• General Description

It combines trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$.

• Features

■AEC-Q101 Qualified

■Low $R_{DS(ON)}$ to minimize conductive loss

■High GOX reliability

■Low Thermal resistance

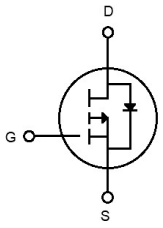
•Application

■BLDC Motor driver

■DC-DC

■Battery protection

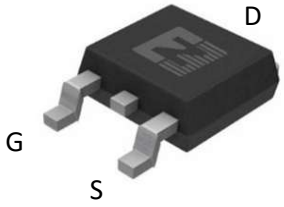
• Product Summary



V_{DS}= -30V

$R_{DS(ON)}$ = 2.9mΩ

I_D= -120A



TO-252

RoHS

REACH COMPLIANT

HF

•Ordering Information:

Part NO.	ZMA029P03D
Marking	ZM029P03
Packing Information	REEL TAPE
Basic ordering unit (pcs)	2500

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		-30	V
Gate-Source Voltage①	V_{GS}		±20	V
Continuous Drain Current	I_D	T_C=25℃	-120	A
	I_D	T_C=75℃	-99	A
	I_D	T_C=100℃	-85	A
Pulsed Drain Current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_{mb} = 25 °C;	-480	A
Total Power Dissipation	P_D	T_C=25℃	107	W
Total Power Dissipation	P_D	T_A=25℃	2.4	W
Operating Junction Temperature	T_J		-55 to +175	℃
Storage Temperature	T_{STG}		-55 to +175	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.1mH, V_{GS}=10V, Rg=25Ω,	240	mJ
		L=0.5mH, V_{GS}=10V, Rg=25Ω,	504	mJ
ESD Level (HBM)	CLASS 2			

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	1.4	°C/W
Thermal resistance, junction-ambient②	R_{thJA}②		-	62	°C/W
Soldering temperature	Tsold		-	260	°C

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D =-250uA	-30			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =-250uA	-1.3	-1.8	-2.5	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}= -30V			1.0	uA
Gate- Source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS} = 0V			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D= -24A		2.9	3.5	mΩ
		V_{GS}=-4.5V, I_D= -12A		4.2	6	mΩ
Forward Transconductance	g_{FS}	V_{DS} =-5V, I_{SD} = -20A		20		s
Diode Forward Voltage	V_{FSD}	V_{GS} =0V, I_{SD} = -24A			1.3	V

●Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V_{DS}=-25V	-	10870	-	pF
Output capacitance	Coss		-	1082	-	
Reverse transfer capacitance	Crss		-	854	-	
Gate Risistance	Rg	f = 1MHz	-	3		Ω
Total gate charge	Qg	V_{DD} = -15V, I_D = -20A, V_{GS} = -10V	-	184	-	nC
	Qg(-4.5v)		-	83	-	
Gate - Source charge	Qgs		-	37	-	
Gate - Drain charge	Qgd		-	23	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=-10V,V_{DS}=-15V, R_G =3.3Ω, I_D =-20A	-	27	-	ns
Turn-ON Rise time	t_r		-	105	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	98	-	ns
Turn-Off Fall time	t_f		-	33	-	ns

