

FMVDN1012E-H

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FMVDN1012E-H

500mA 20V Dual N-Channel Enhancement Mode MOSFET With ESD Protection

Features

- $V_{DS}=20V$, $I_D=500mA$.
- $R_{DS(ON)} \leq 700m\Omega$, @ $V_{GS}=4.5V$, $I_D=0.60A$.
- $R_{DS(ON)} \leq 850m\Omega$, @ $V_{GS}=2.5V$, $I_D=0.50A$.
- High-side switching.
- Low on-resistance and low threshold.
- Fast switching speed.
- ESD protected up to 1.8KV (HBM).
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

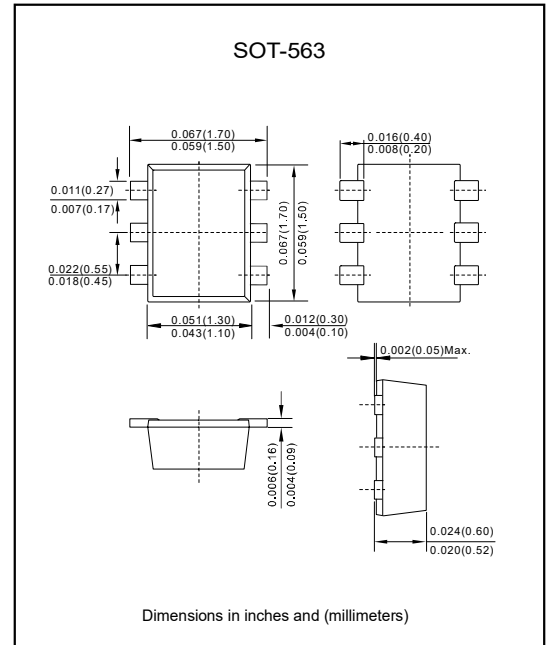
Application

- Drivers: relays, solenoids, lamps, hammers, displays, and memories.
- Battery operated systems and power supply converter circuits.
- Load/power switching cell phones and pagers.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-563.
- Terminals : Solder plated, solder able per MIL-STD-750, Method 2026.
- Weight : Approximated 3.2mg.

Package outline



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

Parameter	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	20	V
Gate-source voltage	V_{GS}	± 10	V
Continuous drain current	I_D	500	mA
Pulsed drain current (Note1)	I_{DM}	1	A
Power dissipation (Note2, $T_A=25^\circ C$)	P_D	150	mW
Power dissipation (Note3, $T_c=25^\circ C$)		275	
Thermal resistance, junction to ambient	$R_{\theta JA}$	833	$^\circ C/W$
Thermal resistance, junction to case	$R_{\theta JC}$	455	
Junction temperature	T_J	+150	$^\circ C$
Storage temperature range	T_{STG}	-55 to + 150	$^\circ C$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu A$, $V_{GS}=0V$	20			V
Drain-source leakage current	I_{DSS}	$V_{DS}=16V$, $V_{GS}=0V$			100	nA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 4.5V$, $V_{DS}=0V$			± 1	μA
On characteristics						
Gate threshold voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu A$	0.45	0.80	1.20	V
Static drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=4.5V$, $I_D=0.60A$		250	700	m Ω
		$V_{GS}=2.5V$, $I_D=0.50A$		330	850	
Forward tranconductance	g_{FS}	$V_{DS}=10V$, $I_D=0.40A$		1		S
Dynamic parameters						
Input capacitance (Note4)	C_{iss}	$V_{GS}=0V$, $V_{DS}=16V$, $f=1.0MHz$		100		pF
Out capacitance (Note4)	C_{oss}			16		
Reverse transfer capacitance (Note4)	C_{rss}			12		
Switching parameters						
Total gate charge	Q_g	$V_{DS}=10V$, $V_{GS}=4.5V$, $I_D=250mA$		750		nC
Gate-source charge	Q_{gs}			75		
Gate-drain charge	Q_{gd}			225		
Turn-on delay time (Note4)	$t_{d(on)}$	$V_{DD}=10V$, $R_L=47\Omega$, $I_D=200mA$, $V_{GS}=4.5V$, $R_G=10\Omega$		5		ns
Turn-on rise time (Note4)	t_r			5		
Turn-off delay time (Note4)	$t_{d(off)}$			25		
Turn-off fall time (Note4)	t_f			11		
Source-drain diode ratings and characteristics						
Diode forward voltage (Note5)	V_{SD}	$I_S=0.15A$, $V_{GS}=0V$			1.2	V

Note : 1. Repetitive Rating : Pulse width limited by maximum junction temperature.

