

# P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	$R_{DS(on)}\left(\Omega\right)$	I <sub>D</sub> (A)			
- 60	$0.020 \text{ at V}_{GS} = -10 \text{ V}$	- 50			
	0.025 at V <sub>GS</sub> = - 4.5 V	- 45			

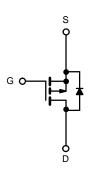
### **FEATURES**

- TrenchFET® Power MOSFET
- Material categorization:

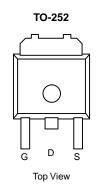


### **APPLICATIONS**

· Load Switch



P-Channel MOSFET



ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Limit	Unit			
Drain-Source Voltage	V <sub>DS</sub>	- 60	V			
Gate-Source Voltage	V <sub>GS</sub>	± 20	T			
Continuous Drain Current (T <sub>.I</sub> = 175 °C)	T <sub>C</sub> = 25 °C	l <sub>D</sub>	- 50			
Continuous Diain Current (1) = 173 C)	T <sub>C</sub> = 125 °C	D'D	- 40	A		
Pulsed Drain Current	I <sub>DM</sub>	- 160	A			
Avalanche Current	I <sub>AS</sub>	- 50				
Single Pulse Avalanche Energy <sup>a</sup>	L = 0.1 mH	E <sub>AS</sub>	125	mJ		
Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	113 <sup>c</sup>	w		
rowei Dissipation	T <sub>A</sub> = 25 °C	' D	2.5 <sup>b, c</sup>			
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C			

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Junction-to-Ambient <sup>b</sup>	t ≤ 10 s	- R <sub>thJA</sub>	15	18	°C/W		
Junction-to-Ambient*	Steady State		40	50			
Junction-to-Case		R <sub>thJC</sub>	0.82	1.1			

#### Notes

- a. Duty cycle  $\leq$  1 %.
- b. When mounted on 1" square PCB (FR-4 material).
- c. See SOA curve for voltage derating.
- d. Package limited.



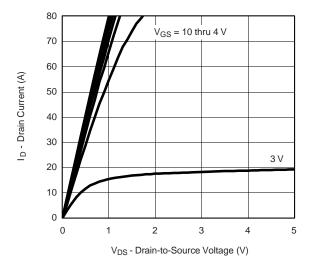
Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static	•						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	- 60			V	
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	- 1.5		- 3	V	
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
		V <sub>DS</sub> = - 60 V, V <sub>GS</sub> = 0 V			- 1		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = - 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			- 50	-	
		V <sub>DS</sub> = - 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 150 °C			- 100		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = - 5 V, V <sub>GS</sub> = - 10 V	- 50			Α	
		V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 17 A	0.020		0.025		
	D	V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 40 A, T <sub>J</sub> = 125 °C			0.030	Ω	
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 40 A, T <sub>J</sub> = 150 °C			0.035		
		V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 14 A		0.025	0.040		
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = - 15 V, I <sub>D</sub> = - 17 A		61		S	
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>			2950			
Output Capacitance	C <sub>oss</sub>	$V_{GS} = 0 \text{ V}, V_{DS} = -25 \text{ V}, f = 1 \text{ MHz}$		380		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			305			
Total Gate Charge <sup>c</sup>	$Q_g$			110	165		
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>	$V_{DS} = -30 \text{ V}, V_{GS} = -10 \text{ V}, I_{D} = -40 \text{ A}$		19		nC	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			28			
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			15	23		
Rise Time <sup>c</sup>	t <sub>r</sub>	$V_{DD} = -30 \text{ V}, R_{L} = 0.6 \Omega$		70	105		
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>	$I_D \cong -40 \text{ A}, V_{GEN} = -10 \text{ V}, R_G = 6$		175	260	ns	
Fall Time <sup>c</sup>	t <sub>f</sub>	Ω		175	260		
Source-Drain Diode Ratings and Cha	aracteristics -	T <sub>C</sub> = 25 °C <sup>b</sup>					
Continuous Current	I <sub>S</sub>				- 40	۸	
Pulsed Current	I <sub>SM</sub>				- 80	Α	
Forward Voltage <sup>a</sup>	$V_{SD}$	I <sub>F</sub> = - 40 A, V <sub>GS</sub> = 0 V		- 1	- 1.6	V	
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = - 40 A, dI/dt = 100 A/μs		45	70	ns	

- a. Pulse test; pulse width  $\leq$  300  $\mu$ s, duty cycle  $\leq$  2 %. b. Guaranteed by design, not subject to production testing. c. Independent of operating temperature.

