MSKSEMI 美森科
SEMICONDUCTOR

ESD TVS TSS MOV GDT PLED

MS3416
Product specification

Description

The MS3416 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 Battery protection or in other Switching application.
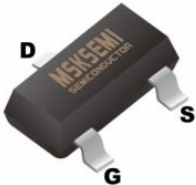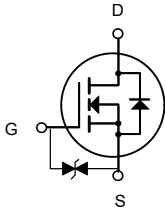
Applications

- Battery protection
- Load switch
- Uninterruptible power supply

General Features

- V_{DS} = 20V I_D =6A
- $R_{DS(ON)}$ < 17mΩ @ V_{GS}=4.5V
- ESD=2500HBM

Reference News

PACKAGE OUTLINE	N-Channel MOSFET	Marking
  SOT-23		**3416**

Absolute Maximum Ratings (T$_A$=25℃unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	±12	V
I_D	Drain Current-Continuous	6	A
I_{DM}	Drain Current-Pulsed (Note 1)	30	A
P_D	Maximum Power Dissipation	1.4	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	℃
$R_{θJA}$	Thermal Resistance,Junction-to-Ambient (Note 2)	89	℃/W

Electrical Characteristics (T$_A$=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V I$_D$=250µA	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
Gate Threshold Voltage	V$_{GS(th)}$	V$_{DS}$=V$_{GS}$,I$_D$=250µA	0.45	0.7	1.0	V
Drain-Source On-State Resistance	R$_{DS(ON)}$	V$_{GS}$=4.5V, I$_D$=6.5A	-	14	17	mΩ
		V$_{GS}$=2.5V, I$_D$=5.5A	-	18	23	mΩ
		V$_{GS}$=1.8V, I$_D$=5A	-	28	40	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$=5V,I$_D$=6.5A	8	-	-	S
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
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$_D$=6.5A, V$_{GS}$=4.5V	-	8		nC
Gate-Source Charge	Q$_{gs}$		-	2.5	-	nC
Gate-Drain Charge	Q$_{gd}$		-	3	-	nC
Diode Forward Voltage [Note 3]	V$_{SD}$	V$_{GS}$=0V,I$_s$=6.5A	-	-	1.2	V
Diode Forward Current [Note 2]	I$_s$		-	-	6.5	A

Notes:

Repetitive Rating: Pulse width limited by maximum junction temperature.
Surface Mounted on FR4 Board, t ≤ 10 sec.
Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2%.
Guaranteed by design, not subject to production
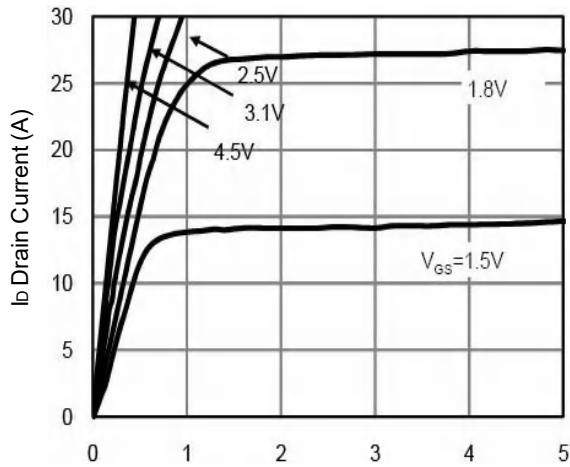
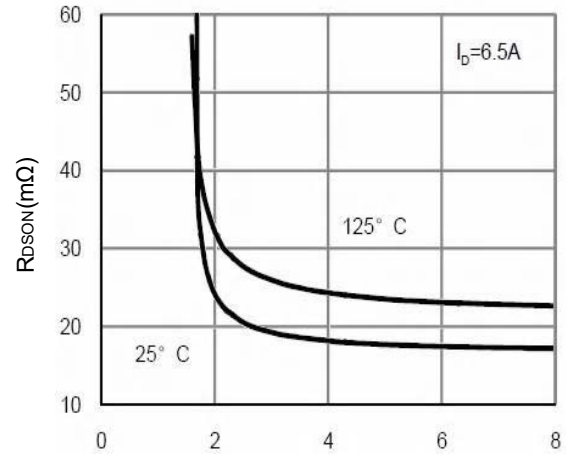## Typical Characteristics

