

FQPF22P10

P-Channel QFET® MOSFET

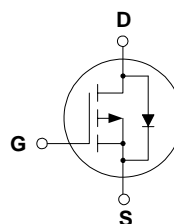
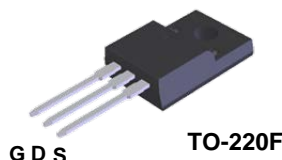
-100 V, -13.2 A, 125 mΩ

Description

This P-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

Features

- -13.2 A, -100 V, $R_{DS(on)}$ =125 mΩ(Max.) @ $V_{GS}=-10$ V, $I_D=-6.6$ A
- Low Gate Charge (Typ. 40 nC)
- Low C_{rss} (Typ. 160 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FQPF22P10	Unit
V_{DSS}	Drain-Source Voltage	-100	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	-13.2	A
	- Continuous ($T_C = 100^\circ\text{C}$)	-9.3	A
I_{DM}	Drain Current - Pulsed (Note 1)	-52.8	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	710	mJ
I_{AR}	Avalanche Current (Note 1)	-13.2	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	4.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	-6.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	45	W
	- Derate above 25°C	0.3	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	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	3.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-100	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to 25°C	--	-0.1	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$	--	--	-1	μA
		$V_{DS} = -80\text{ V}, T_C = 125^\circ\text{C}$	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-2.0	--	-4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -6.6\text{ A}$	--	0.096	0.125	Ω
g_{FS}	Forward Transconductance	$V_{DS} = -40\text{ V}, I_D = -6.6\text{ A}$ (Note 4)	--	11	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	1170	1500	pF
C_{oss}	Output Capacitance		--	460	600	pF
C_{rss}	Reverse Transfer Capacitance		--	160	200	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -50\text{ V}, I_D = -22\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 4, 5)	--	17	45	ns
t_r	Turn-On Rise Time		--	170	350	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns
t_f	Turn-Off Fall Time		--	110	230	ns
Q_g	Total Gate Charge	$V_{DS} = -80\text{ V}, I_D = -22\text{ A},$ $V_{GS} = -10\text{ V}$ (Note 4, 5)	--	40	50	nC
Q_{gs}	Gate-Source Charge		--	7.0	--	nC
Q_{gd}	Gate-Drain Charge		--	21	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	-13.2	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	-52.8	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = -13.2 A	--	--	-4.0	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = -22 A, dI _F / dt = 100 A/μs (Note 4)	--	110	--	ns
Q _{rr}	Reverse Recovery Charge		--	0.6	--	μC

Notes:

1. Repetitive Rating ; Pulse width limited by maximum junction temperature
2. $L = 6.1\text{ mH}, I_{AS} = -13.2\text{ A}, V_{DD} = -25\text{ V}, R_G = 25\text{ }\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq -22\text{ A}, dI/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

