

FMOSH4153K

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FMOSH4153K

20V N-Channel High Density Trench MOSFET ESD Protection

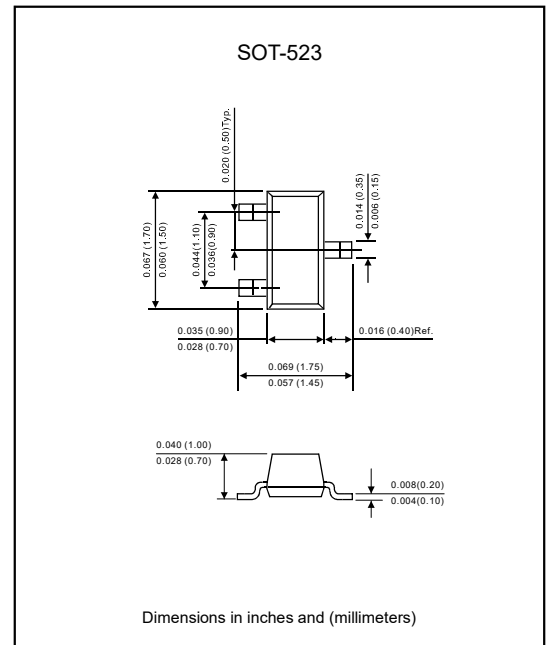
Features

- $V_{DS}=20V, I_D=1A$.
- $R_{DS(on)} < 400m\Omega @ V_{GS}=4.5V, I_D=0.8A$.
- $R_{DS(on)} < 500m\Omega @ V_{GS}=2.5V, I_D=0.5A$.
- Super high dense cell trench design for low $R_{DS(on)}$.
- Reliable and rugged.
- ESD protected.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.FMOSH4153K-H.

Mechanical data

- Epoxy: UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-523.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

Package outline



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

Parameter	Symbol	Ratings	Units
Drain-source voltage	V_{DS}	20	V
Gate-source voltage	V_{GS}	± 8	V
Continuous drain current (Note 1)	I_D	1	A
Pulsed drain current (Note 2)	I_{DM}	4	A
Drain-source diode forward current (Note 1)	I_S	0.8	A
Total power dissipation	P_D	0.35	W
		0.2	
Thermal resistance form junction to ambient, Steady state (Note 1)	$R_{\theta JA}$	820	$^\circ C/W$
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 noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Units
Off characteristics						
Drain-source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	BV_{DSS}	20			V
Zero gate voltage drain current	$V_{DS}=16V, V_{GS}=0V$	I_{DSS}			1	nA
Gate-source leakage current	$V_{DS}=0V, V_{GS}=\pm 8V$	I_{GSS}			± 10	μA

On characteristics (Note3)

Gate threshold voltage	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	$V_{GS(TH)}$	0.5	0.7	1	V
Static drain-source on-resistance	$V_{GS}=4.5V, I_{DS}=0.8A$	$R_{DS(ON)}$		280	400	m Ω
	$V_{GS}=2.5V, I_{DS}=0.5A$			350	500	
Forward transconductance	$V_{DS}=5V, I_{DS}=0.8A$	g_{FS}		2.7		S
Diode forward voltage (Note3)	$V_{GS}=0V, I_{SD}=0.8A$	V_{SD}			1.2	V

Dynamic characteristics (Note4)

Input capacitance	$V_{GS}=0V, V_{DS}=10V, F_{req.}=1MHz$	C_{iss}		38		pF
Output capacitance		C_{oss}		21		
Reverse transfer capacitance		C_{rss}		18		
Total gate charge	$V_{GS}=4.5V, V_{DS}=10V, I_D=0.8A$	Q_g		1.6		nC
Gate-source charge		Q_{gs}		0.4		
Gate-drain charge		Q_{gd}		0.25		

Switching characteristic (Note4)

Turn-on delay time	$V_{GEN}=4.5V, V_{DS}=10V, I_D=0.8A, R_{GEN}=6\Omega, R_L=6\Omega$	$T_{d(on)}$		10.4		nS
Turn-on rise time		T_r		3.9		
Turn-off delay time		$T_{d(off)}$		26		
Turn-off fall time		T_f		4.8		

Note : 1. Surface mounted on FR-4 board, $t \leq 10s$.

