Ordering number : ENA1903A

# ATP613

## N-Channel Power MOSFET
## 500V, 5.5A, 2Ω, ATPAK

ON Semiconductor®
http://onsemi.com

### Features

- Reverse recovery time $t_{rr}$=60ns(typ.)
- Input Capacitance Ciss=350pF(typ.)
- Halogen free compliance
- ON-resistance $R_{DS}(on)$=1.55Ω(typ.)
- 10V drive

### Specifications

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

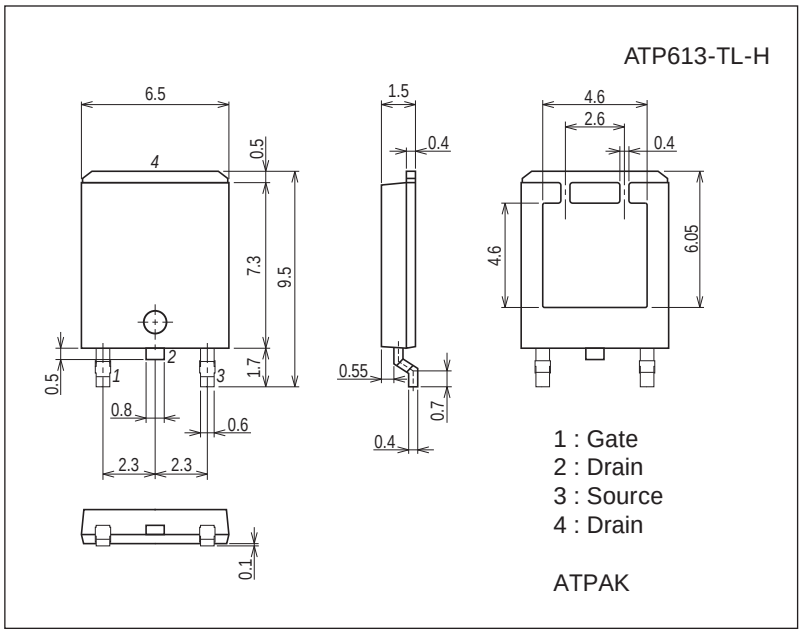
| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Drain-to-Source Voltage | $V_{DSS}$ | | 500 | V |
| Gate-to-Source Voltage | $V_{GSS}$ | | ±30 | V |
| Drain Current (DC) | $I_D$ | | 5.5 | A |
| Drain Current (Pulse) | $I_{DP}$ | PW≤10μs, duty cycle≤1% | 19 | A |
| Source-to-Drain Diode Forward Current (DC) | $I_S$ | | 5.5 | A |
| Source-to-Drain Diode Forward Current (Pulse) | $I_{SP}$ | PW≤10μs, duty cycle≤1% | 19 | A |
| Allowable Power Dissipation | $P_D$ | Tc=25°C | 70 | W |
| Channel Temperature | Tch | | 150 | °C |
| Storage Temperature | Tstg | | −55 to +150 | °C |
| Avalanche Energy (Single Pulse) *1 | $E_{AS}$ | | 93 | mJ |
| Avalanche Current *2 | $I_{AV}$ | | 5.5 | A |

Note :*1 $V_{DD}$=99V, L=5mH, $I_{AV}$=5.5A (Fig.1)
*2 L≤5mH, 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

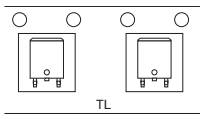
unit : mm (typ)
7057-001



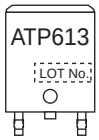

### Product & Package Information

- Package : ATPAK
- JEITA, JEDEC : -
- Minimum Packing Quantity : 3,000 pcs./reel

