

# P-Channel Enhancement Mode Field-Effect Transistor

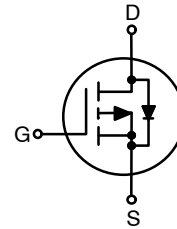
## BSS84

### General Description

This P-channel enhancement-mode field-effect transistor is produced using onsemi's proprietary, high cell density, DMOS technology. This very high density process minimizes on-state resistance and to provide rugged and reliable performance and fast switching. The BSS84 can be used, with a minimum of effort, in most applications requiring up to 0.13 A DC and can deliver current up to 0.52 A. This product is particularly suited to low-voltage applications requiring a low-current high-side switch.

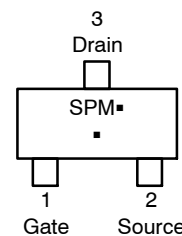
### Features

- -0.13 A, -50 V,  $R_{DS(on)} = 10 \Omega$  at  $V_{GS} = -5$  V
- Voltage-Controlled P-Channel Small-Signal Switch
- High-Density Cell Design for Low  $R_{DS(on)}$
- High Saturation Current
- This Device is Pb-Free and Halogen Free



SOT-23-3  
CASE 318-08

### MARKING DIAGRAM



- SP = Specific Device Code  
M = Date Code\*  
■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
BSS84, BSS84-G	SOT-23-3 (Pb-Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# BSS84

## ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Unit
$V_{DSS}$	Drain–Source Voltage	–50	V
$V_{GSS}$	Gate–Source Voltage	$\pm 20$	
$I_D$	Drain Current – Continuous (Note 1)	–0.13	A
	Drain Current – Pulsed (Note 1)	–0.52	
$P_D$	Maximum Power Dissipation (Note 1)	0.36	W
	Derate Above $25^\circ\text{C}$	2.9	mW/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	–55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/16" from Case for 10 s	300	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Unit
$R_{\theta JA}$	Thermal Resistance, Junction–to–Ambient (Note 1)	350	$^\circ\text{C}/\text{W}$

## ELECTRICAL CHARACTERISTICS (Note 2) $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	–50	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$	–	–48	–	mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}$	–	–	–15	$\mu\text{A}$
		$V_{DS} = -50\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$	–	–	–60	
$I_{GSS}$	Gate–Body Leakage	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	–	–	$\pm 10$	nA

### ON CHARACTERISTICS (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -1\text{ mA}$	–0.8	–1.7	–2	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -1\text{ mA}$ , Referenced to $25^\circ\text{C}$	–	3	–	mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = -5\text{ V}, I_D = -0.10\text{ A}$	–	1.2	10	$\Omega$
		$V_{GS} = -5\text{ V}, I_D = -0.10\text{ A}, T_J = 125^\circ\text{C}$	–	1.9	17	
$I_{D(on)}$	On–State Drain Current	$V_{GS} = -5\text{ V}, V_{DS} = -10\text{ V}$	–0.6	–	–	A
$g_{FS}$	Forward Transconductance	$V_{DS} = -25\text{ V}, I_D = -0.10\text{ A}$	0.05	0.6	–	S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	–	73	–	pF
$C_{oss}$	Output Capacitance		–	10	–	
$C_{rss}$	Reverse Transfer Capacitance		–	5	–	
$R_G$	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$	–	9	–	$\Omega$

**ELECTRICAL CHARACTERISTICS** (Note 2)  $T_A = 25^\circ\text{C}$  unless otherwise noted. (continued)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>SWITCHING CHARACTERISTICS</b> (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -30\text{ V}$ , $I_D = -0.27\text{ A}$ , $V_{GS} = -10\text{ V}$ , $R_{GEN} = 6\ \Omega$	–	2.5	5.0	ns
$t_r$	Turn-On Rise Time		–	6.3	13	
$t_{d(off)}$	Turn-Off Delay Time		–	10	20	
$t_f$	Turn-Off Fall Time		–	4.8	9.6	
$Q_g$	Total Gate Charge	$V_{DS} = -25\text{ V}$ , $I_D = -0.10\text{ A}$ , $V_{GS} = -5\text{ V}$	–	0.9	1.3	nC
$Q_{gs}$	Gate-Source Charge		–	0.2	–	
$Q_{gd}$	Gate-Drain Charge		–	0.3	–	

**DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS**

I <sub>S</sub>	Maximum Continuous Drain–Source Diode Forward Current		–	–	–0.13	A
V <sub>SD</sub>	Drain–Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = –0.26 A (Note 2)	–	–0.8	–1.2	V
t <sub>rr</sub>	Diode Reverse Recovery Time	I <sub>F</sub> = –0.1 A, d <sub>iF</sub> /d <sub>t</sub> = 100 A/μs (Note 2)	–	10	–	ns
Q <sub>rr</sub>	Diode Reverse Recovery Charge		–	3	–	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JA}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.



