

FMNP2301-H

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-2.8A -20V P-Channel Enhancement Mode Power MOSFET

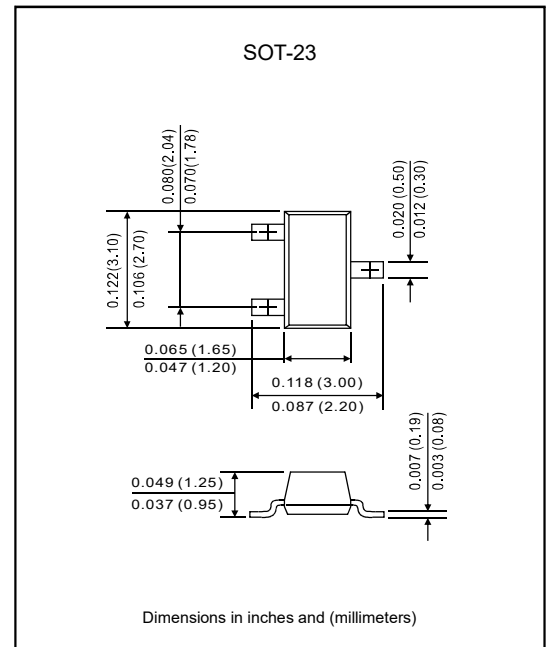
Features

- $-V_{DS}=20V$, $-I_D=4.5A$.
- $R_{DS(ON)} \leq 110\text{ m}\Omega$, @ $-V_{GS}=4.5V$, $-I_D=2.8A$.
- $R_{DS(ON)} \leq 140\text{ m}\Omega$, @ $-V_{GS}=2.5V$, $-I_D=2.0A$.
- Super high dense cell trench design for low on-resistance.
- Rugged and reliable.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-23.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Weight : Approximated 10mg.

Package outline



Maximum ratings (At $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Ratings	Units
Drain-source voltage	$-V_{DS}$	20	V
Gate-source voltage	V_{GS}	± 12	V
Continuous drain current (Note 1) ($T_A=25^\circ\text{C}$)	$-I_D$	2.8	A
Pulsed drain current (Note 2)	$-I_{DM}$	8	A
Drain-source diode forward current (Note 1)	$-I_S$	1.2	A
Power dissipation (Note 1)	P_D	1.25	W
		0.75	
Thermal resistance, junction to ambient (Note 1)	$R_{\theta JA}$	125	$^\circ\text{C/W}$
Junction temperature	T_J	+150	$^\circ\text{C}$
Storage temperature range	T_{STG}	-55 to +150	$^\circ\text{C}$

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Electrical characteristics (At $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	$V_{GS}=0V, -I_D=250A$	$-BV_{DSS}$	20			V
Zero gate voltage drain current	$-V_{DS}=20V, V_{GS}=0V$	$-I_{DSS}$			1	μA
Gate-body leakage current	$V_{GS}=\pm 12V, V_{DS}=0V$	I_{GSS}			± 100	nA

On characteristics (Note2)

Gate threshold voltage	$V_{DS}=V_{GS}, -I_D=250\mu A$	$-V_{GS(th)}$	0.5	0.7	1.0	V
Drain-source on-state resistance	$-V_{GS}=4.5V, -I_D=2.8A$	$R_{DS(on)}$		90	110	m Ω
	$-V_{GS}=2.5V, -I_D=2.0A$			115	140	

Dynamic parameters (Note3)

Input capacitance	$V_{GS}=0V, V_{DS}=-6V, f=1.0MHz$	C_{iss}		581		pF
Output capacitance		C_{oss}		121		
Reverse transfer capacitance		C_{rss}		79		

Switching parameters (Note3)

Total gate charge	$-V_{GS}=4.5V, -V_{DS}=6V, -I_D=2.8A$	Q_g		8.3		nC
Gate-source charge		Q_{gs}		1.54		
Gate-drain charge		Q_{gd}		1.21		
Turn-on delay time	$-V_{DD}=6V, -I_D=2A, -V_{GEN}=4.5V, R_L=6\Omega, R_{GEN}=6\Omega$	$t_{d(on)}$		7.8		ns
Turn-on rise time		t_r		2.9		
Turn-off delay time		$t_{d(off)}$		36.2		
Turn-off fall time		t_f		10.8		

