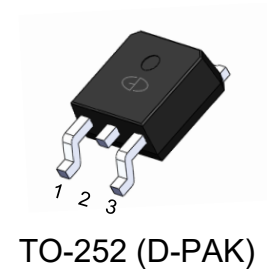


## P-Channel -40V (D-S) Power MOSFET

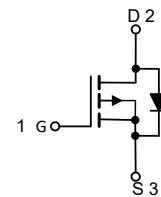
### Features

- 100% Avalanche Tested
- Extremely Low Losses with Low FOM  $R_{ds(on)} \cdot Q_g$
- Halogen Free, Pb-Free
- RoHS Compliant



### Applications

- DC/DC
- Motors, lamps
- Power switching



Absolute Maximum Ratings ( $T_J=25^\circ\text{C}$ unless otherwise noted)			
Parameter	Symbol	Value	Unit
Drain Source Voltage	$V_{DS}$	-40	V
Gate Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current, Continuous $V_{GS}=-10\text{V}$	$I_D$	$T_C=25^\circ\text{C}$	-23
		$T_C=100^\circ\text{C}$	-15
Drain Current, Pulsed (Note 1)	$I_{DM}$	92	A
Single Avalanche Energy (Note 2)	$E_{AS}$	68	mJ
Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	34
		$T_C=100^\circ\text{C}$	14
Operating Junction/ Storage Temperature Range	$T_J/ T_{STG}$	-55 to +150	$^\circ\text{C}$

Note 1: Single pulse;  $t_p \leq 1\mu\text{s}$ .

Note 2:  $V_{DD} = -20\text{V}$ ,  $V_{GS} = -10\text{V}$ ,  $L = 0.5\text{mH}$ ,  $R_G = 25\Omega$ , starting  $T_J = 25^\circ\text{C}$ .

Thermal Characteristics			
Parameter	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{thJC}$	3.7	$^\circ\text{C/W}$
Thermal Resistance Junction to Ambient (Note 3)	$R_{thJA}$	62.5	$^\circ\text{C/W}$

Note 3: Device mounted on 1 square inch FR4 PCB board, with 2oz single-sided copper, in a  $25^\circ\text{C}$  still air environment.

## Electrical Characteristics (T<sub>J</sub> =25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-40	--	--	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-40V, V <sub>GS</sub> =0V	--	--	-1	uA
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250uA	-1	--	-2.5	V
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
Drain-Source On-state Resistance (Note 4)	R <sub>DS(on)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-10A	--	30	39	mΩ
Total Gate Charge	Q <sub>g</sub>	V <sub>GS(off)</sub> =0V, V <sub>GS(on)</sub> =-10V, V <sub>DD</sub> =-20V, I <sub>D</sub> =-10A	--	19.3	--	nC
Gate-Source Charge	Q <sub>gs</sub>		--	2.5	--	
Gate-Drain Charge	Q <sub>gd</sub>		--	5.5	--	
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> =-10V, V <sub>DD</sub> =-20V, R <sub>L</sub> =2Ω, R <sub>G</sub> =3Ω	--	13	--	ns
Turn-on Rise Time	t <sub>r</sub>		--	16	--	
Turn-off Delay Time	t <sub>d(off)</sub>		--	180	--	
Turn-off Fall Time	t <sub>f</sub>		--	86	--	
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =-20V, f=1MHz	--	1021	--	pF
Output Capacitance	C <sub>oss</sub>		--	63.6	--	
Reverse Transfer Capacitance	C <sub>rss</sub>		--	48.6	--	

## Reverse Diode Characteristics (T<sub>J</sub> =25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Current, Continuous	I <sub>SD</sub>	T <sub>C</sub> =25°C	--	--	-24	A
Diode Forward Voltage (Note 4)	V <sub>SD</sub>	I <sub>F</sub> =-10A, V <sub>GS</sub> =0V	--	--	-1.2	V
Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> =-10A, di/dt = 100 A/μs	--	34	--	ns
Reverse Recovery Charge	Q <sub>rr</sub>		--	35	--	nC

Note 4: Pulse test; pulse width ≤ 380μs, duty cycle ≤ 1%.

