

DESCRIPTION

The 3416 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a wide variety of applications.

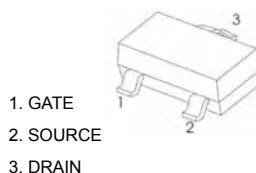
FEATURES

Low Gate Charge
High Power and current handling capability
Lead free product is acquired
ESD Rating: HBM 2KV

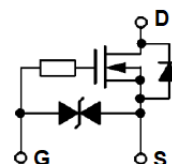
V_{DS} 20 V
 I_D 7.6 A
 $R_{DS(ON)}$ 12.3 m Ω

3416

SOT-23



Equivalent Circuit



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Limit	Unit
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	20	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	± 12	V
I_D	Drain Current-Continuous($T_A=25^\circ\text{C}$)	7.6	A
	Drain Current-Continuous($T_A=100^\circ\text{C}$)	4.8	A
I_{DM} (pulse)	Drain Current-Continuous@ Current-Pulsed (Note 1)	30.4	A
P_D	Maximum Power Dissipation($T_A=25^\circ\text{C}$)	1.3	W
	Maximum Power Dissipation($T_A=100^\circ\text{C}$)	0.5	W
E_{AS}	Avalanche energy (Note 2)	25	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to- Ambient		94	$^\circ\text{C}/W$

Electrical Characteristics (T_J=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV _{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 T _J =25℃			1	μA
		V _{DS} =20V, V _{GS} =0V T _J =125℃			100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±10V, V _{DS} =0V			±10	uA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.5		1	V
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =5A		13.6		S
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =4.5V, I _D =5A T _J =25℃		12.3	16	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance	V _{GS} =2.5V, I _D =4A T _J =25℃		15.6	20.7	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V,V _{GS} =0V, f=1.0KHz		670		pF
C _{oss}	Output Capacitance			150		pF
C _{rss}	Reverse Transfer Capacitance			90		pF
Switching Parameters						
t _{d(on)}	Turn-on Delay Time	V _{GS} =4.5V, V _{DS} =10V, R _L =2Ω, R _{GEN} =3Ω		11		nS
t _r	Turn-on Rise Time			34		nS
t _{d(off)}	Turn-Off Delay Time			55		nS
t _f	Turn-Off Fall Time			51		nS
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =5A		9.1		nC
Q _{gs}	Gate-Source Charge			1.6		nC
Q _{gd}	Gate-Drain Charge			2		nC
Source-Drain Diode Characteristics						
I _{SD}	Source-Drain Current (Body Diode)				7.6	A
V _{SD}	Forward on Voltage ^(Note 3)	V _{GS} =0V, I _S =5A			1.2	V

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

Notes 2.EAS condition: T_J=25°C, V_{DD}=10V, V_G=10V, R_g=25Ω, L=0.5mH.

