

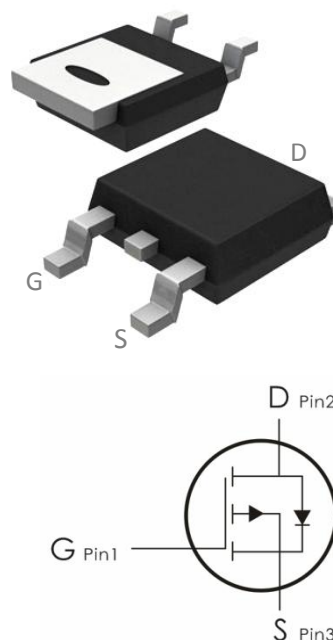
## Description:

This P-Channel MOSFET uses advanced trench technology and design to provide excellent  $R_{DS(on)}$  with low gate charge.

It can be used in a wide variety of applications.

## Features:

- 1)  $V_{DS}=-30V, I_D=-30A, R_{DS(on)}<25m\Omega @V_{GS}=-10V$  (Typ:  $19m\Omega$ )
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low  $R_{DS(on)}$ .
- 5) Excellent package for good heat dissipation.
- 6) MSL3



## Package Marking and Ordering Information:

| Part NO. | Marking | Package | Packing       |
|----------|---------|---------|---------------|
| DOD405   | D405    | TO- 252 | 2500 pcs/Reel |

## Absolute Maximum Ratings: ( $T_C=25^{\circ}C$ unless otherwise noted)

| Symbol         | Parameter                                                 | Ratings     | Units       |
|----------------|-----------------------------------------------------------|-------------|-------------|
| $V_{DS}$       | Drain-Source Voltage                                      | -30         | V           |
| $V_{GS}$       | Gate-Source Voltage                                       | $\pm 20$    | V           |
| $I_D$          | Continuous Drain Current- $T_C=25^{\circ}C$ <sup>1</sup>  | -30         | A           |
|                | Continuous Drain Current- $T_C=100^{\circ}C$ <sup>1</sup> | -21         | A           |
| $I_{DM}$       | Pulsed Drain Current <sup>2</sup>                         | -120        | A           |
| $P_D$          | Total Power Dissipation                                   | 31.3        | W           |
| $E_{AS}$       | Single Pulsed Avalanche Energy <sup>3</sup>               | 45          | mJ          |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range          | -55 to +150 | $^{\circ}C$ |

