FMNN3416E-H

List

FMNN3416E-H

6.0A 20V N-Channel Enhancement Mode Power MOSFET ESD Protection

Features

- V_{DS}=20V, I_D=6.0A.
- $R_{DS(ON)}$≤ 22mΩ, @V_{GS}=4.5V, I_D=5.0A.
- $R_{DS(ON)}$≤ 36mΩ, @V_{GS}=2.5V, I_D=3.0A.
- Excellent on-resistance and low gate charge.
- High power and current handing capability.
- ESD rating : 2KV HBM.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

Application

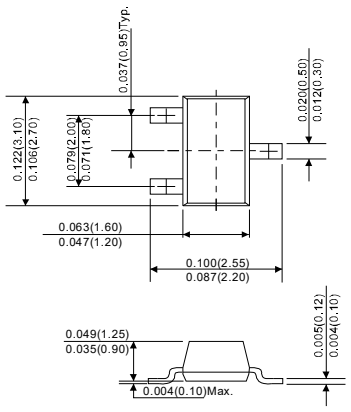
- PWM applications.
- Load switch.
- Power management.

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 8mg.

Package outline

SOT-23



Dimensions in inches and (millimeters)

Maximum ratings (At T_A=25°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	6	A
Pulsed drain current (Note1)	I_{DM}	20.4	A
Power dissipation	P_D	0.9	W
Thermal resistance, junction to ambient (t ≤ 5s)	$R_{\theta JA}$	139	°C/W
Junction temperature	T_J	+150	°C
Storage temperature range	T_{STG}	-55 to + 150	°C

FMNN3416E-H

Electrical characteristics (At T_A=25°C unless otherwise specified)

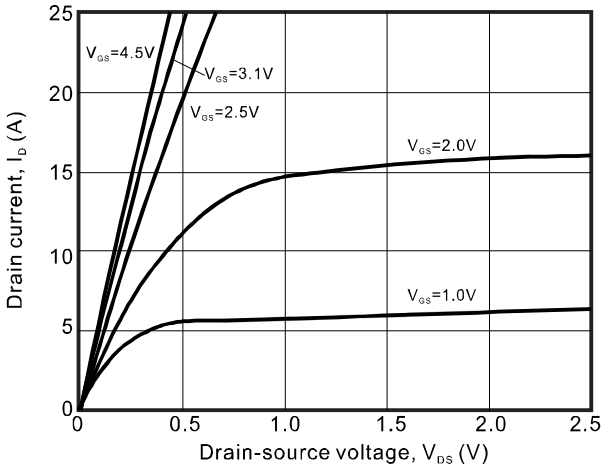
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	BV_{DSS}	I_D=250μA, V_{GS}=0V	20			V
Drain-source leakage current	I_{DSS}	V_{DS}=20V, V_{GS}=0V			1	μA
Gate-source leakage current	I_{GSS}	V_{GS}=±10V, V_{DS}=0V			±10	μA
On characteristics						
Gate threshold voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	0.4	0.7	1.0	V
Static drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=5.0A		17	22	mΩ
		V_{GS}=2.5V, I_D=3.0A		26	36	
Dynamic parameters						
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=10V, f=1.0MHz		545		pF
Out capacitance	C_{oss}			103		
Reverse transfer capacitance	C_{rss}			90		
Switching parameters						
Total gate charge	Q_g	V_{DS}=10V, V_{GS}=4.5V, I_D=5.0A		8.0		nC
Gate-source charge	Q_{gs}			2.5		
Gate-drain charge	Q_{gd}			3.0		
Turn-on delay time	$t_{d(on)}$	V_{DD}=10V, V_{GEN}=4.5V, R_L=1.5Ω ,R_{GEN}=3.0Ω		0.5		ns
Rise time	t_r			1.0		
Turn-off delay time	$t_{d(off)}$			12		
Fall time	t_f			4.0		
Source-drain diode ratings and characteristics						
Diode forward voltage	V_{SD}	I_S=1.25A, V_{GS}=0V		0.81	1.2	V
Continuous drain to source diode forward current	I_S				5	A
Pulsed drain to source diode forward current	I_{SM}				20	A

Note: 1.Pulsed test: pulse width ≤ 300μs, duty cycle ≤ 2%.
2.Guaranteed by design, not subject to production testing.