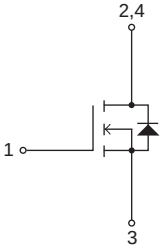
### Packing Type: TL




### Marking



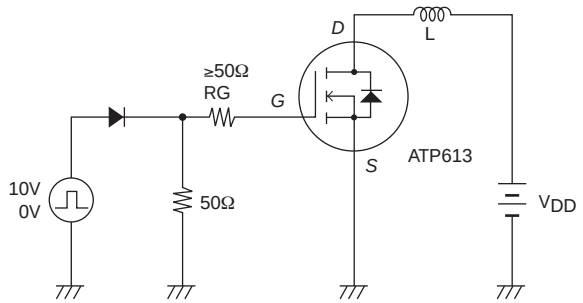

### Electrical Connection



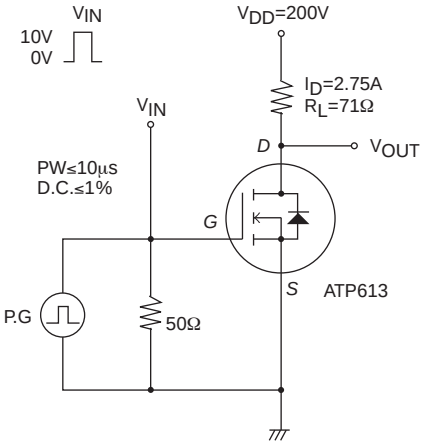
## Electrical Characteristics at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=10mA, $V_{GS}$=0V | 500 | | | V |
| Zero-Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=400V, $V_{GS}$=0V | | | 100 | μA |
| 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 | 3 | | 5 | V |
| Forward Transfer Admittance | \| yfs \| | $V_{DS}$=10V, $I_D$=2.75A | 1.5 | 2.9 | | S |
| Static Drain-to-Source On-State Resistance | $R_{DS}$(on) | $I_D$=2.75A, $V_{GS}$=10V | | 1.55 | 2.0 | Ω |
| Input Capacitance | Ciss | $V_{DS}$=30V, f=1MHz | | 350 | | pF |
| Output Capacitance | Coss | | | 68 | | pF |
| Reverse Transfer Capacitance | Crss | | | 15 | | pF |
| Turn-ON Delay Time | $t_d$(on) | See Fig.2 | | 14.2 | | ns |
| Rise Time | $t_r$ | | | 46 | | ns |
| Turn-OFF Delay Time | $t_d$(off) | | | 37.6 | | ns |
| Fall Time | $t_f$ | | | 20.4 | | ns |
| Total Gate Charge | Qg | $V_{DS}$=200V, $V_{GS}$=10V, $I_D$=5.5A | | 13.8 | | nC |
| Gate-to-Source Charge | Qgs | | | 3.2 | | nC |
| Gate-to-Drain “Miller” Charge | Qgd | | | 7.6 | | nC |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=5.5A, $V_{GS}$=0V | | 1.1 | 1.5 | V |
| Reverse Recovery Time | $t_{rr}$ | See Fig.3 | | 60 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | $I_S$=5.5A, $V_{GS}$=0V, di/dt=100A/μs | | 120 | | nC |

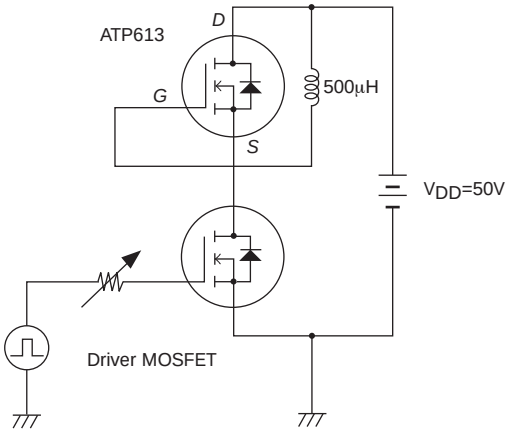
### Fig.1 Unclamped Inductive Switching Test Circuit




