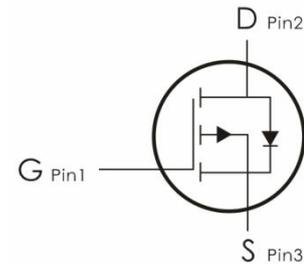
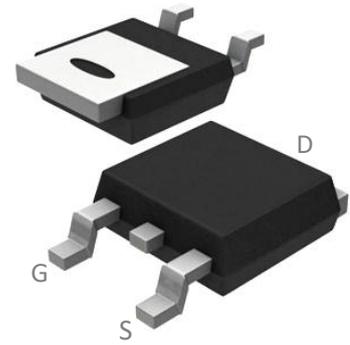


## Description:

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)  $V_{DS}=-40V, I_D=-55A, R_{DS(ON)}<13m\ \Omega @V_{GS}=-10V$  (Typ:  $9.5m\ \Omega$ )
- 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
DD013PG	D013P	TO- 252	2500 pcs/Reel

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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain-Source Voltage	-40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current <sup>1</sup>	-55	A
	Continuous Drain Current- $T_C=100^\circ\text{C}$ <sup>1</sup>	-38.5	
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-220	
$P_D$	Power Dissipation	40	W
$E_{AS}$	Single pulse avalanche energy <sup>3</sup>	125	mJ
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55-+150	$^\circ\text{C}$

## Thermal Characteristics:

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.1	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62	

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\ \mu\text{A}$	-40	---	---	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS}=0V, V_{DS}=-40V$	---	---	-1	$\mu\text{A}$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0A$	---	---	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$	-1	-1.6	-2.5	V
$R_{DS(on)}$	Drain-Source On Resistance <sup>4</sup>	$V_{GS}=-10V, I_D=-20A$	---	9.5	13	$\text{m}\Omega$
		$V_{GS}=-4.5V, I_D=-10A$	---	12.5	16	$\text{m}\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=-25V, V_{GS}=0V, f=1\text{MHz}$	---	2100	---	pF
$C_{oss}$	Output Capacitance		---	270	--	
$C_{rss}$	Reverse Transfer Capacitance		---	215	---	
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=-20V, I_D=-11A,$ $R_{ENG}=2.5\ \Omega, V_{GS}=-10V$	---	10	---	ns
$t_r$	Rise Time		---	20	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	53	---	ns
$t_f$	Fall Time		---	29	---	ns
$Q_g$	Total Gate Charge	$V_{GS}=-10V, V_{DS}=-20V,$ $I_D=-11A$	---	35	---	nC
$Q_{gs}$	Gate-Source Charge		---	6.2	---	nC
$Q_{gd}$	Gate-Drain "Miller" Charge		---	7.3	---	nC
<b>Drain-Source Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_{SD}=-11A$	---	---	-1.2	V
$I_S$	Continuous Drain Current	$V_D=V_G=0V$	---	---	-55	A
$I_{SM}$	Pulsed Drain Current		---	---	-220	A

## 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 :  $T_J=25^{\circ}C, V_{DD}=-20V, V_G=-10V, L=0.5mH$
4. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 0.5\%$