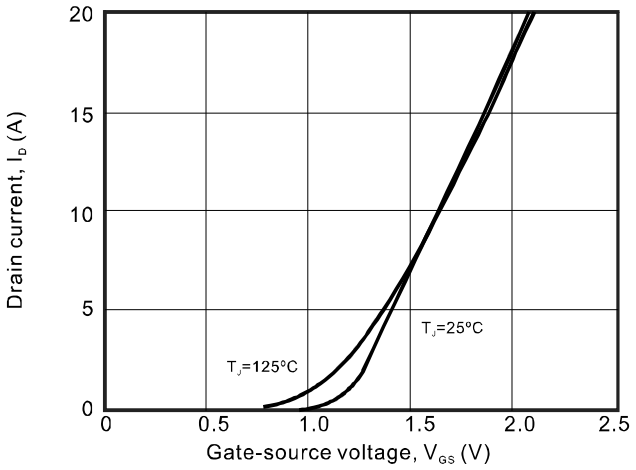
FMNN3416E-H

Rating and characteristic curves

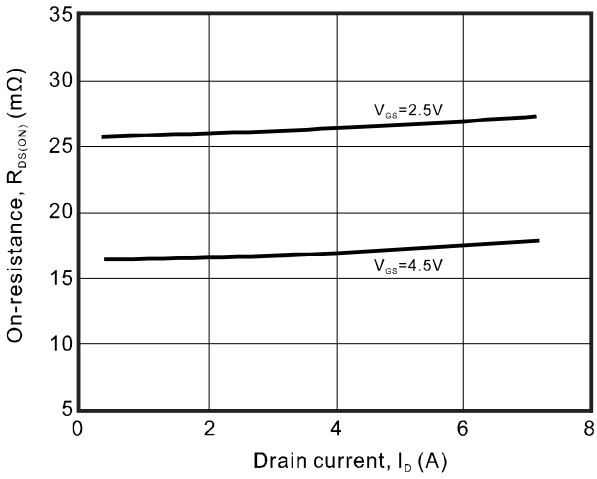
Output characteristics



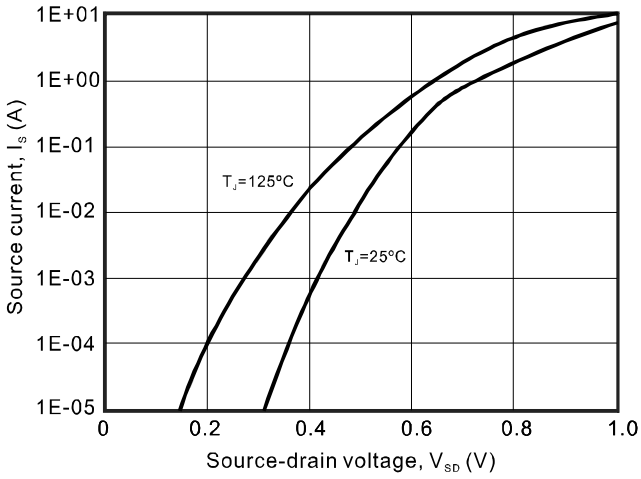
Typical transfer characteristics



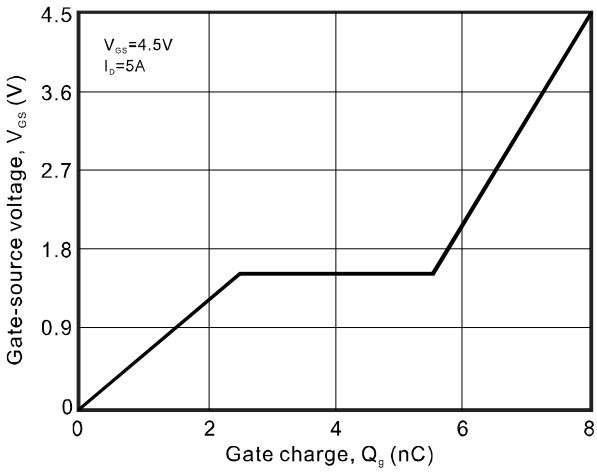
On-resistance vs. Drain current



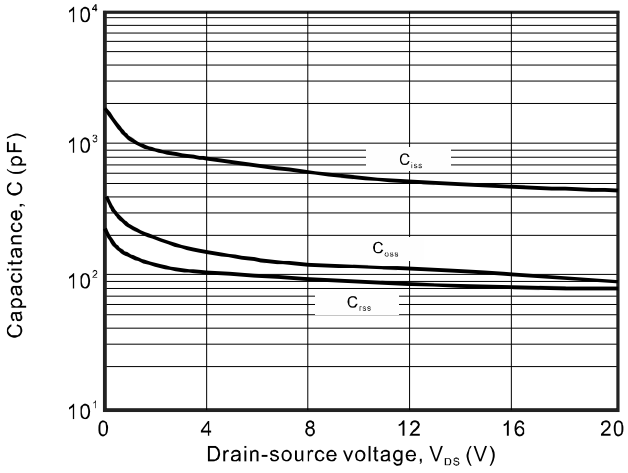
Body diode characteristics



