

Description:

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

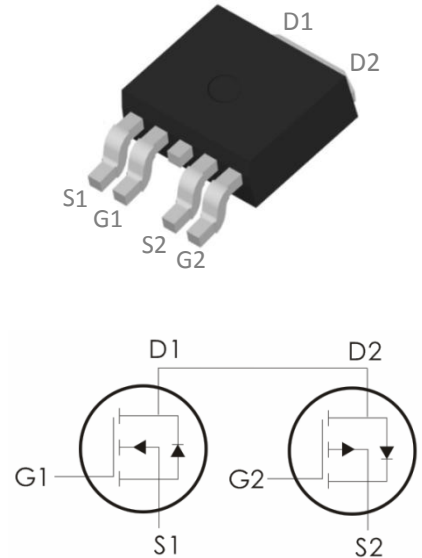
It can be used in a wide variety of applications.

Features:

N-Channel: $V_{DS}=30V, I_D=25A, R_{DS(on)} < 13\text{ m}\Omega @ V_{GS}=10V$

P-Channel: $V_{DS}=-30V, I_D=-19A, R_{DS(on)} < 33\text{ m}\Omega @ V_{GS}=-10\text{ V}$

- 1) Low gate charge.
- 2) Green device available.
- 3) Advanced high cell density trench technology for ultra $R_{DS(on)}$.
- 4) Excellent package for good heat dissipation.



Package Marking and Ordering Information:

Part NO.	Marking	Package	Packing
P2003ND5G-DO	P2003ND5G	TO- 252-4	2500 pcs/Reel

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

Symbol	Parameter	N-Channel	P-Channel	Units
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
I_D	Continuous Drain Current-Continuous- $T_C=25^\circ\text{C}$	25	-19	A
	Continuous Drain Current-Continuous- $T_C=100^\circ\text{C}$	22	-13	
I_{DM}	Drain Current – Pulsed ¹	70	-60	A
E_{AS}	Single Pulse Avalanche Energy ²	40	36	mJ
P_D	Power Dissipation - $T_C=25^\circ\text{C}$	30	30	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150		$^\circ\text{C}$

Thermal Characteristics:

Symbol	Parameter	N-Max	P-Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.2	4.2	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Sourctce Breakdown Voltage	V _{GS} =0V, I _D =250 μ A	30	---	---	V
I _{DSS}	Drain-Source Leakage Current	V _{GS} =0V, V _{DS} =30V, T _J =25 °C	---	---	1.0	μ A
I _{GSS}	Gate-Source Leakage Current	V _{GS} = ± 20V, V _{DS} =0A	---	---	± 100	nA
On Characteristics						
V _{GS(th)}	GATE-Source Threshold Voltage	V _{GS} =V _{DS} , I _D =250 μ A	1.0	1.5	2.5	V
R _{DS(ON)}	Drain-Source On Resistance ³	V _{GS} =10V, I _D =10A	---	10	13	m Ω
		V _{GS} =4.5V, I _D =5A	---	16	22.5	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	550	---	pF
C _{oss}	Output Capacitance		---	105	---	
C _{rss}	Reverse Transfer Capacitance		---	95	---	
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DS} =30V , V _{GS} =10V , R _G =3.0 Ω , I _D =18A	---	5	---	ns
t _r	Rise Time		---	8	---	ns
t _{d(off)}	Turn-Off Delay Time		---	21	---	ns
t _f	Fall Time		---	7	---	ns
Q _g	Total Gate Charge	V _{DS} =15V , V _{GS} =10V , I _D =10A	---	15	---	nC
Q _{gs}	Gate-Source Charge		---	4.7	---	nC
Q _{gd}	Gate-Drain “Miller” Charge		---	3.6	---	nC
Drain-Source Diode Characteristics						
I _S	Continuous Source Current ^{1 , 5}	VG=VD=0V	---	---	25	A
I _{SM}	Pulsed Source Current ^{2 , 5}		---	---	70	A
V _{SD}	Forward on voltage	I _{SD} =18A, T _J =25 °C, V _{GS} =0V	---	---	1.2	V

