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# FCU900N60Z

## N-Channel SuperFET® II MOSFET

600 V, 4.5 A, 900 mΩ



### Features

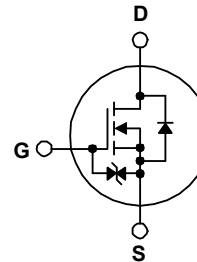
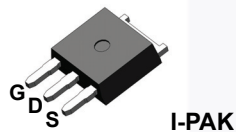
- 675 V @  $T_J = 150^\circ\text{C}$
- Typ.  $R_{DS(on)} = 820\text{ m}\Omega$
- Ultra Low Gate Charge (Typ.  $Q_g = 13\text{ nC}$ )
- Low Effective Output Capacitance (Typ.  $C_{oss(eff.)} = 48.6\text{ pF}$ )
- 100% Avalanche Tested
- ESD Improved Capacity
- RoHS Compliant

### Description

SuperFET® II MOSFET is Fairchild Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching performance,  $dv/dt$  rate and higher avalanche energy. Consequently, SuperFET II MOSFET is very suitable for the switching power applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications.

### Applications

- LCD / LED / PDP TV and Monitor Lighting
- Solar Inverter
- Charger



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FCU900N60Z	Unit
$V_{DSS}$	Drain to Source Voltage	600	V
$V_{GSS}$	Gate to Source Voltage	- DC	$\pm 20$
		- AC ( $f > 1\text{ Hz}$ )	$\pm 30$
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	4.5
		- Continuous ( $T_C = 100^\circ\text{C}$ )	2.8
$I_{DM}$	Drain Current	- Pulsed (Note 1)	13.5
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	47.5
$I_{AR}$	Avalanche Current	(Note 1)	1
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	0.52
$dv/dt$	MOSFET $dv/dt$	100	V/ns
	Peak Diode Recovery $dv/dt$	(Note 3)	
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	52
		- Derate Above $25^\circ\text{C}$	0.42
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FCU900N60Z	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	100	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FCU900N60Z	FCU900N60Z	IPAK	Tube	N/A	N/A	70 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$	625	-	-	V
		$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}, T_J = 150^\circ\text{C}$	675	-	-	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 1\text{ mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.67	-	$\text{V}/^\circ\text{C}$
$BV_{DS}$	Drain to Source Avalanche Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 4.5\text{ A}$	-	700	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 600\text{ V}, T_C = 125^\circ\text{C}$	-	-	10	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 10$	$\mu\text{A}$

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	2.5	-	3.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 2.3\text{ A}$	-	0.82	0.90	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{ V}, I_D = 2.3\text{ A}$	-	4.6	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	534	710	pF
$C_{oss}$	Output Capacitance		-	399	530	pF
$C_{rss}$	Reverse Transfer Capacitance		-	19.7	30	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	11.1	-	pF
$C_{oss(eff.)}$	Effective Output Capacitance	$V_{DS} = 0\text{ V to } 480\text{ V}, V_{GS} = 0\text{ V}$	-	48.6	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380\text{ V}, I_D = 2.3\text{ A}, V_{GS} = 10\text{ V}$	-	13.1	17	nC
$Q_{gs}$	Gate to Source Gate Charge		-	2.2	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	-	4.5	-
ESR	Equivalent Series Resistance	$f = 1\text{ MHz}$	-	2.4	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{ V}, I_D = 2.3\text{ A}, V_{GS} = 10\text{ V}, R_G = 4.7\ \Omega$	-	10.9	32	ns
$t_r$	Turn-On Rise Time		-	5.3	21	ns
$t_{d(off)}$	Turn-Off Delay Time		-	33.6	77	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	11.9	34

### Drain-Source Diode Characteristics

$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	4.5	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	13.5	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 2.3\text{ A}$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_{SD} = 2.3\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$	-	156	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1.3	-	$\mu\text{C}$

#### Notes:

- Repetitive rating: pulse-width limited by maximum junction temperature.
- $I_{AS} = 1.0\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
- $I_{SD} \leq 2.3\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
- Essentially independent of operating temperature.

