

N-Channel Enhancement Mode Power MOSFET

Description

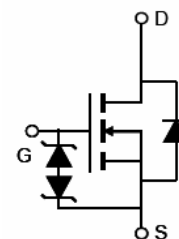
The HM3416E uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected.

General Features

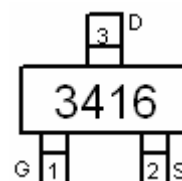
- $V_{DS} = 20V, I_D = 6A$
 $R_{DS(ON)} = 11.5m\Omega$ (Typ) @ $V_{GS}=2.5V$
 $R_{DS(ON)} = 8.5m\Omega$ (Typ) @ $V_{GS}=4.5V$
ESD Rating: 2000V HBM
- High Power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- PWM application
- Load switch



Schematic diagram



Marking and pin assignment



SOT-23-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
3416	HM3416E	SOT-23-3L	Ø180mm	8mm	3000 units

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	6	A
Drain Current-Pulsed (Note 1)	I_{DM}	30	A
Maximum Power Dissipation	P_D	1.4	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	89.3	$^\circ\text{C/W}$
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Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	20		-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=20V, V_{GS}=0V$	-	-	1	μA

Gate-Body Leakage Current	I _{GSS}	V _{GS} =±10V,V _{DS} =0V	-	-	±10	μA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	0.4	0.7	1.0	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =4.5V, I _D =6A	-	8.5	12	mΩ
		V _{GS} =2.5V, I _D =5A	-	11.5	18	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =4.5A	8	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =10V,V _{GS} =0V, F=1.0MHz	-	660	-	PF
Output Capacitance	C _{OSS}		-	160	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	87	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =10V,R _L =1. 5Ω V _{GS} =5V,R _{GEN} =3Ω	-	0.5		nS
Turn-on Rise Time	t _r		-	1		nS
Turn-Off Delay Time	t _{d(off)}		-	12		nS
Turn-Off Fall Time	t _f		-	4		nS
Total Gate Charge	Q _g	V _{DS} =10V,I _D =6A, V _{GS} =4.5V	-	8		nC
Gate-Source Charge	Q _{gs}		-	2.5	-	nC
Gate-Drain Charge	Q _{gd}		-	3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V,I _S =1A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	6	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