### Fig.2 Switching Time Test Circuit

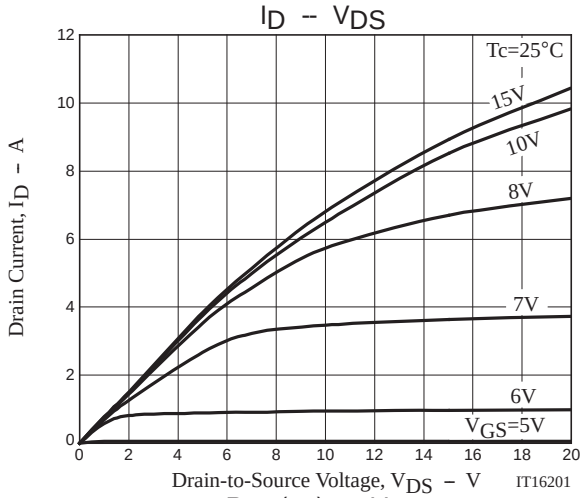


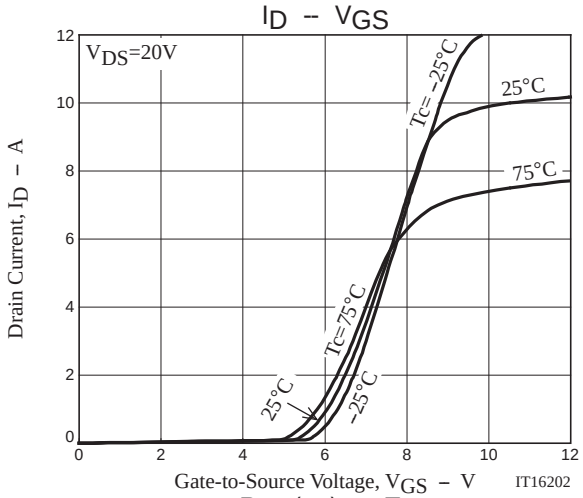

### Fig.3 Reverse Recovery Time Test Circuit

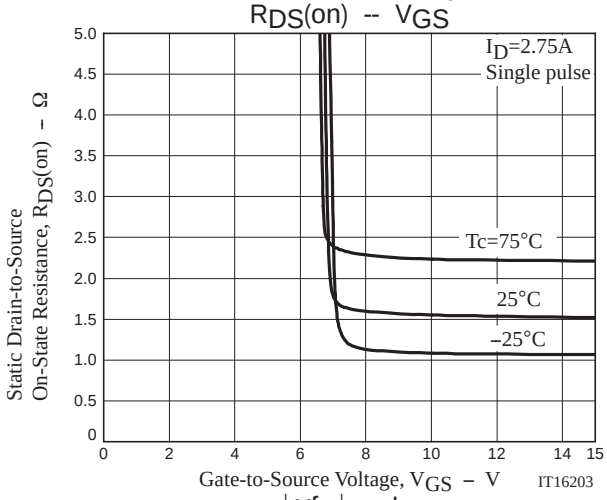


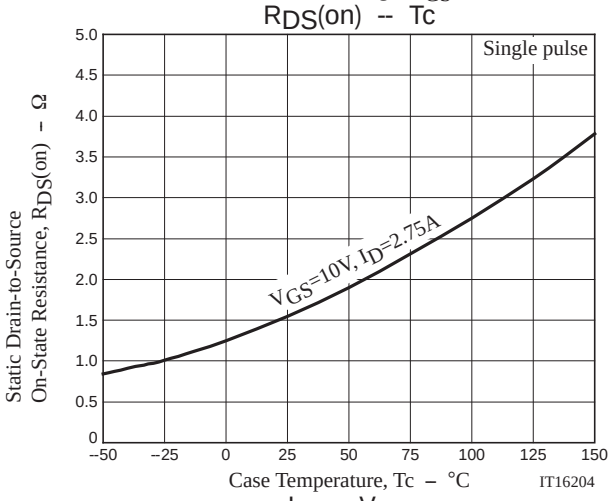

## Ordering Information

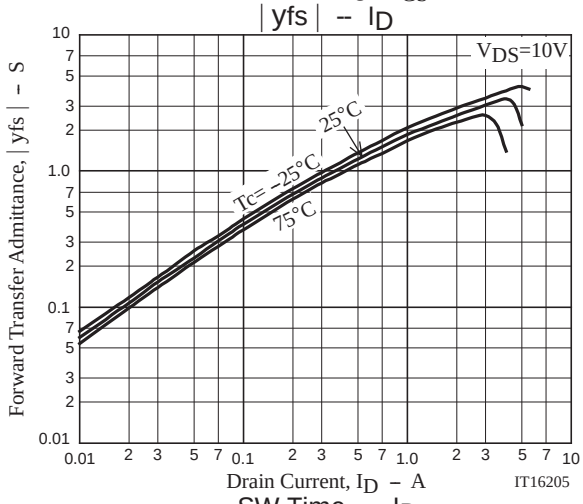
| Device | Package | Shipping | memo |
|---|---|---|---|
| ATP613-TL-H | ATPAK | 3,000pcs./reel | Pb Free and Halogen Free |