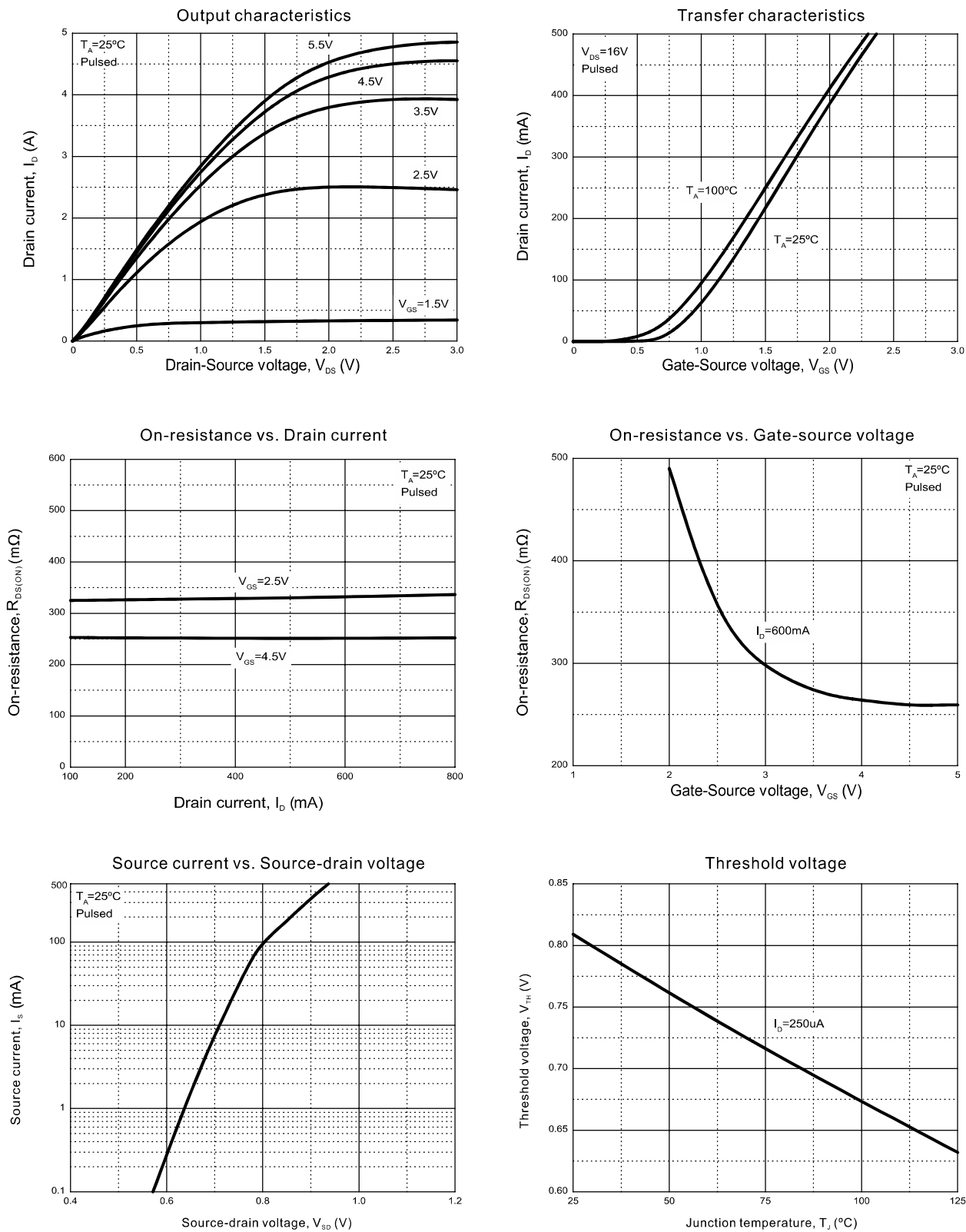
2. This test is performed with no heat sink at $T_A=25^{\circ}\text{C}$.3. This test is performed with infinite heat sink at $T_c=25^{\circ}\text{C}$.