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

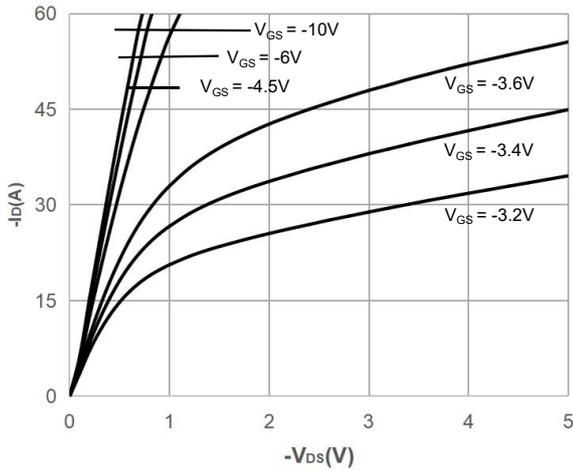


Figure 1: Output Characteristics

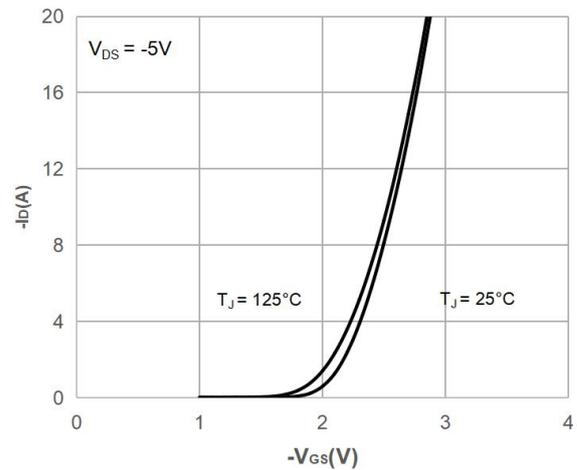


Figure 2: Typical Transfer Characteristics

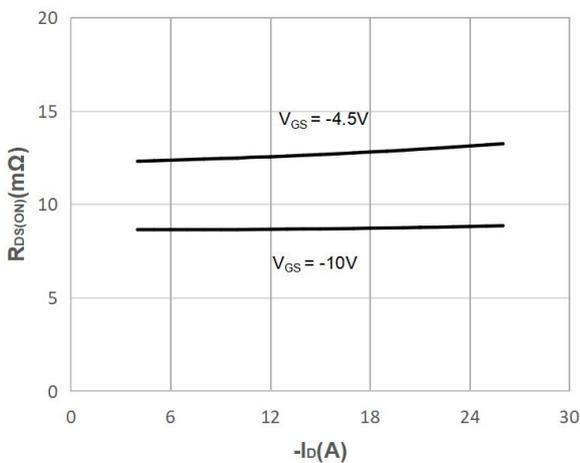


Figure 3: On-resistance vs. Drain Current

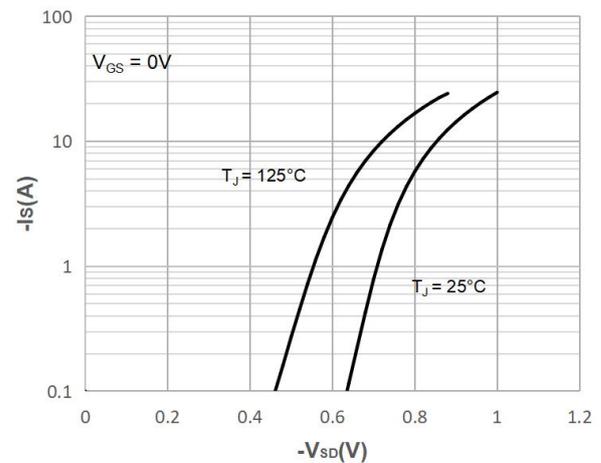


Figure 4: Body Diode Characteristics