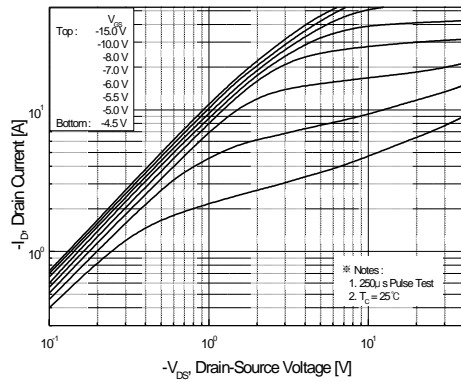


Figure 1. On-Region Characteristics

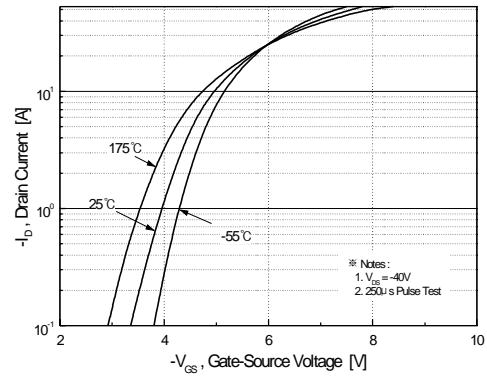


Figure 2. Transfer Characteristics

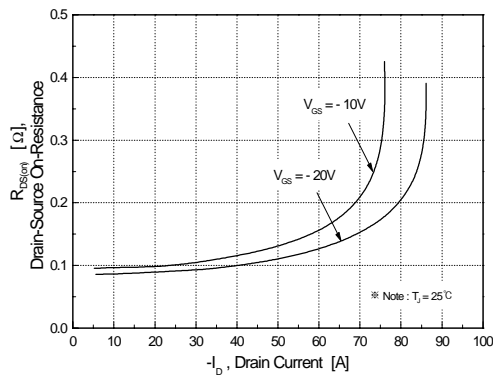


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

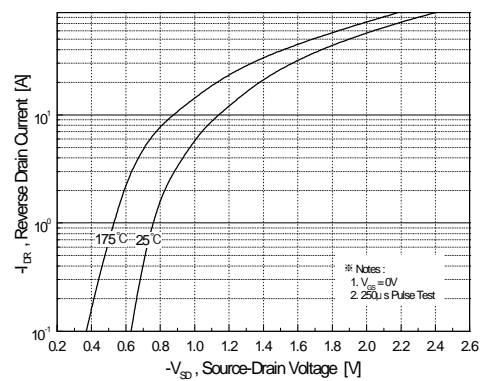


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

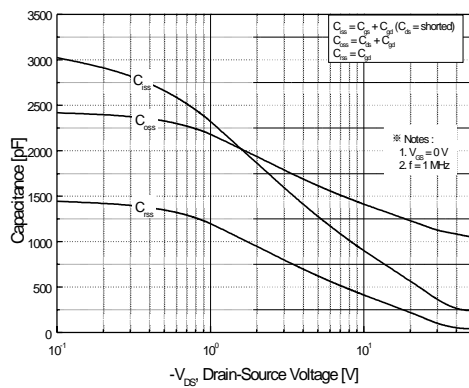


Figure 5. Capacitance Characteristics

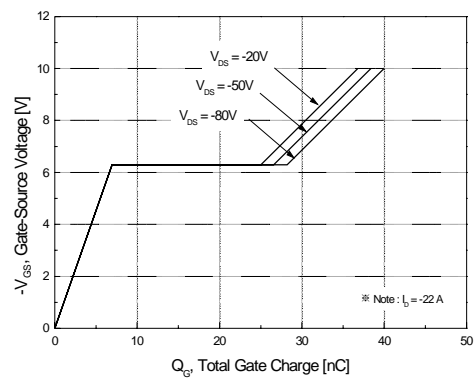


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