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

RATING AND CHARACTERISTIC CURVES

Figure 1. Output Characteristics

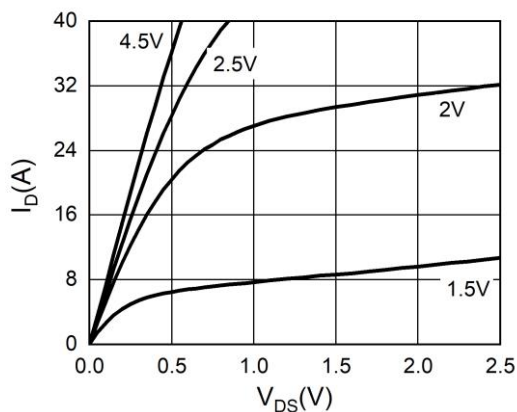


Figure 2. Transfer Characteristics

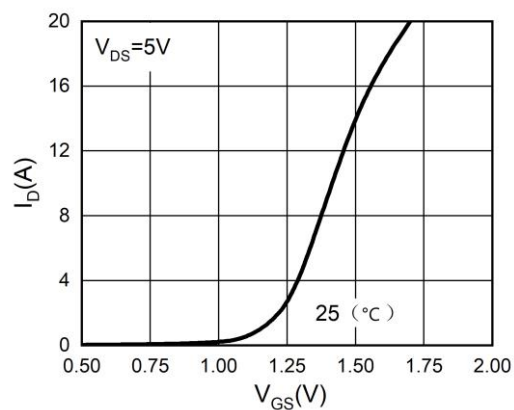


Figure 3. Power Dissipation

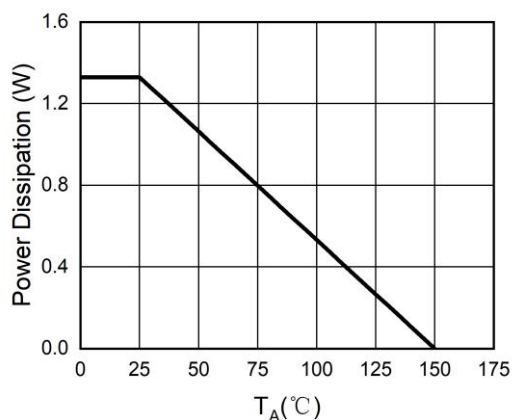


Figure 4. Drain Current

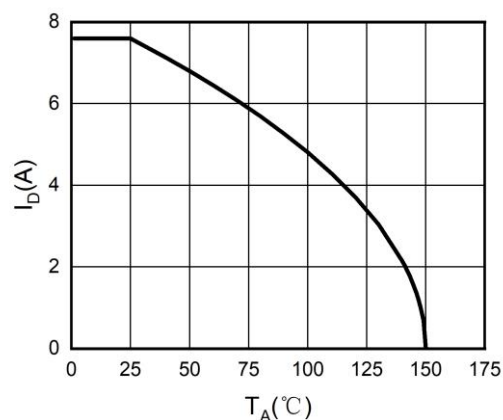


Figure 5. BV_{DSS} vs Junction Temperature

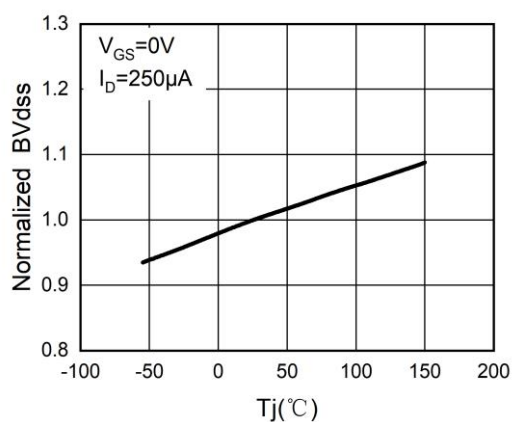
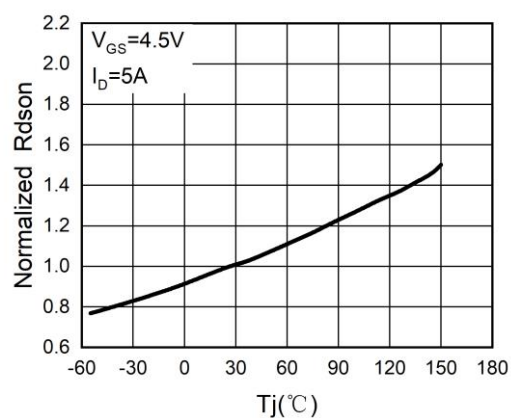