- $350^\circ\text{C}/\text{W}$  when mounted on a minimum pad.

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

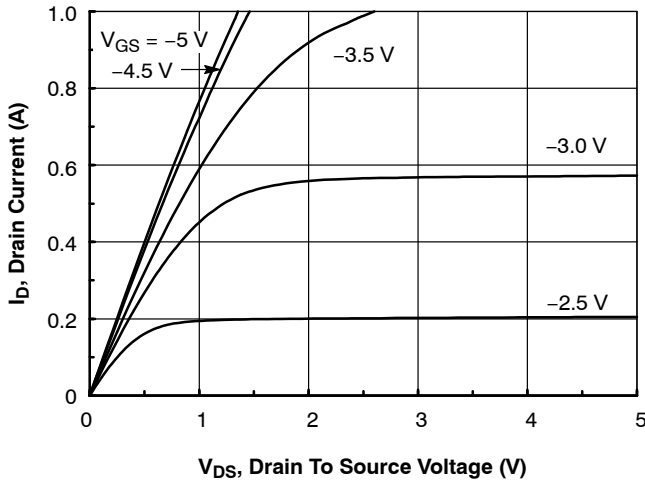
**TYPICAL CHARACTERISTICS**

Figure 1. On-Region Characteristics

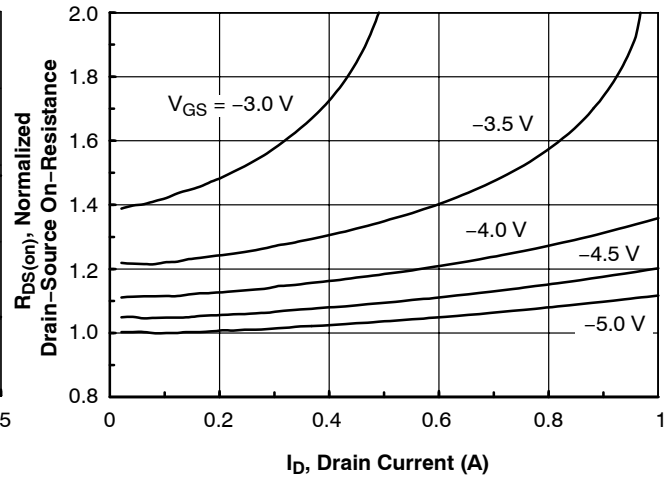


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

TYPICAL CHARACTERISTICS (continued)