Fig.1 Typical Output Characteristics
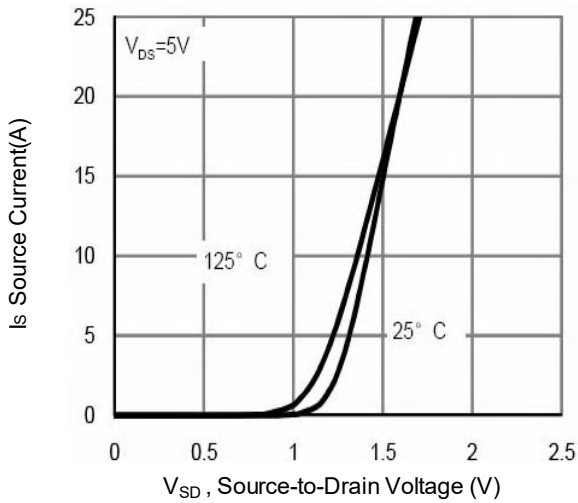

Fig.2 On-Resistance vs. Gate-Source

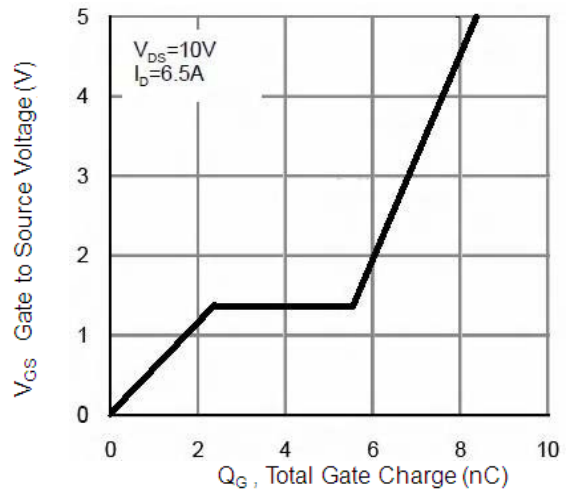**Fig.3 Forward Characteristics of Reverse**

Fig.4 Gate-Charge Characteristics
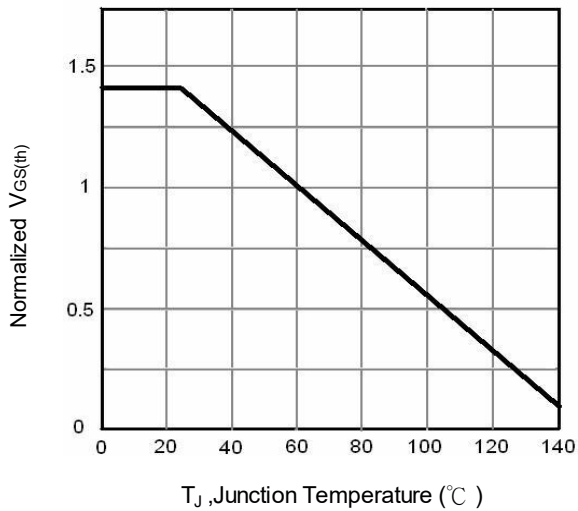
Fig.5 Normalized $V_{GS(th)}$ vs. T_J
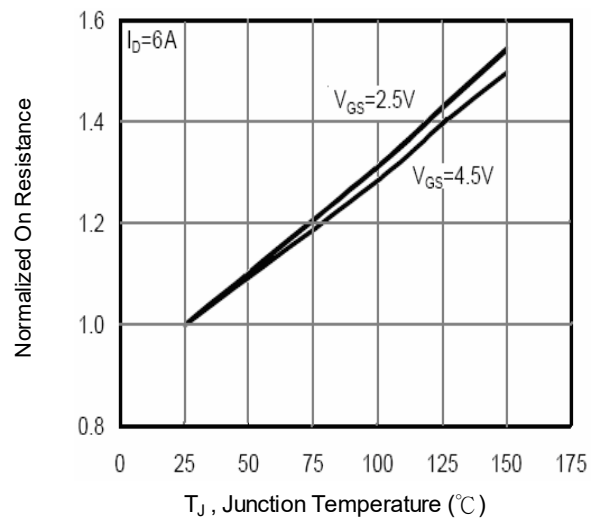
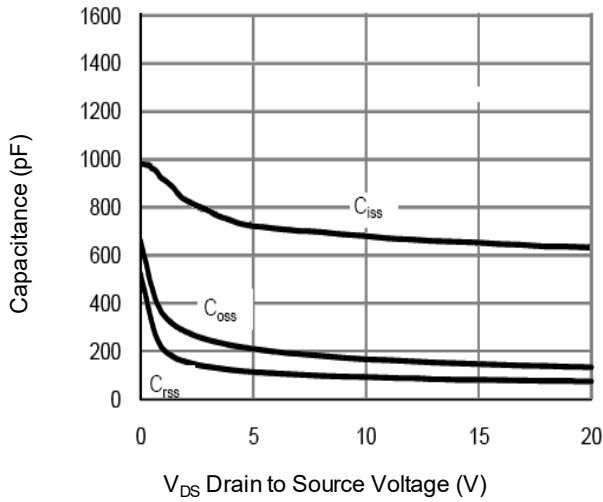**Fig.6 Normalized R_{DSON} vs. T_J**

