

FMOS3415KL-H

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FMOS3415KL-H

-4.0A -20V P-Channel Enhancement Mode Power MOSFET ESD Protection

Features

- $-V_{DS} = 20V, -I_D = 4.0A$
- $R_{DS(ON)} \leq 40m\Omega @ -V_{GS}=4.5V, -I_D=4.0A.$
- $R_{DS(ON)} \leq 50m\Omega @ -V_{GS}=2.5V, -I_D=3.0A.$
- Advanced trench technology.
- Excellent on-resistance and low gate charge.
- High power and current handing capability.
- ESD rating : > 2kV HBM.
- Lead-free parts meet RoHS requirements.

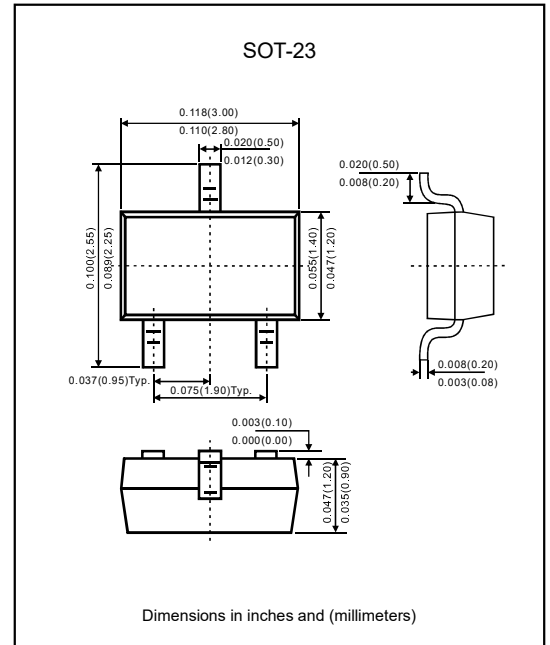
Applications

- 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.
- Mounting Position : Any.

Package outline



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

Parameter	Symbol	Ratings	Unit
Drain-source voltage	$-V_{DS}$	20	V
Gate-source voltage	V_{GS}	± 10	V
Continuous drain current	$-I_D$	4.0	A
Pulsed drain current (Note 1)	$-I_{DM}$	12	A
Power dissipation	P_D	0.72	W
Thermal resistance, junction to ambient (t $\leq 5s$)	$R_{\theta JA}$	130	$^\circ C/W$
Thermal resistance, junction to foot (Drain) (Steady state)	$R_{\theta JF}$	75	$^\circ C/W$
Operating 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)

