

FH3415E

P-Channel Enhancement Mode MOSFET

Description

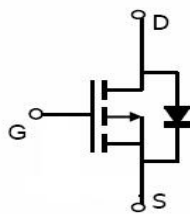
The FH3415E is the P-Channel enhancement mode MOSFET in a plastic package (SOT-23) using the Trench technology.

Applications

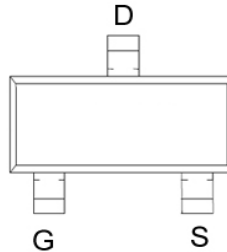
- Low Switch
- DC-DC Converters
- Lithium-Ion Battery Protection

Features

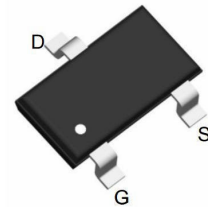
- $V_{DS} = -20V$; $I_D = -4.0A$
- $R_{DS(ON)}(Typ.) = 38m\Omega$ @ $V_{GS} = -4.5V$
- $R_{DS(ON)}(Typ.) = 46m\Omega$ @ $V_{GS} = -2.5V$
- Trench Technology
- Fast Switching
- High Power and Current Handling Capability
- SMD Package (SOT-23)
- MSL-3 compliant



Schematic diagram



Marking and Pin Assignment



SOT-23 top view

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise specified)

Symbol	Parameter		Max.	Units
V_{DSS}	Drain-Source Voltage		-20	V
V_{GSS}	Gate-Source Voltage		± 12	V
D	Continuous Drain Current	$T_C = 25^\circ C$	-4.0	A
		$T_C = 100^\circ C$	-3.2	
I_{DM}	Pulsed Drain Current ^{note1}		-15	A
P_D	Power Dissipation	$T_C = 25^\circ C$	1.4	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		89.8	$^\circ C/W$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^\circ C$

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D = -250μA	-20	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -20V, V _{GS} = 0V,	-	-	-1	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±12V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	-0.45	-0.65	-1.0	V
R _{DS(on)}	Static Drain-Source on-Resistance note2	V _{GS} =-4.5V, I _D =-4A	-	38	43	mΩ
		V _{GS} =-2.5V, I _D =-3A	-	46	55	
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D = -2A	-	6	-	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = -10V, V _{GS} = 0V, f = 1.0MHz	-	911	-	pF
C _{oss}	Output Capacitance		-	126	-	pF
C _{rss}	Reverse Transfer Capacitance		-	114	-	pF
Q _g	Total Gate Charge	V _{DS} = -10V, I _D = -4A, V _{GS} = -4.5V	-	7.9	-	nC
Q _{gs}	Gate-Source Charge		-	1.2	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	1.6	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = -10V, I _D = -3.3A, R _G = 1Ω, V _{GEN} =-4.5V, R _L =1.2Ω	-	12	-	ns
t _r	Turn-on Rise Time		-	35	-	ns
t _{d(off)}	Turn-off Delay Time		-	30	-	ns
t _f	Turn-off Fall Time		-	10	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-4.0	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-15	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _S = -4A	-	-	-1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} =0V, I _S =-4A,	-	20	-	ns
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs	-	9	-	nC

Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

Typical Performance Characteristics

Figure 1: Output Characteristics

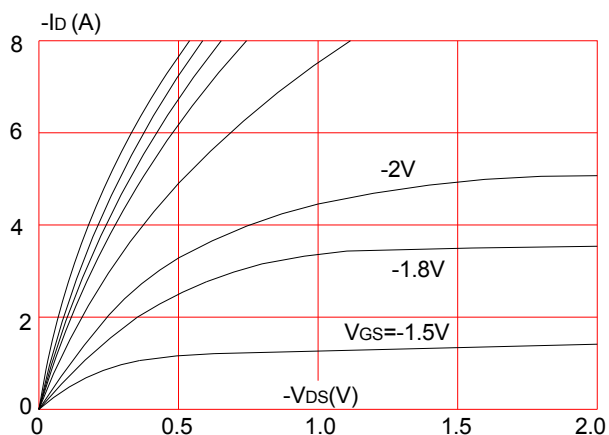


Figure 2: Typical Transfer Characteristics

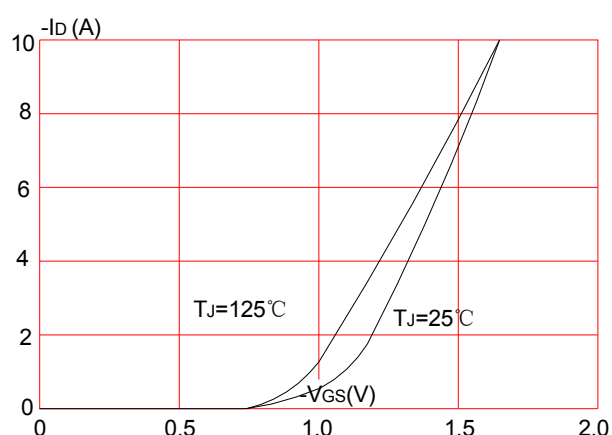


Figure 3: On-resistance vs. Drain Current

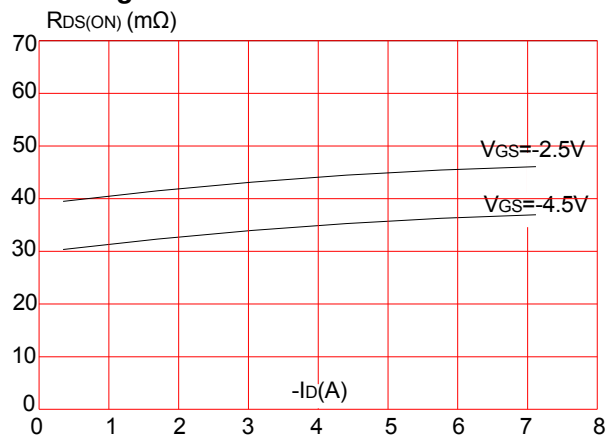


Figure 4: Body Diode Characteristics

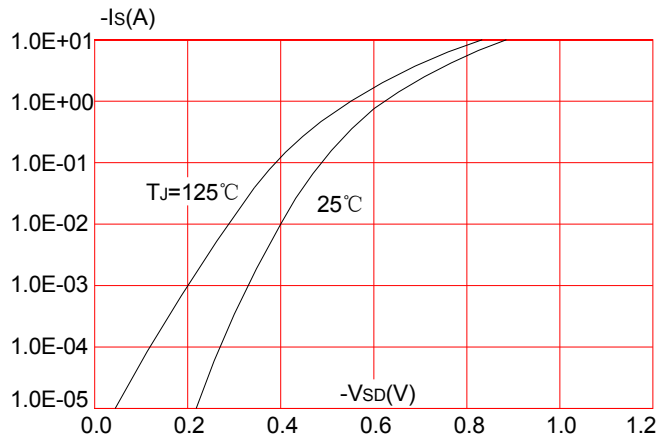


Figure 5: Gate Charge Characteristics

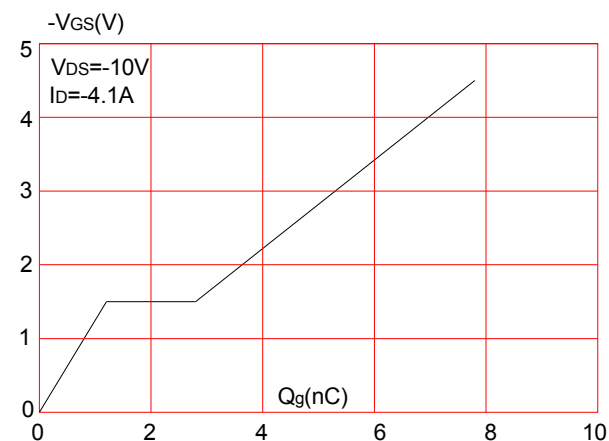


Figure 6: Capacitance Characteristics

