

## MS14P21

### P-Channel 20-V (D-S) MOSFET

#### Description

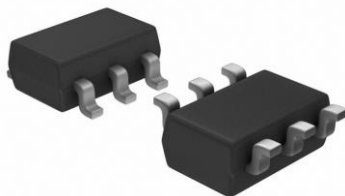
These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $r_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

#### Features

- Low  $r_{DS(on)}$  provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe SC70-6 saves board space
- Fast switching speed
- High performance trench technology
- RoHS compliant package

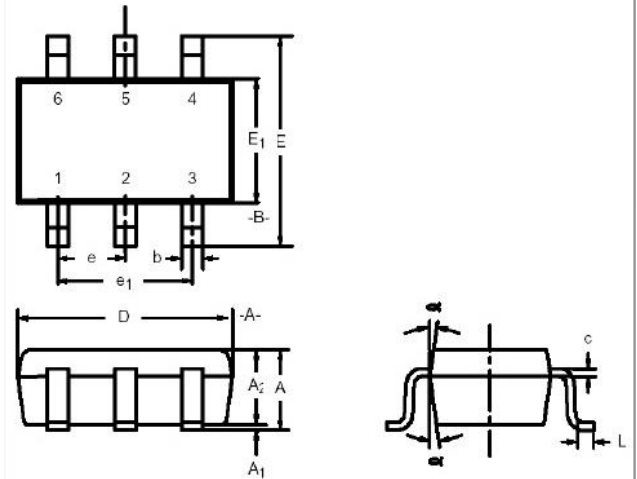
#### Packing & Order Information

3,000/Reel



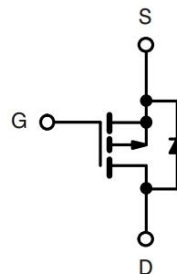
**RoHS**  
COMPLIANT

SC-70: 6



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.90	—	1.10	0.035	—	0.043
A <sub>1</sub>	—	—	0.10	—	—	0.004
A <sub>2</sub>	0.80	—	1.00	0.031	—	0.039
b	0.15	—	0.30	0.006	—	0.012
c	0.10	—	0.25	0.004	—	0.010
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E <sub>1</sub>	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65BSC			0.026BSC		
e <sub>1</sub>	1.20	1.30	1.40	0.047	0.051	0.055
L	0.10	0.20	0.30	0.004	0.008	0.012
α	7°Nom			7°Nom		

#### Graphic symbol



## MS14P21

### P-Channel 20-V (D-S) MOSFET

#### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

##### Absolute Maximum Ratings (Tc=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 8$	V
$I_D$	Continuous Drain Current <sup>a</sup> ( $T_A = 25^\circ\text{C}$ )	-3.7	A
	Continuous Drain Current <sup>a</sup> ( $T_A = 70^\circ\text{C}$ )	-3.0	A
$I_{DM}$	Pulsed Drain Current <sup>b</sup>	-10	A
$I_S$	Continuous Source Current (Diode Conduction) <sup>a</sup>	$\pm 1.4$	A
$P_D$	Power Dissipation <sup>a</sup> ( $T_A = 25^\circ\text{C}$ )	1.56	W
	Power Dissipation <sup>a</sup> ( $T_A = 70^\circ\text{C}$ )	0.81	W
$T_J/T_{STG}$	Operating Junction and Storage Temperature	-55 to +150	$^\circ\text{C}$

##### Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{THJA}$	Maximum Junction-to-Ambient C/W <sup>a</sup> ( $t \leq 5$ sec)	80	$^\circ\text{C/W}$
	Maximum Junction-to-Ambient C/W <sup>a</sup> (Steady-State)	125	

##### Notes:

- a. Surface Mounted on 1" x 1" FR4 Board.  
b. Pulse width limited by maximum junction temperature