Gate charge characteristics



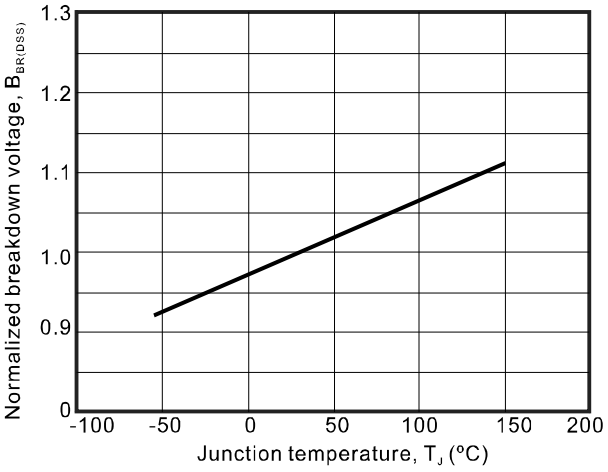
Capacitance characteristics



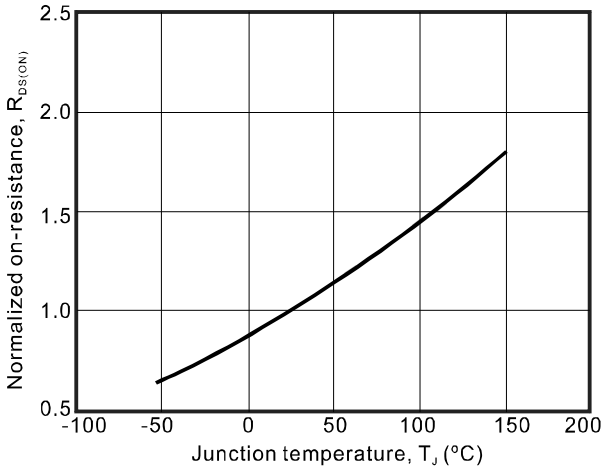
FMNN3416E-H

Rating and characteristic curves

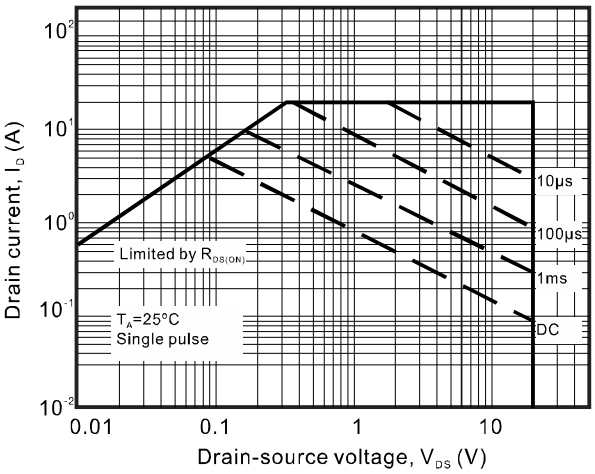
Normalized breakdown voltage vs. Junction temperature



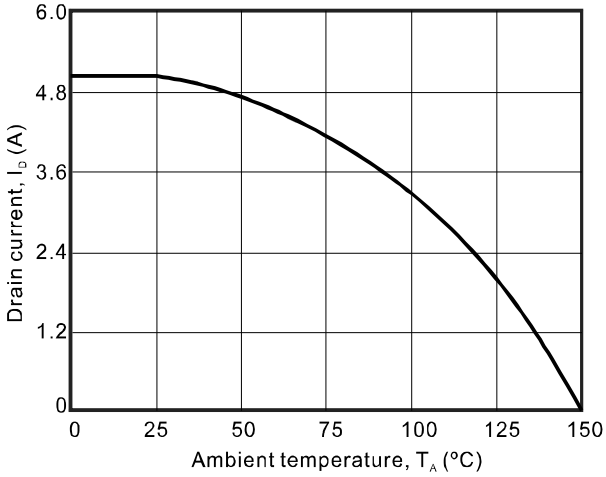
Normalized on-resistance vs. Junction temperature



