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# **Si3457DV**

# Single P-Channel Logic Level PowerTrench® MOSFET

## **General Description**

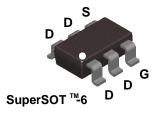
This P-Channel Logic Level MOSFET is produced using Fairchild's advanced PowerTrench process. It has been optimized for battery power management applications.

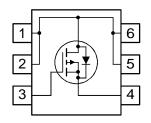
## **Applications**

- Battery management
- · Load switch
- Battery protection

#### **Features**

- -4 A, -30 V.  $R_{DS(ON)} = 50 \text{ m}\Omega \text{ @ V}_{GS} = -10 \text{ V}$   $R_{DS(ON)} = 75 \text{ m}\Omega \text{ @ V}_{GS} = -4.5 \text{ V}$
- · Low gate charge
- High performance trench technology for extremely low  $R_{\mbox{\scriptsize DS}(\mbox{\scriptsize ON})}$





# Absolute Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage		-30	V
V <sub>GSS</sub>	Gate-Source Voltage		±25	V
I <sub>D</sub>	Drain Current - Continuous	(Note 1a)	-4	Α
	- Pulsed		-20	
P <sub>D</sub>	Maximum Power Dissipation	(Note 1a)	1.6	W
		(Note 1b)	0.8	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temp	erature Range	-55 to +150	°C

## **Thermal Characteristics**

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	78	°C/W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	(Note 1)	30	°C/W

**Package Marking and Ordering Information** 

Device Marking	Device	Reel Size	Tape width	Quantity
.457	Si3457DV	7"	8mm	3000 units

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Char	acteristics			ı	l	I
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	-30			V
ΔBV <sub>DSS</sub> ΔT, <sub>J</sub>	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$ , Referenced to 25°C		-22		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	$V_{DS} = -24 \text{ V},  V_{GS} = 0 \text{ V}$			-1	μΑ
I <sub>GSSF</sub>	Gate-Body Leakage, Forward	$V_{GS} = 25 \text{ V}, \qquad V_{DS} = 0 \text{ V}$			100	nA
$I_{GSSR}$	Gate-Body Leakage, Reverse	$V_{GS} = -25 \text{ V}$ $V_{DS} = 0 \text{ V}$			-100	nA
On Char	acteristics (Note 2)					
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	-1	-1.8	-3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}, \text{Referenced to } 25^{\circ}\text{C}$		4		mV/°C
R <sub>DS(on)</sub>	Static Drain–Source On–Resistance	$V_{GS} = -10 \text{ V},  I_D = -4 \text{ A} $ $V_{GS} = -4.5 \text{ V},  I_D = -3.4 \text{ A} $ $V_{GS} = -10 \text{ V}, I_D = -4 \text{ A}; T_J = 125^{\circ}$		44 67 60	50 75 70	mΩ
I <sub>D(on)</sub>	On-State Drain Current	$V_{GS} = -10 \text{ V}, \qquad V_{DS} = -5 \text{ V}$	-20			Α
<b>g</b> FS	Forward Transconductance	$V_{DS} = -5 \text{ V}, \qquad I_{D} = -4 \text{ A}$		8.4		S
Dynamic	Characteristics					
C <sub>iss</sub>	Input Capacitance	$V_{DS} = -15 \text{ V}, \qquad V_{GS} = 0 \text{ V},$		470		pF
Coss	Output Capacitance	f = 1.0 MHz		126		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			61		pF
Switchir	ng Characteristics (Note 2)					
t <sub>d(on)</sub>	Turn-On Delay Time	$V_{DD} = -15 \text{ V}, \qquad I_D = -1 \text{ A},$		7	14	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{GS} = -10 \text{ V}, \qquad R_{GEN} = 6 \Omega$		12	22	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			16	29	ns
t <sub>f</sub>	Turn-Off Fall Time			6	12	ns
Q <sub>g</sub>	Total Gate Charge	$V_{DS} = -15 \text{ V}, \qquad I_{D} = -4 \text{ A},$		6	8.1	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} =5 \text{ V}$		2.1		nC
$Q_{gd}$	Gate-Drain Charge			2		nC
Drain-S	ource Diode Characteristics	and Maximum Ratings				
Is	Maximum Continuous Drain-Source				-1.3	Α
V <sub>SD</sub>	Drain–Source Diode Forward Voltage	$V_{GS} = 0 \text{ V},  I_{S} = -1.3 \text{ A}  \text{(Note 2)}$		-0.77	-1.2	V