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Fig.7 Capacitance
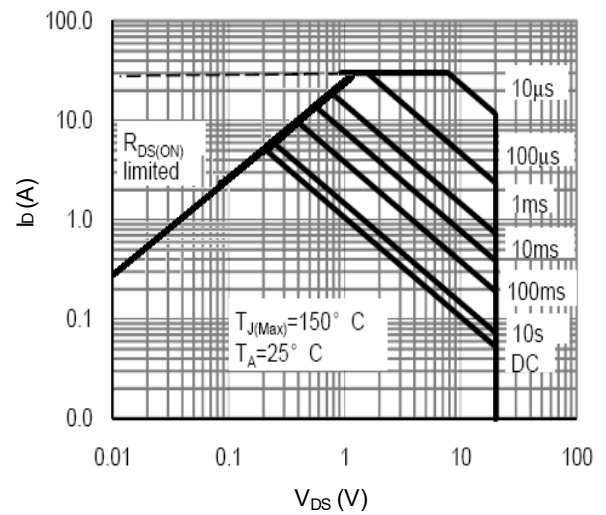
Fig.8 Safe Operating Area
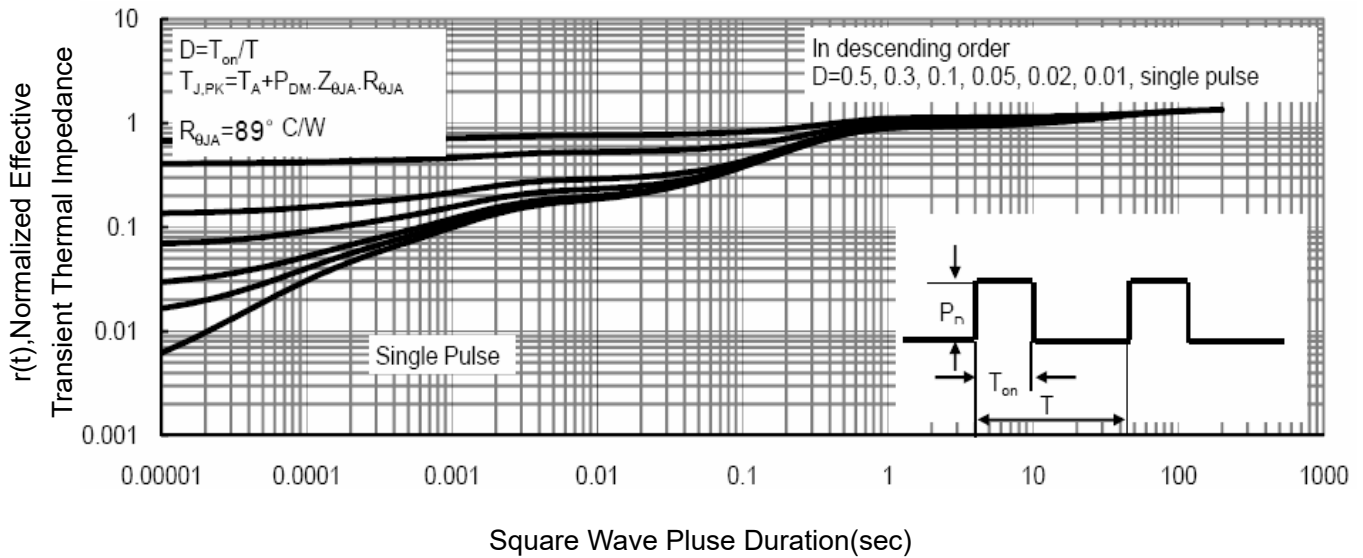
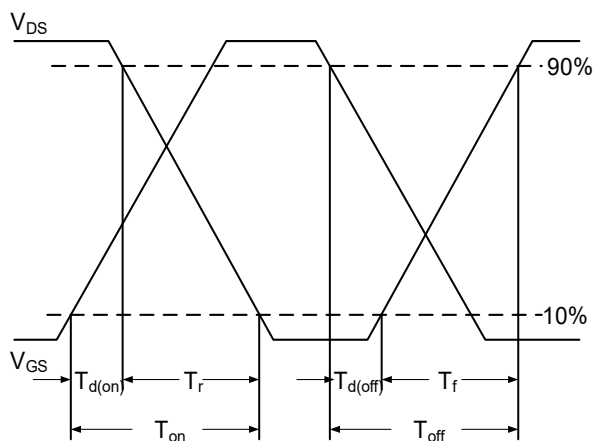**Fig.9 Normalized Maximum Transient Thermal Impedance**