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

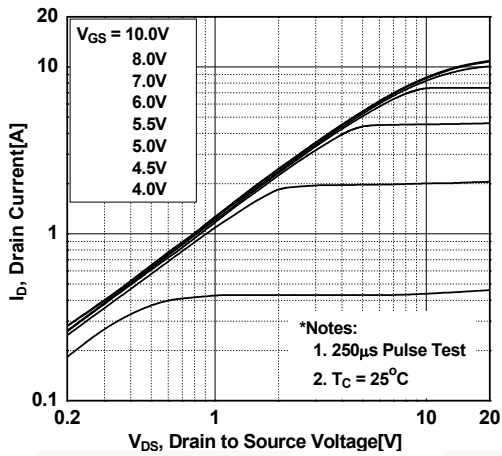


Figure 2. Transfer Characteristics

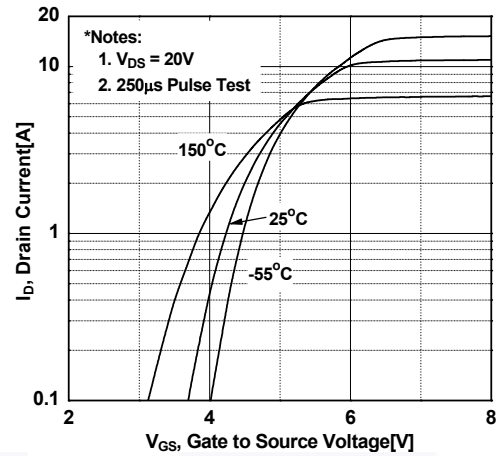


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

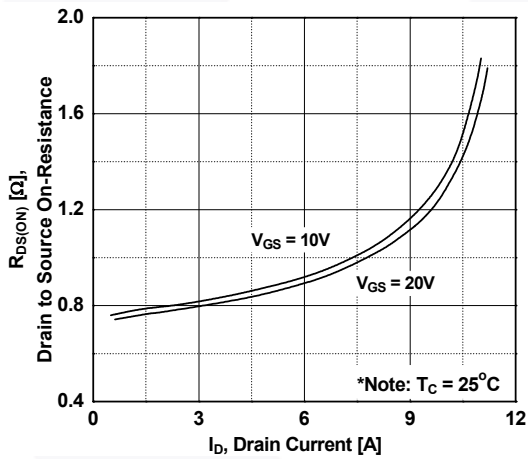


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

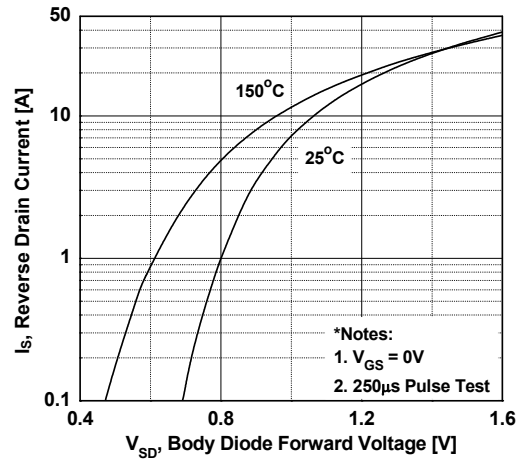


Figure 5. Capacitance Characteristics

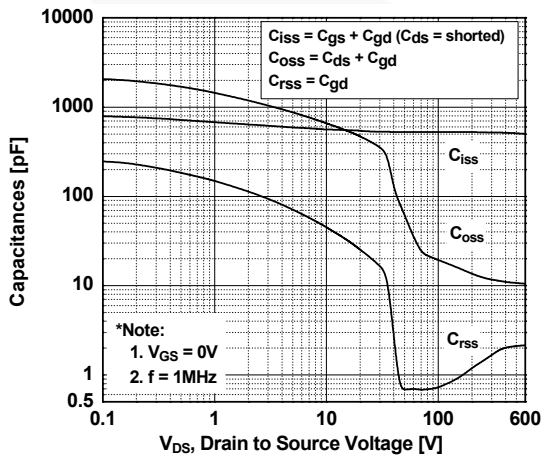
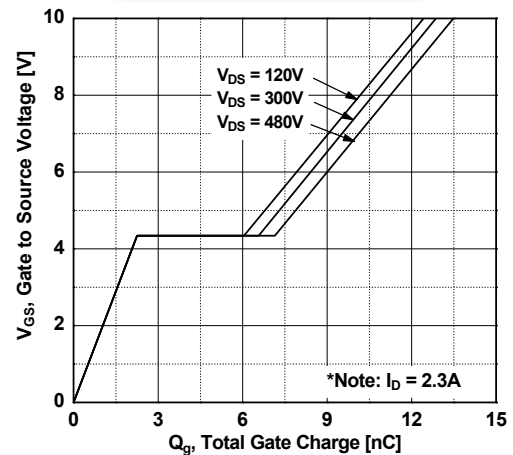