## Thermal Characteristics:

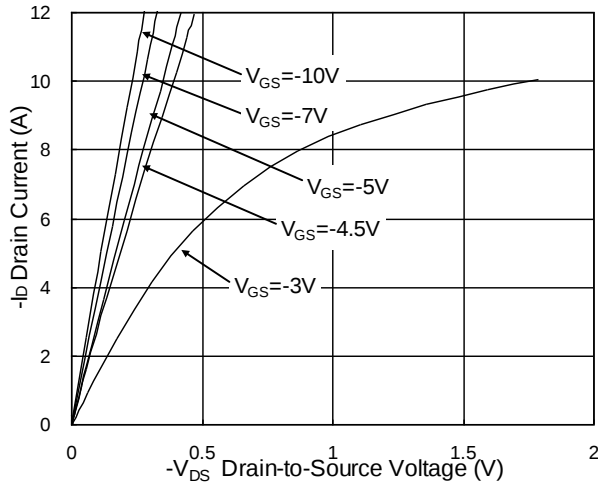
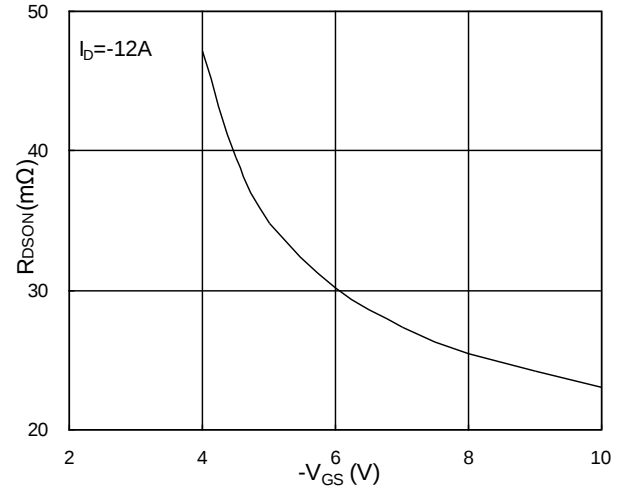
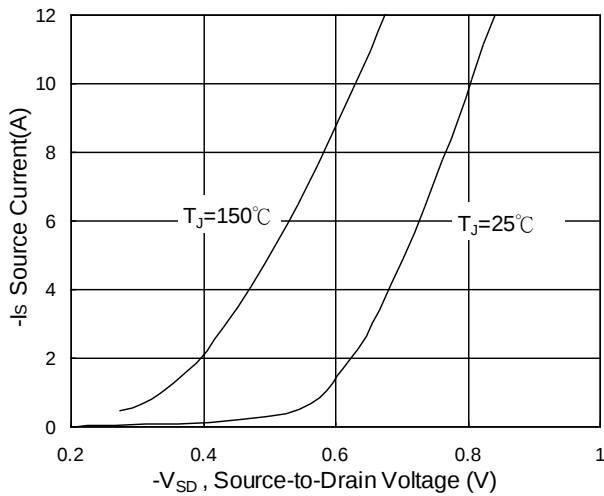
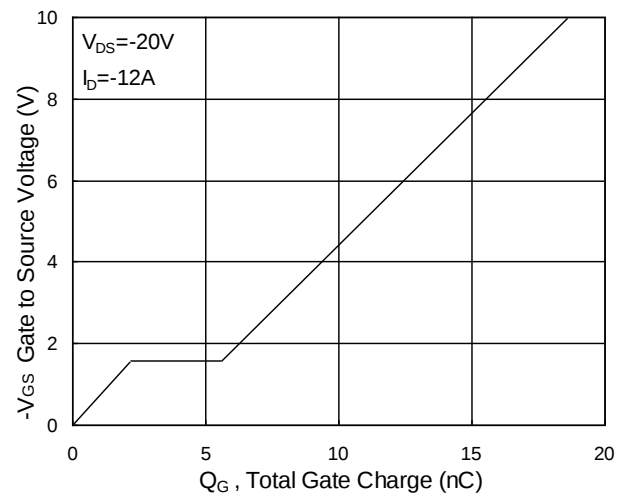
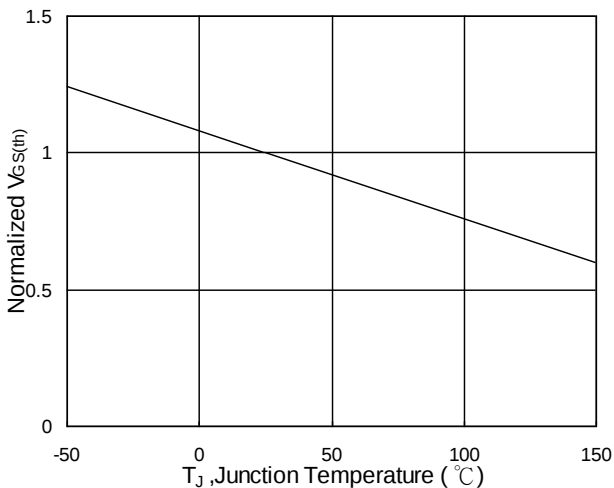
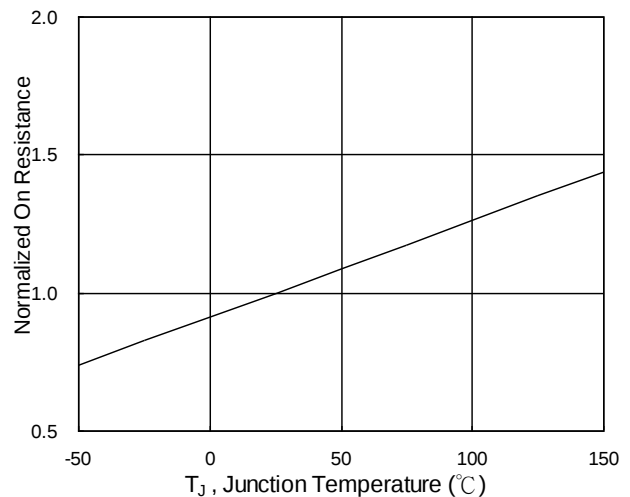
| Symbol          | Parameter                           | Max | Units         |
|-----------------|-------------------------------------|-----|---------------|
| $R_{\theta JA}$ | Thermal Resistance,Junction-Ambient | 62  | $^{\circ}C/W$ |
| $R_{\theta JC}$ | Thermal Resistance,Junction to Case | 4   | $^{\circ}C/W$ |