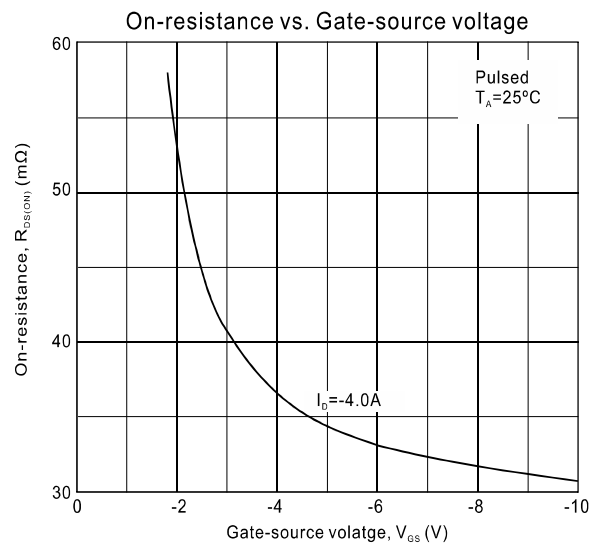
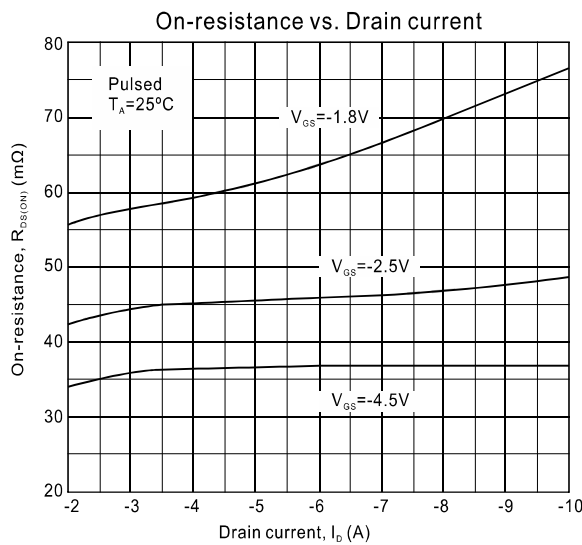
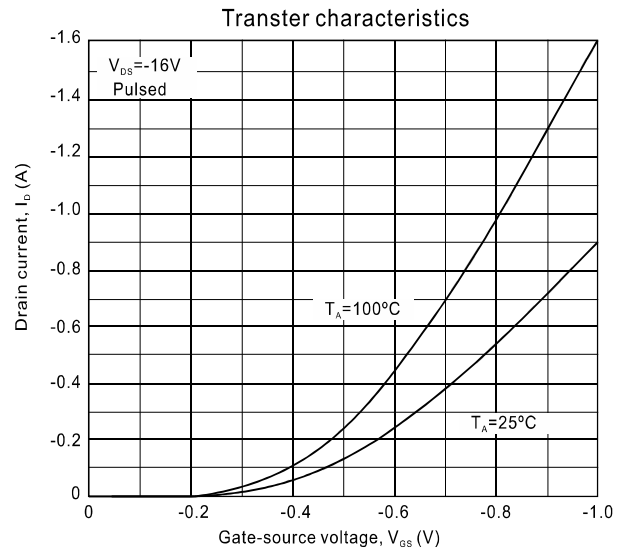
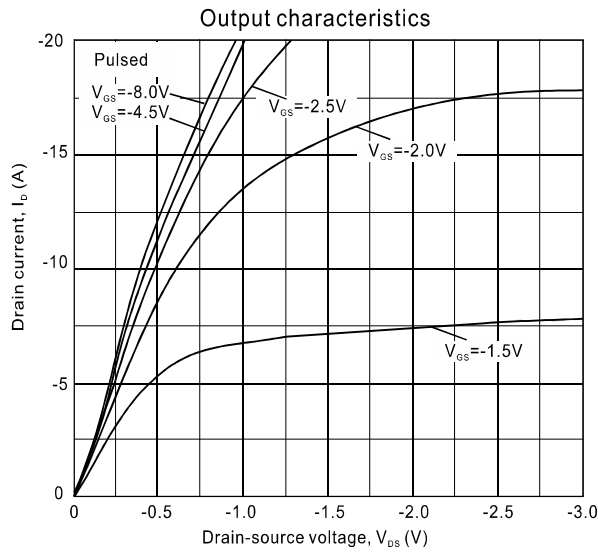
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off characteristics						
Drain-source breakdown voltage	$-BV_{DSS}$	$-I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	20			V
Drain-source leakage current	$-I_{DSS}$	$-V_{DS}=20\text{V}$, $V_{GS}=0\text{V}$			1	μA
Gate-source leakage current	I_{GSS}	$V_{GS}=\pm 8\text{V}$, $V_{DS}=0\text{V}$			± 10	μA
On characteristics						
Gate threshold voltage	$-V_{GS(TH)}$	$V_{DS}=V_{GS}$, $-I_D=250\mu\text{A}$	0.4		1.0	V
Static drain-source on-resistance (Note1)	$R_{DS(ON)}$	$-V_{GS}=4.5\text{V}$, $-I_D=4.0\text{A}$		34	40	m Ω
		$-V_{GS}=2.5\text{V}$, $-I_D=3.0\text{A}$		45	50	
Forward transconductance (Note1)	g_{FS}	$-V_{DS}=5\text{V}$, $-I_D=4\text{A}$	8			S
Dynamic Parameters (Note2)						
Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $-V_{DS}=10\text{V}$, $f=1.0\text{MHz}$		289		pF
Output capacitance	C_{oss}			98		
Reverse transfer capacitance	C_{rss}			22		
Switching parameters						
Total gate charge	Q_g	$-V_{GS}=4.5\text{V}$, $-V_{DS}=10\text{V}$, $-I_D=4.0\text{A}$		9.1		nC
Gate to source charge	Q_{gs}			1.0		
Gate to Drain charge	Q_{gd}			2.6		
Turn-on delay time	$t_{d(on)}$	$-V_{DD}=10\text{V}$, $-V_{GS}=4.5\text{V}$, $-I_D=4\text{A}$ $R_{GEN}=60\Omega$, $R_L=10\Omega$		12		ns
Rise time	t_r			35		
Turn-off delay time	$t_{d(off)}$			30		
Fall time	t_f			10		
Source-drain diode ratings and characteristics						
Drain - source diode forward voltage	$-V_{SD}$	$-I_S=1.25\text{A}$, $-V_{GS}=0\text{V}$		0.81	1.2	V