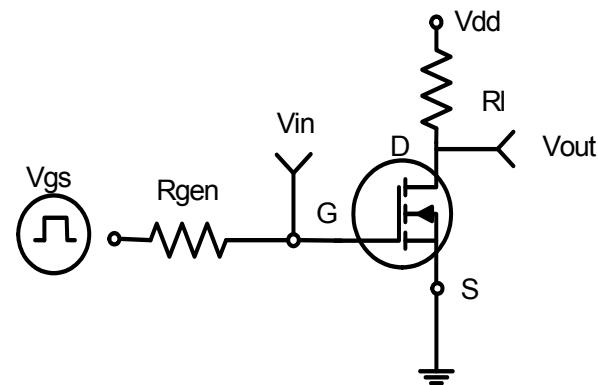


Figure 1: Switching Test Circuit

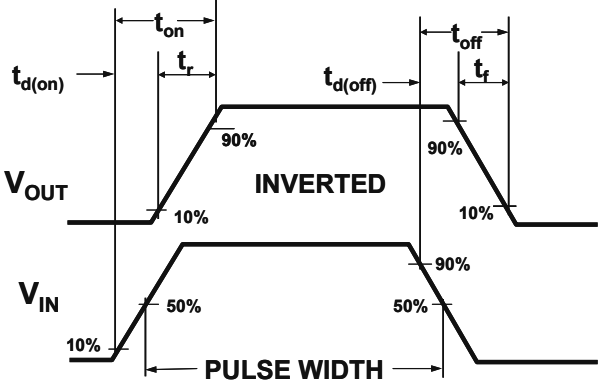


Figure 2: Switching Waveforms

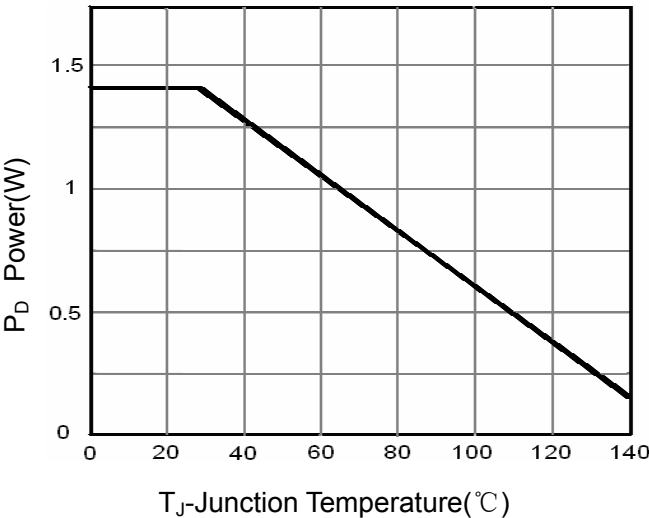


Figure 3 Power Dissipation

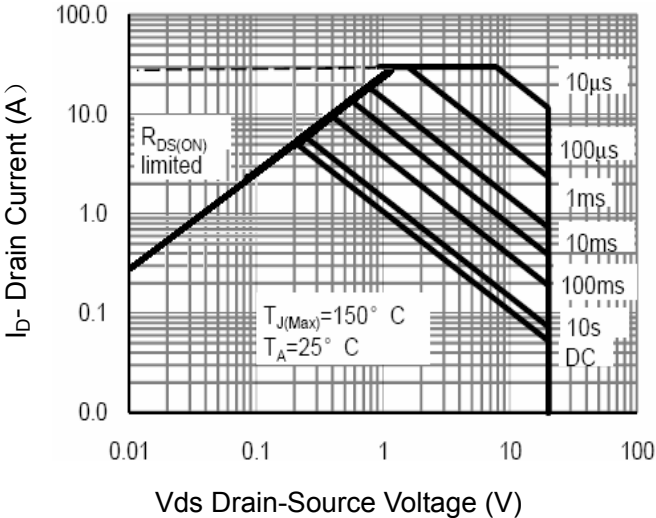


Figure 4 Safe Operation Area