Figure 6. $R_{DS(ON)}$ vs Junction Temperature



RATING AND CHARACTERISTIC CURVES

Figure 7. Gate Charge Waveforms

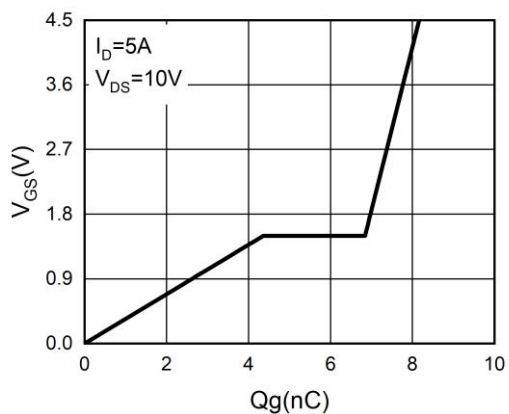


Figure 8. Capacitance

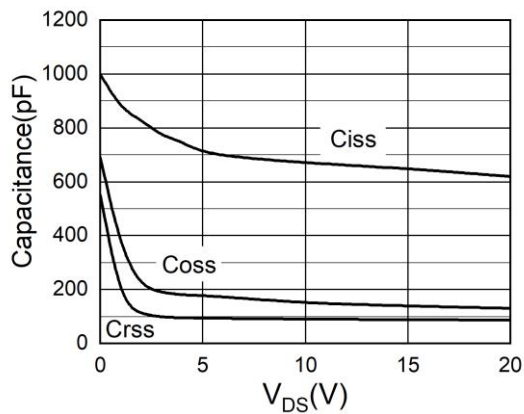


Figure 9. Body-Diode Characteristics

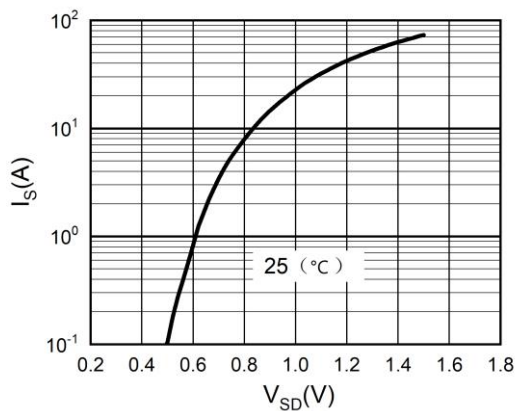
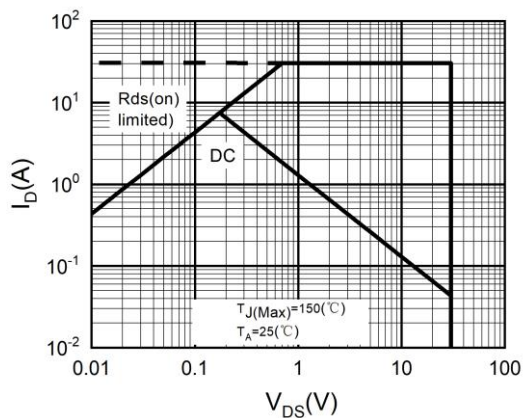
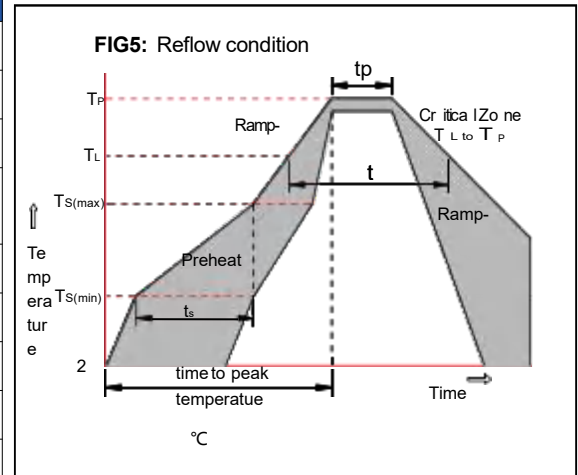