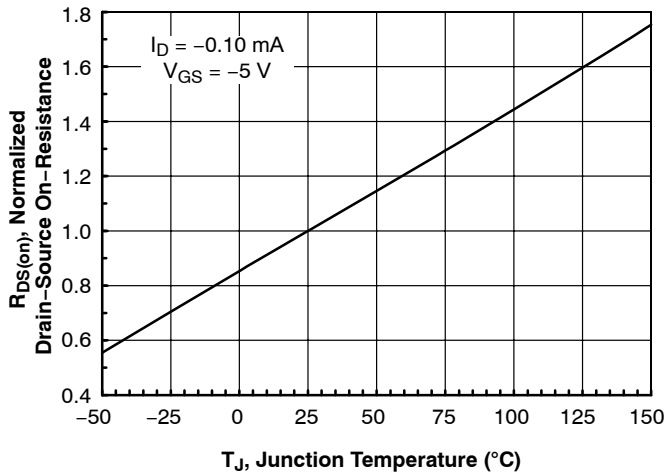


Figure 3. On-Resistance Variation with Temperature

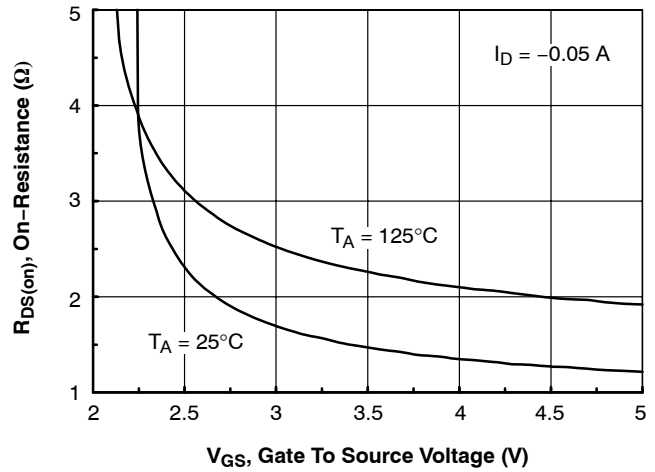


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

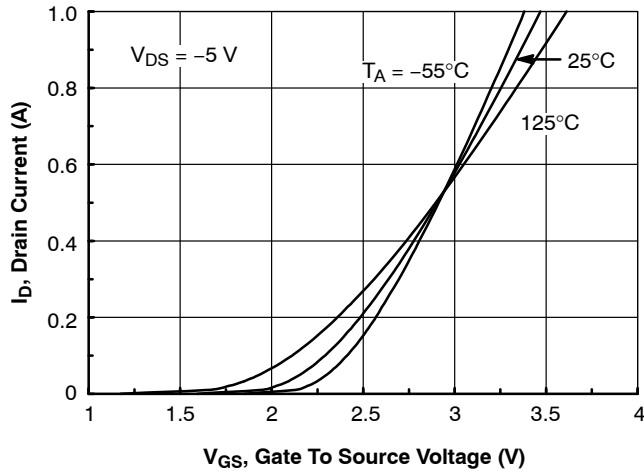


Figure 5. Transfer Characteristics

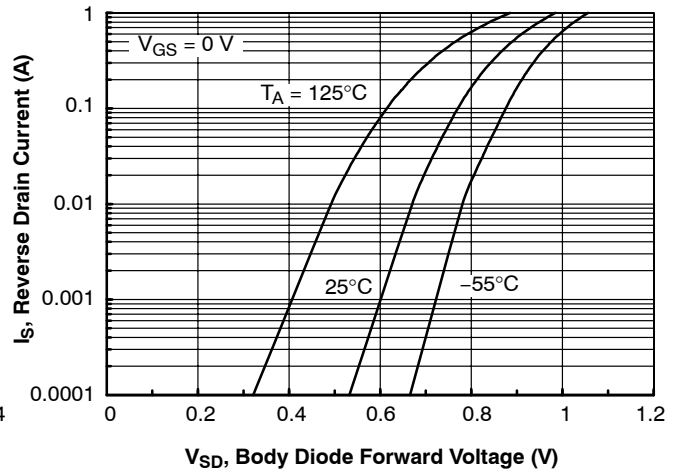


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

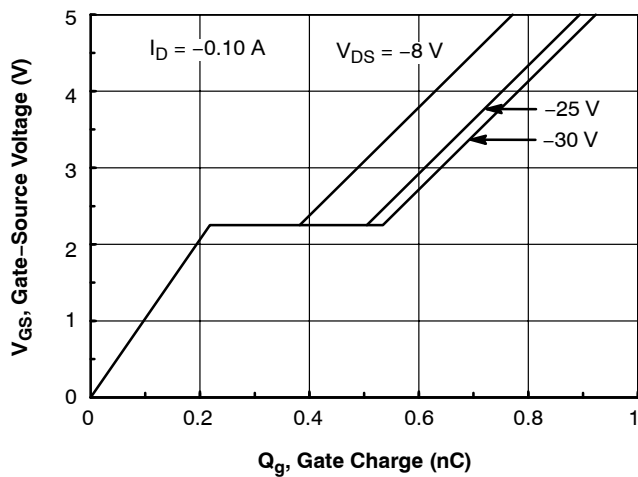


Figure 7. Gate Charge Characteristics

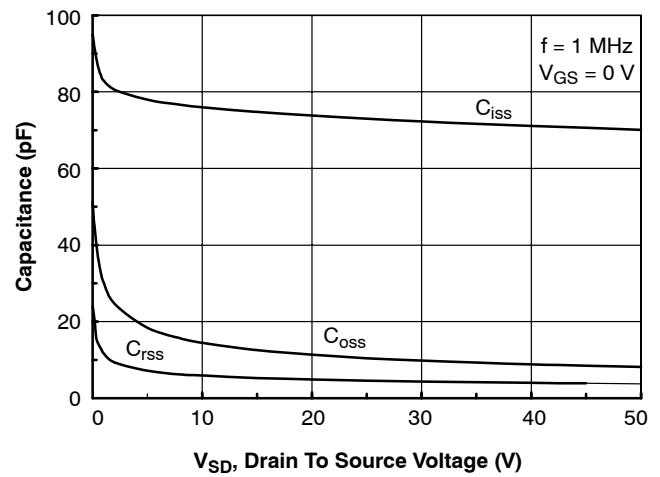


Figure 8. Capacitance Characteristics

TYPICAL CHARACTERISTICS (continued)