Source-drain diode ratings and characteristics

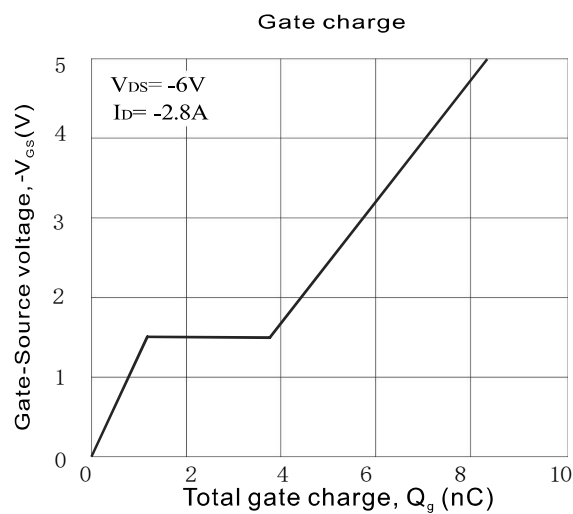
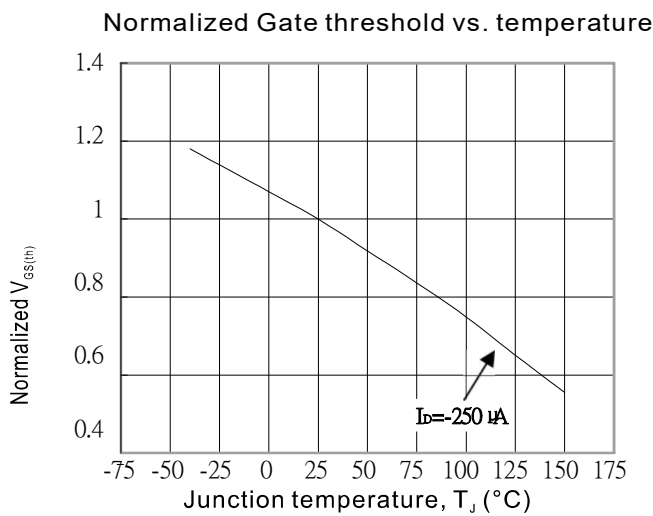
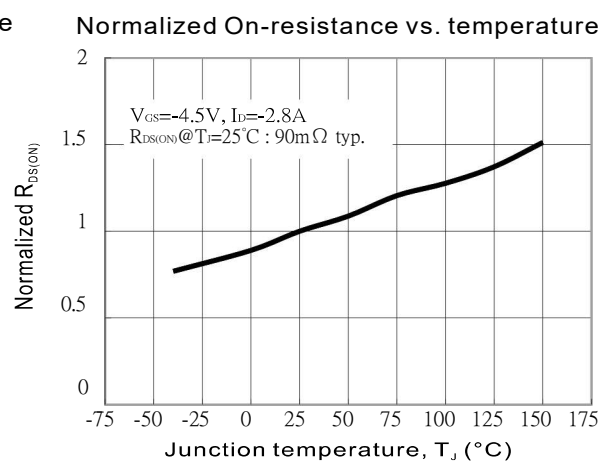
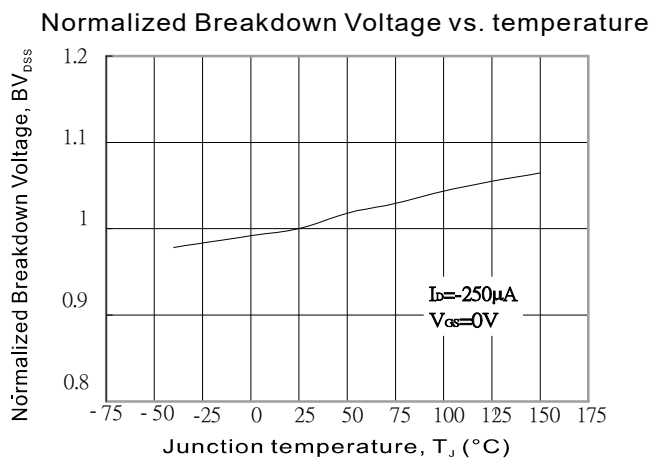
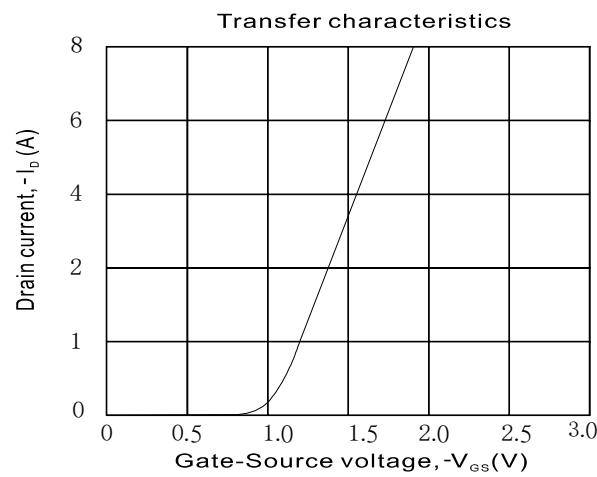
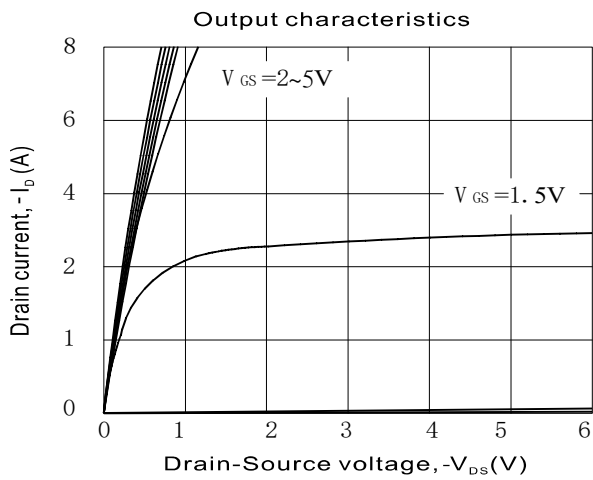
Source-drain forward voltage drop (Note 2)	$-I_S=1.2A, V_{GS}=0V$	$-V_{SD}$			1.2	V
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Note: 1. Surface mounted on FR4 board, $t \leq 10$ seconds.2. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

