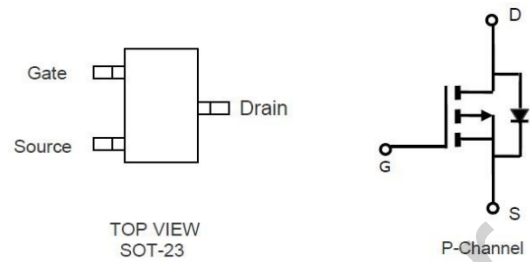


■ DESCRIPTION

The 3413 is the P-Channel logic enhancement mode power field effect transistor is produced using high cell density advanced trench technology..

This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage application, and low in-line power loss are needed in a very small outline surface mount package.

■ PIN CONFIGURATION



■ FEATURE

- ◆ -20V/-4.0A, $R_{DS(ON)}=40m\Omega$ (typ.)@ $V_{GS}=-4.5V$
- ◆ -20V/-4.0A, $R_{DS(ON)}=50m\Omega$ (typ.)@ $V_{GS}=-2.5V$
- ◆ -20V/-2.0A, $R_{DS(ON)}=66m\Omega$ (typ.)@ $V_{GS}=-1.8V$
- ◆ -20V/-1.0A, $R_{DS(ON)}=85m\Omega$ (typ.)@ $V_{GS}=-1.5V$
- ◆ Super high design for extremely low $R_{DS(ON)}$
- ◆ Exceptional on-resistance and Maximum DC current capability
- ◆ Full RoHS compliance
- ◆ SOT23-3L package design

■ APPLICATIONS

- ◆ Power Management
- ◆ Portable Equipment
- ◆ DC/DC Converter
- ◆ Load Switch
- ◆ DSC
- ◆ LCD Display inverter

■ PART NUMBER INFORMATION

3413A-BB C	A= Package Code S: SOT BB=Handing Code TR: Tape&Reel C=Lead Plating Code G: Green Product
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■ ABSOLUTE MAXIMUM RATINGS ($T_A = 25^{\circ}\text{C}$ Unless otherwise noted)

Symbol	Parameter		Typical	Unit
V _{DSS}	Drain-Source Voltage		-20	V
V _{GSS}	Gate-Source Voltage		±12	V
I _D	Continuous Drain Current (T _C =25℃)	V _{GS} =-10V	-4.2	A
	Continuous Drain Current (T _C =70℃)		-3.5	A
I _{DM}	Pulsed Drain Current		-20	A
P _D	Power Dissipation	T _A =25℃	1.5	W
		T _A =70℃	0.9	
T _J	Operation Junction Temperature		150	℃
T _{STG}	Storage Temperature Range		-55~+150	℃
R _{θJA}	Thermal Resistance Junction to Ambient		120	℃/W

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress rating only and functional device operation is not implied