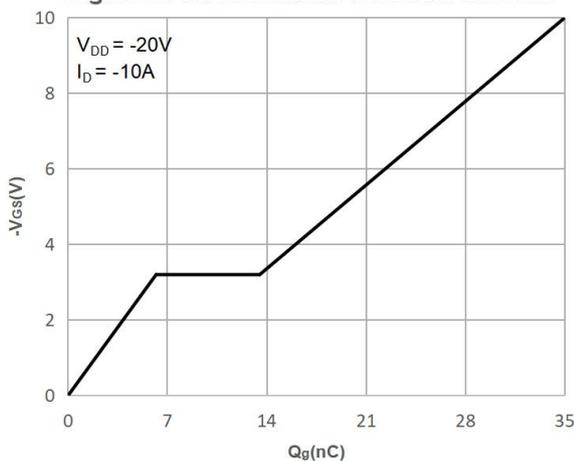


Figure 5: Gate Charge Characteristics

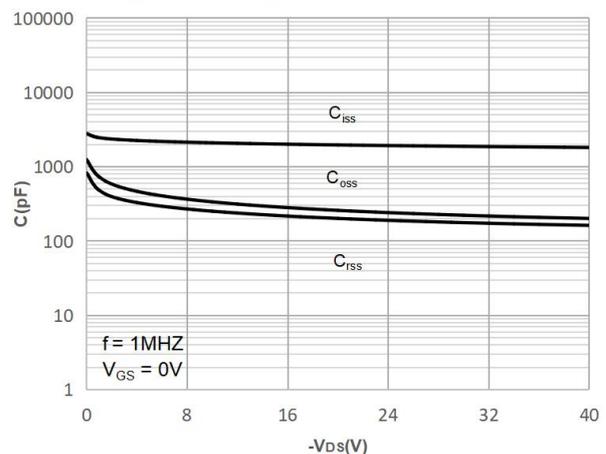
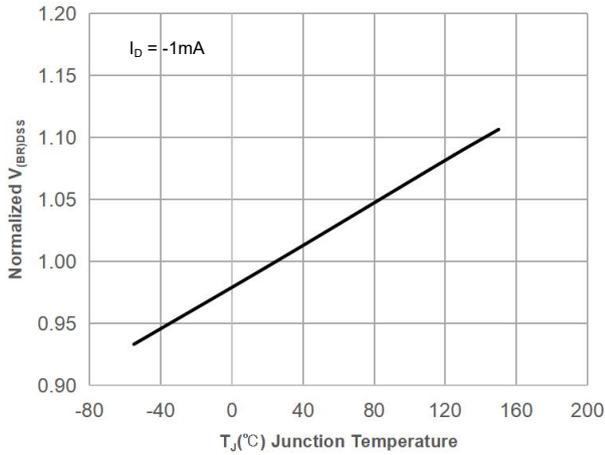
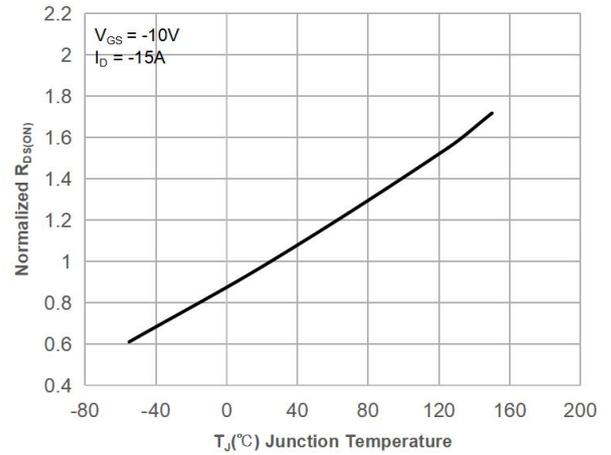


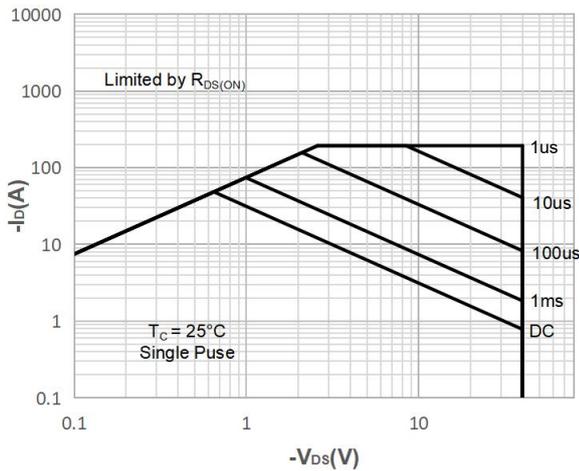
Figure 6: Capacitance Characteristics



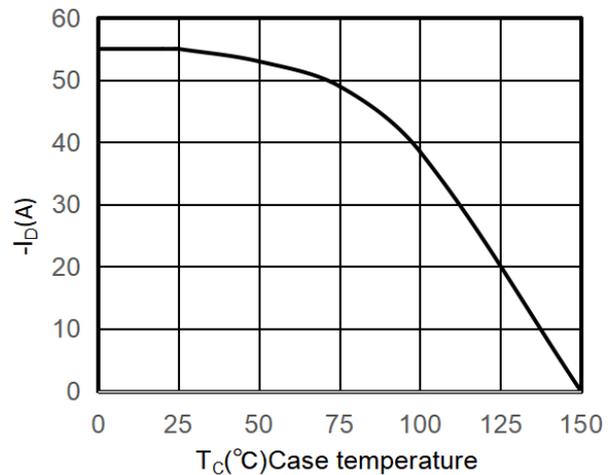
**Figure 7: Normalized Breakdown voltage vs. Junction Temperature**