Square Wave Pluse Duration(sec)

Fig.10 Switching Time Waveform
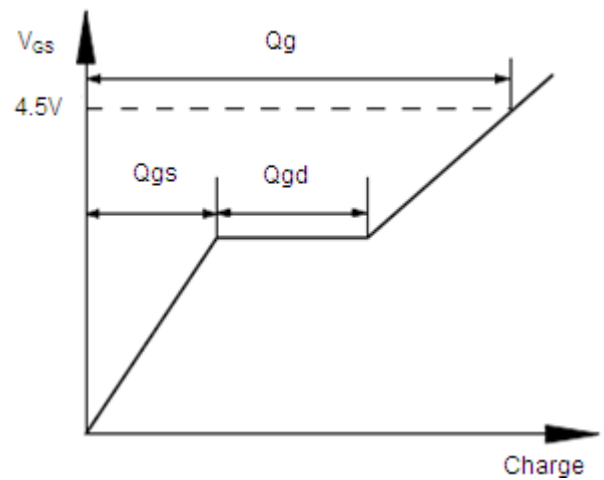
Fig.11 Gate Charge Waveform

PACKAGE MECHANICAL DATA
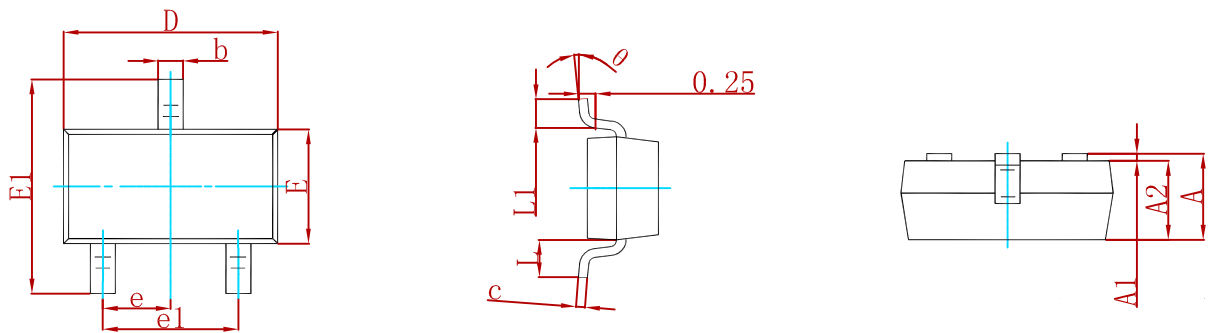
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 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°

Suggested Pad Layout
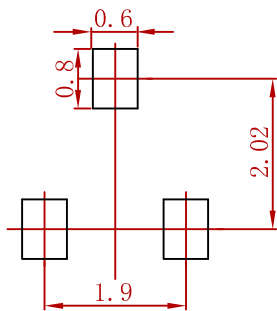
Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

REELSPECIFICATION

P/N	PKG	QTY
MS3416	SOT-23	3000

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