**Electrical Characteristics:** ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

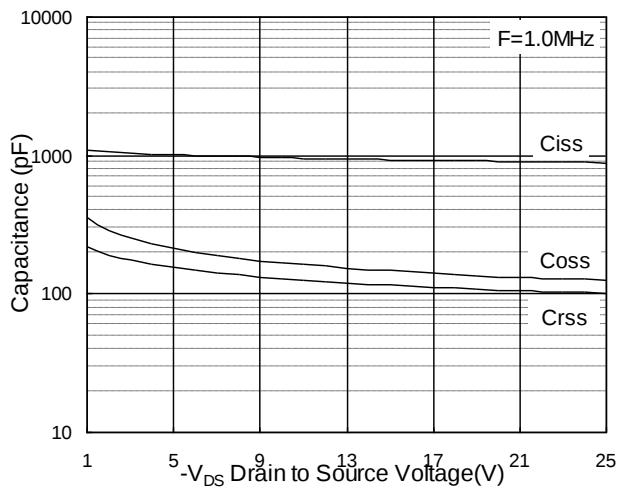
| Symbol                             | Parameter                                      | Conditions                                                                                                         | Min  | Typ  | Max   | Units |
|------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------|------|-------|-------|
| Off Characteristics                |                                                |                                                                                                                    |      |      |       |       |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250 μ A                                                                      | -30  | ---  | ---   | V     |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current                | V <sub>GS</sub> =0V, V <sub>DS</sub> =-30V                                                                         | ---  | ---  | -1    | μ A   |
| I <sub>GSS</sub>                   | Gate-Source Leakage Current                    | V <sub>GS</sub> =± 20V, V <sub>DS</sub> =0A                                                                        | ---  | ---  | ± 100 | nA    |
| On Characteristics                 |                                                |                                                                                                                    |      |      |       |       |
| V <sub>GS(th)</sub>                | Gate-Source Threshold Voltage                  | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250 μ A                                                        | -1.0 | -1.5 | -2.5  | V     |
| R <sub>DS(ON)</sub>                | Static Drain-Source On-Resistance <sup>4</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A                                                                        | ---  | 19   | 25    | m Ω   |
|                                    |                                                | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A                                                                        | ---  | 27   | 40    |       |
| Dynamic Characteristics            |                                                |                                                                                                                    |      |      |       |       |
| C <sub>iss</sub>                   | Input Capacitance                              | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                                                                 | ---  | 1200 | ---   | pF    |
| C <sub>oss</sub>                   | Output Capacitance                             |                                                                                                                    | ---  | 150  | ---   |       |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance                   |                                                                                                                    | ---  | 135  | ---   |       |
| Switching Characteristics          |                                                |                                                                                                                    |      |      |       |       |
| t <sub>d(on)</sub>                 | Turn-On Delay Time                             | V <sub>DD</sub> =-15V, I <sub>D</sub> =-1A,<br>V <sub>GS</sub> =-10V, R <sub>GEN</sub> =6 Ω , R <sub>D</sub> =15 Ω | ---  | 13   | ---   | ns    |
| t <sub>r</sub>                     | Rise Time                                      |                                                                                                                    | ---  | 15   | ---   | ns    |
| t <sub>d(off)</sub>                | Turn-Off Delay Time                            |                                                                                                                    | ---  | 198  | ---   | ns    |
| t <sub>f</sub>                     | Fall Time                                      |                                                                                                                    | ---  | 98   | ---   | ns    |
| Q <sub>g</sub>                     | Total Gate Charge                              | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V,<br>I <sub>D</sub> =-8A                                               | ---  | 50   | ---   | nC    |
| Q <sub>gs</sub>                    | Gate-Source Charge                             |                                                                                                                    | ---  | 9.8  | ---   | nC    |
| Q <sub>gd</sub>                    | Gate-Drain “Miller” Charge                     |                                                                                                                    | ---  | 8.3  | ---   | nC    |
| Drain-Source Diode Characteristics |                                                |                                                                                                                    |      |      |       |       |
| V <sub>SD</sub>                    | Drain Diode Forward Voltage                    | V <sub>GS</sub> =0V, I <sub>S</sub> =-12A                                                                          | ---  | ---  | -1.2  | V     |
| I <sub>S</sub>                     | Continuous Source Current                      | V <sub>G</sub> =V <sub>D</sub> =0V                                                                                 | ---  | ---  | -30   | A     |
| I <sub>SM</sub>                    | Pulsed Source Current                          |                                                                                                                    | ---  | ---  | -120  | A     |
| T <sub>rr</sub>                    | Reverse Recovery Time                          | T <sub>J</sub> =25 °C ,                                                                                            | ---  | 37   | ---   | ns    |
| Q <sub>rr</sub>                    | Reverse Recovery Charge                        | I <sub>F</sub> =-2A, di/dt=-100A/ μ s                                                                              | ---  | 36   | ---   | nC    |