**Typical Characteristics Curves** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Fig.1 - Output Characteristics

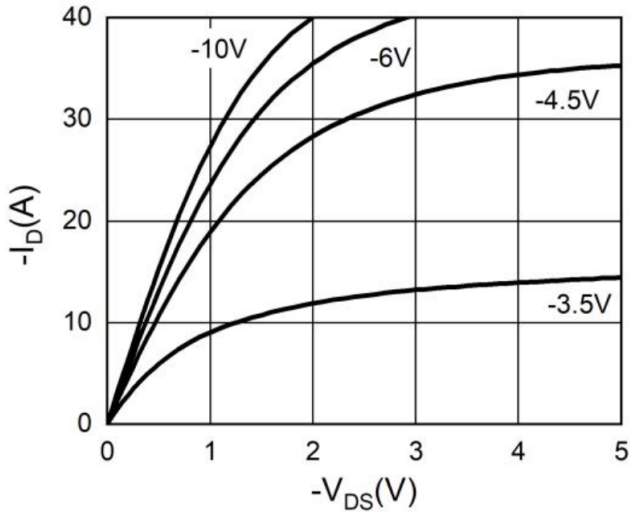


Fig.2 - Transfer Characteristics

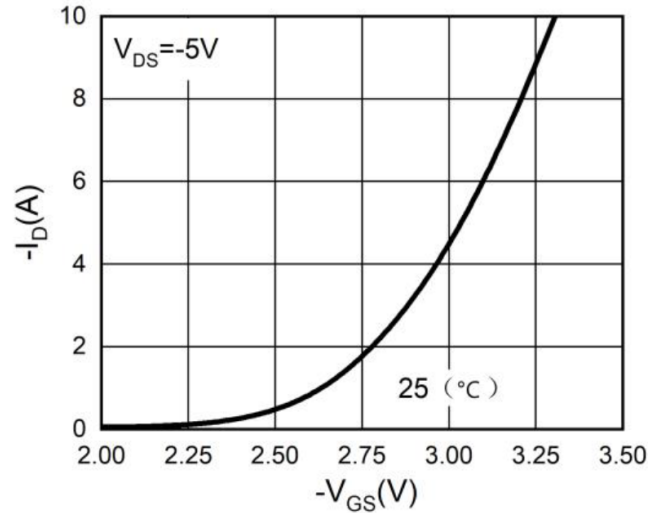