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

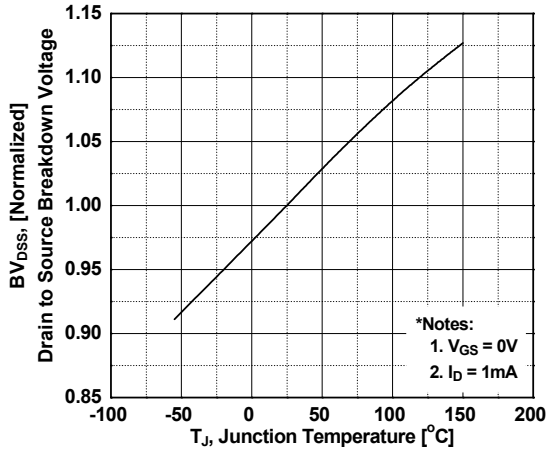


Figure 8. On-Resistance Variation vs. Temperature

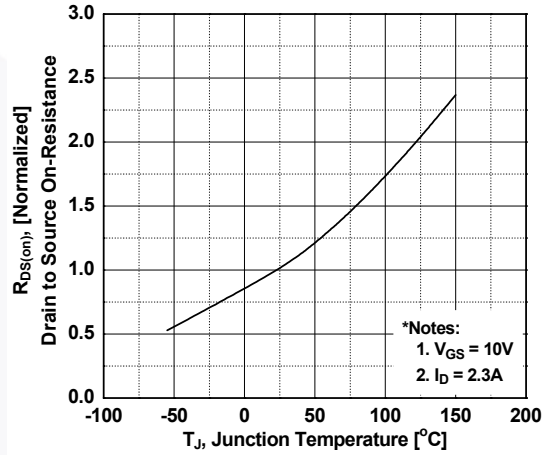


Figure 9. Maximum Safe Operating Area

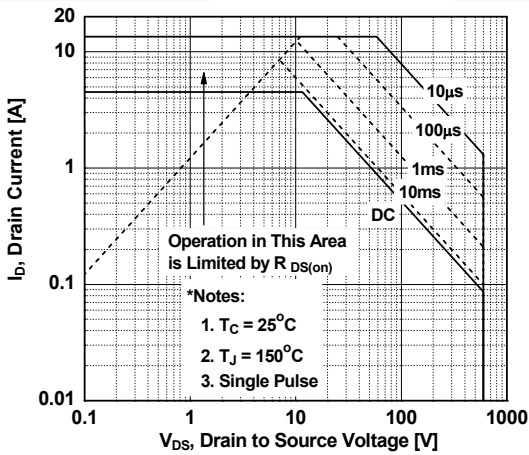


Figure 10. Maximum Drain Current vs. Case Temperature

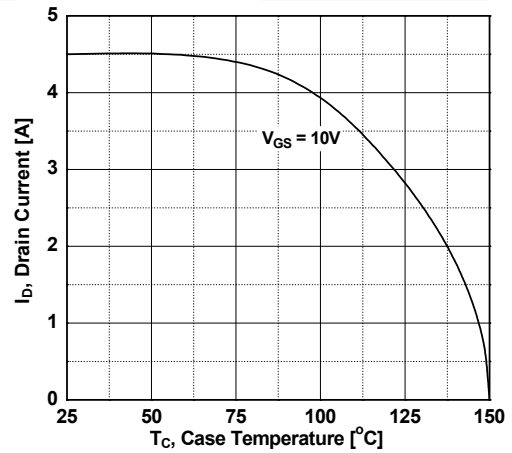
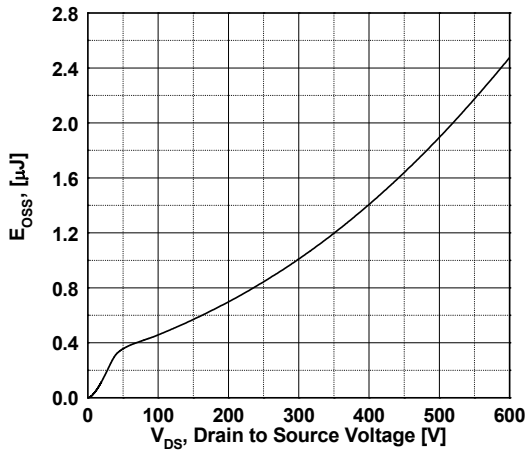