Note : 1. Pulse test : Pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

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

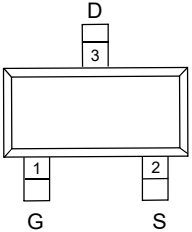
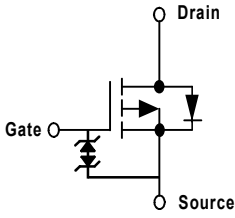
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Rating and characteristic curves



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Pinning information

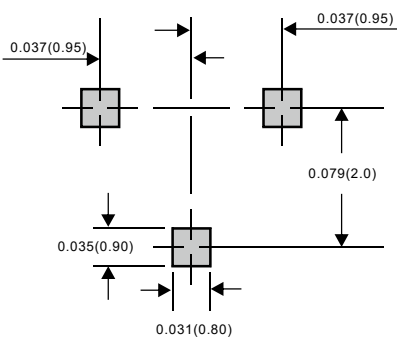
Pin	Simplified outline	Symbol
Pin 1 Gate Pin 2 Source Pin 3 Drain		

Marking

Type number	Marking code
FMOS3415KL-H	3415KL or 3415E

Suggested solder pad layout

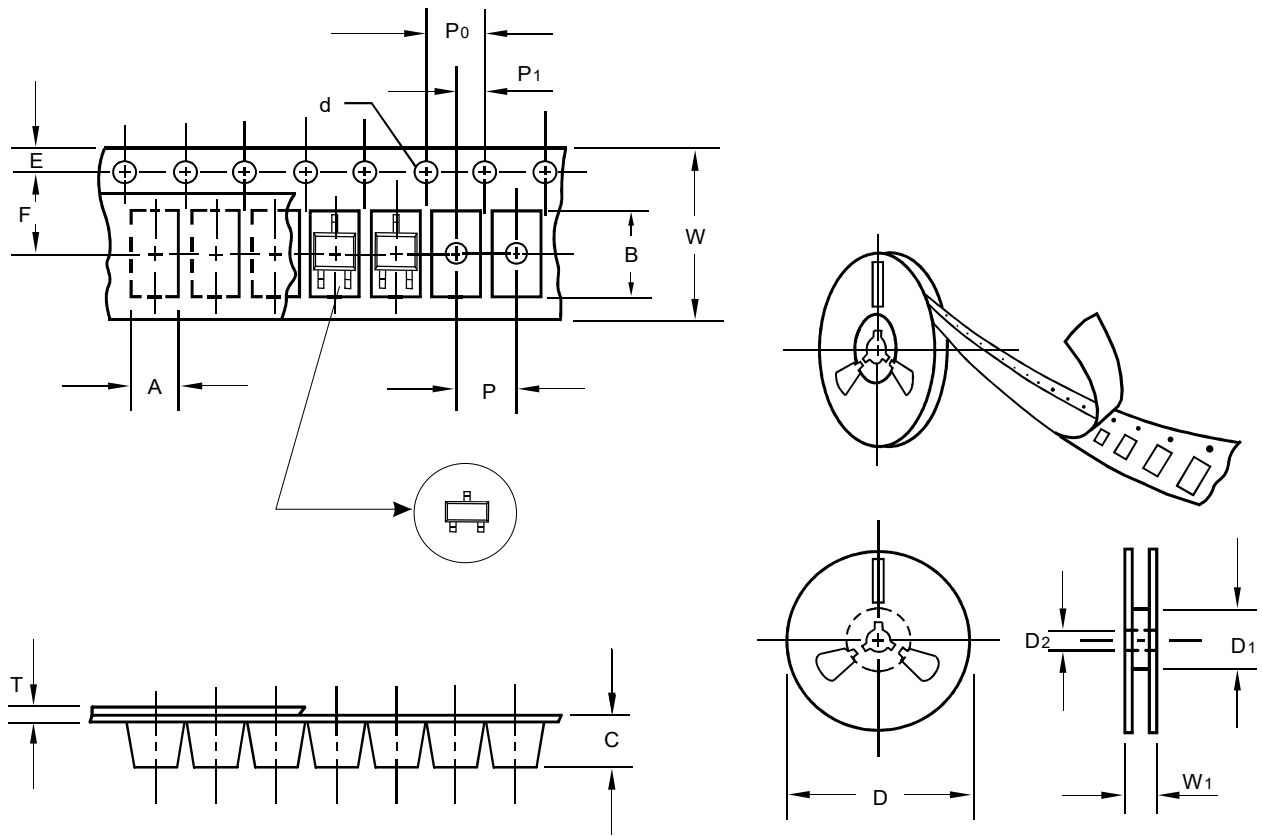