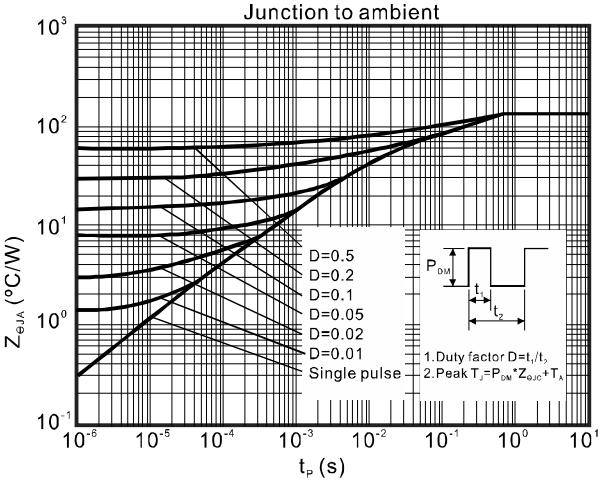
Maximum safe operating area



Maximum continuous drain current

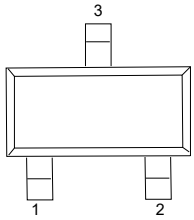
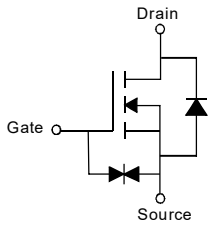