Figure 10. Maximum Safe Operating Area



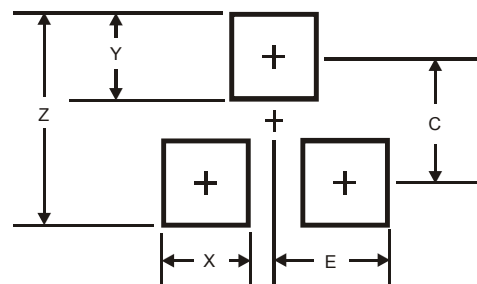
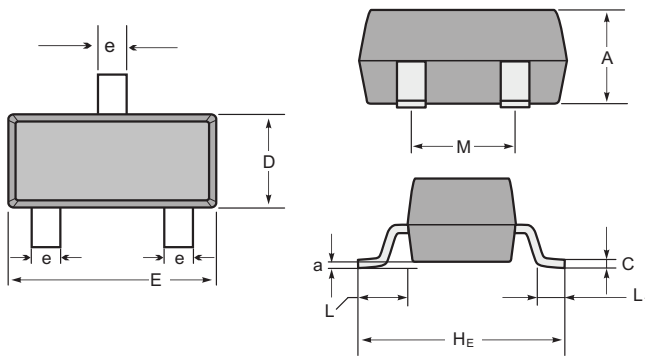
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150°C
	-Temperature Max($T_{s(max)}$)	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217°C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260°C



Package Dimensions & Suggested Pad Layout

SOT23

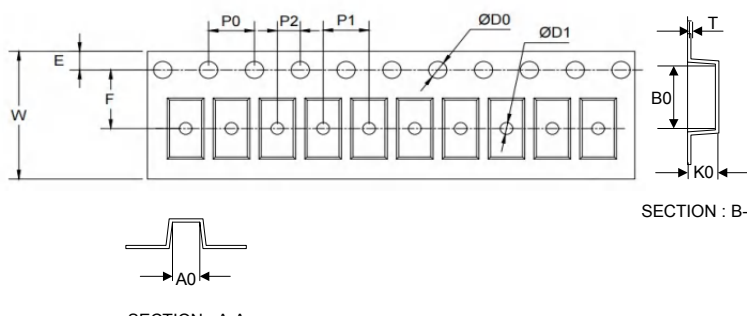
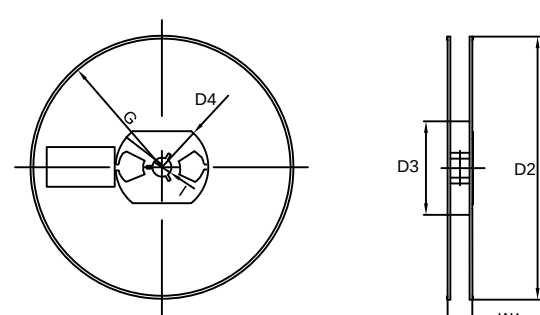


SOT-23 mechanical data

UNIT		A	C	D	E	H _E	e	M	L	L ₁	a
mm	max	1.1	0.15	1.4	3.0	2.6	0.5	1.95	0.55 (ref)	0.36 (ref)	0.0
	min	0.9	0.08	1.2	2.8	2.2	0.3	1.7			0.15
mil	max	43	6	55	118	102	20	77	22 (ref)	14 (ref)	0.0
	min	35	3	47	110	87	12	67			6

Dimensions	SOT23
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

Tape & reel specification

Tape	Symbol	Dimension (mm)
	P0	4.00±0.10
 7" Reel 	P1	4.00±0.10
	P2	2.00±0.10
	D0	1.55±0.10
	D1	1.05±0.10
	E	1.55±0.10
	F	3.60±0.10
	W	8.00±0.10
	A0	3.80±0.20
	B0	3.25±0.20
	K0	1.45±0.10
	T	0.25±0.05
	D2	178.0±3.0
	D3	55Min.
	D4	R24.0±3.0
	G	R82.0±3.0
	I	13.0±2.0
	W1	11.0±3.0
	Quantity: 3000PCS	