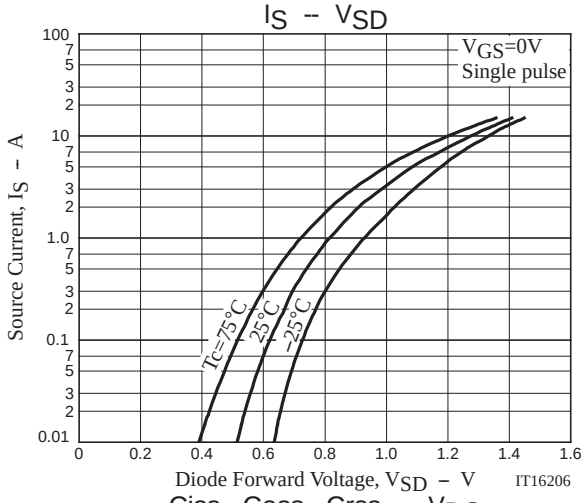

$I_D$ -- $V_{DS}$
Tc=25°C
15V
10V
8V
7V
6V
$V_{GS}$=5V
Drain Current, $I_D$ – A
Drain-to-Source Voltage, $V_{DS}$ – V
IT16201

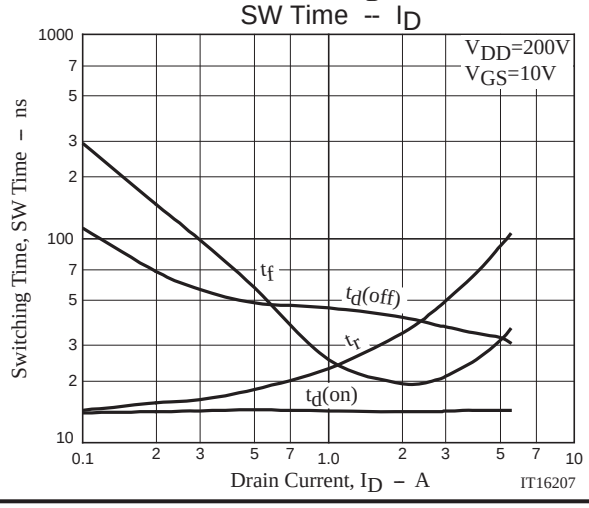

$I_D$ -- $V_{GS}$
$V_{DS}$=20V
Tc=–25°C
25°C
75°C
Tc=75°C
25°C
–25°C
Drain Current, $I_D$ – A
Gate-to-Source Voltage, $V_{GS}$ – V
IT16202

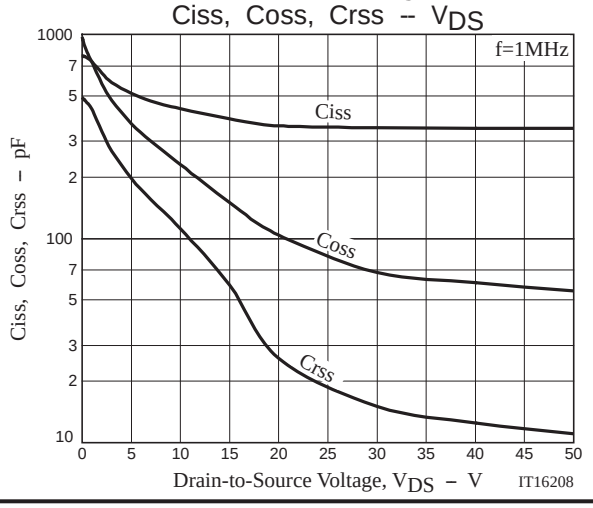

$R_{DS(on)}$ -- $V_{GS}$
$I_D$=2.75A
Single pulse
Tc=75°C
25°C
–25°C
Static Drain-to-Source On-State Resistance, $R_{DS(on)}$ – Ω
Gate-to-Source Voltage, $V_{GS}$ – V
IT16203

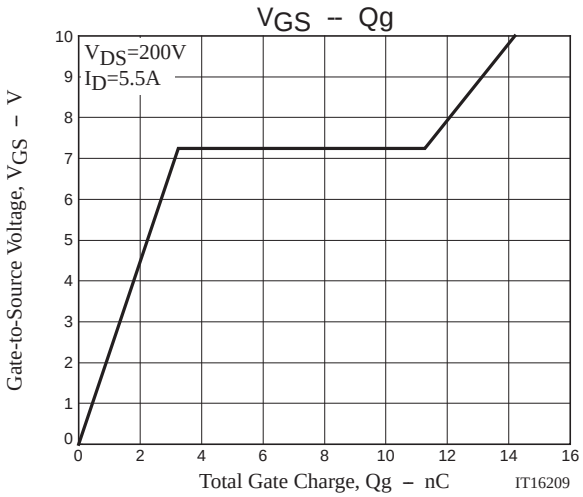

$R_{DS(on)}$ -- Tc
Single pulse
$V_{GS}$=10V, $I_D$=2.75A
Static Drain-to-Source On-State Resistance, $R_{DS(on)}$ – Ω
Case Temperature, Tc – °C
IT16204