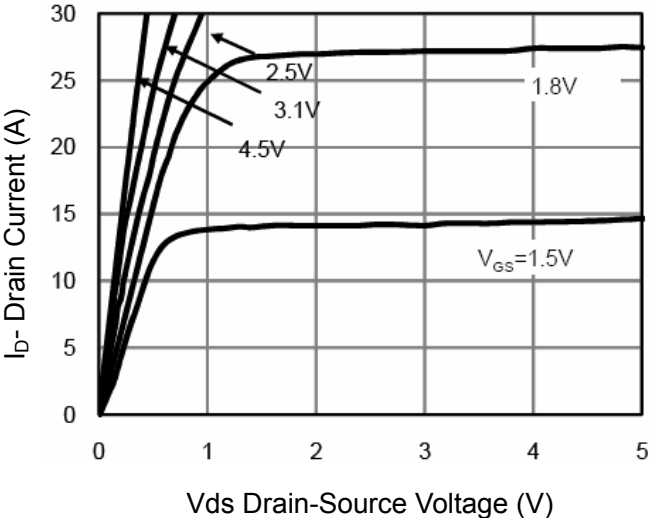


Figure 5 Output CHARACTERISTICS

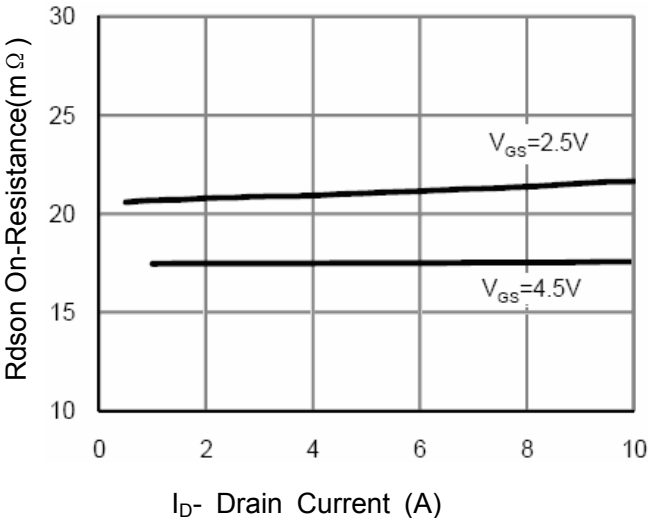


Figure 6 Drain-Source On-Resistance

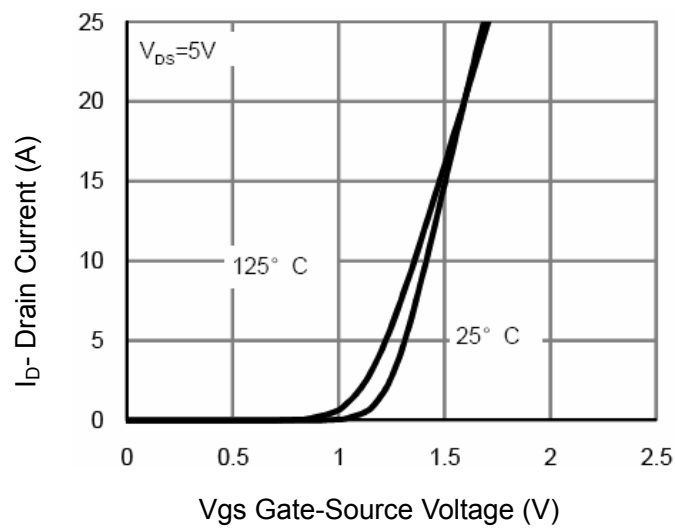


Figure 7 Transfer Characteristics

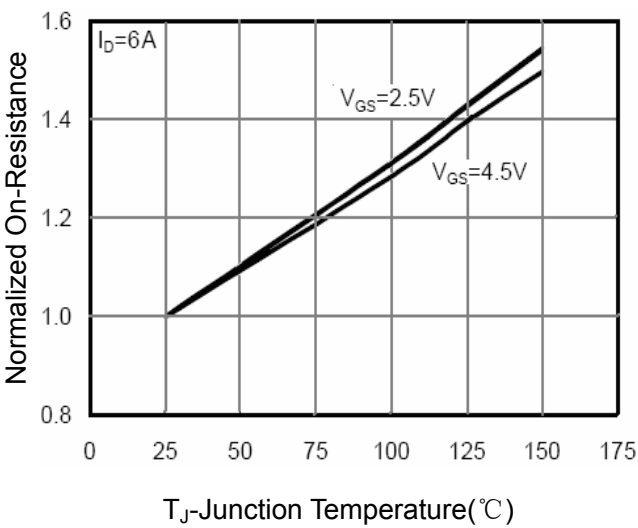