2. Pulse width limited by maximum junction temperature.

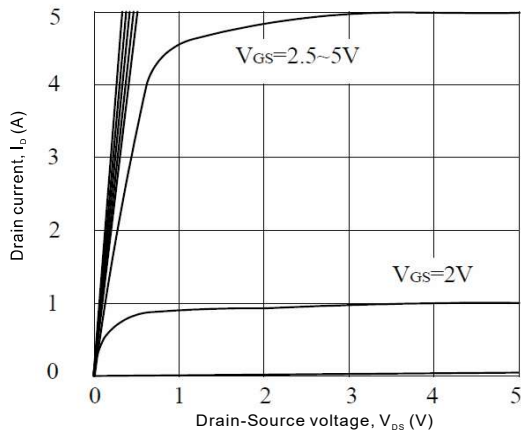
3. Pulse test (pulse width $\leq 300\mu s$, duty cycles $\leq 2\%$).

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

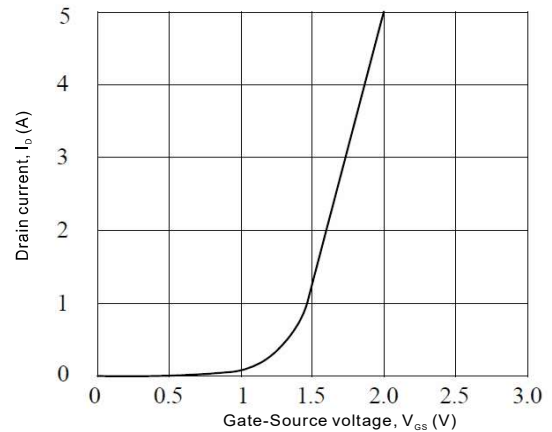
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Rating and characteristic curves

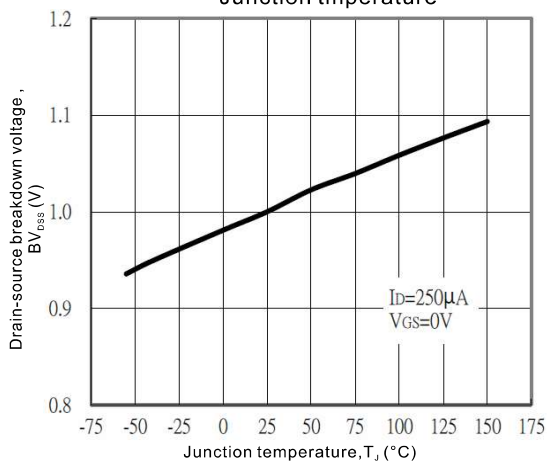
Output characteristics



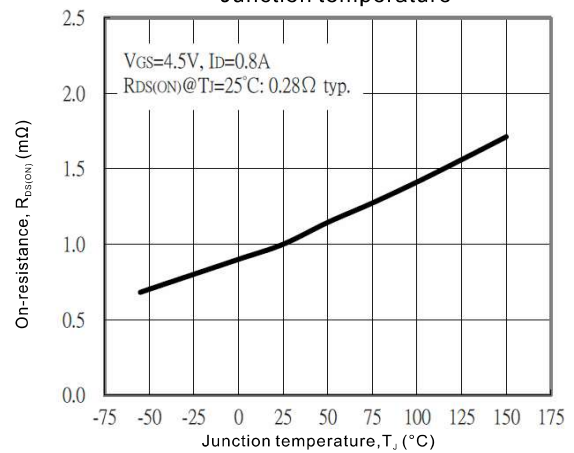
Typical transfer characteristics



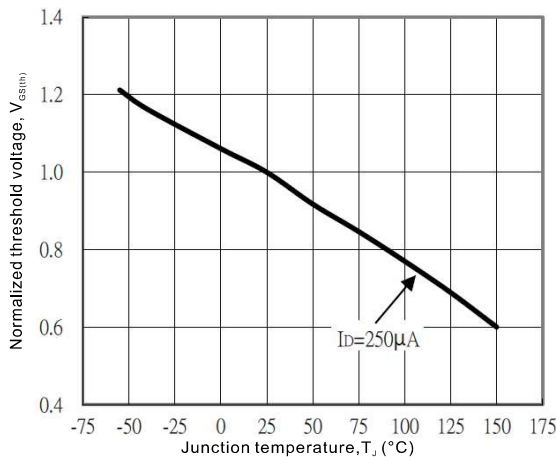
Normalized breakdown voltage vs. Junction temperature