Figure 11. E\_oss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve

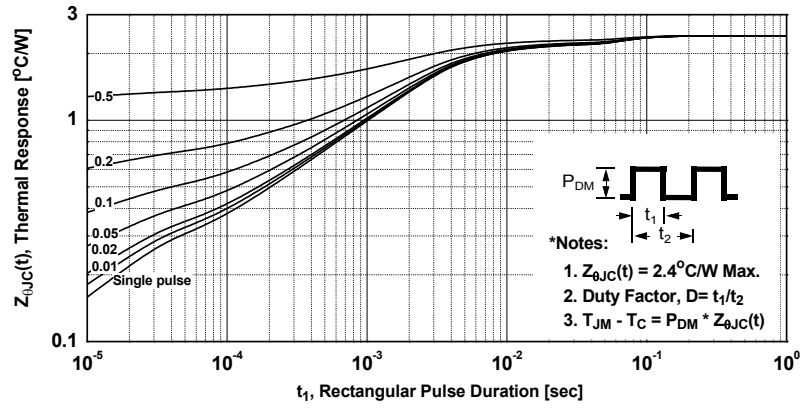




Figure 13. Gate Charge Test Circuit & Waveform



Figure 14. Resistive Switching Test Circuit & Waveforms



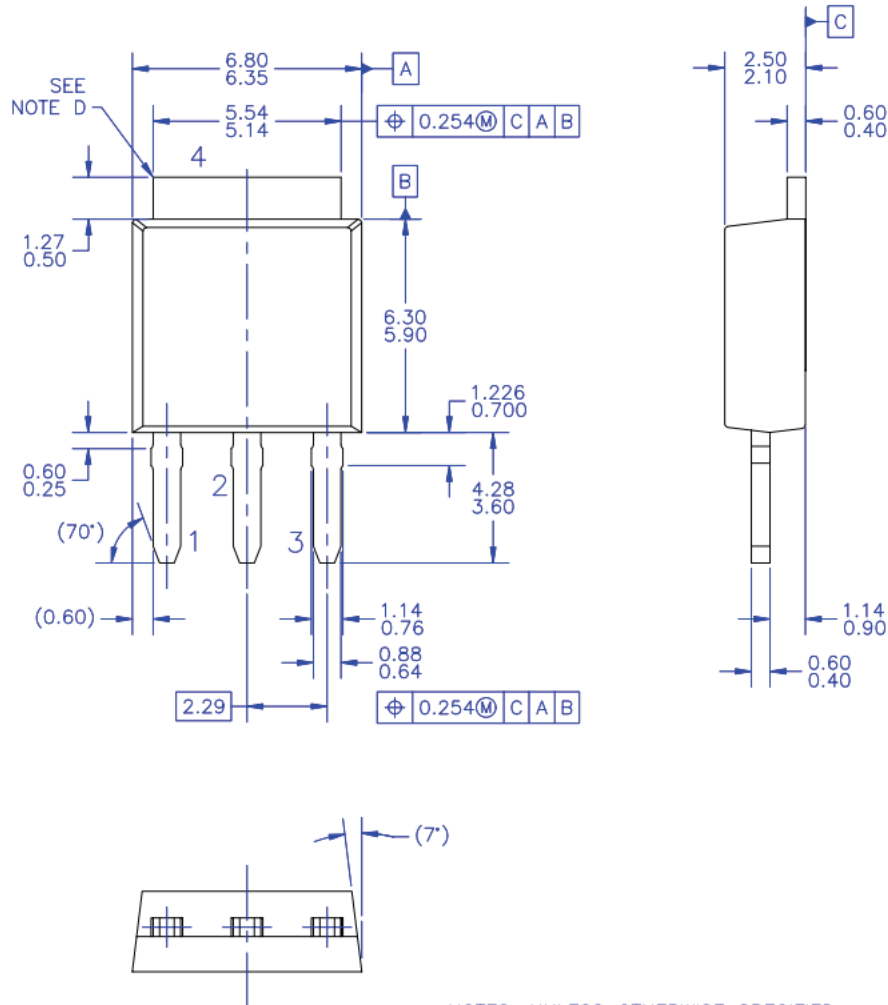
Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 16. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms



**Mechanical Dimensions**



NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) PACKAGE BODY REFERENCE: JEDEC, TO-251, ISSUE D, VARIATION AA, DATED JUNE 2002.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
- E) DRAWING FILE NAME: TO251B03\_3

**Figure 17. TO251 (I-PAK), Molded, 3-Lead (Short Leads), FO71**

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