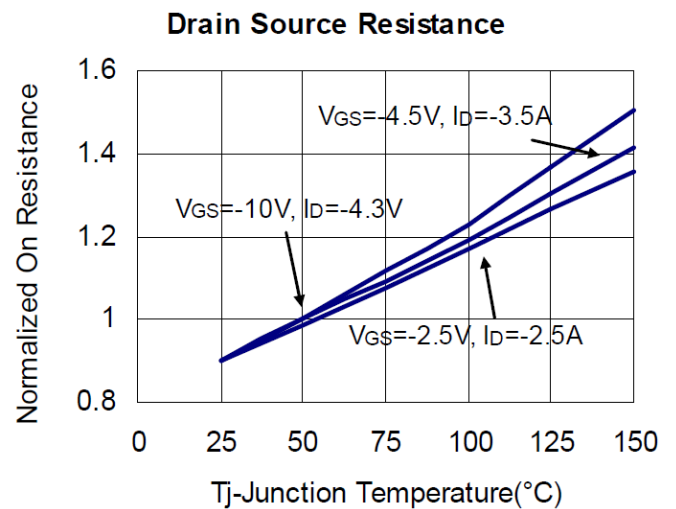
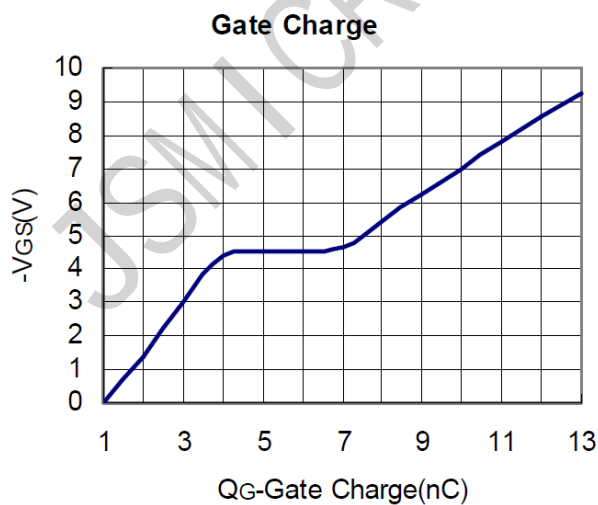
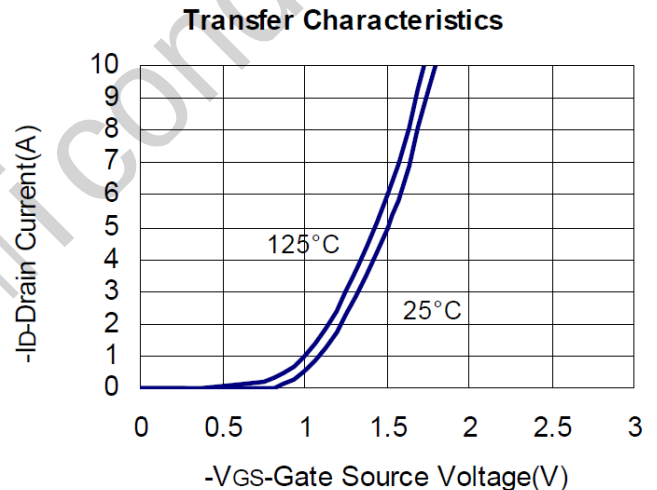
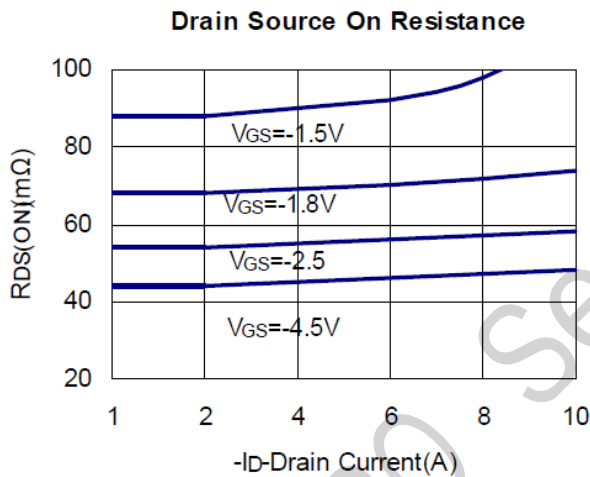
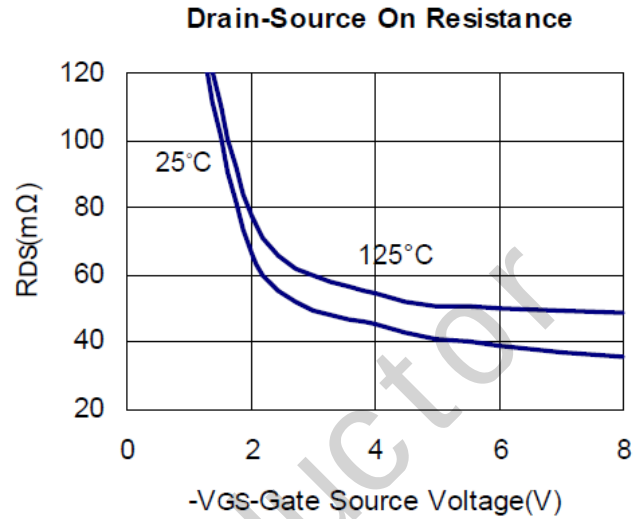
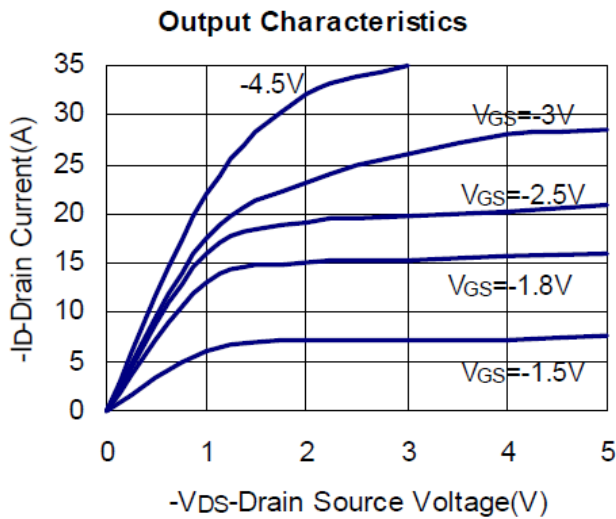
■ **ELECTRICAL CHARACTERISTICS** ($T_A=25^\circ\text{C}$ Unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Parameters						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.3		-1.0	V
I_{GSS}	Gate Leakage Current	$V_{DS}=0V, V_{GS}=\pm 12V$			± 100	nA
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-20V, V_{GS}=0$			-1	μA
		$V_{DS}=-20V, V_{GS}=0$ $T_J=55^\circ\text{C}$			-5	
$R_{DS(ON)}$	Drain-Source On-Resistance	$V_{GS}=-4.5V, I_D=-4.0A$		40	48	m Ω
		$V_{GS}=-2.5V, I_D=-4.0A$		50	60	
		$V_{GS}=-1.8V, I_D=-2.0A$		66	78	
		$V_{GS}=-1.5V, I_D=-1.0A$		85	110	
Gfs	Forward Transconductance	$V_{DS}=-5V, I_D=-4.0A$		22		S
Source-Drain Diode						
V_{SD}	Diode Forward Voltage	$I_S=-1.0A, V_{GS}=0V$		-0.67	-1.2	V
Dynamic Parameters						
Q_g	Total Gate Charge	$V_{DS}=-10V$ $V_{GS}=-4.5V$ $I_D=-4.0A$		11.1		nC
Q_{gs}	Gate-Source Charge			3.1		
Q_{gd}	Gate-Drain Charge			2.4		
C_{iss}	Input Capacitance	$V_{DS}=-10V$ $V_{GS}=0V$ $f=1\text{MHz}$		989		pF
C_{oss}	Output Capacitance			167		
C_{rss}	Reverse Transfer Capacitance			75.5		
$T_{d(on)}$	Turn-On Time	$V_{DS}=-10V$ $I_D=-3.7A$		712		nS
T_r				1386		
$T_{d(off)}$	Turn-Off Time	$V_{GEN}=-4.5V$ $R_G=1\Omega$		9.1		
T_f				4		