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{GS}=10\text{V}$, $R_G=25\Omega$, $L=0.5\text{mH}$, $I_{AS}=8\text{A}$
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$

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

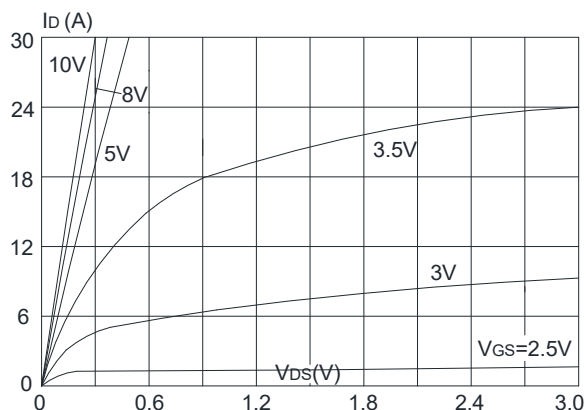


Figure1: Output Characteristics

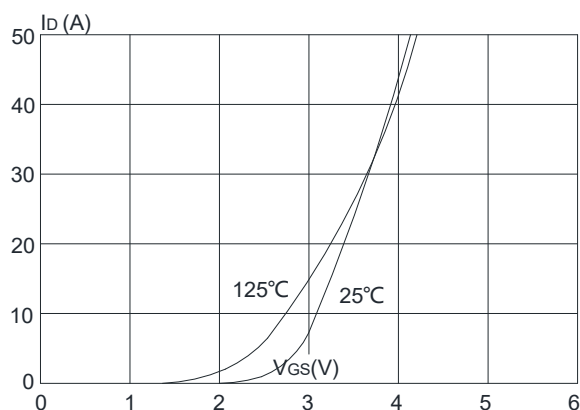


Figure 2: Typical Transfer Characteristics

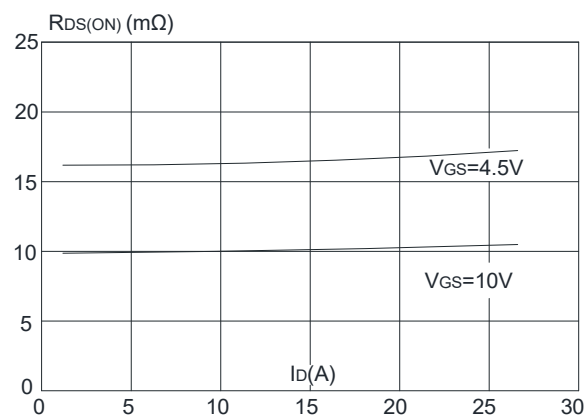


Figure 3: On-resistance vs. Drain Current

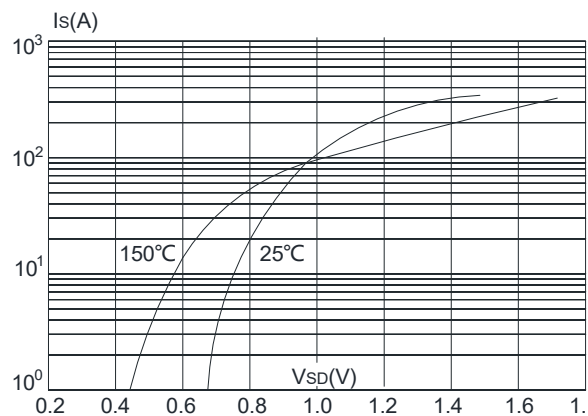


Figure 4: Body Diode Characteristics

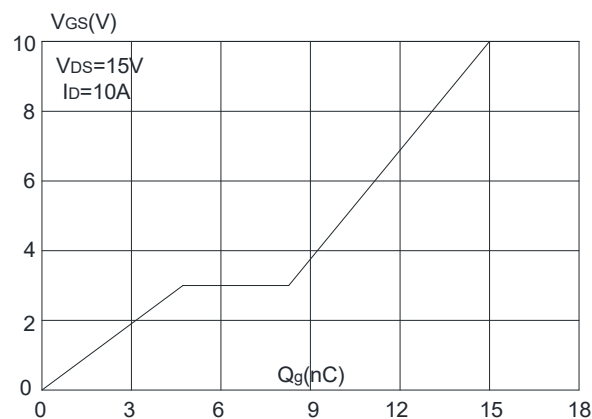


Figure 5: Gate Charge Characteristics

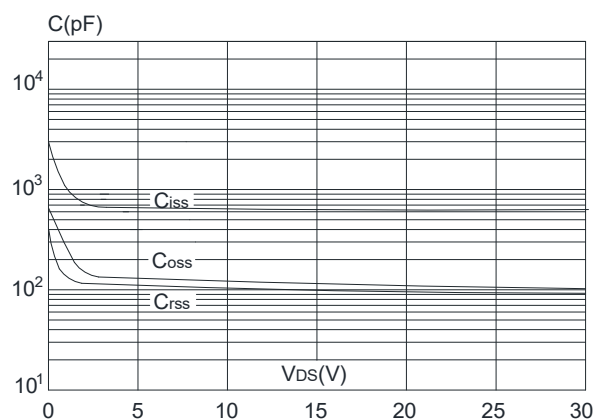


Figure 6: Capacitance Characteristics

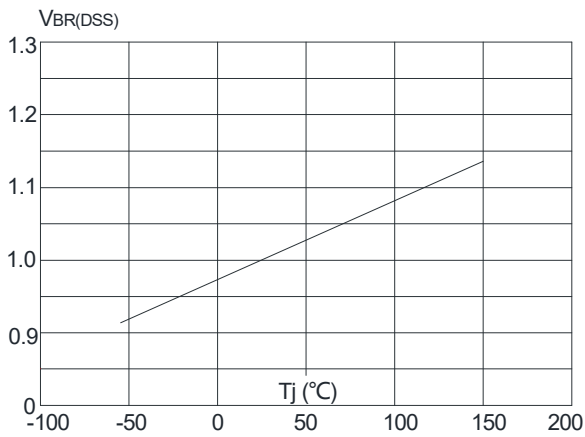


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

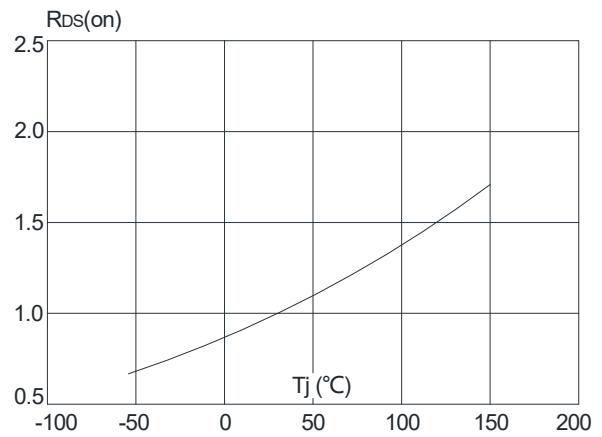