##### Static

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$V_{GS(th)}$		$V_{DS} = V_{GS}$ , $I_D = -250 \mu\text{A}$	-0.4			V
$I_{GSS}$	Gate-Body Leakage	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 8 \text{ V}$			$\pm 100$	nA
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16 \text{ V}$ , $V_{GS} = 0 \text{ V}$ $V_{DS} = -16 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 55^\circ\text{C}$			-1 -10	$\mu\text{A}$
$I_{D(on)}$	On-State Drain Current <sup>A</sup>	$V_{DS} = -5 \text{ V}$ , $V_{GS} = -4.5 \text{ V}$	-5			A
$I_{DS(on)}$	Drain-Source On-Resistance <sup>A</sup>	$V_{GS} = -4.5 \text{ V}$ , $I_D = -3.7 \text{ A}$ $V_{GS} = -2.5 \text{ V}$ , $I_D = -3.1 \text{ A}$ $V_{GS} = -1.8 \text{ V}$ , $I_D = -2.6 \text{ A}$			79 110 160	m $\Omega$
$g_{fs}$	Forward Transconductance <sup>A</sup>	$V_{DS} = -5 \text{ V}$ , $I_D = -1.25 \text{ A}$		9		S
$V_{SD}$	Diode Forward Voltage	$I_S = -0.46 \text{ V}$ , $V_{GS} = 0 \text{ V}$		-0.65		V

## MS14P21

### P-Channel 20-V (D-S) MOSFET

Dynamic <sup>b</sup>						
Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{ V}$ , $I_L = -1\text{ A}$ , $V_{GEN} = -4.5\text{ V}$ , $R_G = 6\text{ }\Omega$	--	10	--	ns
$t_r$	Rise Time		--	9	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	27	--	ns
$t_f$	Fall Time		--	11	--	ns
$Q_g$	Total Gate Charge	$V_{DS} = -10\text{ V}$ , $I_D = -3.7\text{ A}$ , $V_{GS} = -4.5\text{ V}$	--	7.2	--	nC
$Q_{gs}$	Gate-Source Charge		--	1.7	--	nC
$Q_{gd}$	Gate-Drain Charge		--	1.5	--	nC

#### Notes:

- Pulse test:  $PW \leq 300\mu s$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Repetitive rating, pulse width limited by junction temperature.