Fig.3 - Normalized On-Resistance

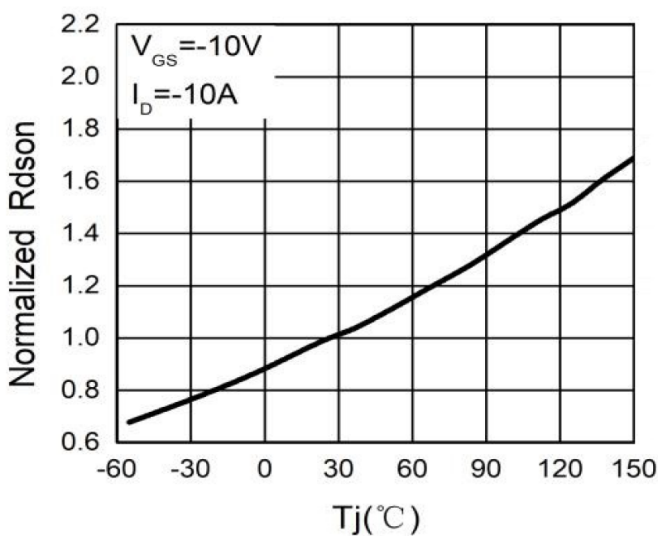


Fig.4 - Capacitance

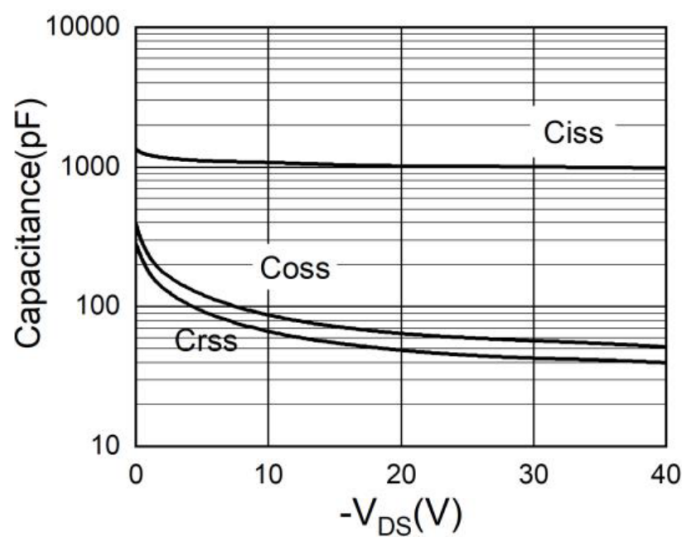


Fig.5 - Gate charge

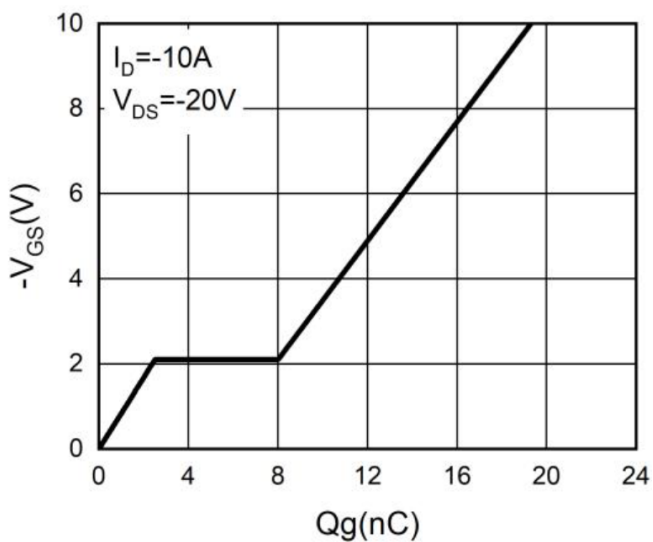
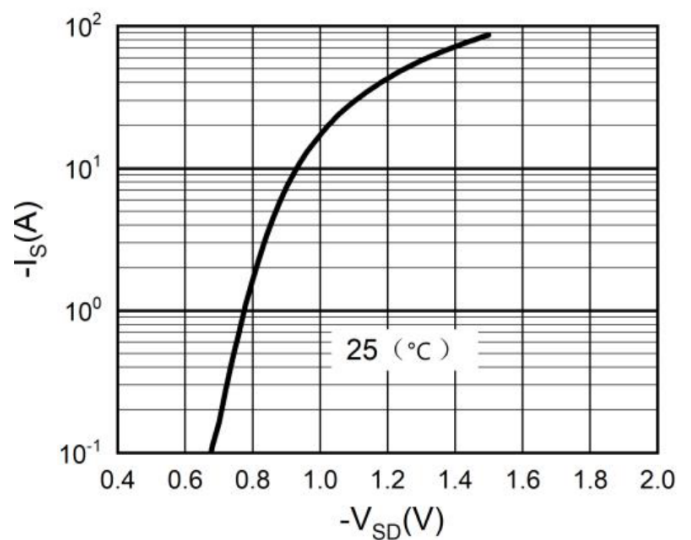