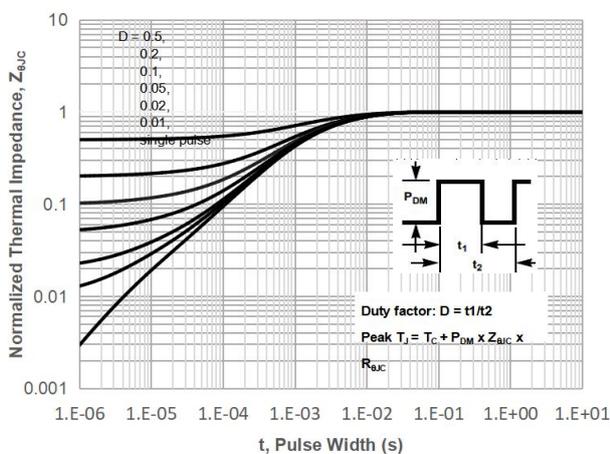
**Figure 8: Normalized on Resistance vs. Junction Temperature**



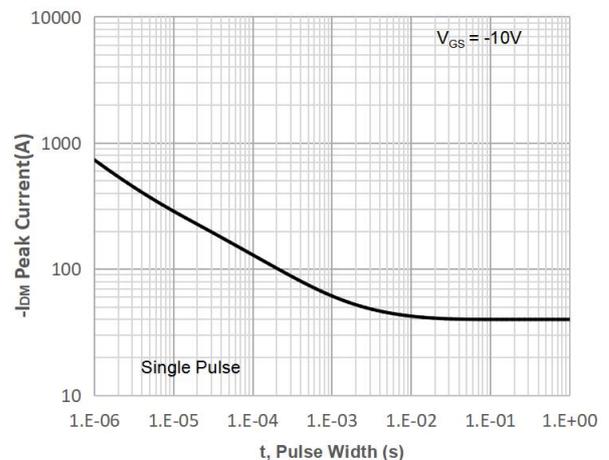
**Figure 9: Maximum Safe Operating Area**