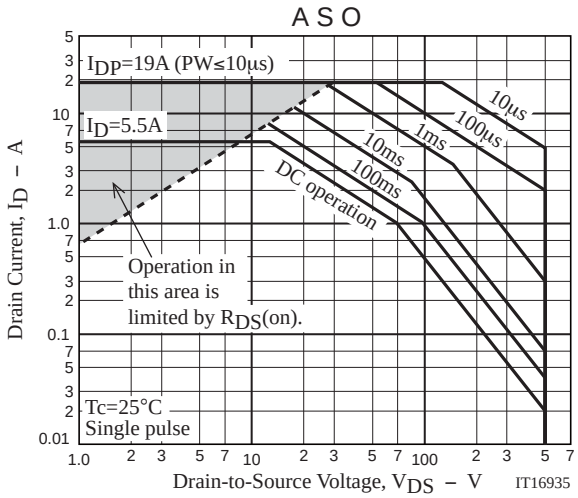

| yfs | -- $I_D$
$V_{DS}$=10V
25°C
Tc=–25°C
75°C
Forward Transfer Admittance, | yfs | – S
Drain Current, $I_D$ – A
IT16205

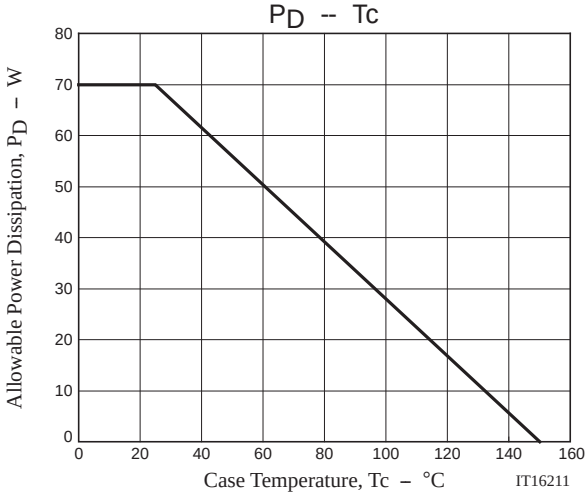

$I_S$ -- $V_{SD}$
$V_{GS}$=0V
Single pulse
Tc=75°C
25°C
–25°C
Source Current, $I_S$ – A
Diode Forward Voltage, $V_{SD}$ – V
IT16206

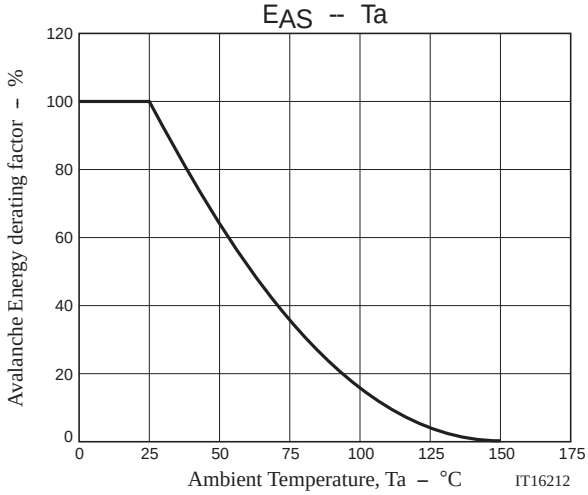

SW Time -- $I_D$
$V_{DD}$=200V
$V_{GS}$=10V
$t_f$
$t_{d(off)}$
$t_r$
$t_{d(on)}$
Switching Time, SW Time – ns
Drain Current, $I_D$ – A
IT16207


Ciss, Coss, Crss -- $V_{DS}$
f=1MHz
Ciss
Coss
Crss
Ciss, Coss, Crss – pF
Drain-to-Source Voltage, $V_{DS}$ – V
IT16208