Fig.1 Gate-Charge Characteristics

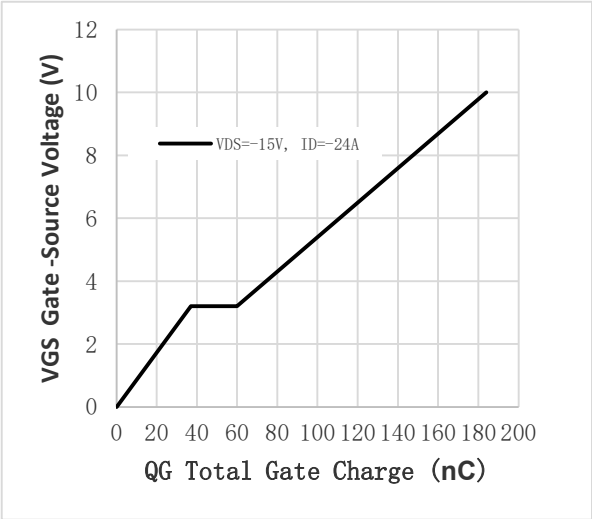


Fig.2 Capacitance Characteristics

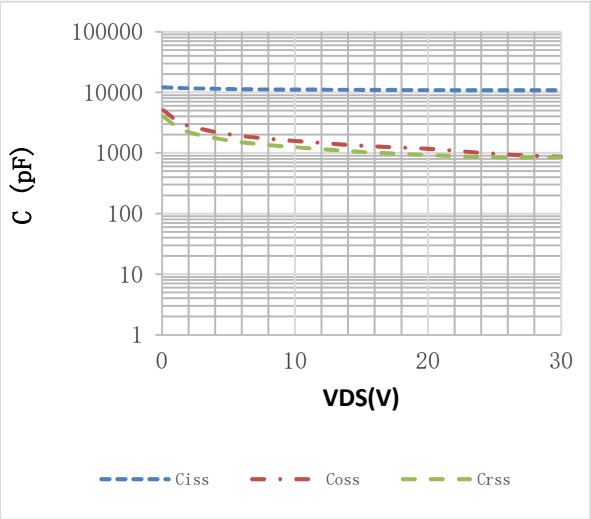


Fig.3 Power Dissipation

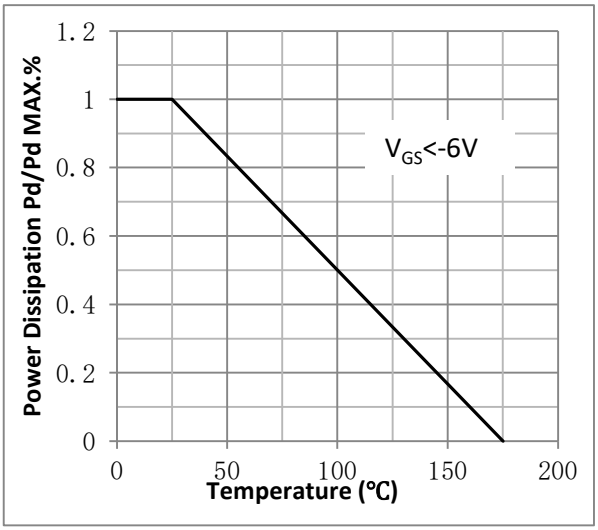


Fig.4 Typical output Characteristics