**Notes:**

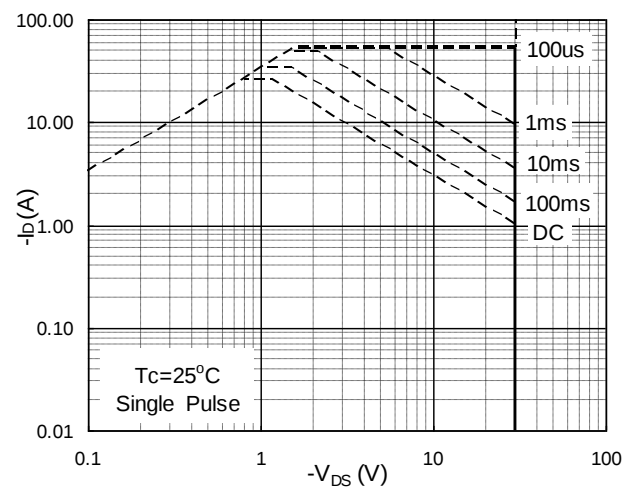
1. Computed continuous current assumes the condition of  $T_{j,Max}$  while the actual continuous current depends on the thermal & electro-mechanical application board design
2. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
3. EAS condition :  $T_J=25^{\circ}C, V_{DD}=-15V, V_G=-10V, L=0.5mH$
4. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