3. Guaranteed by design, not subject to production testing.

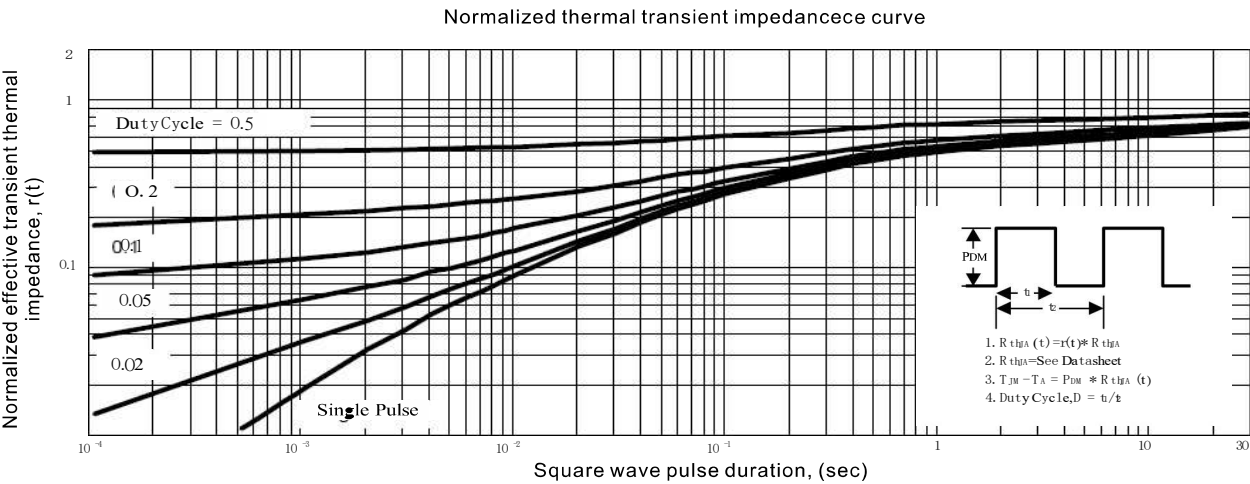
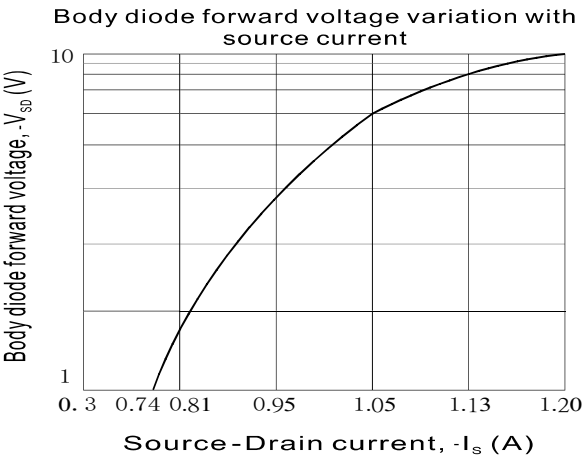
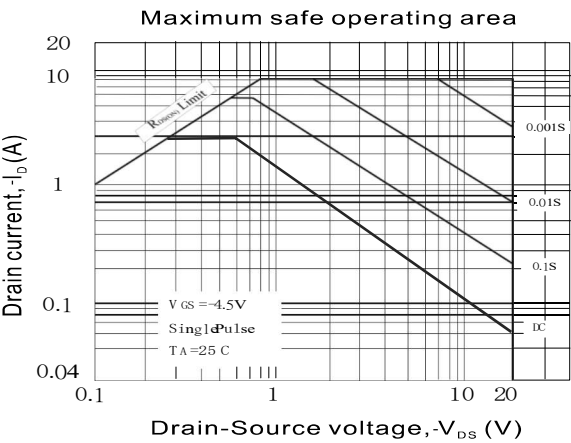
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Rating and characteristic curves