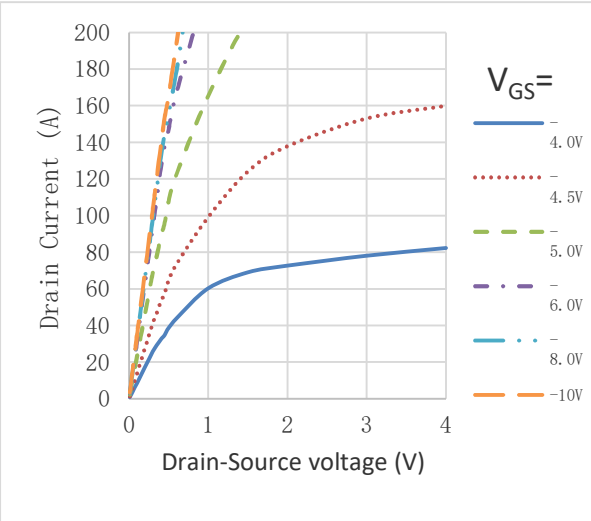


Fig.5 Threshold Voltage V.S Junction Temperature

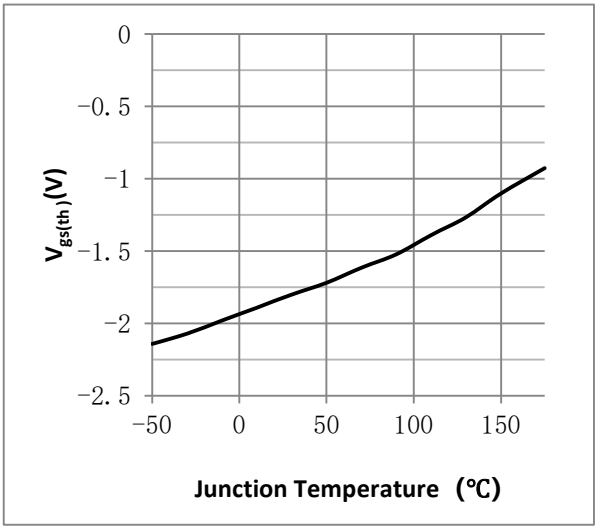


Fig.6 Resistance V.S Drain Current

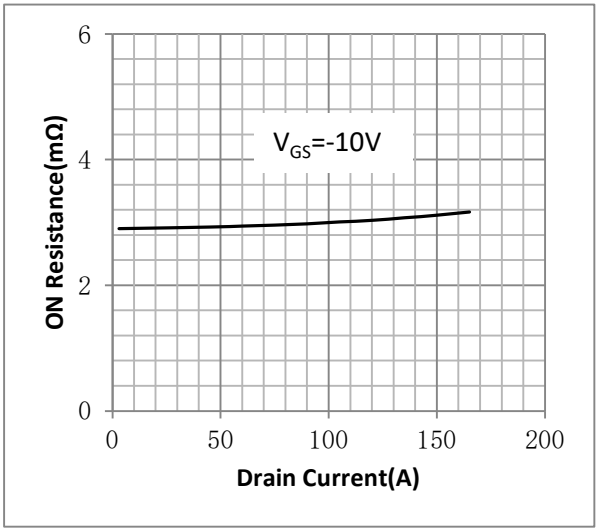


Fig.7 On-Resistance VS Gate Source Voltage

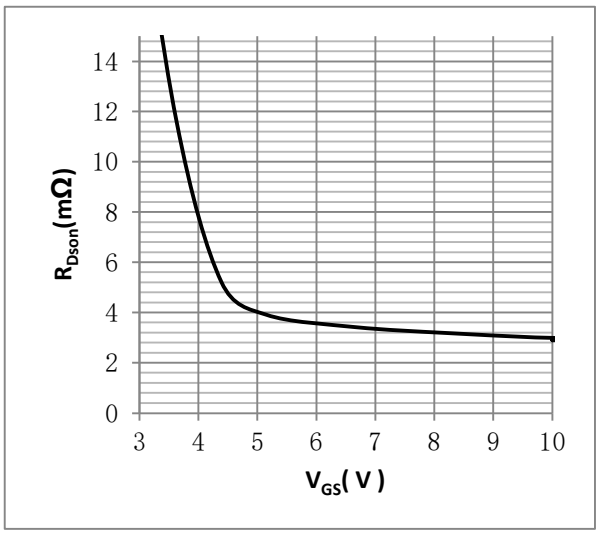