#### Notes:

R<sub>0JA</sub> 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<sub>0JC</sub> is guaranteed by design while R<sub>0CA</sub> is determined by the user's board design.



a) 78°C/W when mounted on a 1in² pad of 2 oz copper



b) 156°C/W when mounted on a minimum pad of 2 oz copper

Scale 1 : 1 on letter size paper

**2.** Pulse Test: Pulse Width <  $300\mu$ s, Duty Cycle < 2.0%

# **Typical Characteristics**

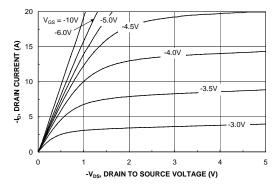


Figure 1. On-Region Characteristics.

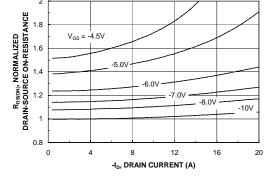


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

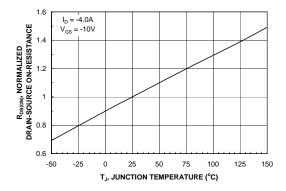


Figure 3. On-Resistance Variation withTemperature.

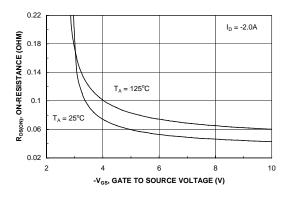


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

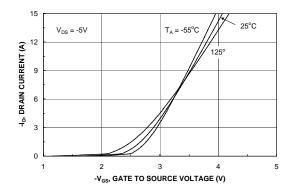


Figure 5. Transfer Characteristics.

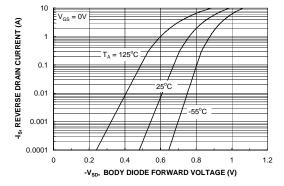
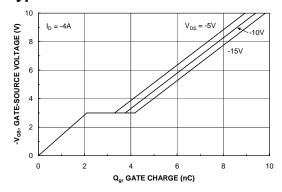


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

# **Typical Characteristics**



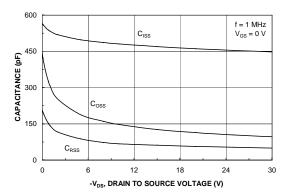
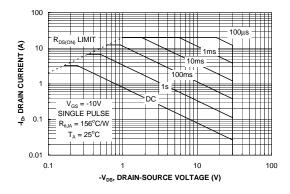


Figure 7. Gate Charge Characteristics.





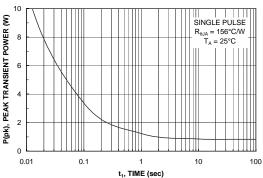


Figure 9. Maximum Safe Operating Area.



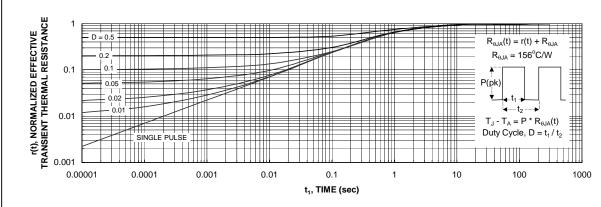


Figure 11. Transient Thermal Response Curve.

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

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