**Typical Characteristics:** ( $T_C=25^{\circ}C$  unless otherwise noted)

**Fig.1 Typical Output Characteristics**

**Fig.2 On-Resistance v.s Gate-Source**

**Fig.3 Forward Characteristics of Reverse**

**Fig.4 Gate-Charge Characteristics**

**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$** 

**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$** 

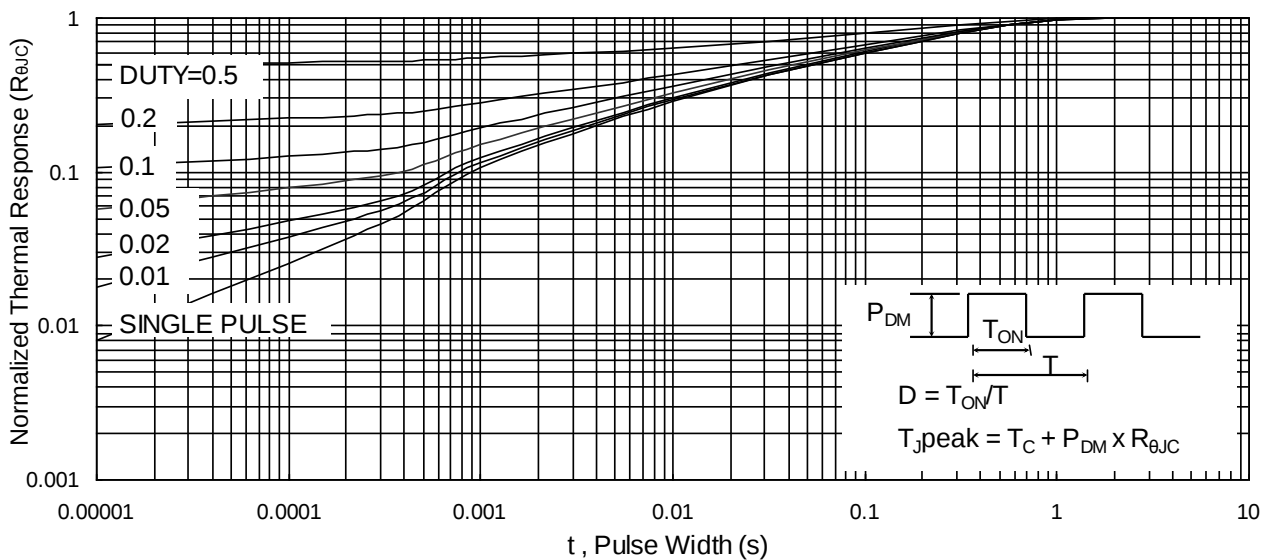
V2.0



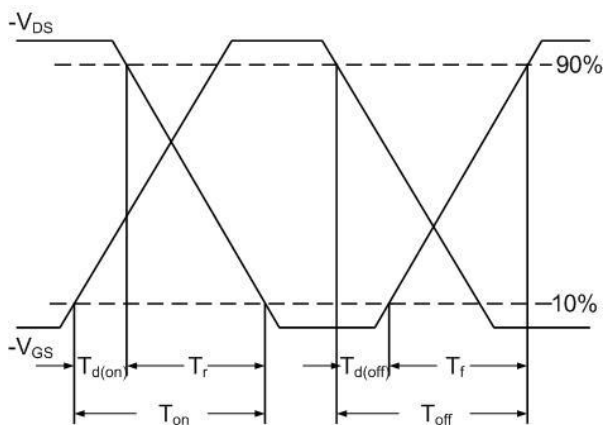
**Fig.7 Capacitance**



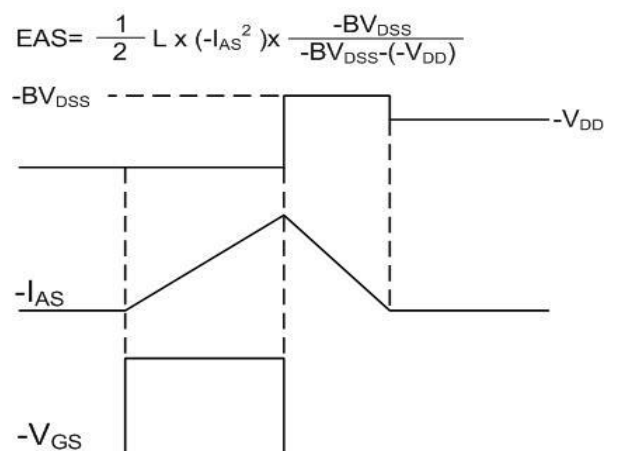
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**

