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June 2014

FQA140N10

N-Channel QFET® MOSFET 100 V, 140 A, 10 $m\Omega$

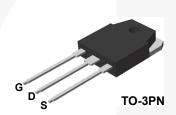
Description

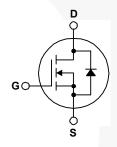
This N-Channel enhancement mode power MOSFET is • 140 A, 100 V, $R_{DS(on)}$ = 10 m Ω (Max.) @ V_{GS} = 10 V, produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state • Low Gate Charge (Typ. 220 nC) resistance, and to provide superior switching performance and Low Crss (Typ. 470 pF) high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor • 100% Avalanche Tested control, and variable switching power applications.

Features

- $I_D = 70 A$

- 175°C Maximum Junction Temperature Rating





Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter	FQA140N10	Unit	
V_{DSS}	Drain-Source Voltage	100	V	
I _D	Drain Current - Continuous (T _C = 25°C)	140	А	
	- Continuous (T _C = 100°C)	99	Α	
I _{DM}	Drain Current - Pulsed (Note	560	Α	
V _{GSS}	Gate-Source Voltage	± 25	V	
E _{AS}	Single Pulsed Avalanche Energy (Note:	2) 1500	mJ	
I _{AR}	Avalanche Current (Note	1) 140	Α	
E _{AR}	Repetitive Avalanche Energy (Note	37.5	mJ	
dv/dt	Peak Diode Recovery dv/dt (Note:	6.5	V/ns	
P_{D}	Power Dissipation (T _C = 25°C)	375	W	
	- Derate above 25°C	2.5	W/°C	
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +175	°C	
T _L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds.	300	°C	

Thermal Characteristics

Symbol	Parameter	FQA140N10	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQA140N10	FQA140N10	TO-3PN	Tube	N/A	N/A	30 units

Electrical Characteristics

T_C = 25°C unless otherwise noted.

cteristics rain-Source Breakdown Voltage reakdown Voltage Temperature refficient rero Gate Voltage Drain Current rate-Body Leakage Current, Forward rate-Body Leakage Current, Reverse reteristics rate Threshold Voltage ratic Drain-Source rate-Resistance	V_{GS} = 0 V, I_D = 250 μA I_D = 250 μA, Referenced to 25°C V_{DS} = 80 V, V_{GS} = 0 V V_{DS} = 64 V, T_C = 150°C V_{GS} = 25 V, V_{DS} = 0 V V_{GS} = -25 V, V_{DS} = 0 V V_{DS} = 0 V	100 2.0	 0.08 	 1 10 100 -100	V V/°(μΑ μΑ nA
rain-Source Breakdown Voltage reakdown Voltage Temperature refficient rero Gate Voltage Drain Current rate-Body Leakage Current, Forward rate-Body Leakage Current, Reverse reteristics rate Threshold Voltage ratio Drain-Source	I_D = 250 μA, Referenced to 25°C V_{DS} = 80 V, V_{GS} = 0 V V_{DS} = 64 V, T_C = 150°C V_{GS} = 25 V, V_{DS} = 0 V V_{GS} = -25 V, V_{DS} = 0 V		0.08	 1 10 100 -100	V/°C μΑ μΑ nA
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ate-Body Leakage Current, Reverse cteristics ate Threshold Voltage atic Drain-Source	$V_{GS} = -25 \text{ V}, V_{DS} = 0 \text{ V}$ $V_{DS} = V_{GS}, I_{D} = 250 \mu\text{A}$			-100	nA
cteristics ate Threshold Voltage atic Drain-Source	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$				
ate Threshold Voltage atic Drain-Source		2.0		4.0	V
ate Threshold Voltage atic Drain-Source		2.0		4.0	V
	V _{GS} = 10 V, I _D = 70 A				
	50 2		0.008	0.01	Ω
orward Transconductance	V _{DS} = 30 V, I _D = 70 A		80		S
Characteristics				1	N.
· ·	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$				pF
			2000	2600	pF
everse Transfer Capacitance			420	550	pF
Characteristics					
ırn-On Delay Time	V _{DD} = 40 V I _D = 140 A	-	75	160	ns
ırn-On Rise Time	22	-	940	1890	ns
ırn-Off Delay Time	- 1.6 = 5 = 5	1	350	710	ns
ırn-Off Fall Time	(Note 4)		360	730	ns
tal Gate Charge	V _{DS} = 64 V, I _D = 140 A,		220	285	nC
ate-Source Charge	V _{GS} = 10 V		39		nC
ate-Drain Charge	(Note 4)	/	114		nC
	cout Capacitance utput Capacitance everse Transfer Capacitance Characteristics un-On Delay Time un-On Rise Time un-Off Delay Time un-Off Fall Time tal Gate Charge ate-Source Charge	cout Capacitance $V_{DS} = 25 \text{ V, V}_{GS} = 0 \text{ V,} \\ f = 1.0 \text{ MHz}$ Characteristics Im-On Delay Time $Im-On \text{ Rise Time} \\ Im-Off \text{ Delay Time} \\ Im-Off Fall Time \\ Im-Off Fall Time \\ Im-Off Fall Charge V_{DS} = 64 \text{ V, I}_{D} = 140 \text{ A,} \\ V_{GS} = 10 \text{ V}$	$\begin{array}{c} \text{but Capacitance} \\ \text{out Capacitance} \\ \text{out put Capacitance} \\ \text{everse Transfer Capacitance} \\ \end{array} \begin{array}{c} V_{DS} = 25 \text{ V, V}_{GS} = 0 \text{ V,} \\ \text{f} = 1.0 \text{ MHz} \\ \end{array} \begin{array}{c}$	$\begin{array}{c} \text{but Capacitance} \\ \text{out Capacitance} \\ \text{out Day Time} \\ \text{out Capacitance} \\ \text{everse Transfer Capacitance} \\ \end{array} \begin{array}{c} V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, \\ f = 1.0 \text{ MHz} \\ \end{array} \begin{array}{c}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