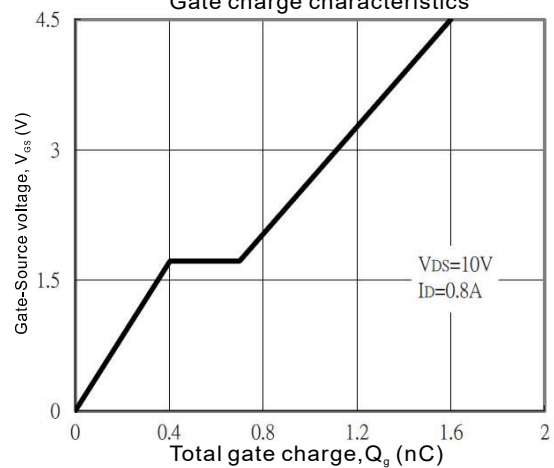
Normalized on resistance vs. Junction temperature



Gate threshold voltage

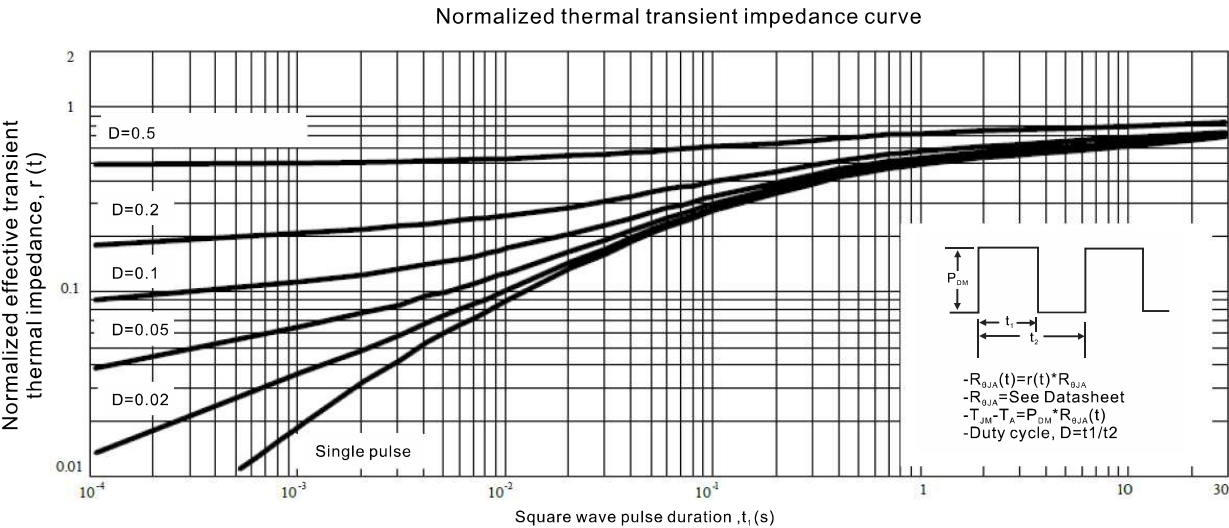
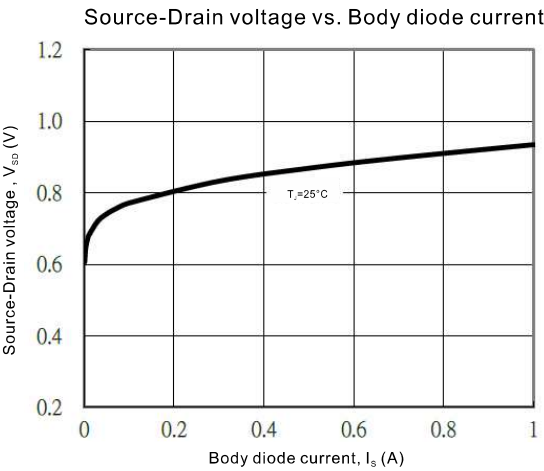
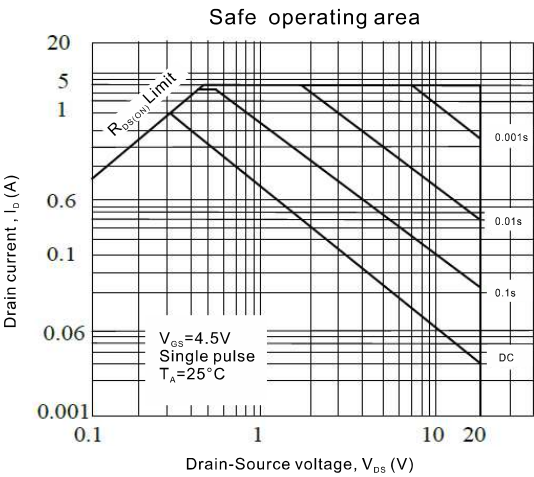


