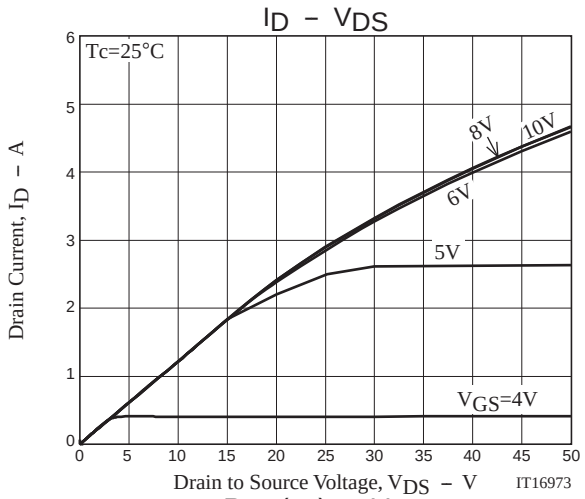


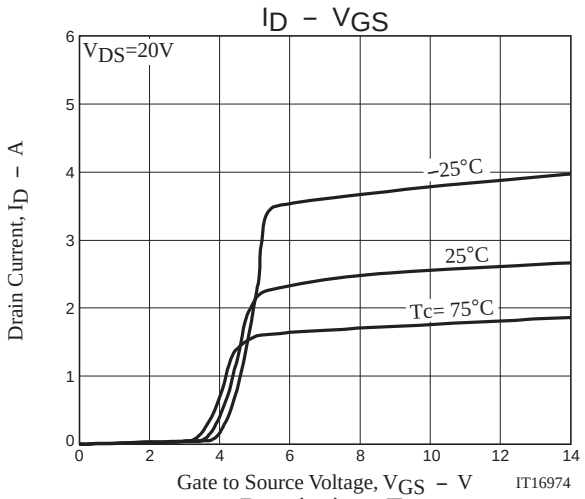

### Fig.3 Reverse Recovery Time Test Circuit

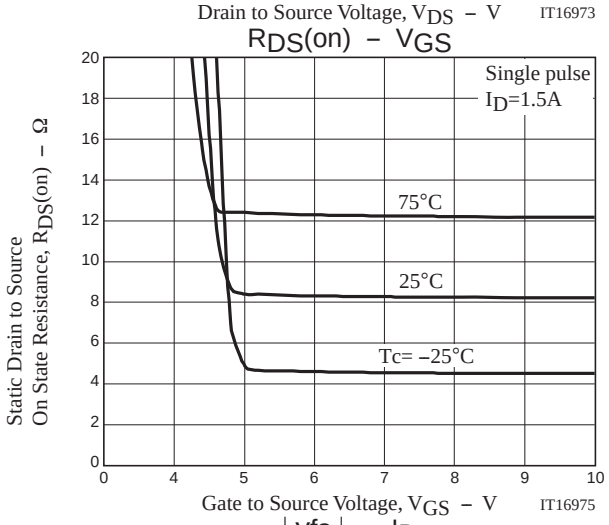


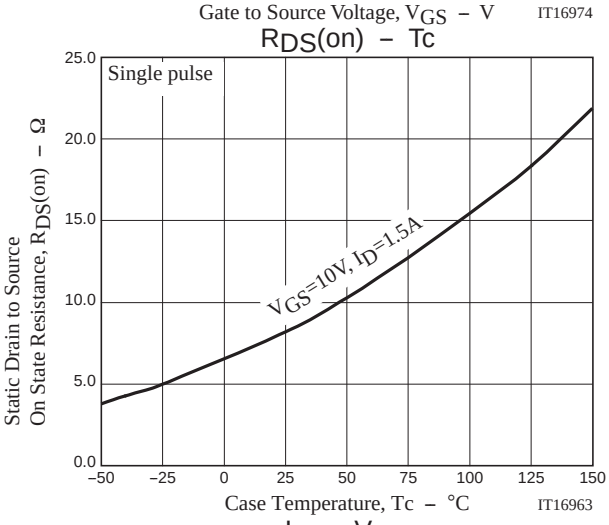

## Ordering Information

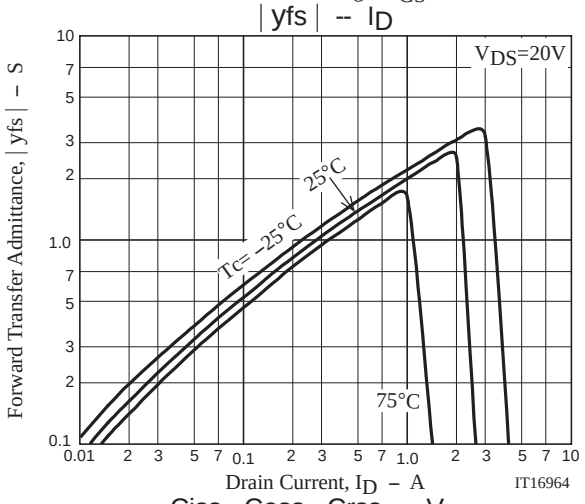
| Device | Package | Shipping | memo |
|---|---|---|---|