Figure 8: Normalized on Resistance vs. Junction Temperature

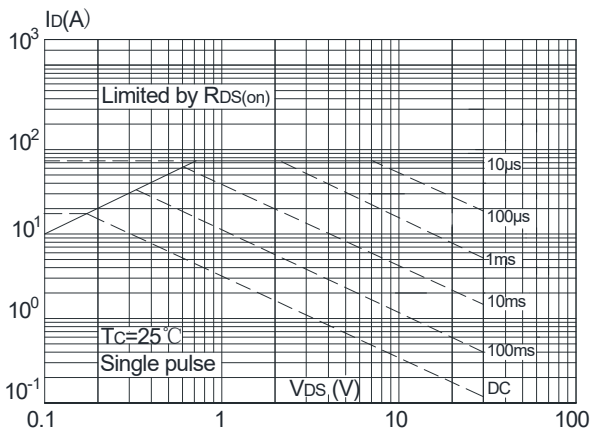


Figure 9: Maximum Safe Operating Area

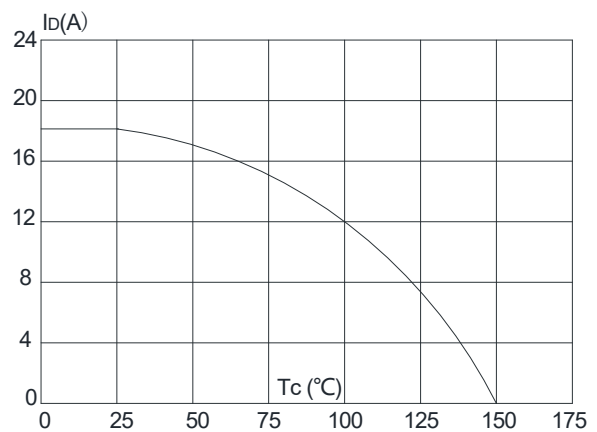


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

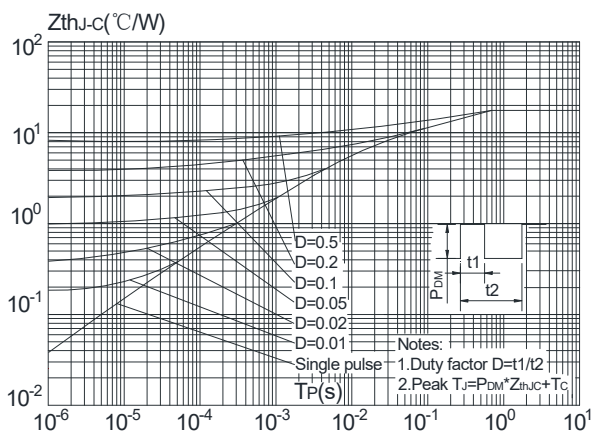


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250 μ A	-30	---	---	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} =0V, V _{DS} =-30V, T _J =25 °C	---	---	-1	μ A
I _{GSS}	Gate-Source Leakage Current	V _{GS} = ± 20V, V _{DS} =0A	---	---	± 100	nA
On Characteristics						
V _{GS(th)}	GATE-Source Threshold Voltage	V _{GS} =V _{DS} , I _D =250 μ A	-1.0	-1.6	-2.5	V
R _{DS(ON)}	Drain-Source On Resistance	V _{GS} =-10V, I _D =-8A	---	25	33	m Ω
		V _{GS} =-4.5V, I _D =-5A	---	34	45	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	660	---	pF
C _{oss}	Output Capacitance		---	100	---	
C _{rss}	Reverse Transfer Capacitance		---	65	---	
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time ^{2,3}	V _{DS} =-15V, I _D =-4A, R _{GEN} =3 Ω , V _{GS} =-10V	---	7.5	---	ns
t _r	Rise Time ^{2,3}		---	5.6	---	ns
t _{d(off)}	Turn-Off Delay Time ^{2,3}		---	19	---	ns
t _f	Fall Time ^{2,3}		---	6	---	ns
Q _g	Total Gate Charge ^{2,3}	V _{GS} =-10V, V _{DS} =-15V, I _D =-6.5A	---	9.2	---	nC
Q _{gs}	Gate-Source Charge ^{2,3}		---	1.6	---	nC
Q _{gd}	Gate-Drain “Miller” Charge ^{2,3}		---	2.2	---	nC
Drain-Source Diode Characteristics						
V _{SD}	Source-Drain Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25 °C	---	---	-1.2	V
I _S	Continuous Source Current ²	V _D =V _G =0V	---	---	19	A
I _{SM}	Pulsed Drain Current	V _D =V _G =0V	---	---	60	A

P-Channel Typical Electrical and Thermal Characteristics (Curves)