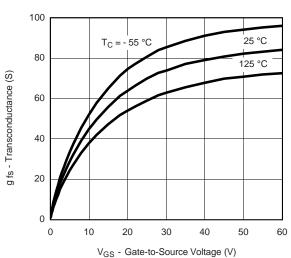
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



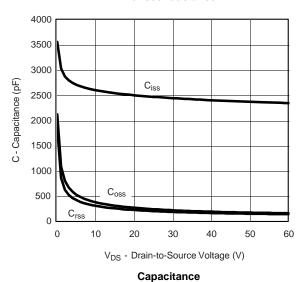
### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



#### **Output Characteristics**

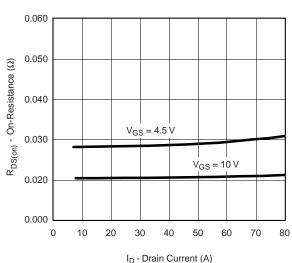


#### Transconductance

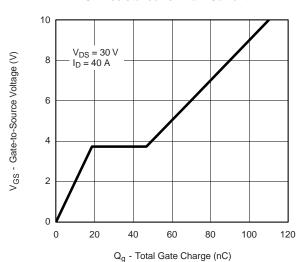


80 70 60 I<sub>D</sub> - Drain Current (A) 40 30  $T_C = 125 \, ^{\circ}C$ 20 25 10 0.0 0.5 2.0 2.5 3.0 3.5 4.0 1.0 1.5 V<sub>GS</sub> - Gate-to-Source Voltage (V)

#### Transfer Characteristics



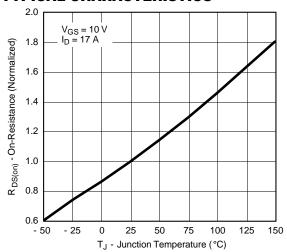
#### **On-Resistance vs. Drain Current**



**Gate Charge** 

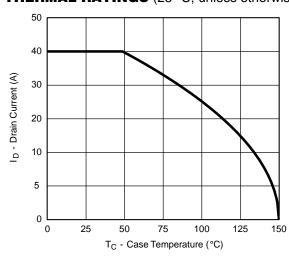


### TYPICAL CHARACTERISTICS

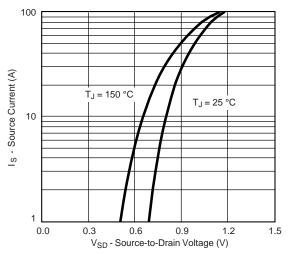


On-Resistance vs. Junction Temperature

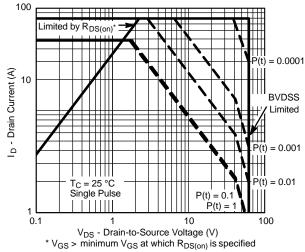
# THERMAL RATINGS (25 °C, unless otherwise noted)



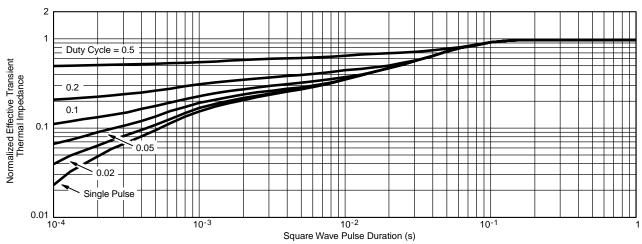
Drain Current vs. Case Temperature



Source-Drain Diode Forward Voltage



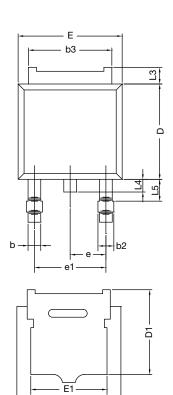
Safe Operating Area

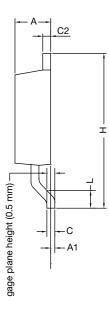


Normalized Thermal Transient Impedance, Junction-to-Case



# **TO-252AA CASE OUTLINE**





	MILLIMETERS		INC	HES	
DIM.	MIN.	MAX.	MIN.	MAX.	
А	2.18	2.38	0.086	0.094	
A1	-	0.127	-	0.005	
b	0.64	0.88	0.025	0.035	
b2	0.76	1.14	0.030	0.045	
b3	4.95	5.46	0.195	0.215	
С	0.46	0.61	0.018	0.024	
C2	0.46	0.89	0.018	0.035	
D	5.97	6.22	0.235	0.245	
D1	5.21	-	0.205	-	
Е	6.35	6.73	0.250	0.265	
E1	4.32	-	0.170	-	
Н	9.40	10.41	0.370	0.410	
е	2.28	BSC	0.090 BSC		
e1	4.56	BSC	0.180 BSC		
L	1.40	1.78	0.055	0.070	
L3	0.89	1.27	0.035	0.050	
L4	-	1.02	-	0.040	
L5	1.14	1.52	0.045	0.060	
ECN: X12-0247-Rev. M, 24-Dec-12					

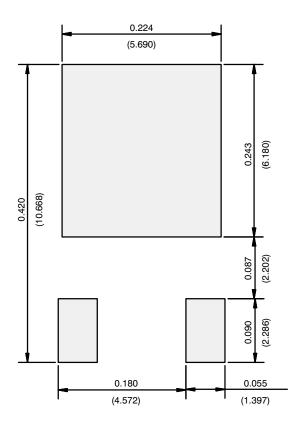
ECN: X12-0247-Rev. M, 24-Dec-DWG: 5347

#### Note

• Dimension L3 is for reference only.



## **RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)**



Recommended Minimum Pads Dimensions in Inches/(mm)



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