VGS – Qg
VDS=200V
ID=5.5A
Gate-to-Source Voltage, VGS – V
Total Gate Charge, Qg – nC
IT16209


A S O
IDP=19A (PW≤10μs)
ID=5.5A
10μs
100μs
1ms
10ms
100ms
DC operation
Operation in this area is limited by RDS(on).
Tc=25°C
Single pulse
Drain Current, ID – A
Drain-to-Source Voltage, VDS – V
IT16935


PD -- Tc
Allowable Power Dissipation, PD – W
Case Temperature, Tc – °C
IT16211


EAS -- Ta
Avalanche Energy derating factor – %
Ambient Temperature, Ta – °C
IT16212

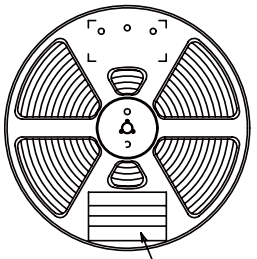
**Taping Specification**

ATP613-TL-H

## 1. Packing Format (TL)

| Package Name | Carrier Tape Type | Maximum Number of devices contained (pcs) | | | Packing format | |
|---|---|---|---|---|---|---|
| | | Reel | Inner box | Outer box | INNER BOX SD-C-18 | OUTER BOX SD-A-18 |
| ATPAK | ATP | 3,000 | 3,000 | 15,000 | 1 reels contained<br>Dimensions:mm (external)<br>340×340×28 | 5 inner boxes contained<br>Dimensions:mm (external)<br>355×355×165 |

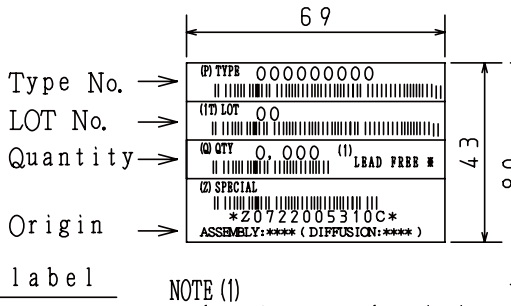
Packing method



Reel label

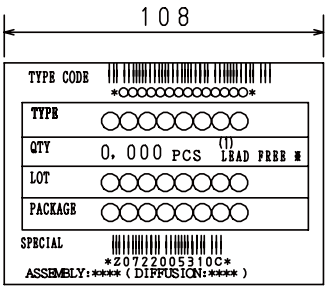
Reel label, Inner box label

(unit:mm)




Outer box label

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



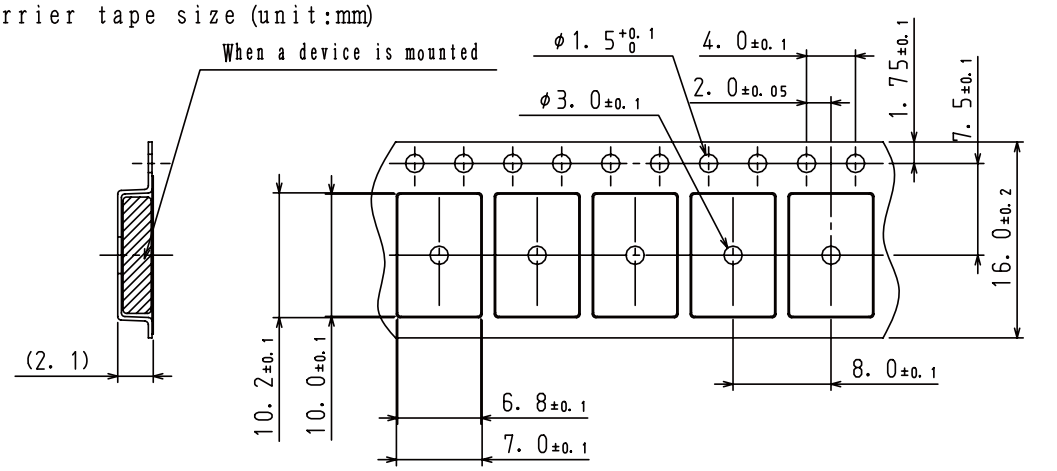

NOTE (1)