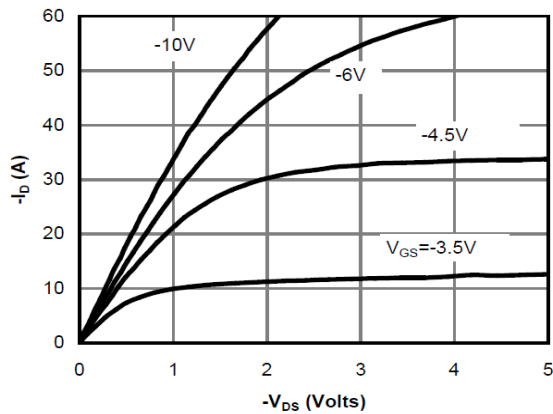


Figure 1: On-Region Characteristics

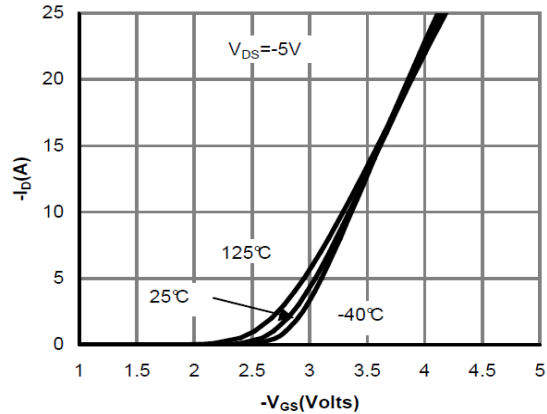


Figure 2: Transfer Characteristics

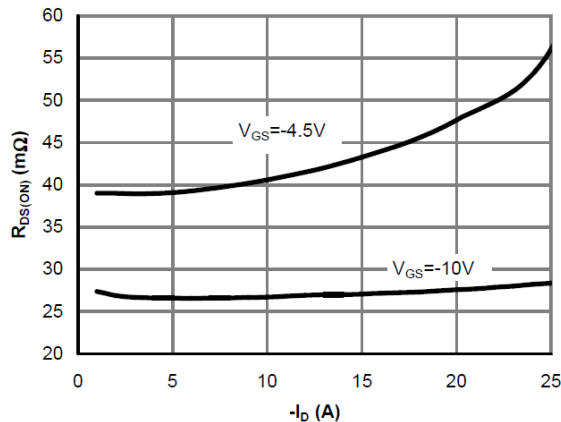


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

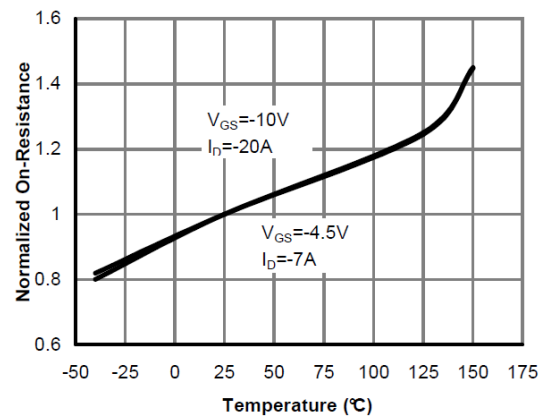


Figure 4: On-Resistance vs. Junction Temperature

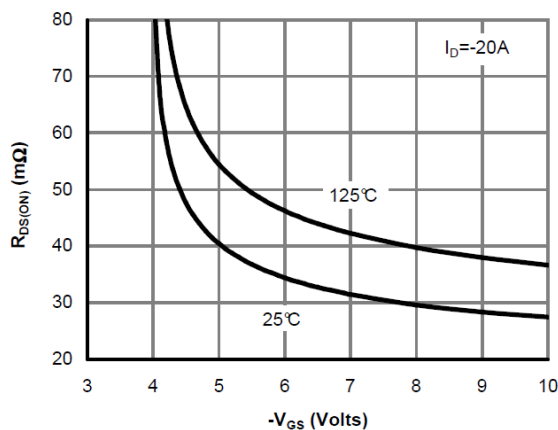


Figure 5: On-Resistance vs. Gate-Source Voltage

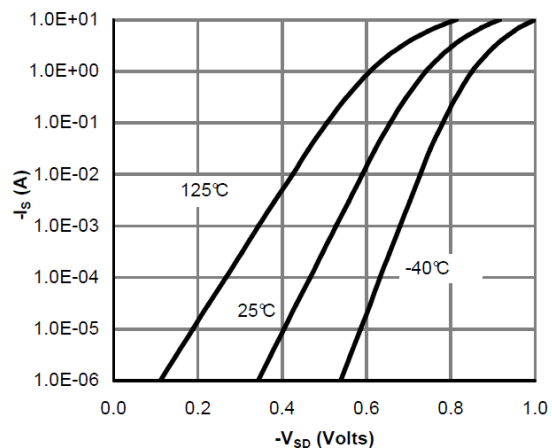


Figure 6: Body-Diode Characteristics

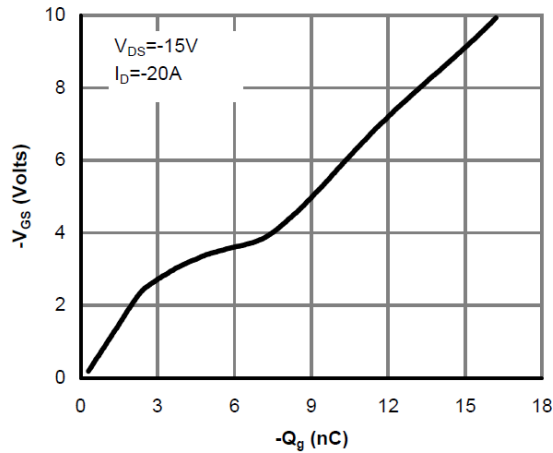