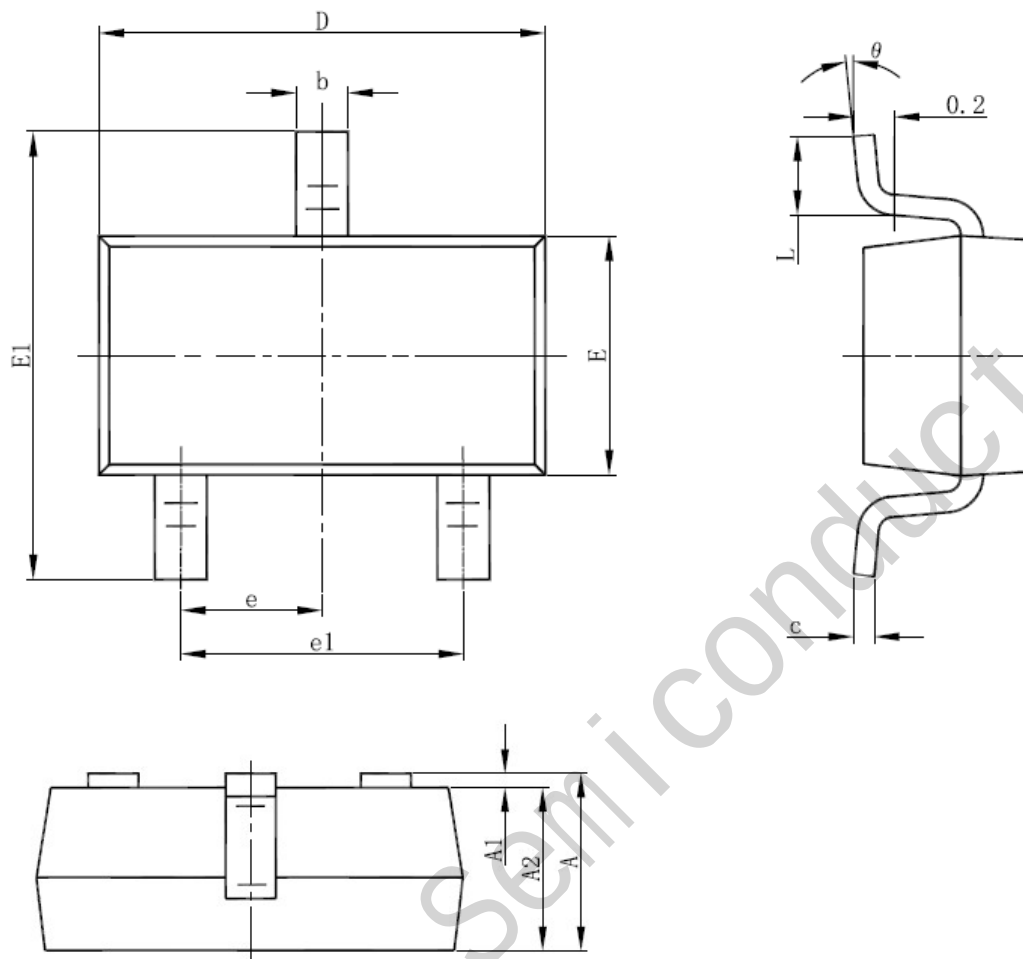
Note: 1. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