| WPH4003-1E | TO-3PF-3L | 30pcs./magazine | Pb Free |

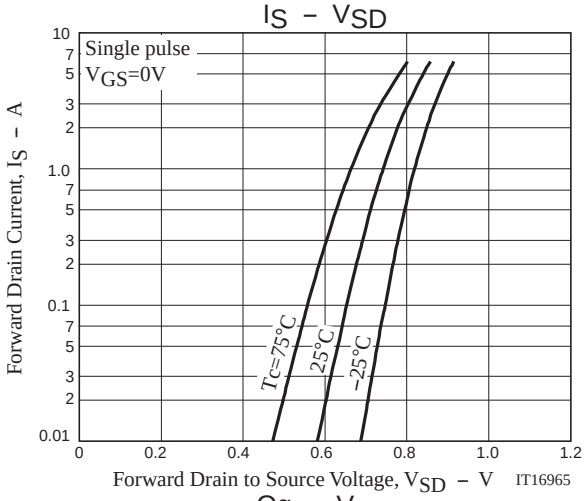

ID – VDS
Tc=25°C
8V
10V
6V
5V
VGS=4V
Drain Current, ID – A
Drain to Source Voltage, VDS – V
IT16973

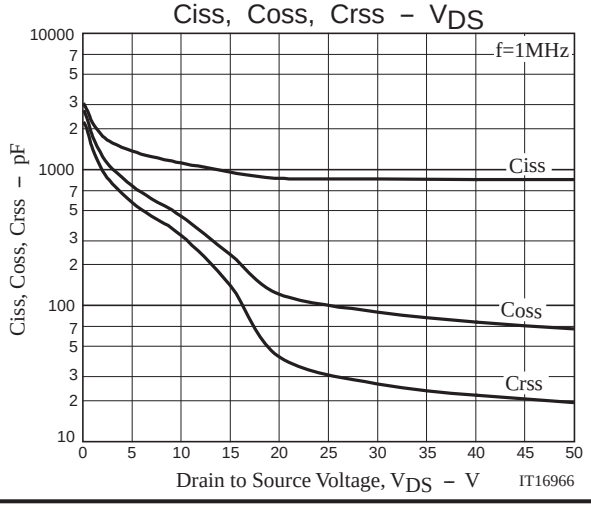

ID – VGS
VDS=20V
–25°C
25°C
Tc= 75°C
Drain Current, ID – A
Gate to Source Voltage, VGS – V
IT16974