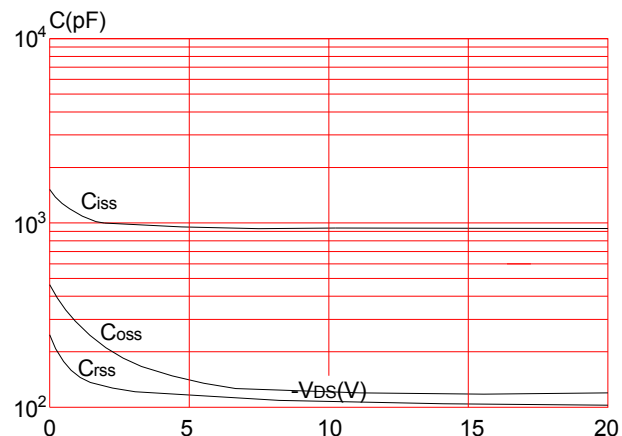


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

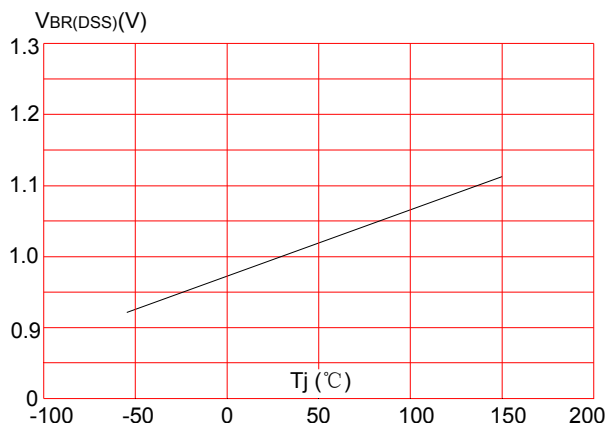


Figure 8: Normalized on Resistance vs. Junction Temperature

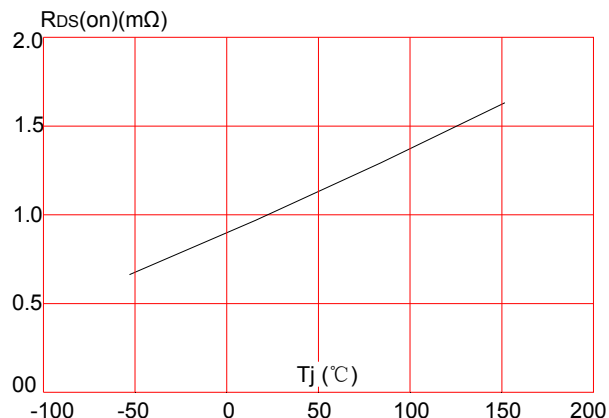


Figure 9: Maximum Safe Operating Area

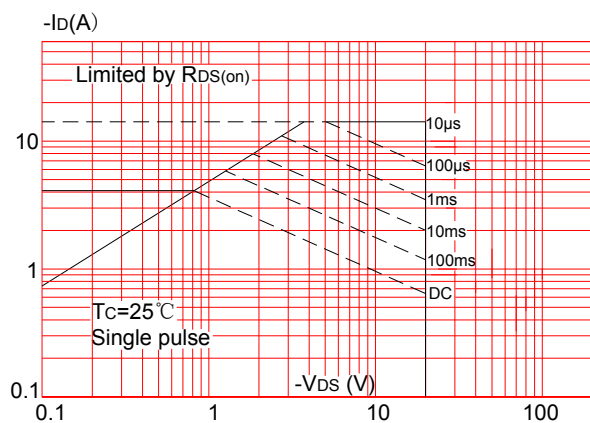


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

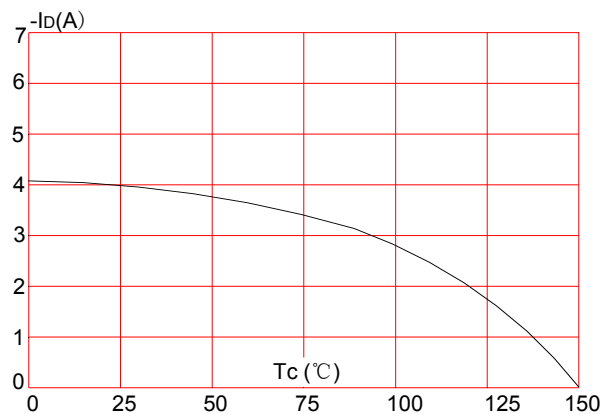
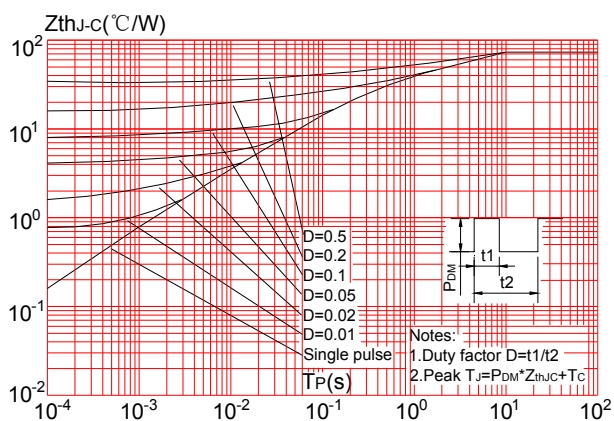


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient (SOT-23)