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

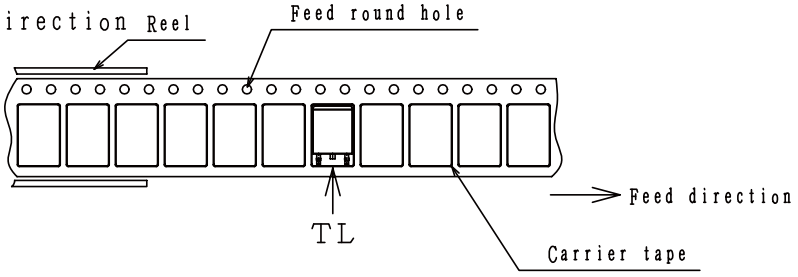
| Label | JEITA Phase |
|---|---|
| LEAD FREE 3 | JEITA Phase 3A |
| LEAD FREE 4 | JEITA Phase 3 |

## 2. Taping configuration

### 2-1. Carrier tape size (unit:mm)



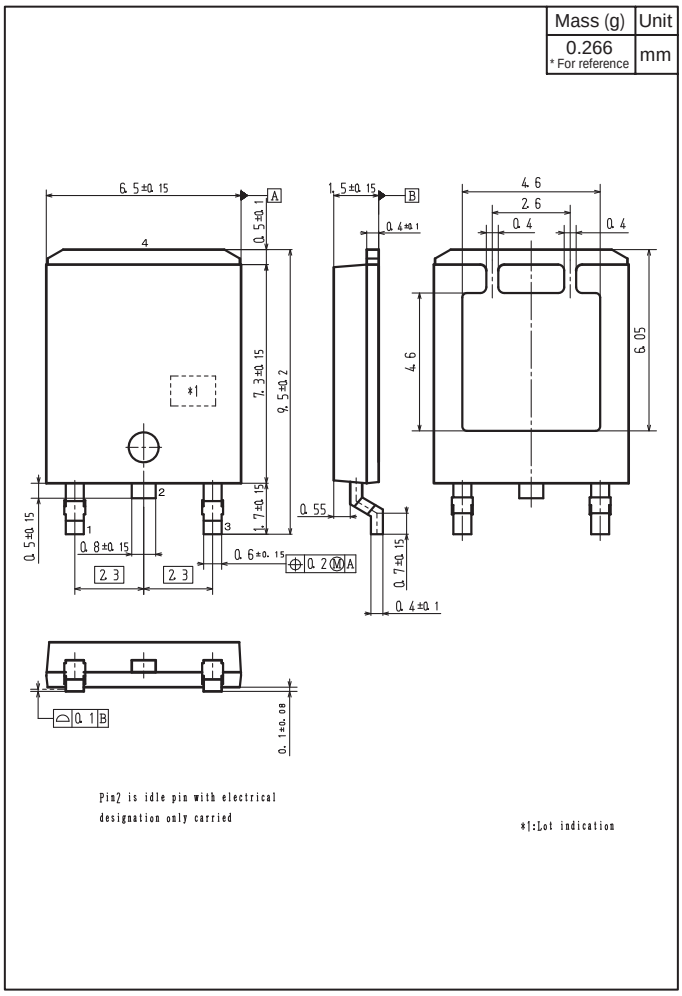

### 2-2. Device placement direction



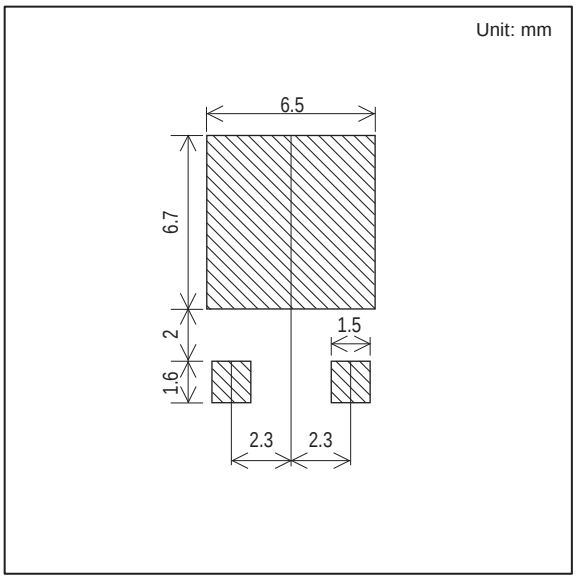

The one erectrode terminals on feed hole side····TL

## Outline Drawing

ATP613-TL-H




## Land Pattern Example



Note on usage : Since the ATP613 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.