Fig.8 On-Resistance V.S Junction Temperature

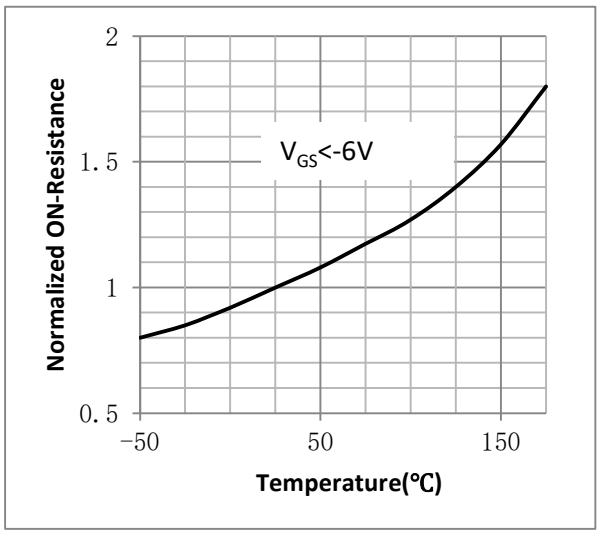


Figure 9. Diode Forward Voltage vs. Current

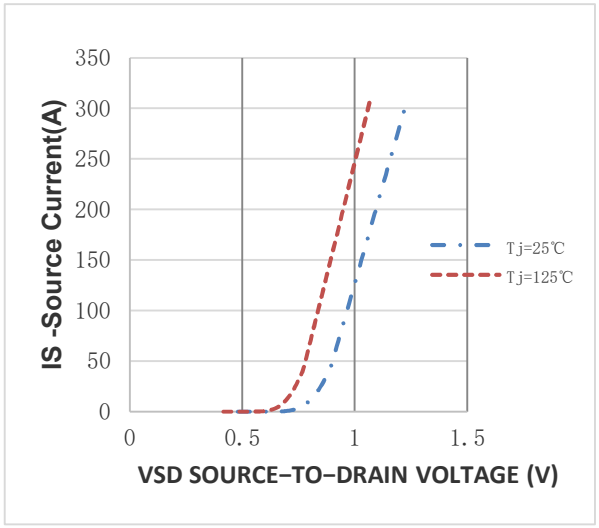


Figure 10. Transfer Characteristics

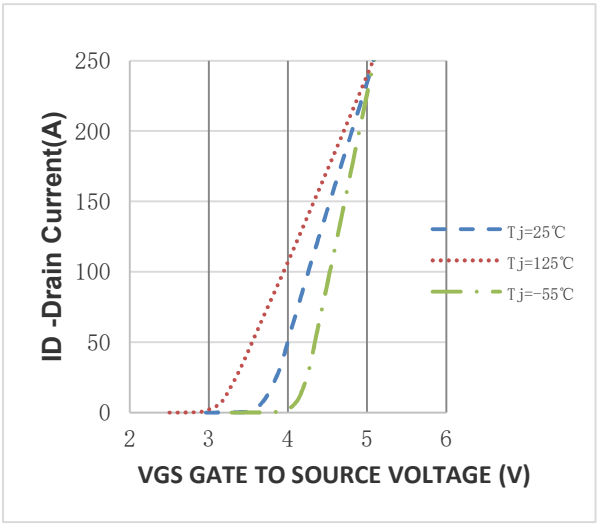