SOT-23



Dimensions in inches and (millimeters)

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-23
Carrier width	A	0.1	3.15
Carrier length	B	0.1	2.77
Carrier depth	C	0.1	1.22
Sprocket hole	d	0.1	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	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W1	1.0	11.40

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

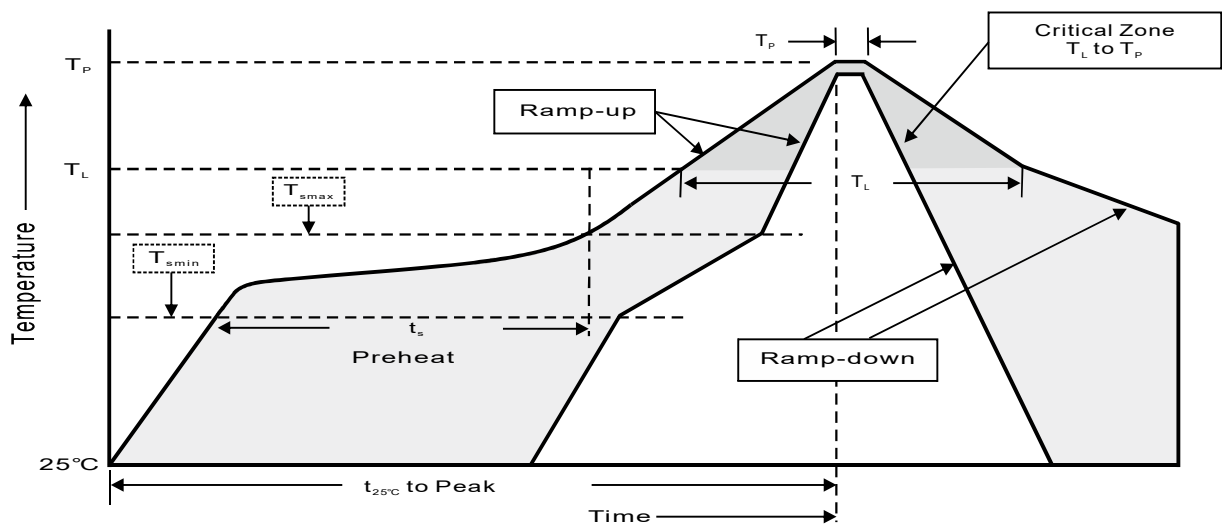
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Reel packing

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*123*183	178	382*257*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