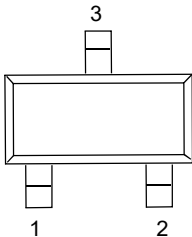
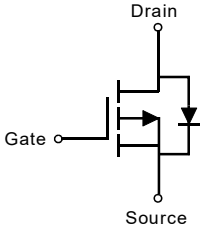
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Rating and characteristic curves



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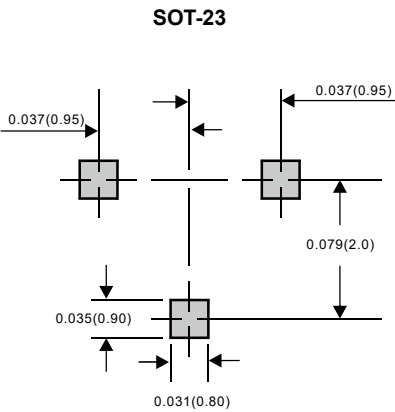
Pinning information

Pin	Simplified outline	Symbol
Pin 1 Gate Pin 2 Source Pin 3 Drain		

Marking

Type number	Marking code
FMNP2301-H	2301C

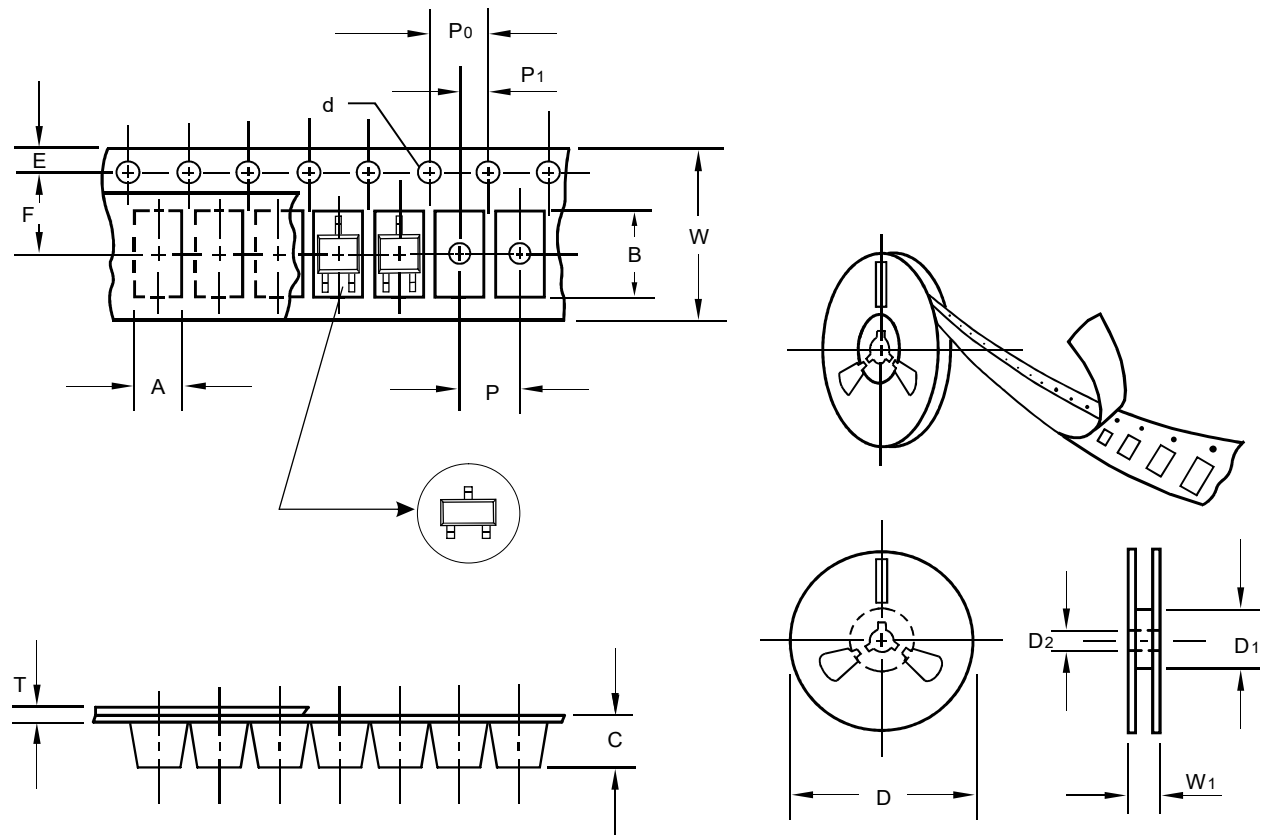
Suggested solder pad layout



Dimensions in inches and (millimeters)

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-23
Carrier width	A	0.3	3.15
Carrier length	B	0.3	2.77
Carrier depth	C	0.3	1.22
Sprocket hole	d	0.3	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	54.40
Feed hole diameter	D2	0.5	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.50
Punch hole pitch	P	0.1	4.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Overall tape thickness	T	0.3	0.23
Tape width	W	0.3	8.00
Reel width	W1	3.0	12.3