Fig.6 - Forward Characteristic



**Typical Characteristics Curves** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Fig.7 - Safe Operating Area

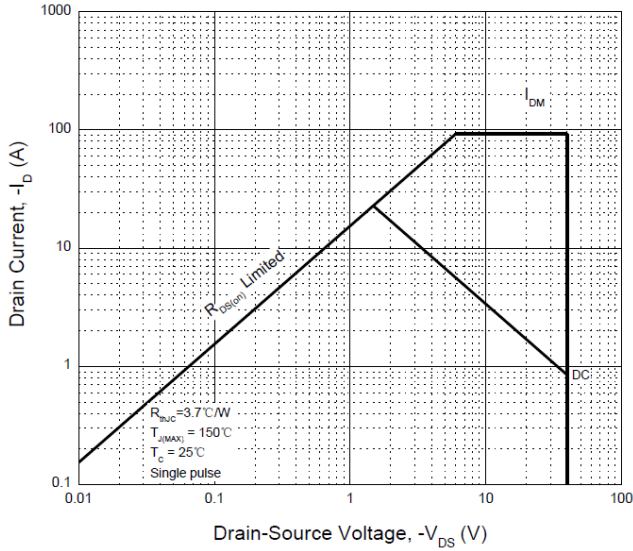


Fig.8 - Power Derating

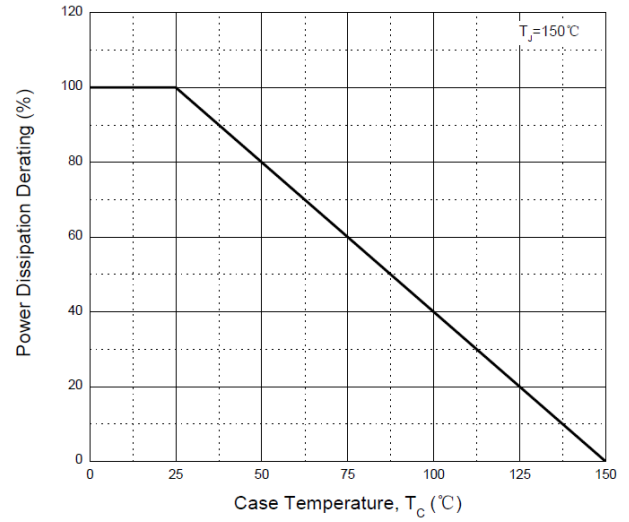
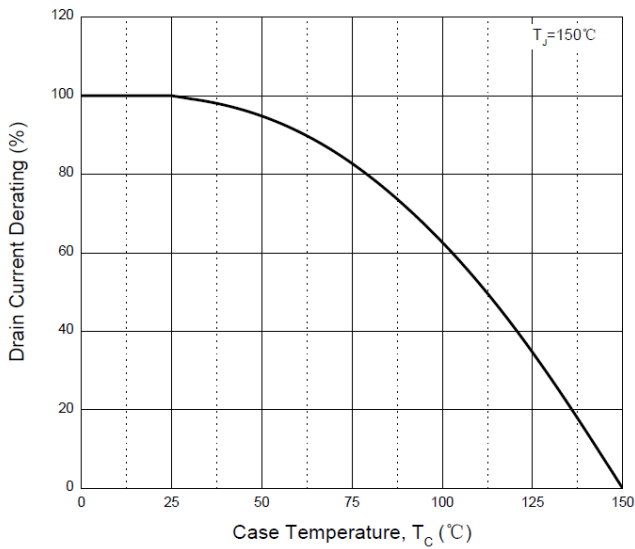
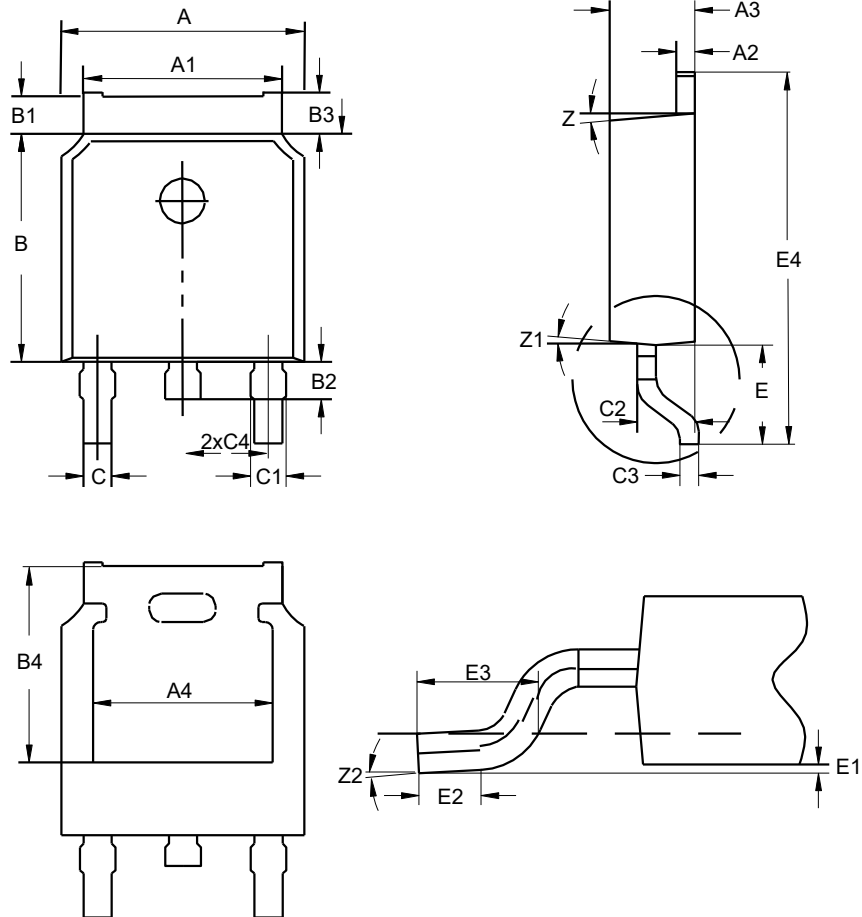