Gate charge characteristics



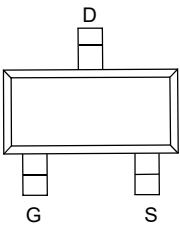
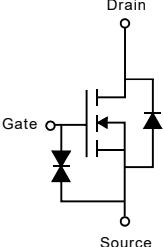
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Rating and characteristic curves

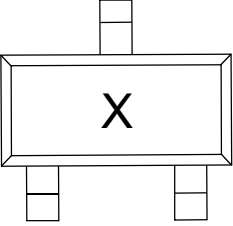


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Pinning information

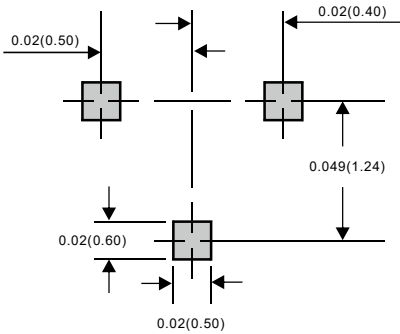
Pin	Simplified outline	Symbol
PinD Drain PinG Gate PinS Source		

Marking

Type number	Marking code
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Suggested solder pad layout

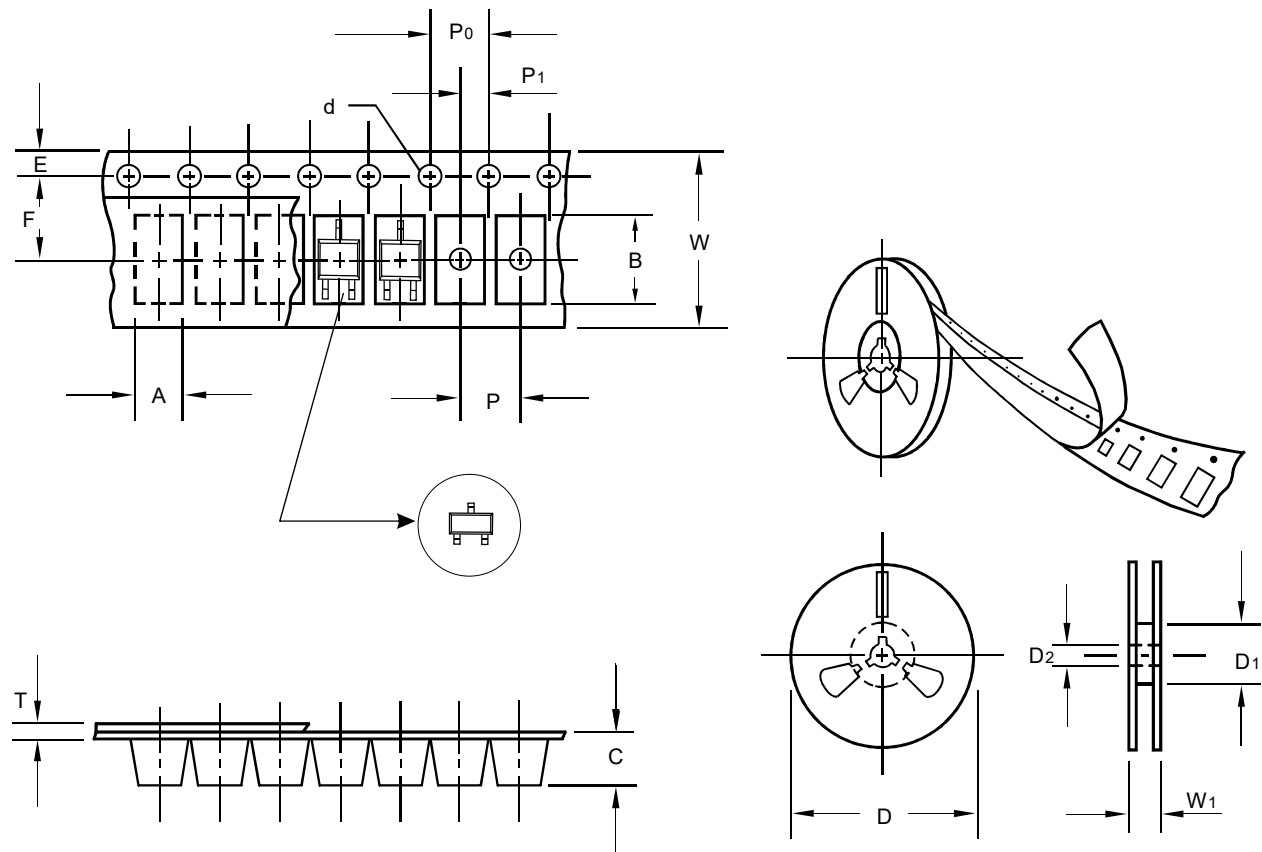
SOT-523



Dimensions in inches and (millimeters)

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Packing information



unit:mm

Item	Symbol	Tolerance	SOT-523
Carrier width	A	0.1	1.85
Carrier length	B	0.1	1.85
Carrier depth	C	0.1	0.875
Sprocket hole	d	0.1	1.5
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	60.00