Figure 7: Gate-Charge Characteristics

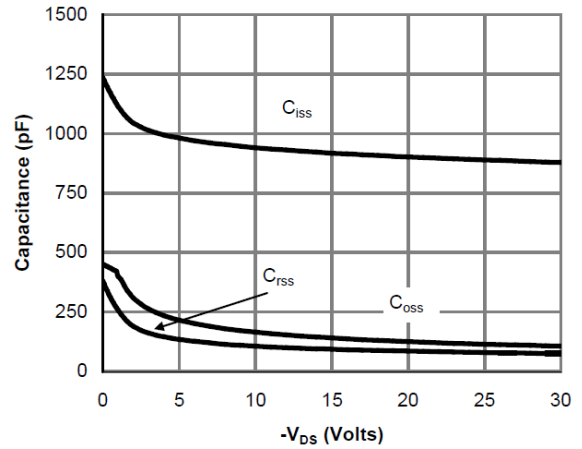


Figure 8: Capacitance Characteristics

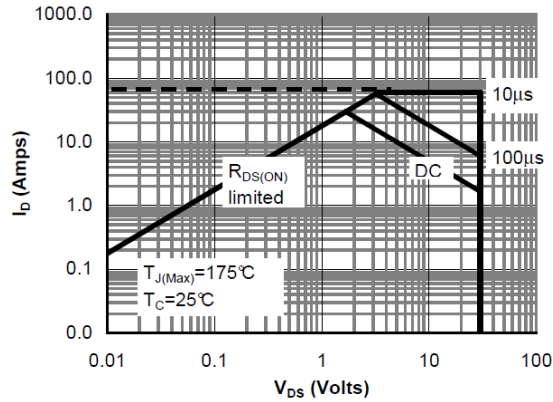


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

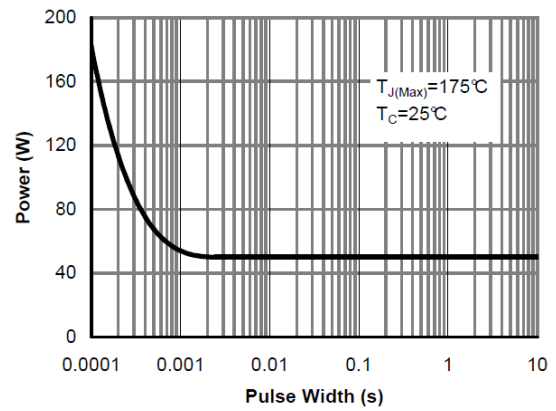


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

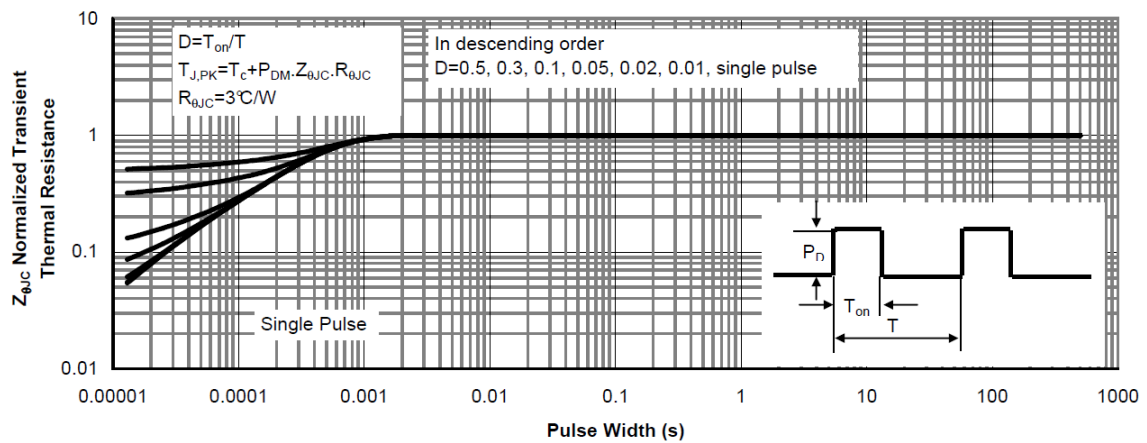
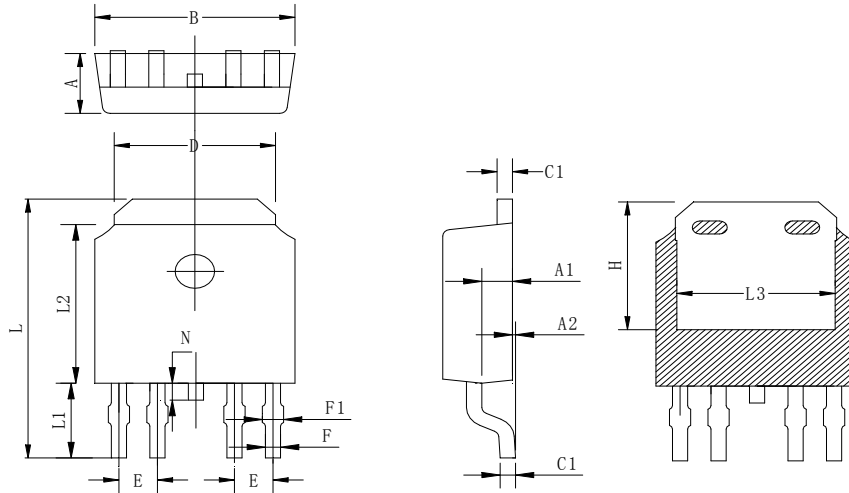


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TO-252-4Package Outline Data

UNIT: mm



Symbol	Min	Typ	Max
A	2.20	2.30	2.40