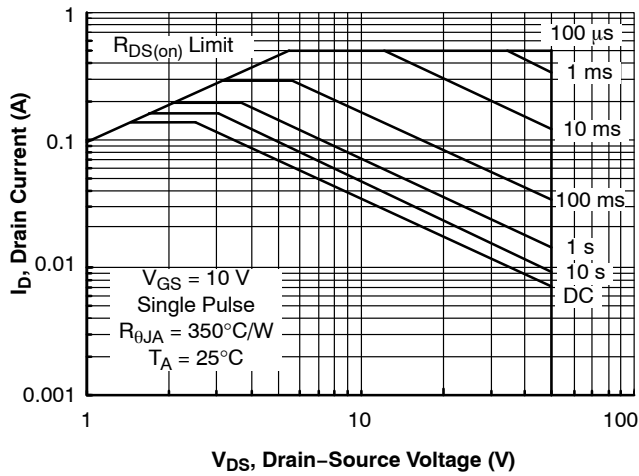


Figure 9. Maximum Safe Operating Area

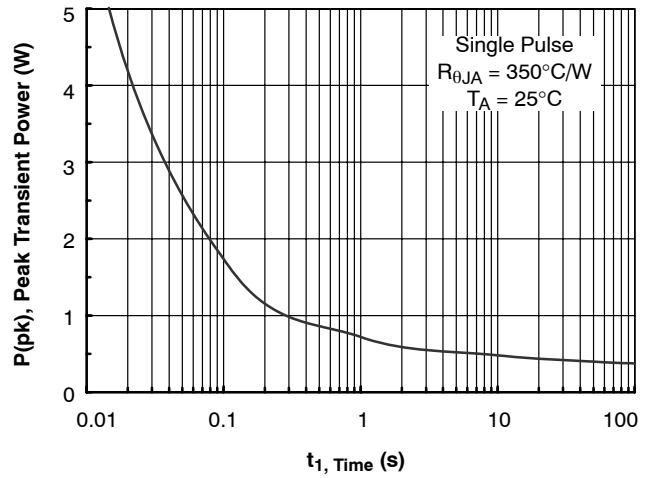


Figure 10. Single Pulse Maximum Power Dissipation

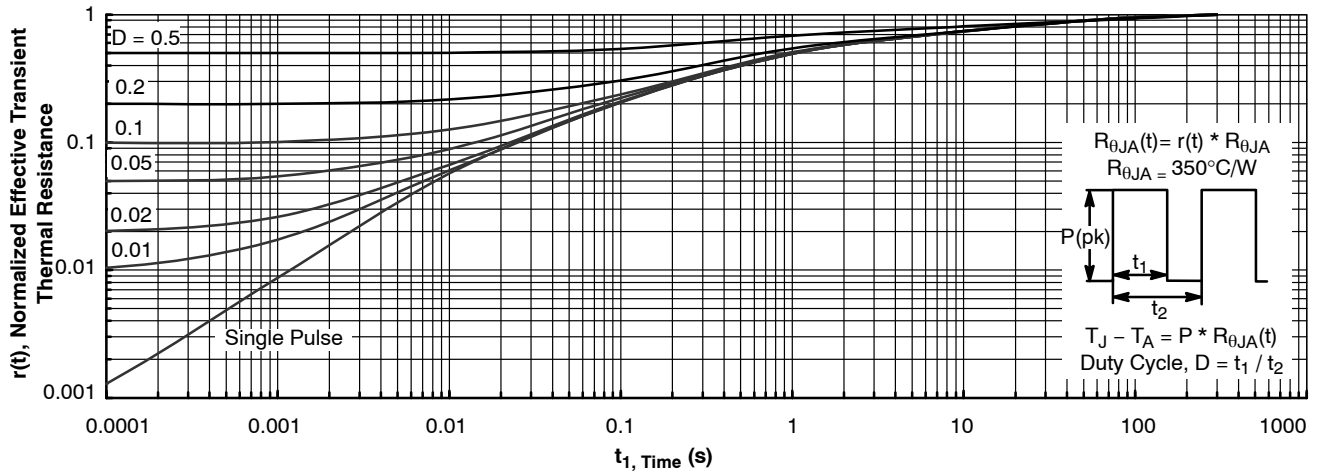


Figure 11. Transient Thermal Response Curve

Thermal characterization performed using the conditions described in Note 1a.  
Transient thermal response will change depending on the circuit board design.

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