Typical Electrical and Thermal Characteristics

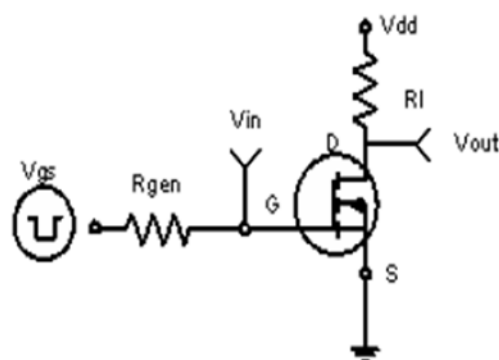


Figure1:Switching Test Circuit

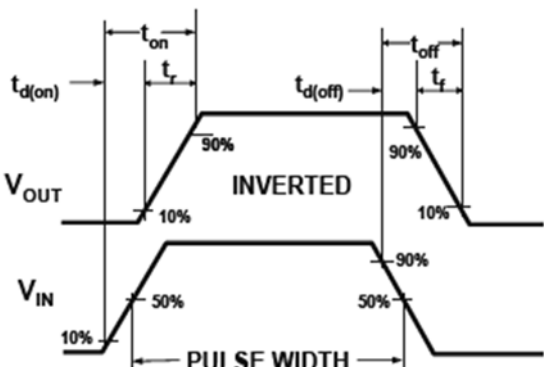


Figure2:Switching Waveforms