4. These parameters have no way to verify.

5. Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$

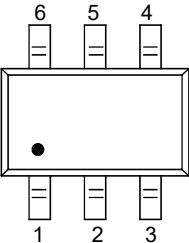
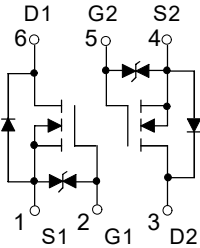
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Rating and characteristic curves



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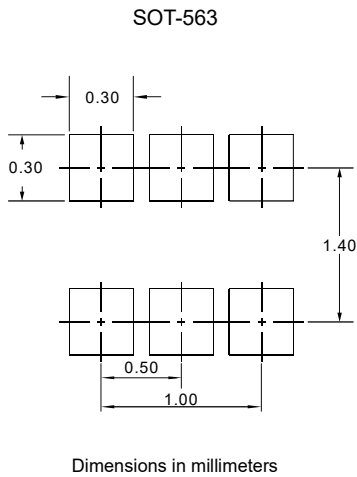
Pinning information

Pin	Simplified outline	Symbol
Pin 1 Source 1 Pin 2 Gate 1 Pin 3 Drain 2 Pin 4 Source 2 Pin 5 Gate 2 Pin 6 Drain 1		

Marking

Type number	Marking code
FMVDN1012E-H	Na1

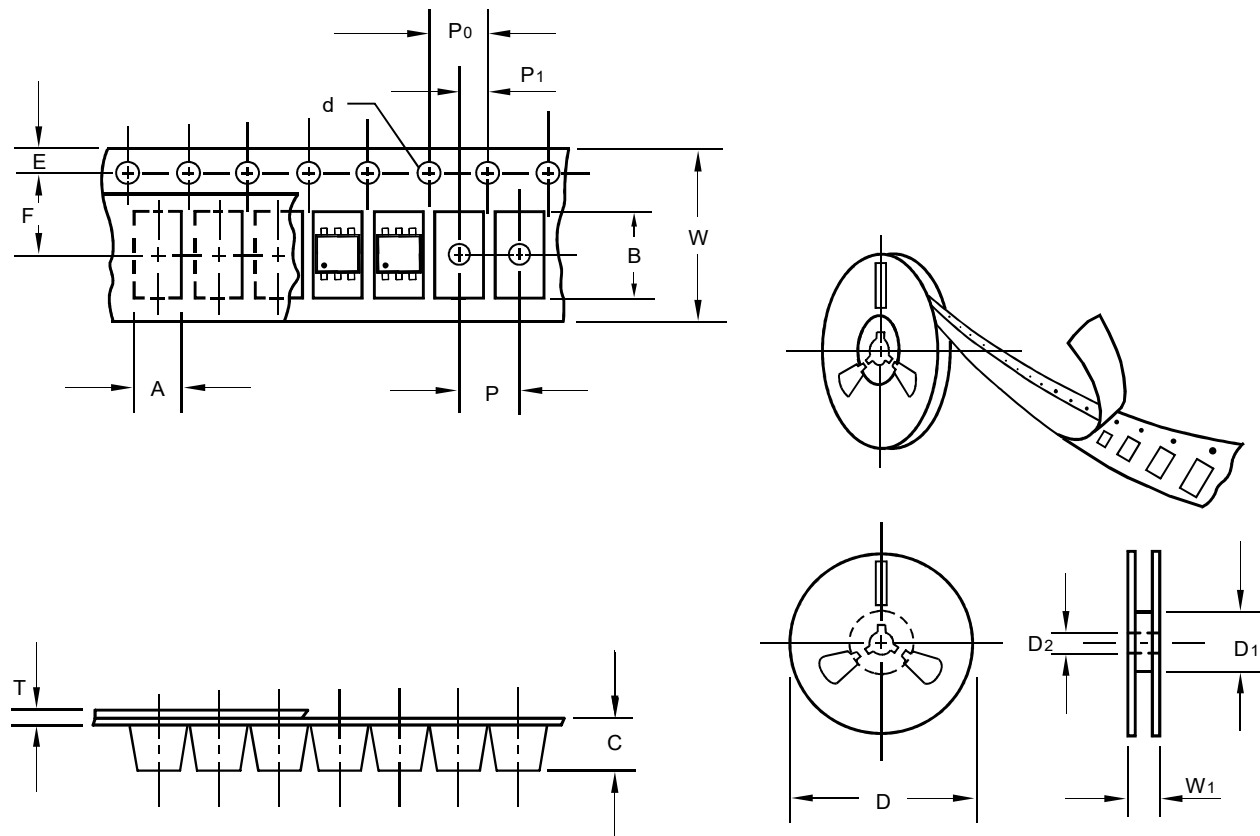
Suggested solder pad layout



- Note :
- 1. Controlling dimension : in millimeters.
 - 2. General tolerance : $\pm 0.05\text{mm}$.