A1	0.91	1.01	1.11
A2	0.05	0.15	0.25
B	6.45	6.60	6.75
C	0.45	0.50	0.58
C1	0.45	0.50	0.58
D	5.12	5.32	5.52
E	1.27 TYP		
F1	0.45	0.60	0.75
F	0.40	0.50	0.60
H	4.70	4.90	5.10
L	9.70	10.00	10.20
L1	2.6	2.8	3.0
L2	5.95	6.10	6.25
L3	5.00	5.20	5.40`
N	0.45	0.65	0.85

Marking Information:

①. Doingter LOGO

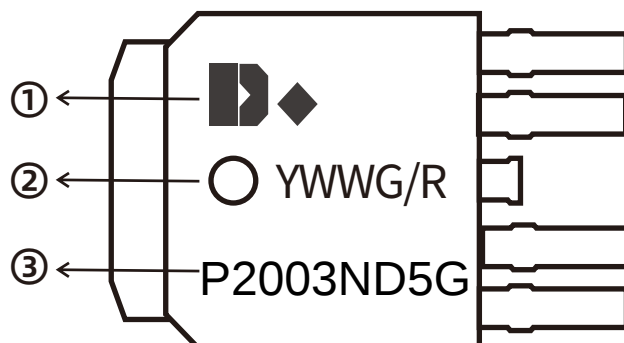
②. Date Code(YWWG / R)

Y : Year Code , last digit of the year

WW : Week Code(01-53)

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

③. Part NO.



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