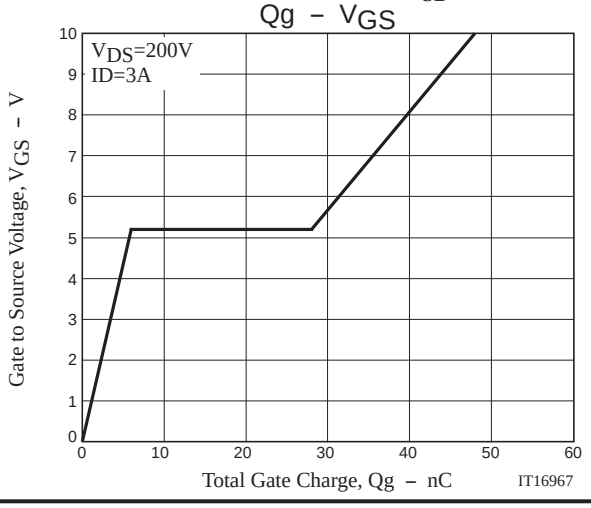

RDS(on) – VGS
Single pulse
ID=1.5A
75°C
25°C
Tc= –25°C
Static Drain to Source
On State Resistance, RDS(on) – Ω
Gate to Source Voltage, VGS – V
IT16975


RDS(on) – Tc
Single pulse
VGS=10V, ID=1.5A
Static Drain to Source
On State Resistance, RDS(on) – Ω
Case Temperature, Tc – °C
IT16963

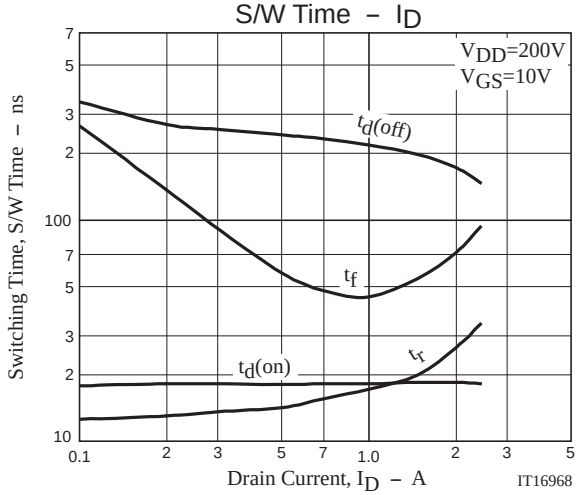

| yfs | -- ID
VDS=20V
25°C
Tc= –25°C
75°C
Forward Transfer Admittance, | yfs | – S
Drain Current, ID – A
IT16964


IS – VSD
Single pulse
VGS=0V
Tc=75°C
25°C
–25°C
Forward Drain Current, IS – A
Forward Drain to Source Voltage, VSD – V
IT16965

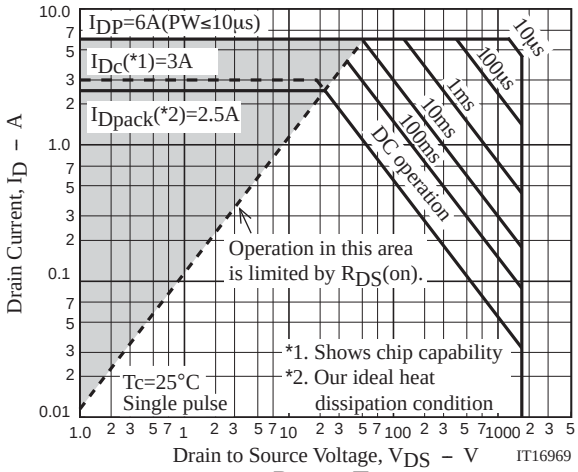

Ciss, Coss, Crss – VDS
f=1MHz
Ciss
Coss
Crss
Ciss, Coss, Crss – pF
Drain to Source Voltage, VDS – V
IT16966


Qg – VGS
VDS=200V
ID=3A
Gate to Source Voltage, VGS – V
Total Gate Charge, Qg – nC
IT16967