Maximum effective transient thermal impedance, Junction to ambient

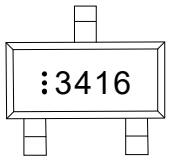


FMNN3416E-H

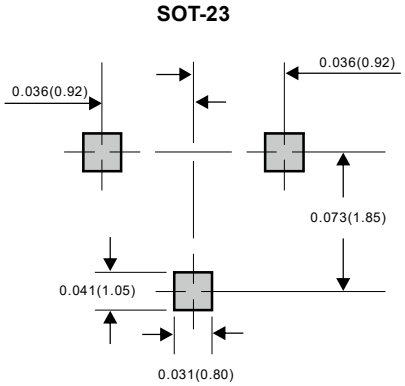
Pinning information

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

Marking

Type number	Marking code
FMNN3416E-H	

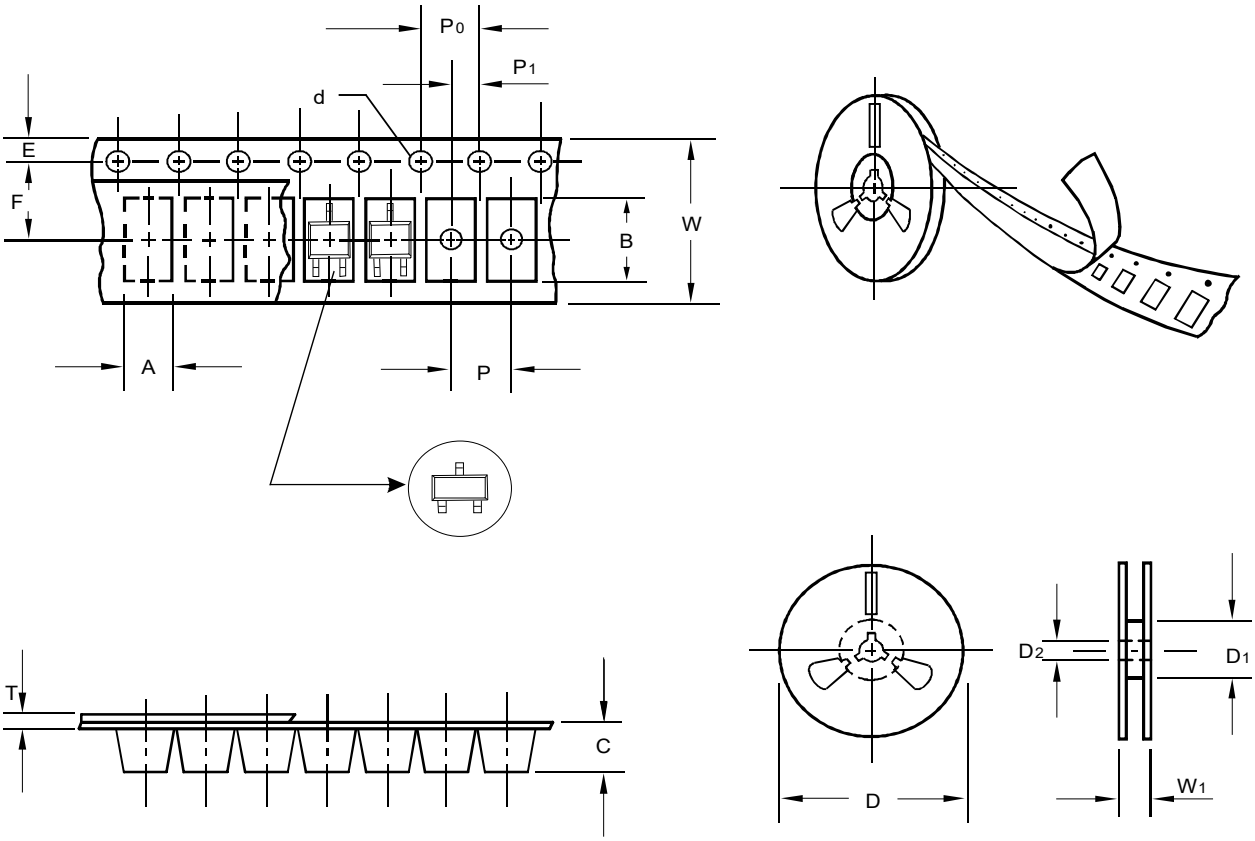
Suggested solder pad layout



Dimensions in inches and (millimeters)

FMNN3416E-H

Packing information



unit:mm

Item	Symbol	Tolerance	SOT-23
Carrier width	A	0.5	3.15
Carrier length	B	0.5	2.77
Carrier depth	C	0.5	1.22
Sprocket hole	d	0.5	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D_1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D_1	min	53.40
Feed hole diameter	D_2	0.5	12.00
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	P_0	0.1	4.00
Embossment center	P_1	0.1	2.00
Overall tape thickness	T	0.5	0.23
Tape width	W	0.5	8.00
Reel width	W_1	5.0	12.30

Note:Devices are packed in accor dance with EIA standar RS-481-A and specifications listed above.

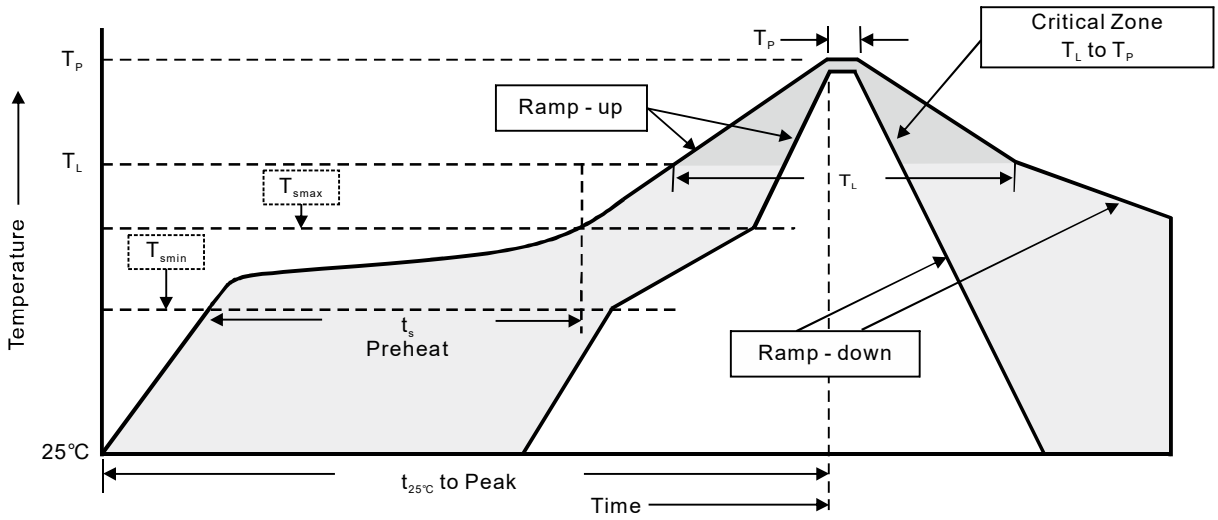
FMNN3416E-H

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*123*183	178	382*257*387	240,000

Suggested thermal profiles for soldering processes

1. Storage environment : Temperature = 5℃ ~ 40℃, 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 ℃/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	 150℃ 200℃ 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	 < 3 ℃ / sec
Time maintained above : - Temperature (T_L) - Time (T_L)	 217℃ 60 ~ 260 sec
Peak temperature (T_P)	255 ℃ -0 / +5℃
Time with 5℃ of actual peak temperature (T_P)	10 ~ 30 sec
Ramp-down rate	< 6℃ / sec
Time 25℃ to peak temperature	< 6 minutes