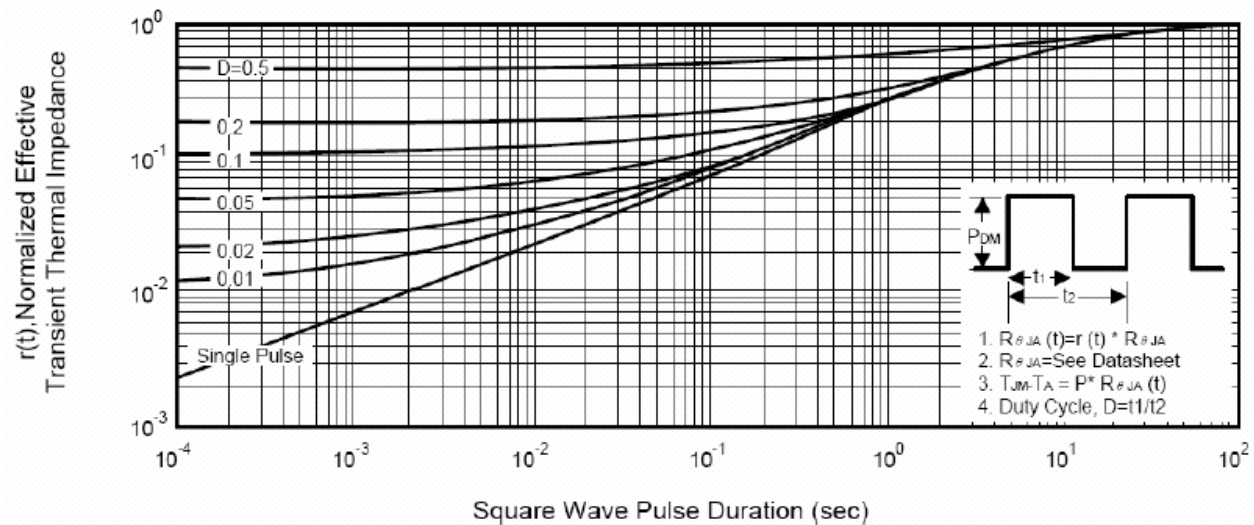
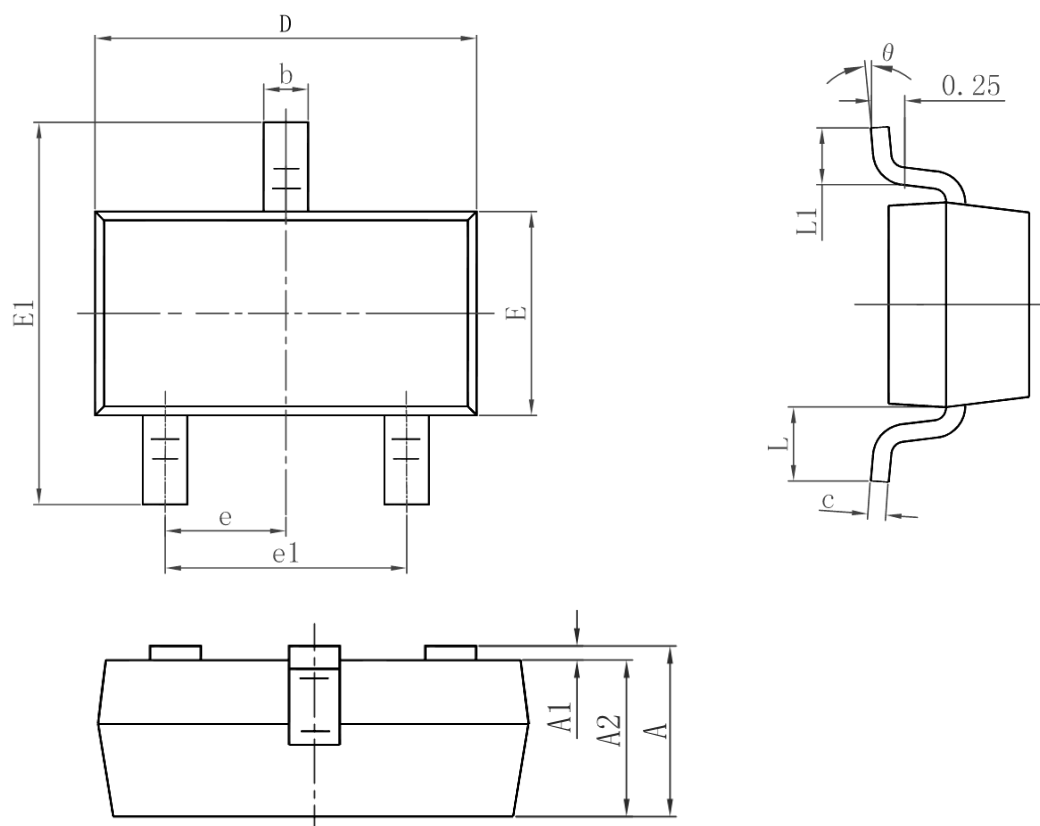


Figure 3: Normalized Maximum Transient Thermal Impedance

Package Dimensions : SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°