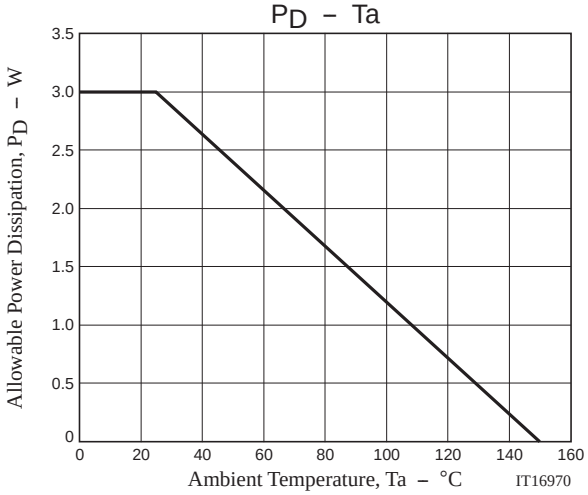
S/W Time – $I_D$



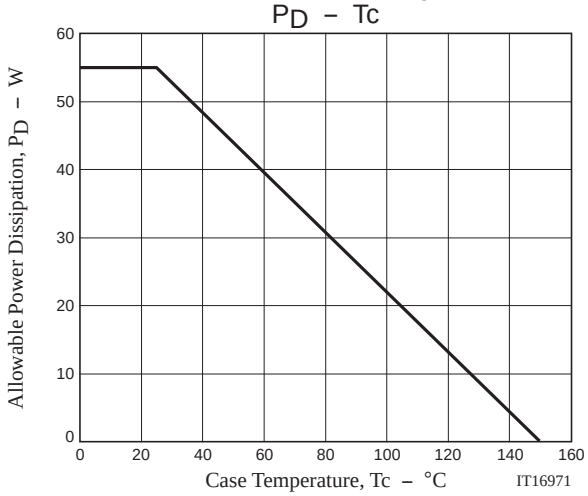

A S O



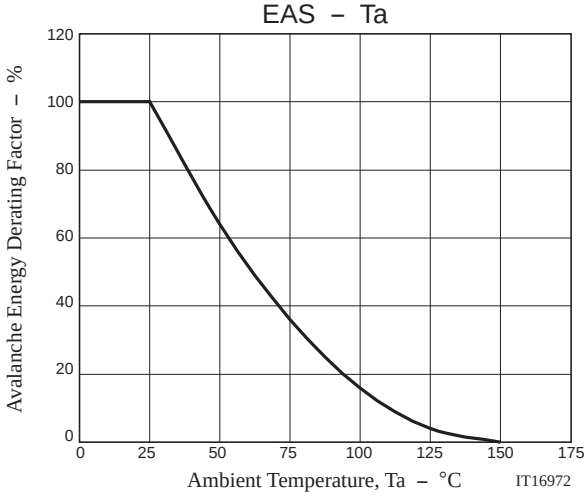

$P_D$ – Ta




$P_D$ – Tc




EAS – Ta



**Magazine Specification**

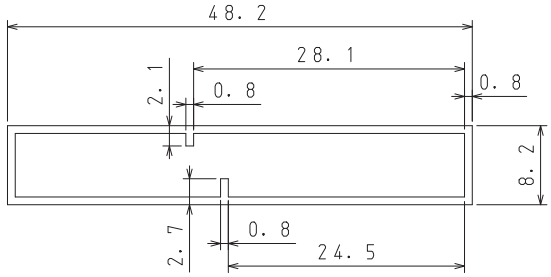
WPH4003-1E

## 1. Packing Format

| Package Name | Maximum Number of devices contained (pcs) | | | Packing format | |
|---|---|---|---|---|---|
| | Magazine | Inner box | Outer box | Inner BOX | Outer BOX |
| TO-3PF-3L | 30 | 360 | 1440 | SPD-0V0001<br>12 magazines contained<br>Dimensions:mm (external)<br>568×150×55 | SPD-LV0010<br>4 inner boxes contained<br>Dimensions:mm (external)<br>590x225x178 |

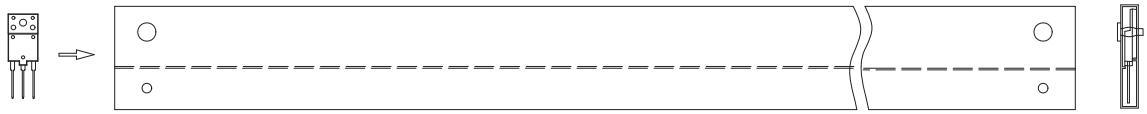
## 2. Magazine dimensions

(unit:mm)