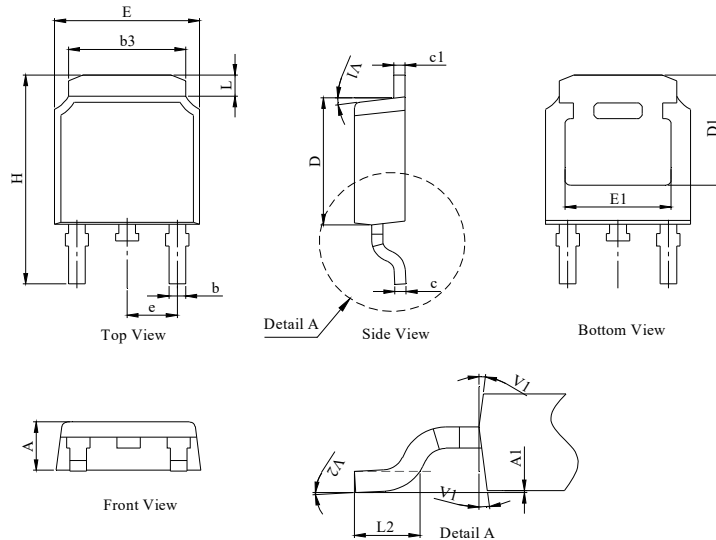


**Fig.11 Unclamped Inductive Switching Waveform**

## TO-252 Package Information

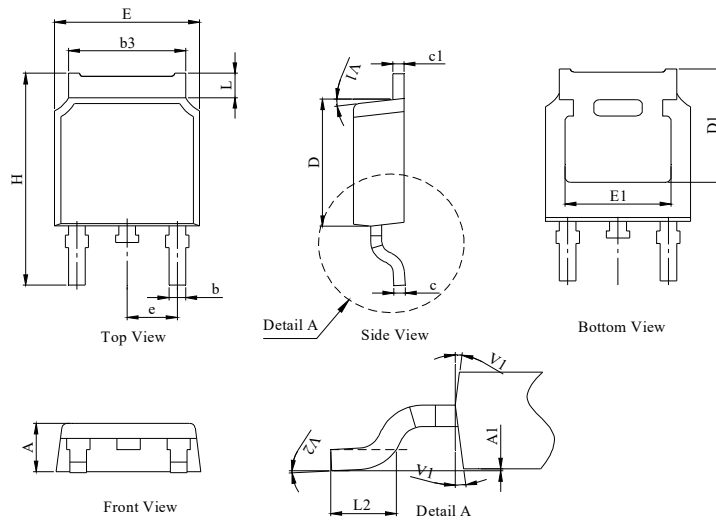
### Package Outline Type-A

UNIT: mm



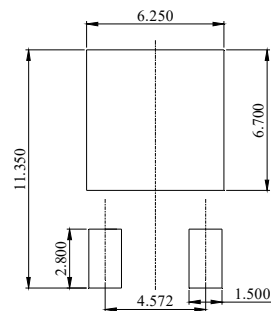
| DIM. | MILLIMETER |       |       |
|------|------------|-------|-------|
|      | MIN.       | NOM.  | MAX.  |
| A    | 2.18       | 2.30  | 2.39  |
| A1   | 0          | --    | 0.13  |
| b    | 0.64       | 0.76  | 0.89  |
| c    | 0.40       | 0.50  | 0.61  |
| c1   | 0.46       | 0.50  | 0.58  |
| D    | 5.97       | 6.10  | 6.23  |
| D1   | 5.05       | --    | --    |
| E    | 6.35       | 6.60  | 6.73  |
| E1   | 4.32       | --    | --    |
| b3   | 5.21       | 5.38  | 5.55  |
| e    | 2.29 BSC   |       |       |
| H    | 9.40       | 10.00 | 10.40 |
| L    | 0.89       | --    | 1.27  |
| L2   | 1.40       | --    | 1.78  |
| V1   | 7° REF     |       |       |
| V2   | 0°         | --    | 6°    |