Figure 8 Drain-Source On-Resistance

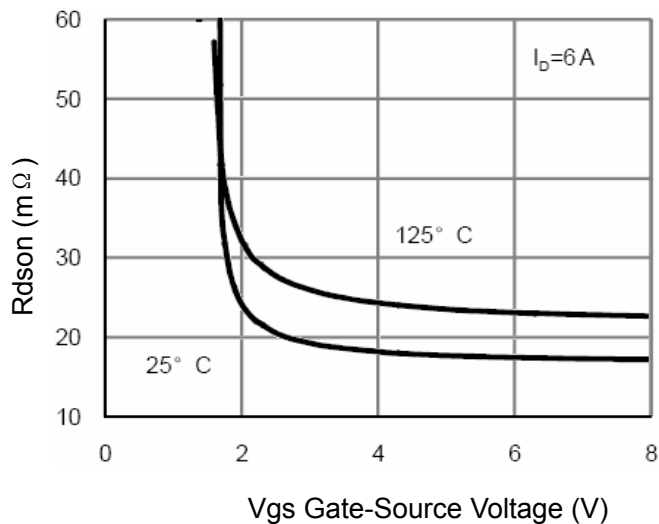


Figure 9 Rdson vs Vgs

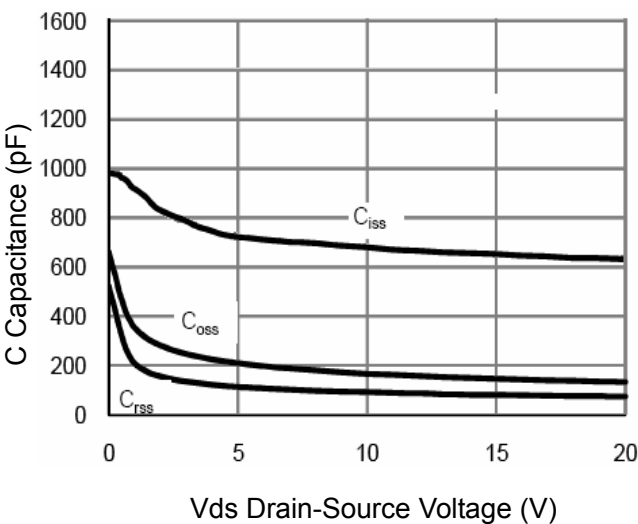


Figure 10 Capacitance vs Vds

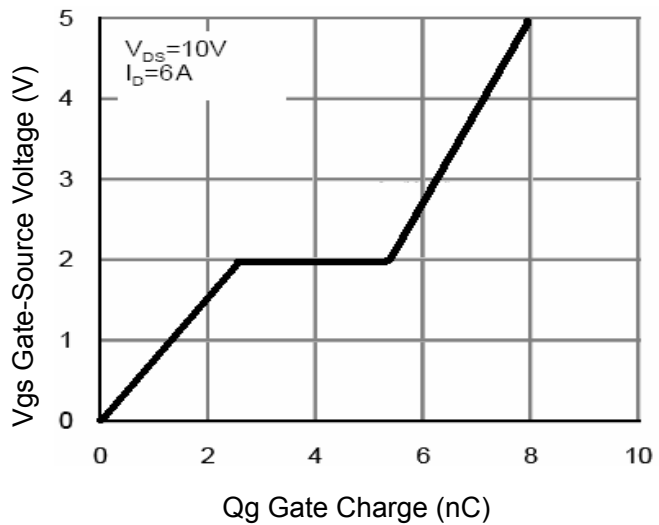


Figure 11 Gate Charge

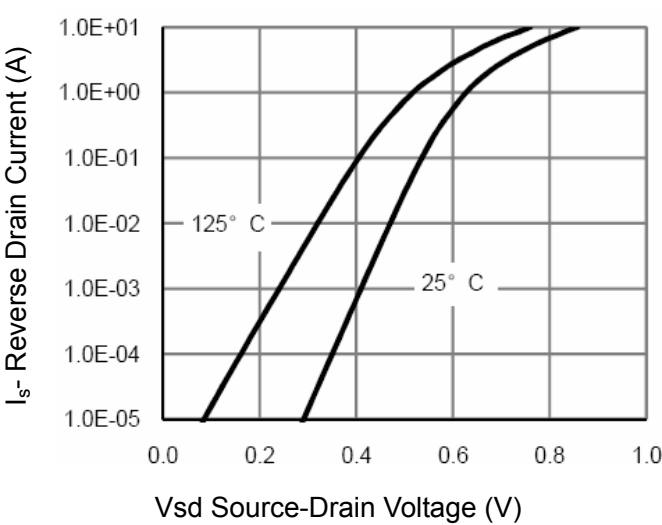