**Figure 10: Maximum Continuous Driain Current vs. Case Temperature**



**Figure 11: Normalized Maximum Transient Thermal Impedance**

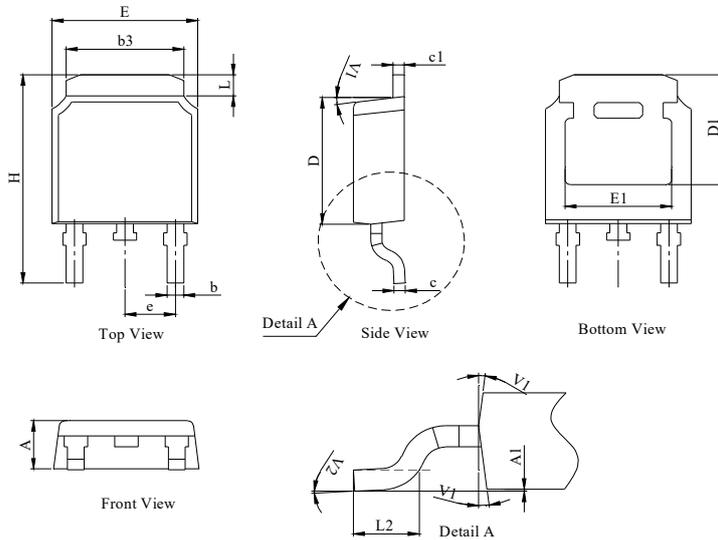


**Figure 12: Peak Current Capacity**

## TO-252 Package Information

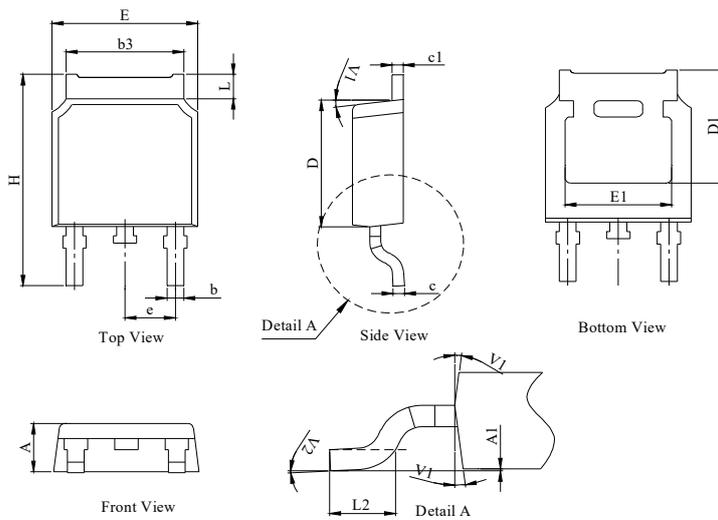
### Package Outline Type-A

UNIT: mm



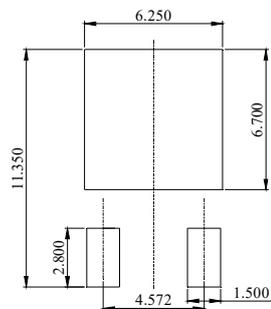
DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.18	2.30	2.39
A1	0	--	0.13
b	0.64	0.76	0.89
c	0.40	0.50	0.61
c1	0.46	0.50	0.58
D	5.97	6.10	6.23
D1	5.05	--	--
E	6.35	6.60	6.73
E1	4.32	--	--
b3	5.21	5.38	5.55
e	2.29 BSC		
H	9.40	10.00	10.40
L	0.89	--	1.27
L2	1.40	--	1.78
V1	7° REF		
V2	0°	--	6°