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

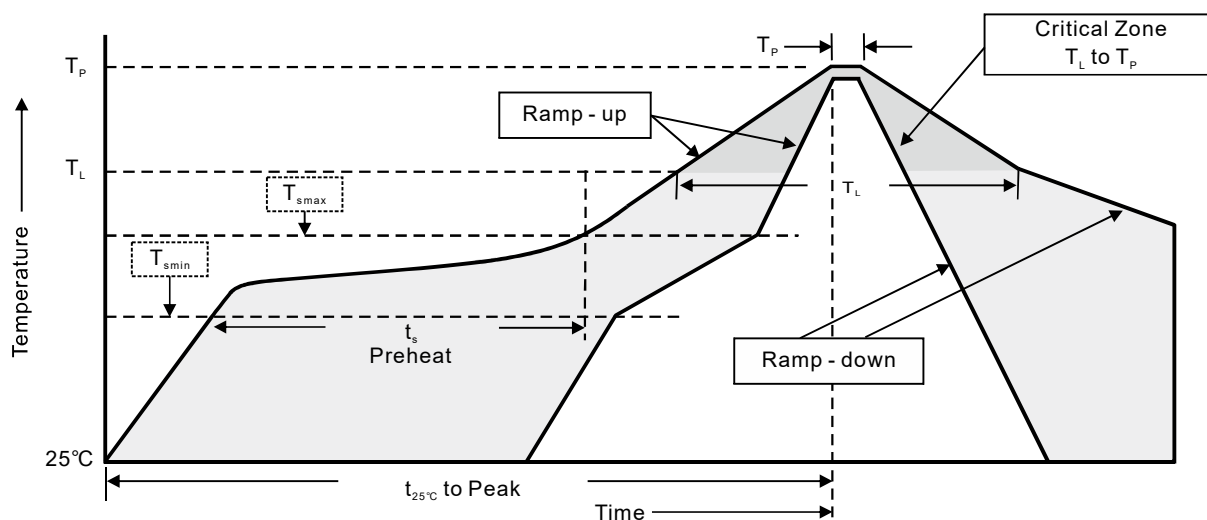
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Reel packing

Package	Reel Size	Reel (pcs)	Component Spacing (m/m)	Box (pcs)	Inner Box (m/m)	Reel DIA, (m/m)	Carton Size (m/m)	Carton (pcs)
SOT-23	7"	3,000	4.0	30,000	183 x 123 x 183	178	382 x 257 x 387	240,000

Suggested thermal profiles for soldering processes

1. Storage environment : Temperature = 5°C ~ 40°C, Humidity = 55%, ±25%.
2. Reflow soldering of surface - Mount devices.



3. Reflow soldering

Profile feature	Soldering condition
Average ramp-up rate (T_L to T_p)	< 3 °C/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	150°C 200°C 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	< 3 °C / sec
Time maintained above : - Temperature (T_L) - Time (T_L)	217°C 60 ~ 260 sec
Peak temperature (T_p)	255 °C -0 / +5°C
Time with 5°C of actual peak temperature (T_p)	10 ~ 30 sec
Ramp-down rate	< 6°C / sec
Time 25°C to peak temperature	< 6 minutes