Figure 12 Source- Drain Diode Forward

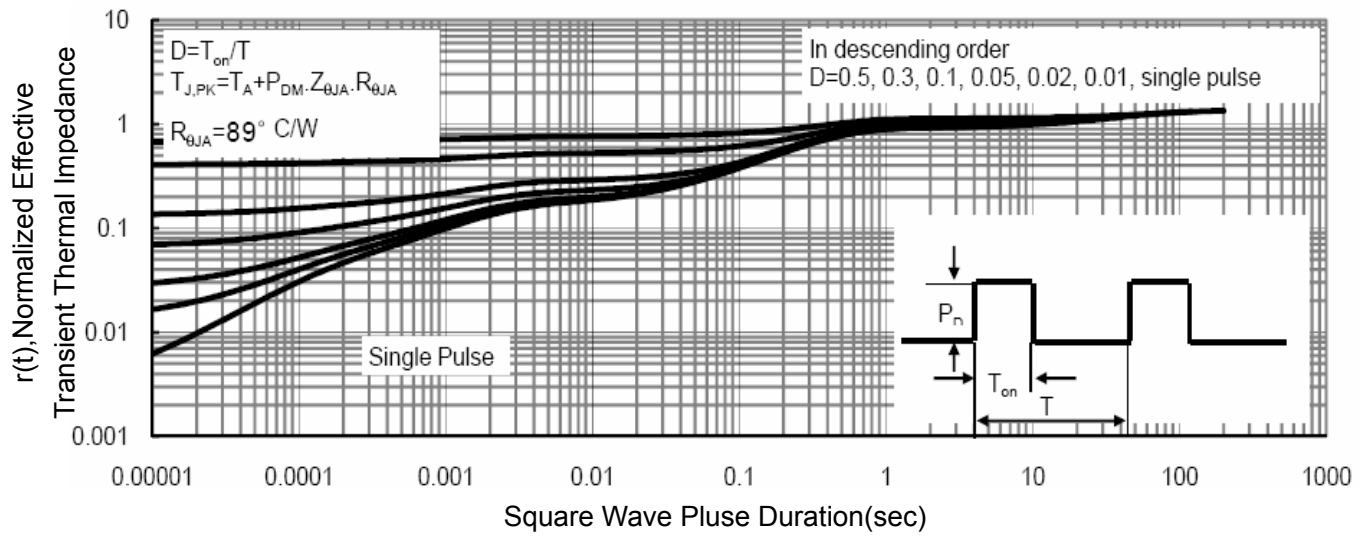
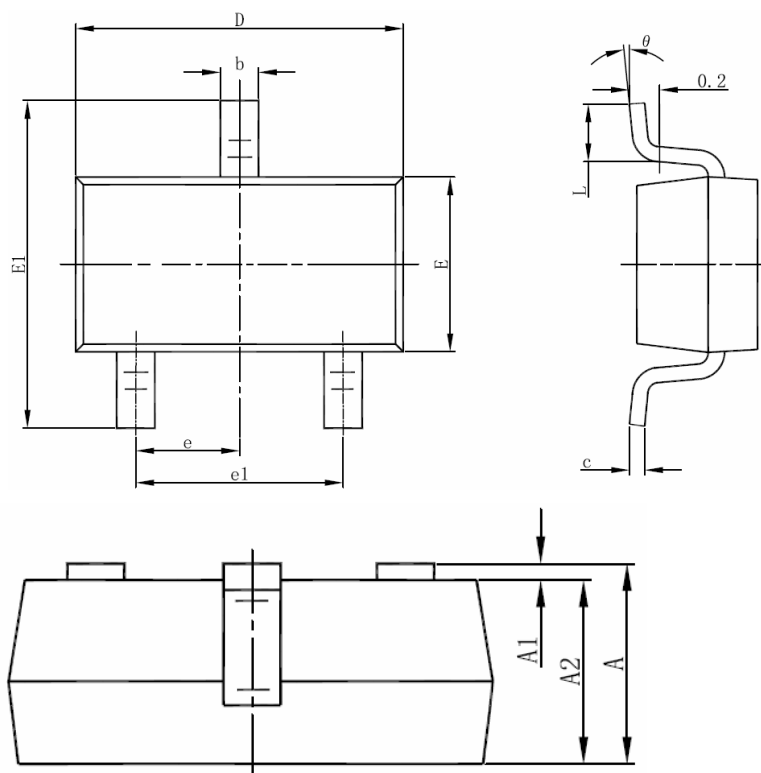


Figure 13 Normalized Maximum Transient Thermal Impedance

SOT-23-3L PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

NOTES

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.