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	0.1	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.

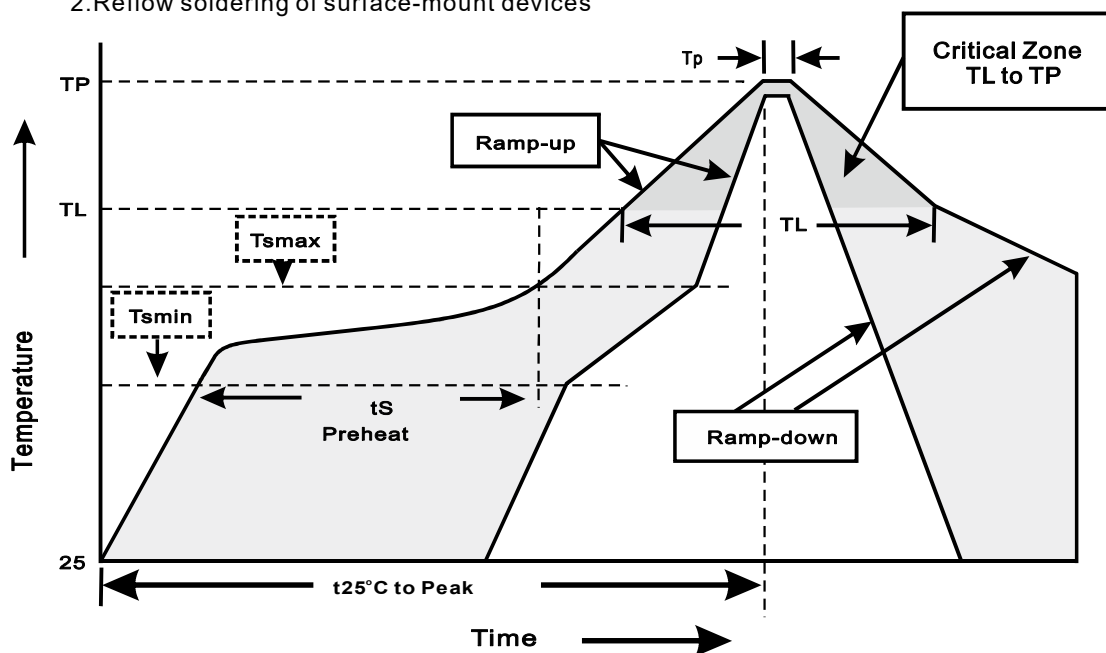
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Reel packing

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-523	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)	$<3^{\circ}\text{C}/\text{sec}$
Preheat -Temperature Min(T_{min}) -Temperature Max(T_{max}) -Time(min to max)(t_s)	150°C 200°C $60\sim 120\text{sec}$
T_{max} to T_L -Ramp-upRate	$<3^{\circ}\text{C}/\text{sec}$
Time maintained above: -Temperature(T_L) -Time(t_L)	217°C $60\sim 260\text{sec}$
Peak Temperature(T_P)	$255^{\circ}\text{C}-0/+5^{\circ}\text{C}$
Time within 5°C of actual Peak Temperature(t_P)	$10\sim 30\text{sec}$
Ramp-down Rate	$<6^{\circ}\text{C}/\text{sec}$
Time 25°C to Peak Temperature	$<6\text{minutes}$