### Package Outline Type-B



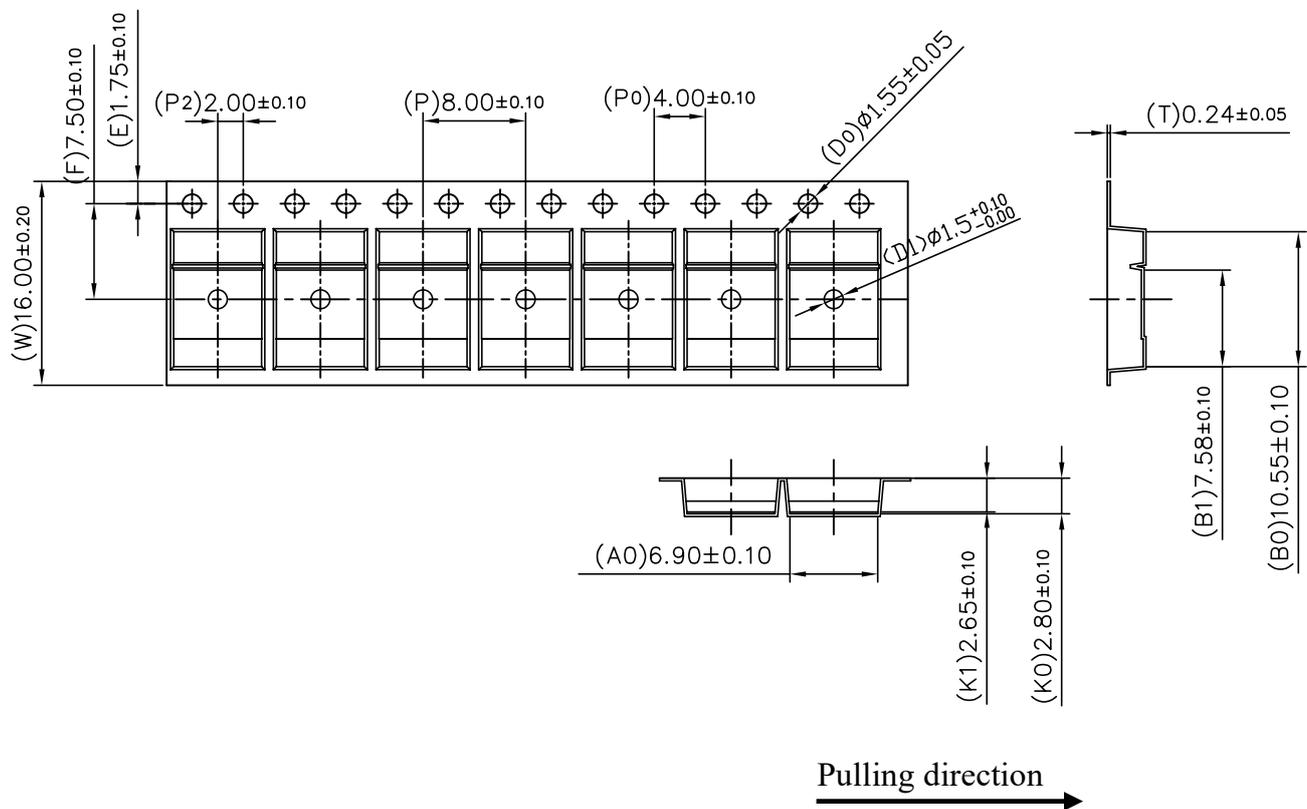
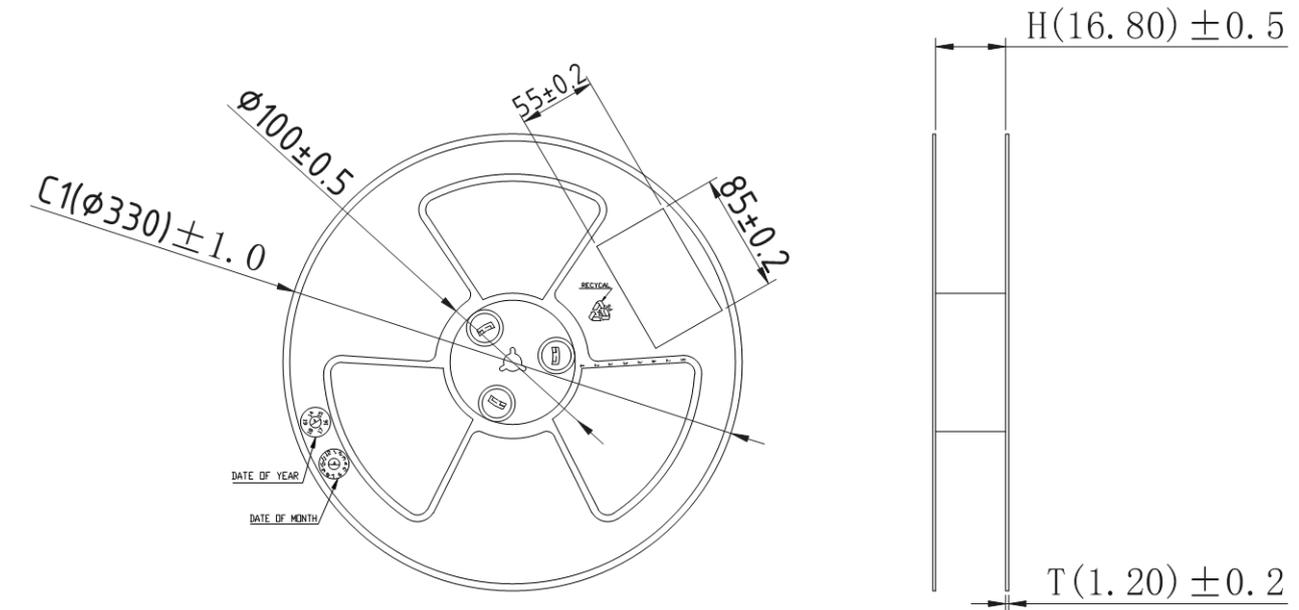
DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.10	2.30	2.40
A1	0	--	0.13
b	0.66	0.76	0.86
b3	5.21	5.38	5.55
c	0.40	0.50	0.60
c1	0.44	0.50	0.58
D	5.90	6.10	6.30
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	-	-
e	2.29 BSC		
H	9.50	10.00	10.70
L	1.09	--	1.21
L2	1.35	--	1.65
V1	7° REF		
V2	0°	--	6°

### Recommended Soldering Footprint



## Tape & Reel Information

Dimensions in mm



**Marking Information:**

①. Doingter LOGO

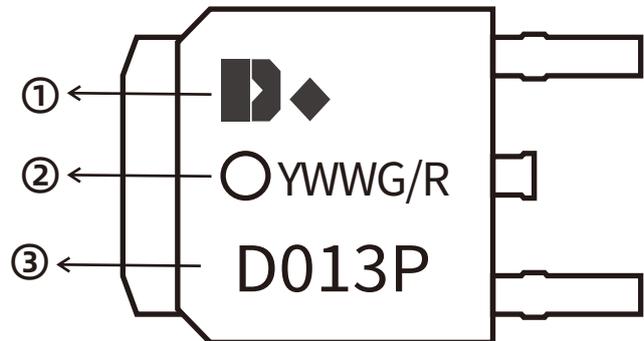
②. Date Code(YWWG / R)

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)
1.1	2025-07-11	Release of final version

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