		•					
I _S	Maximum Continuous Drain-Source Dic	de Forward Current	(Note 5)	-		140	Α
I _{SM}	Maximum Pulsed Drain-Source Diode F	Forward Current		-		560	Α
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 140 A		-		1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 140 A,		-	140		ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs		-	730	//	nC

- Notes:
 1. Repetitive rating : pulse-width limited by maximum junction temperature.
 2. L = 0.115 mH, I_{AS} = 140 A, V_{DD} = 25 V, V_{RG} = 25 V_{RG} = 25 V_{RG} = 25°C.
 3. V_{RG} = 25°C.
 4. Essentially independent of operating temperature.
 5. Continuous drain current calculated by maximum junction temperature : limited by package.

Typical Characteristics

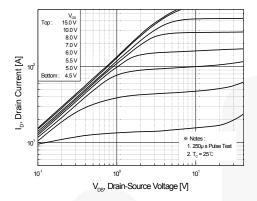


Figure 1. On-Region Characteristics

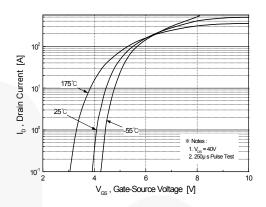


Figure 2. Transfer Characteristics

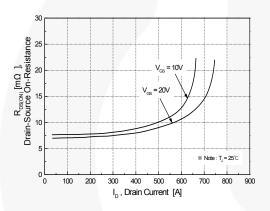


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

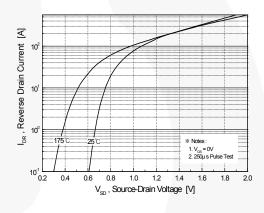


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

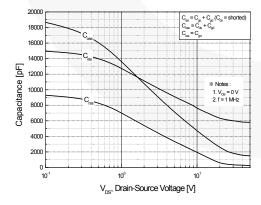


Figure 5. Capacitance Characteristics

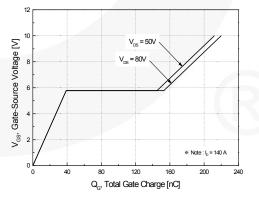


Figure 6. Gate Charge Characteristics

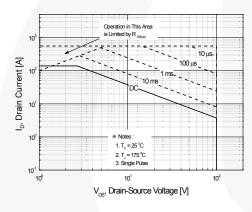
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Typical Characteristics (Continued)