### Package Outline Type-B



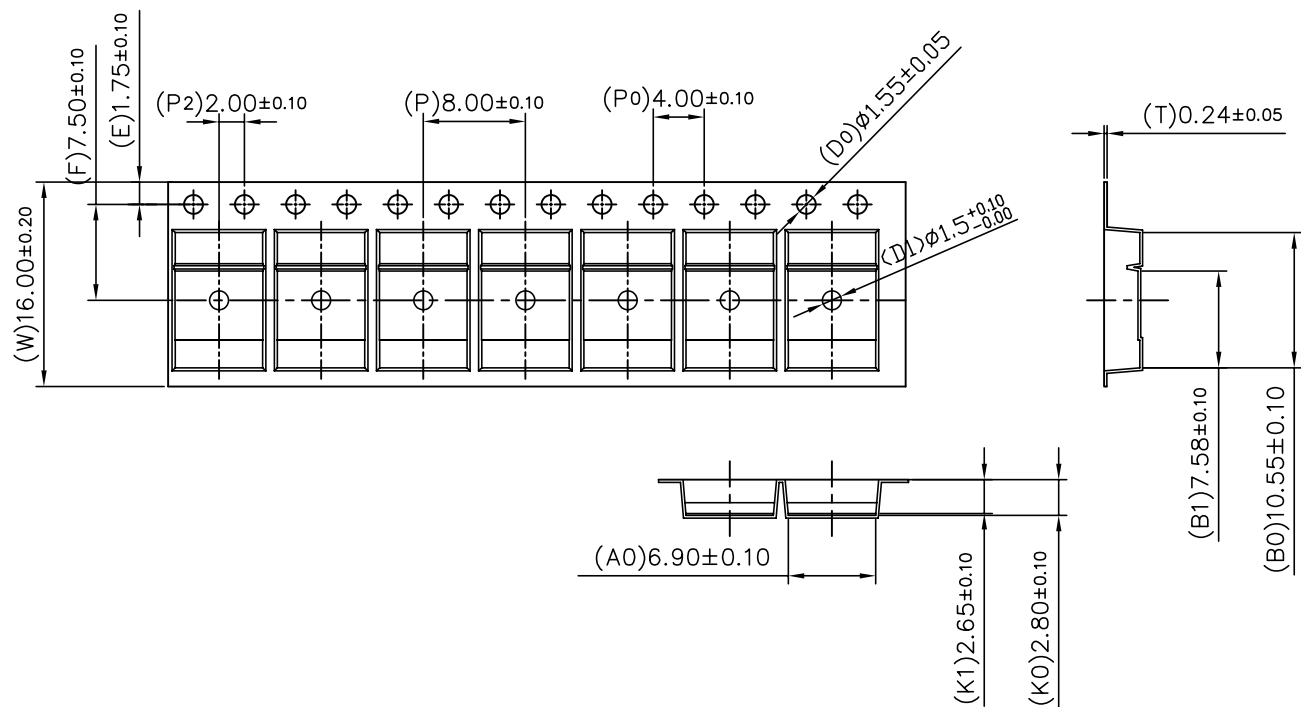
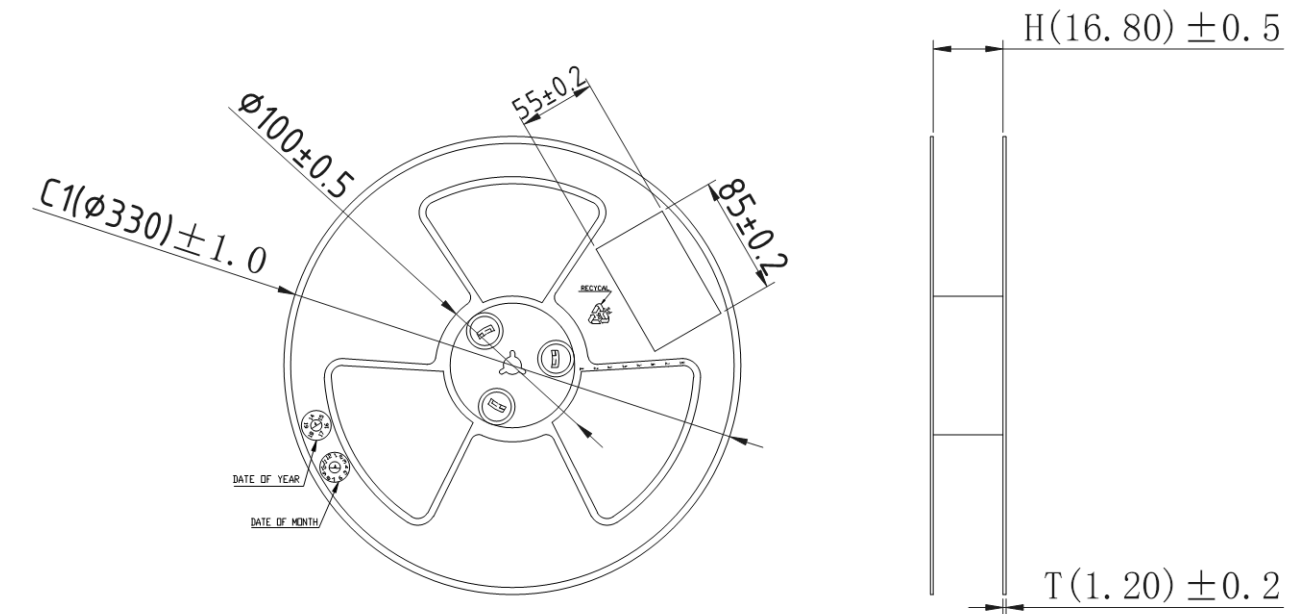
| DIM. | MILLIMETER |       |       |
|------|------------|-------|-------|
|      | MIN.       | NOM.  | MAX.  |
| A    | 2.10       | 2.30  | 2.40  |
| A1   | 0          | --    | 0.13  |
| b    | 0.66       | 0.76  | 0.86  |
| b3   | 5.21       | 5.38  | 5.55  |
| c    | 0.40       | 0.50  | 0.60  |
| c1   | 0.44       | 0.50  | 0.58  |
| D    | 5.90       | 6.10  | 6.30  |
| D1   | 5.30REF    |       |       |
| E    | 6.40       | 6.60  | 6.80  |
| E1   | 4.63       | -     | -     |
| e    | 2.29 BSC   |       |       |
| H    | 9.50       | 10.00 | 10.70 |
| L    | 1.09       | --    | 1.21  |
| L2   | 1.35       | --    | 1.65  |
| V1   | 7° REF     |       |       |
| V2   | 0°         | --    | 6°    |