## MS14P21

### P-Channel 20-V (D-S) MOSFET

#### Typical Electrical Characteristics

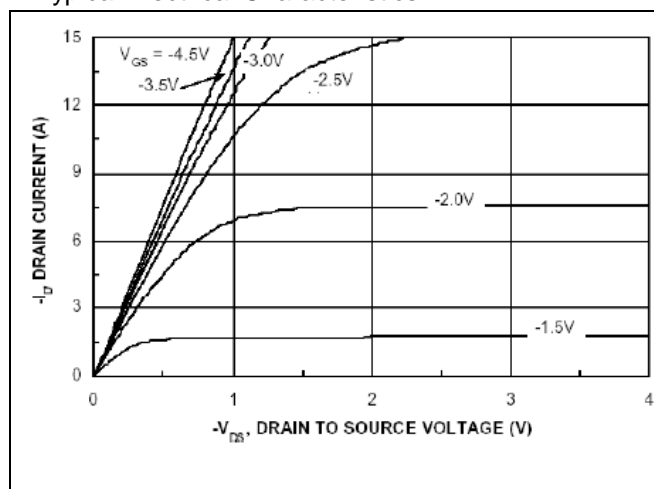


FIG.1-ON REGION CHARACTERISTICS

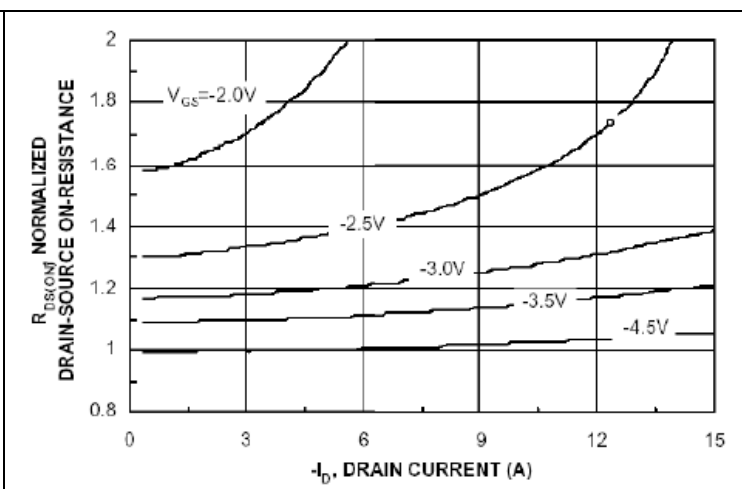


FIG.2-TRANSFER CHARACTERISTICS

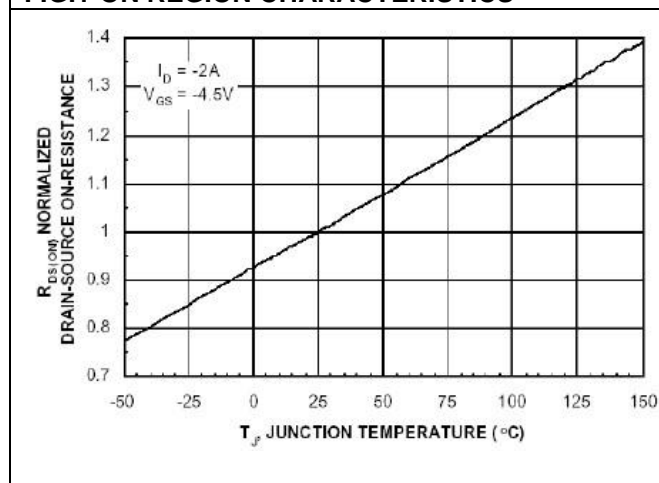


FIG.3- ON-RESISTANCE VARIATION WITH TEMPERATURE

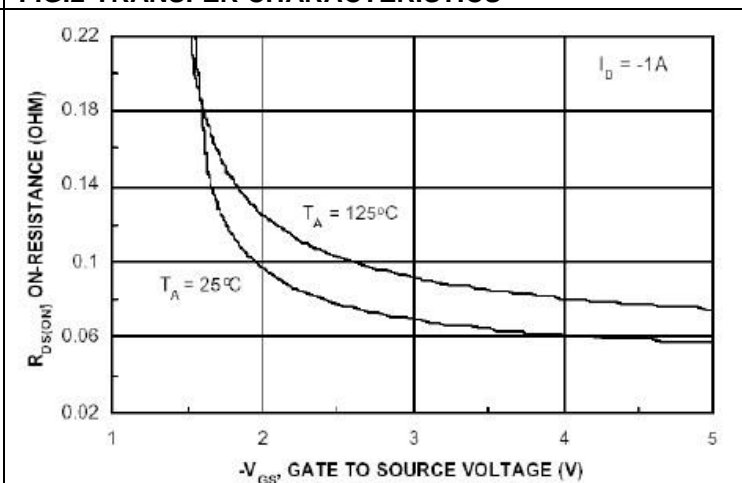


FIG.4-ON-RESISTANCE VARIATION WITH GATE TO SOURCE VOLTAGE

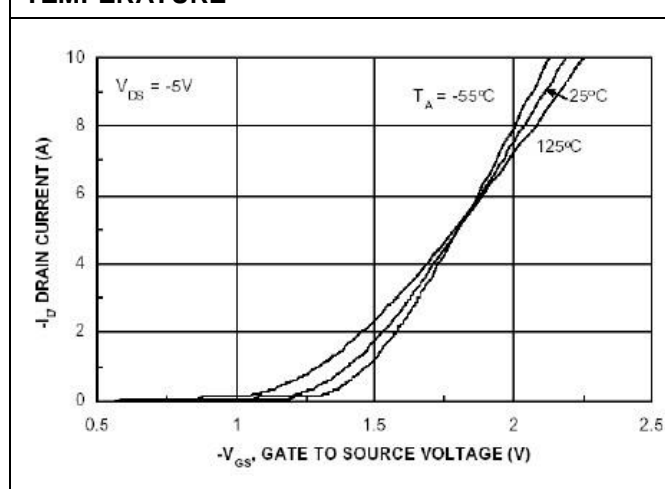


FIG.5-TRANSFER CHARACTERISTICS

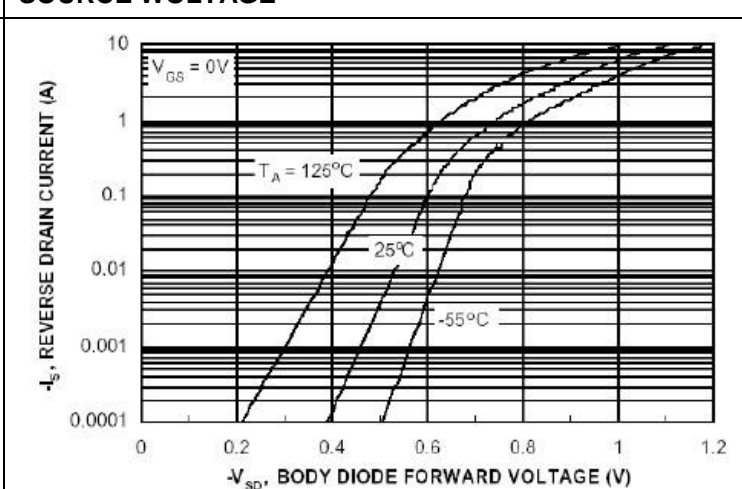


FIG.6-BODY DIODE FORWARD VOLTAGE VARIATION WITH SOURCE CURRENT AND TEMPERATURE

## MS14P21

### P-Channel 20-V (D-S) MOSFET

#### ■ Typical Electrical Characteristics

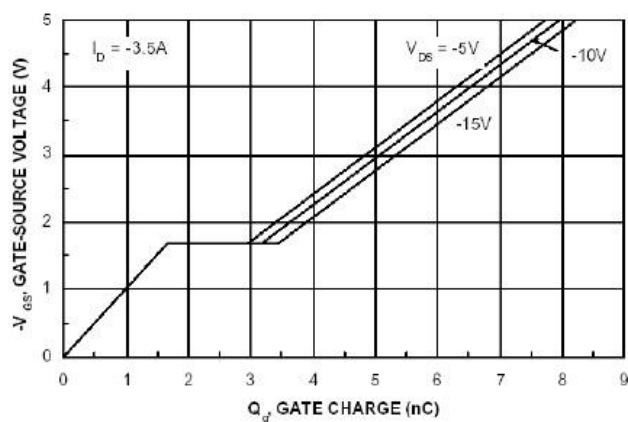