2. Static parameters are based on package level with recommended wire bonding

■ **TYPICAL CHARACTERISTICS** (25 °C Unless Note)



SOT23 PACKAGE OUTLINE DIMENSIONS

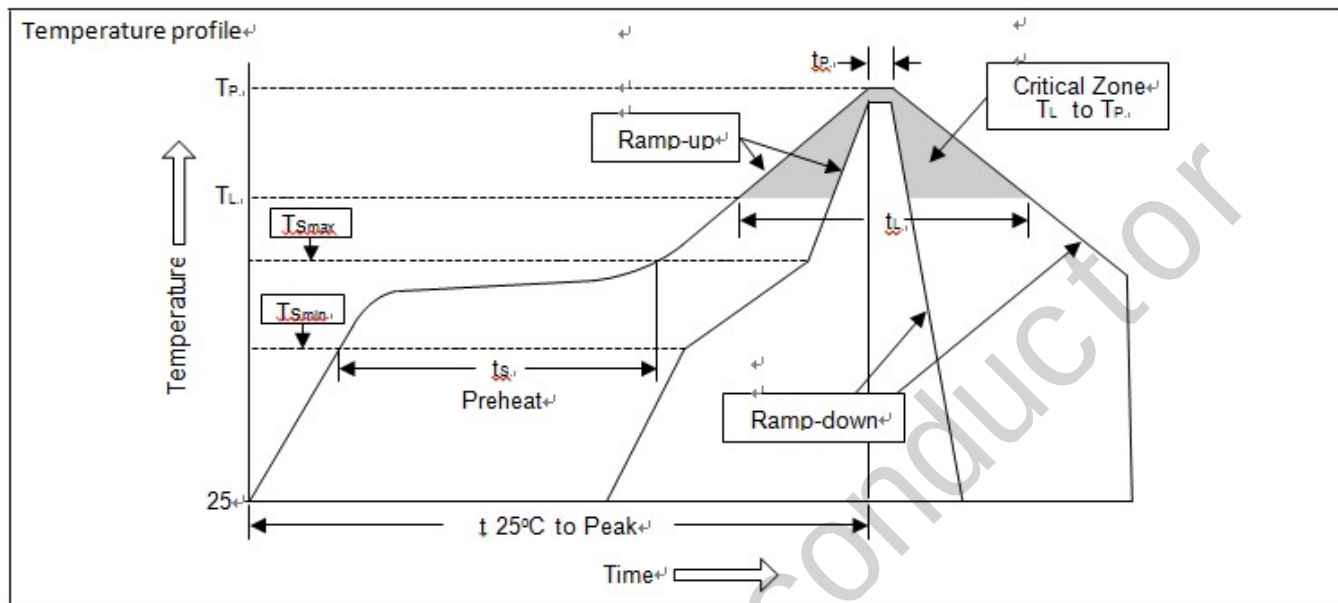


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

■ SOLDERING METHODS FOR UNIVERCHIP

Storage environment Temperature=10°C~35°C Humidity=65%±15%

Reflow soldering of surface mount device



Profile Feature	Sn-Pb Eutectic Assembly	Pb free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat		
-Temperature Min (T_{Smin})	100°C	150°C
-Temperature Max (T_{Smax})	150°C	200°C
-Time (min to max) (t_s)	60~120 sec	60~180 sec
T_{Smax} to T_L		
-Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above		
-Temperature (T_L)	183°C	217°C
-Time (t_L)	60~150 sec	60~150 sec
Peak Temperature (T_P)	240°C+0/-5°C	260°C+0/-5°C
Time within 5°C of actual Peak Temperature (t_p)	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<6 minutes