 - 3. The pad layout is for reference purposes only.

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-563
Carrier width	A	0.5	1.78
Carrier length	B	0.5	1.78
Carrier depth	C	0.5	0.69
Sprocket hole	d	0.5	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	54.00
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	0.5	0.23
Tape width	W	0.5	8.00
Reel width	W1	5.0	12.10

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

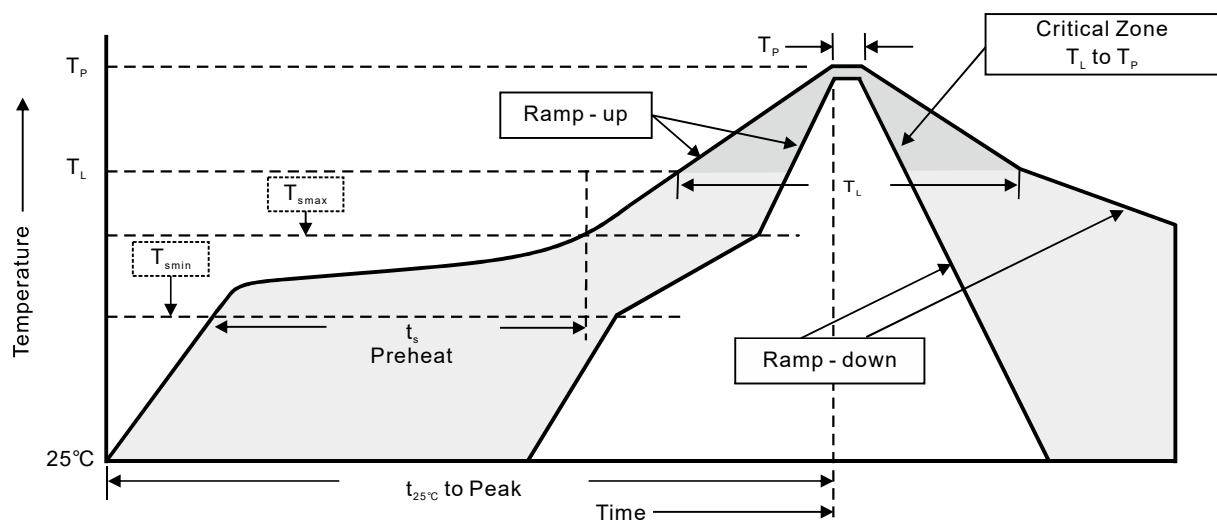
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Reel packing

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-563	7"	3,000	4.0	45,000	203 x 203 x 195	178	438 x 438 x 220	180,000

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