25 (Normalized) 1.5 (No

Figure 7. Breakdown Voltage Variation vs. Temperature

Figure 8. On-Resistance Variation vs. Temperature



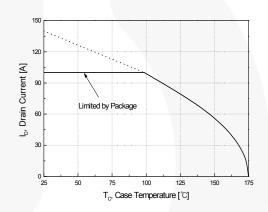


Figure 9. Maximum Safe Operating Area

Figure 10. Maximum Drain Current vs. Case Temperature

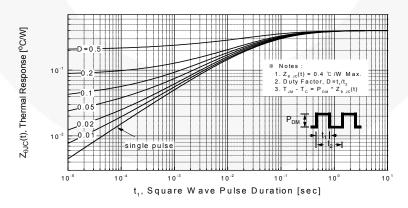


Figure 11. Transient Thermal Response Curve

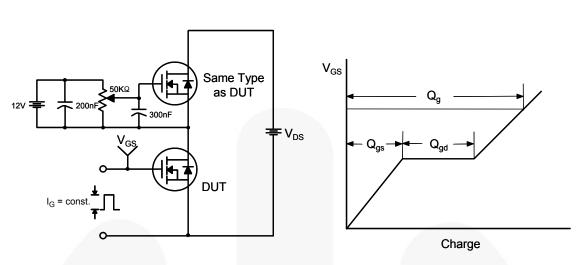


Figure 12. Gate Charge Test Circuit & Waveform

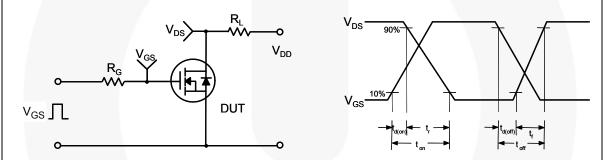


Figure 13. Resistive Switching Test Circuit & Waveforms

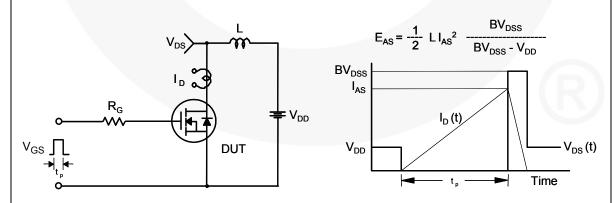
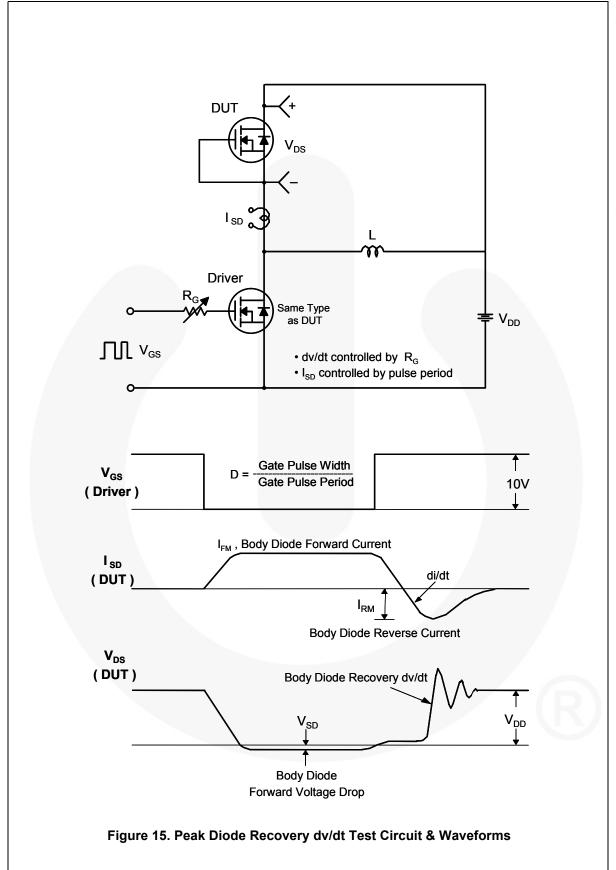
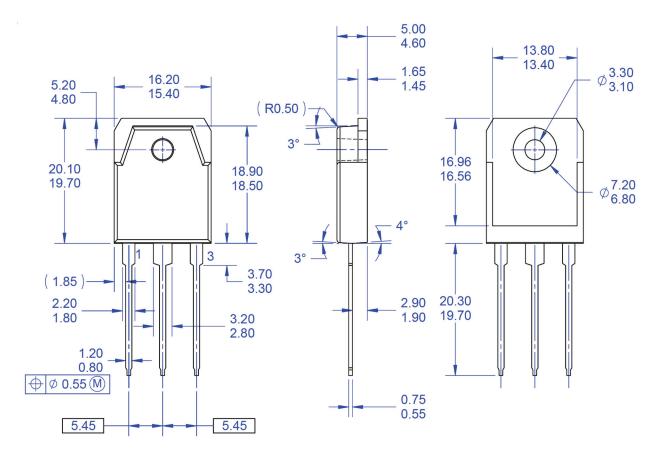
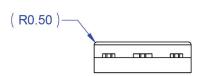


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions





NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
 C) DIMENSION AND TOLERANCING PER
- ASME14.5-2009.
 D) DIMENSIONS ARE EXCLUSSIVE OF BURRS,
- MOLD FLASH, AND TIE BAR EXTRUSSIONS.
 E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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