FIG.7-GATE CHARGE CHARACTERISTIC

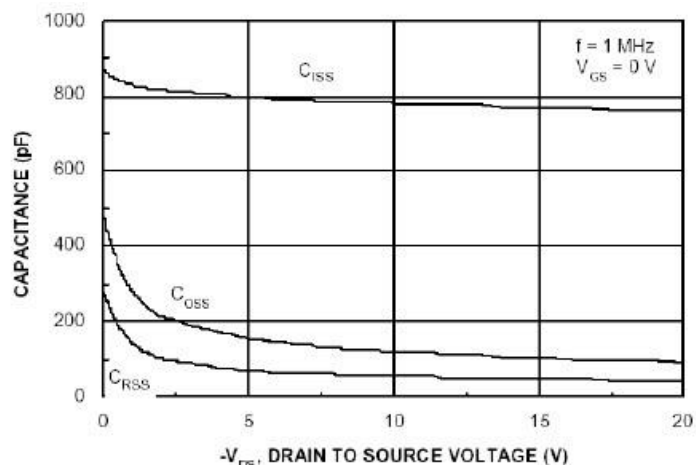


FIG.8-CAPACITANCE CHARACTERISTIC

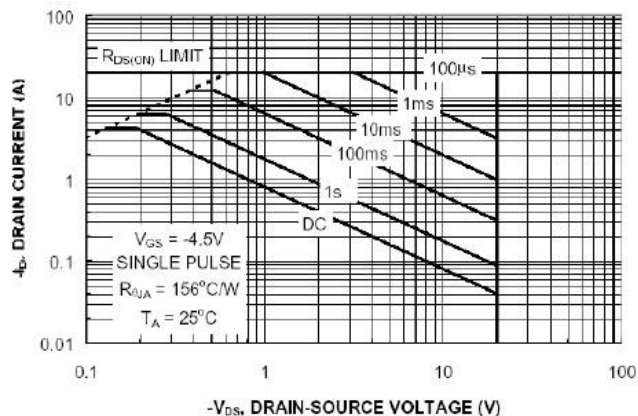


FIG.9-MAXIMUM SAFE OPERATING AREA

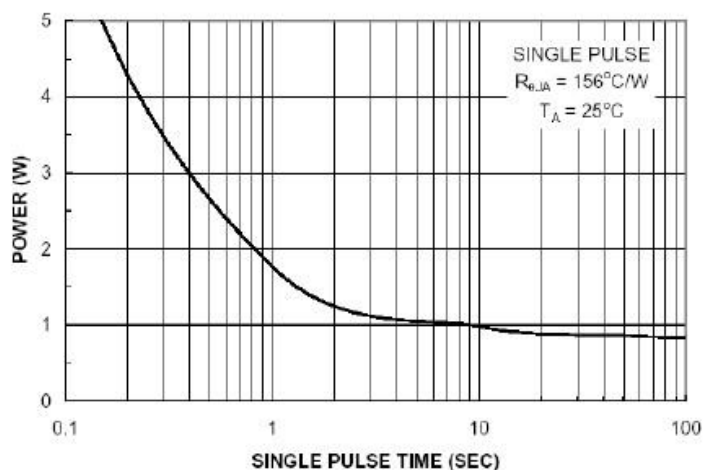


FIG.10-SINGLE PULSE MAXIMUM POWER DISSIPATION

#### Normalized Thermal Transient Junction to Ambient

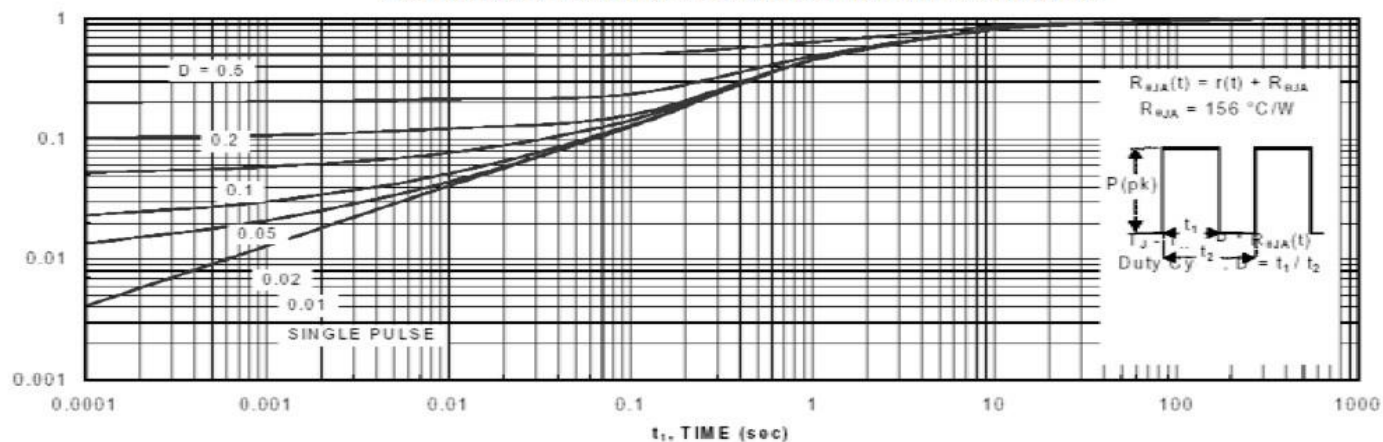


FIG.11-TRANSIENT THERMAL RESPONSE CURVE

## MS14P21

### P-Channel 20-V (D-S) MOSFET

#### Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Bruckewell Technology Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Bruckewell"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product. Bruckewell makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Bruckewell disclaims

- (i) Any and all liability arising out of the application or use of any product.
- (ii) Any and all liability, including without limitation special, consequential or incidental damages.
- (iii) Any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Bruckewell's knowledge of typical requirements that are often placed on Bruckewell products in generic applications.

Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time.

Product specifications do not expand or otherwise modify Bruckewell's terms and conditions of purchase, including but not limited to the warranty expressed therein.