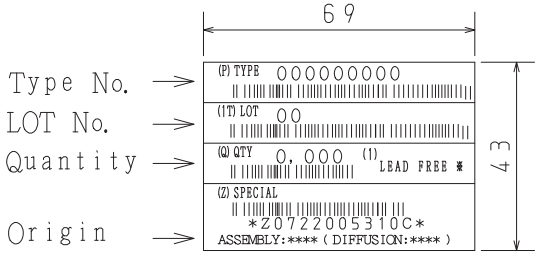

Tolerance=±0.2mm
Thickness=0.8±0.2mm
Length =508.0±1mm
Material =PVC or PET
(Antistatic treatment)

## 3. Storage method to magazine



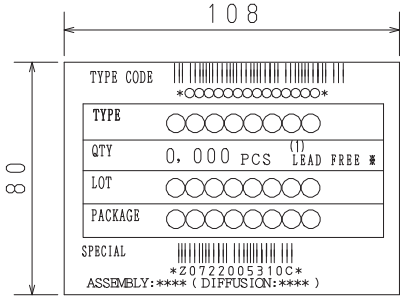



## 4. Inner box label (unit:mm)




## 5. Outer box label (unit:mm)

It is a label at the time of factory shipments.
The form of a label may change in physical distribution process.

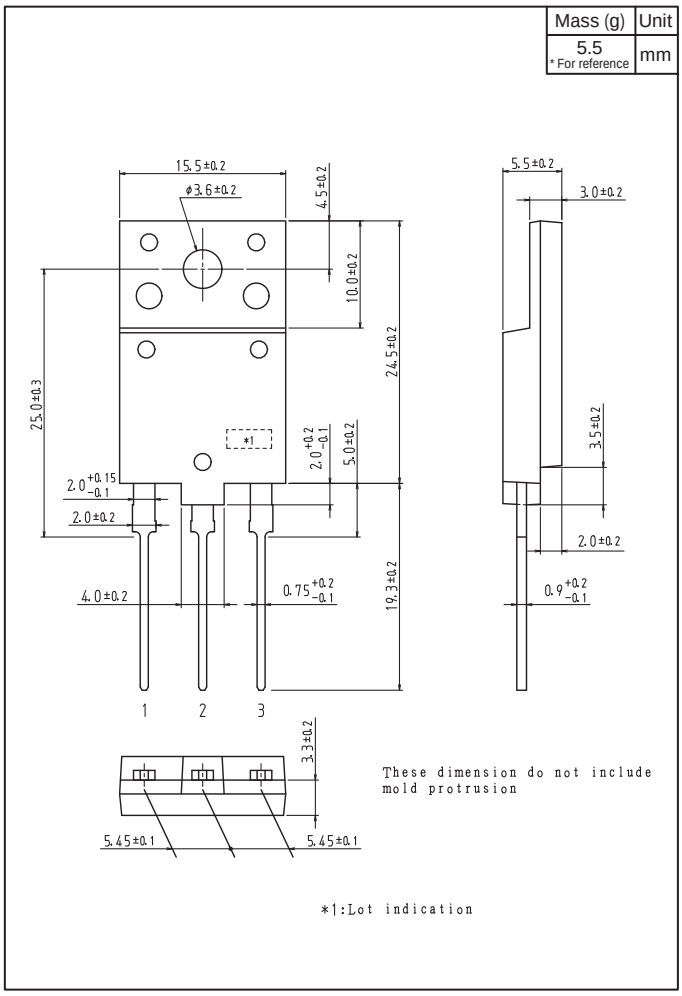



NOTE (1)
The LEAD FREE ※ description shows that the surface treatment of the terminal is lead free.

| Label | JEITA Phase |
|---|---|
| LEAD FREE 3 | JEITA Phase 3A |

## Outline Drawing

WPH4003-1E



Note on usage : Since the WPH4003 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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