### Recommended Soldering Footprint



## Tape & Reel Information

Dimensions in mm



Pulling direction →

## Marking Information:

①. Doingter LOGO

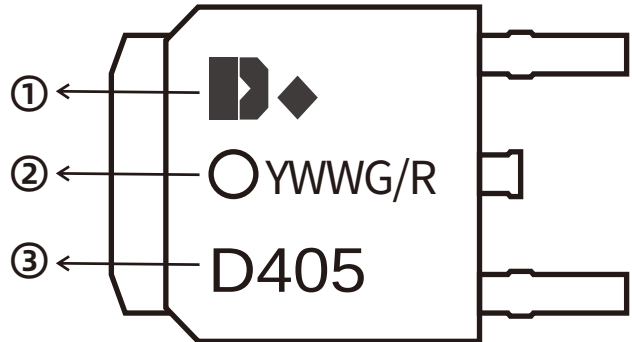
②. Date Code(YWWG / R)

Y : Year Code , last digit of the year

WW : Week Code(01-53)

G/R : G(Green) /R(Lead Free)

③. Part NO.



## Previous Version

| Version | Date       | Subjects (major changes since last revision) |
|---------|------------|----------------------------------------------|
| 2.0     | 2024-09-11 | Release of final version                     |

## Attention :

- Information furnished in this document is believed to be accurate and reliable. However, Shenzhen Doingter Semiconductor Co.,Ltd. assumes noresponsibility for the consequences of use without consideration for such information nor use beyond it.
  - Information mentioned in this document is subject to change without notice, apart from that when an agreement is signed, Shenzhen Doingter complies with the agreement. Products and information provided in this document have no infringement of patents.
  - Shenzhen Doingter assumes noresponsibility for any infringement of other rights of third parties which may result from the use of such products and information. This document supersedes and replaces all information previously supplied.
-  Is a registered trademark of Shenzhen Doingter Semiconductor Co., Ltd. Copyright © 2013 Shenzhen DoingterSemiconductor Co.,Ltd. Printed All rights reserved.