Fig.9 - Drain Current Derating



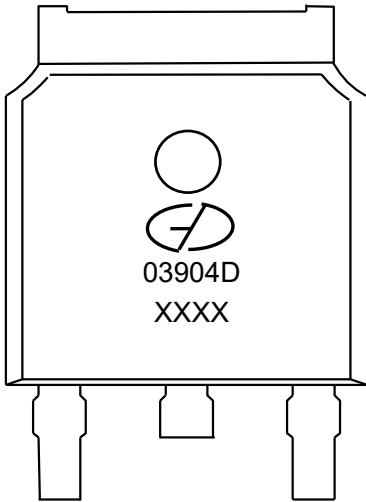
**Package Outline Dimensions** (Unit: millimeters)

**TO-252(D-PAK)**




TO-252							
	Min.	Nom.	Max.		Min.	Nom.	Max.
A	6.34	6.54	6.74	C2	1.34	1.54	1.74
A1	5.2	5.3	5.4	C3	0.4	0.5	0.6
A2	0.4	0.5	0.6	C4	2.09	2.29	2.49
A3	2.08	2.28	2.48	E	2.6	2.9	3.2
A4	4.6	4.8	5.0	E1	0	-	0.15
B	5.8	6.1	6.4	E2	0.7	-	-
B1	0.82	1.02	1.22	E3	1.3	1.6	1.9
B2	0.8	1	1.2	E4	9.8	10.1	10.4
B3	0.9	1.1	1.3	Z	-	7°	-
B4	5.05	5.25	5.45	Z1	-	7°	-
C	0.66	0.76	0.86	Z2	0°	-	10°
C1	0.65	0.85	1.05	-	-	-	-

## Marking Outline



Part Name: GMP03904D

1. Logo Mark: 
2. P/N Mark: 03904D
3. Date Code: XXXX

## Revision History

Version	Date	Major Changes
Rev.A	2024.05.29	Official Release

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