Fig.11 Safe Operating Area

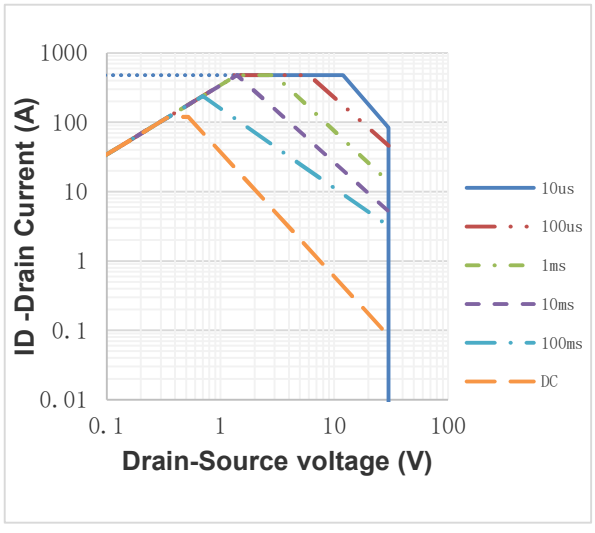
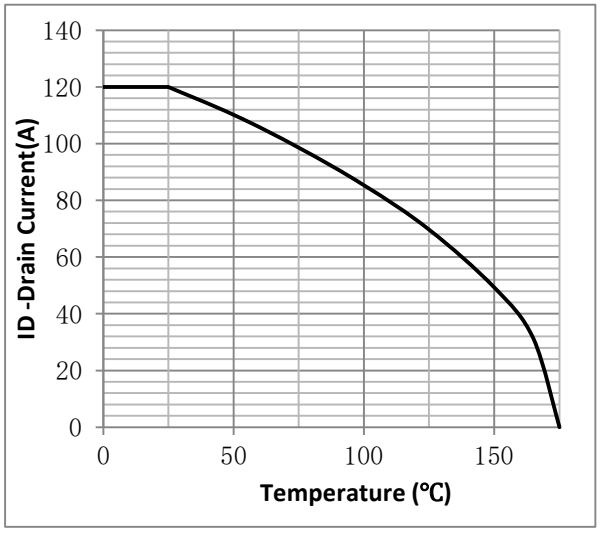
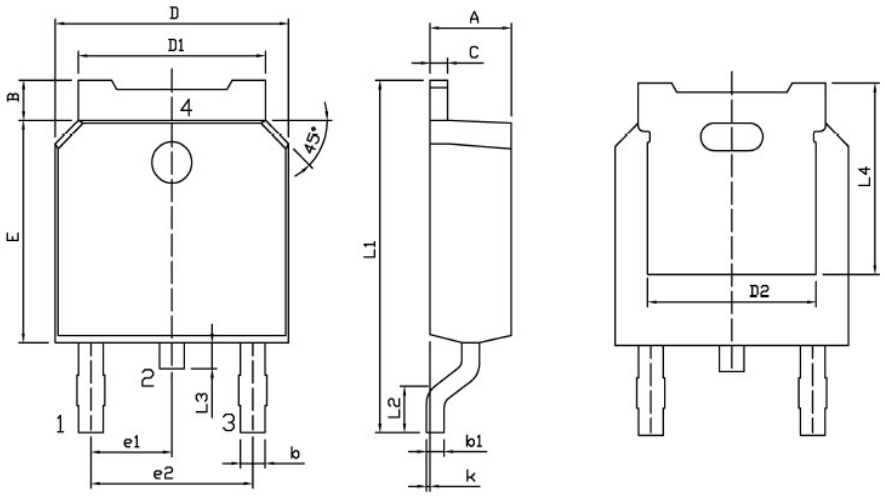


Fig.12 ID vs. Case Temperature③



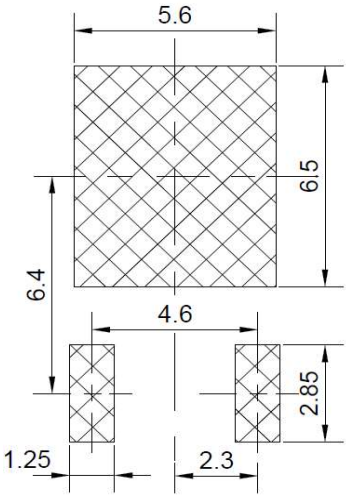
●TO-252 Package Outline

Option L:



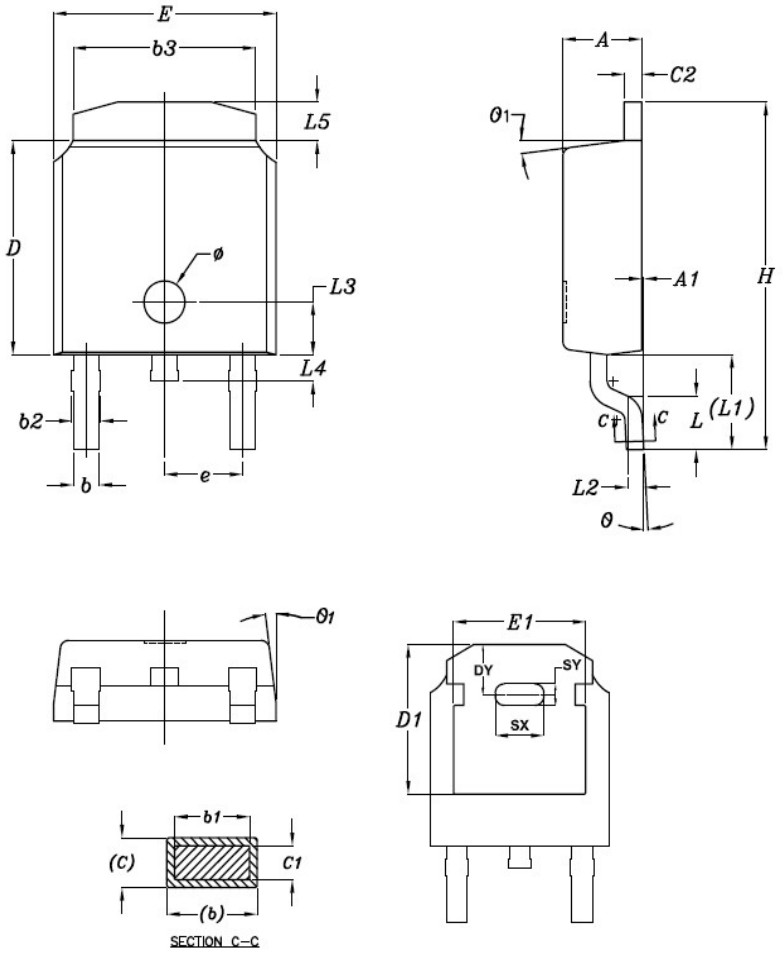
Dimensions In Millimeters					
Symbol	MIN	MAX	Symbol	MIN	MAX
A	2.20	2.40	E	5.95	6.25
B	0.95	1.25	e1	2.24	2.34
b	0.70	0.90	e2	4.43	4.73
b1	0.45	0.55	L1	9.85	10.35
C	0.45	0.55	L2	1.70	2.00
D	6.45	6.75	L3	0.60	0.90
D1	5.10	5.50	L4	5.05	
D2	4.85		k	0.00	0.10

Land Pattern
(Only for Reference)



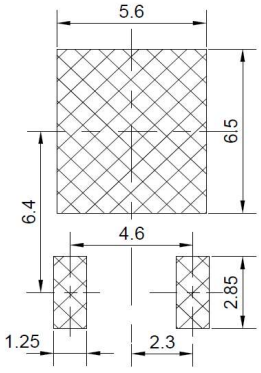
●TO-252 Package Outline

Option Q:



ITEM	DIMENSIONS			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.18	2.39	0.086	0.094
A1	——	0.13	——	0.005
b	0.70	0.89	0.028	0.035
b1	0.70	0.86	0.028	0.034
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c1	0.41	0.56	0.016	0.022
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	5.54	0.205	0.218
E	6.35	6.73	0.250	0.265
E1	4.32	5.27	0.170	0.207
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	1.40	1.78	0.055	0.070
L1	2.60	2.90	0.102	0.114
L2	0.51 BSC		0.020 BSC	
3 L3	1.65	1.95	0.065	0.077
L4	0.60	0.90	0.024	0.035
3 L5	0.89	1.27	0.035	0.050
θ	1°	5°	1°	5°
θ1	7° REF		7° REF	
ø	1.20 REF		0.047 REF	
SX	1.52 REF		0.060 REF	
SY	0.50 REF		0.020 REF	
DY	1.70 REF		0.067 REF	

Land Pattern
(Only for Reference)



Note:

① Pulse : VGS=+20V/-20V, Duty cycle=50%,Tj=175℃, t=1000 hours; For DC， the following test conditions can be passed: VGS=-20V/+10V, Tj=175℃, t=1000 hours；

② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate；

③Practically the current will be limited by PCB, thermal design and operating temperature. V_{GS}=-10V.

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Revision History

Version	Date	Change
A	2021.2.3	NEW
B	2021.11.7	1.Modified Typical output Characteristics curve
C	2022.9.6	1.Add Reach,HF figure 2.Modified ID curve
D	2025.11.14	Update POD