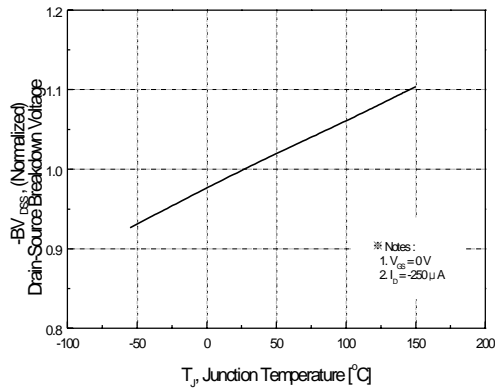


Figure 7. Breakdown Voltage Variation vs. Temperature

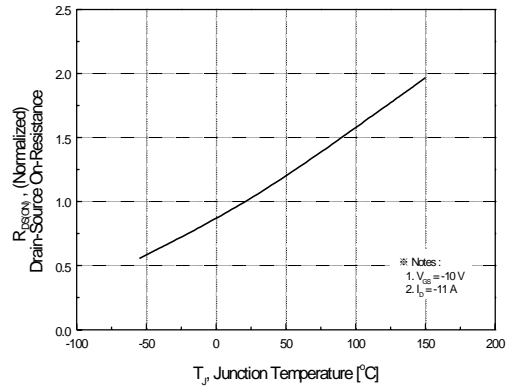


Figure 8. On-Resistance Variation vs. Temperature

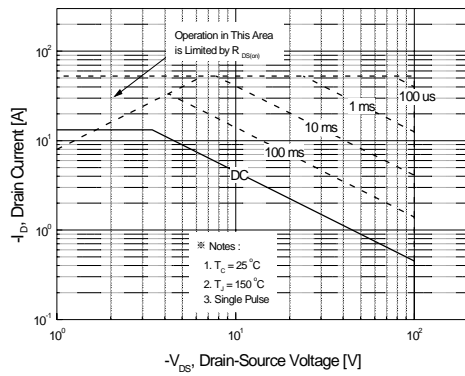


Figure 9. Maximum Safe Operating Area

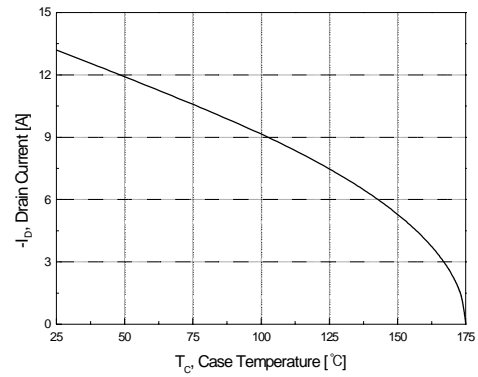


Figure 10. Maximum Drain Current vs. Case Temperature

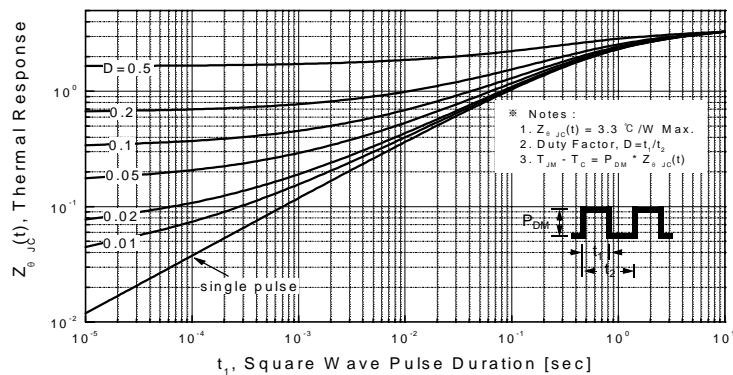
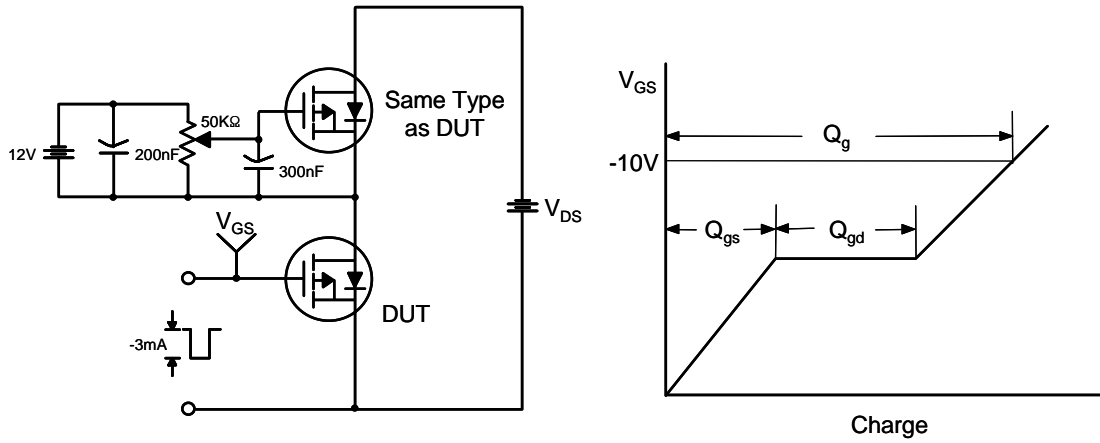
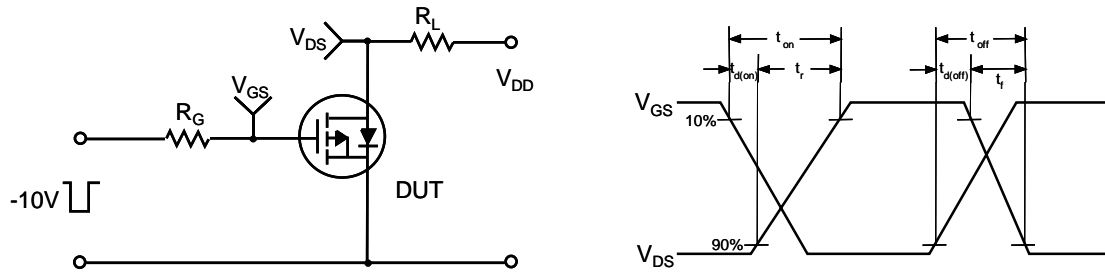


Figure 11. Transient Thermal Response Curve

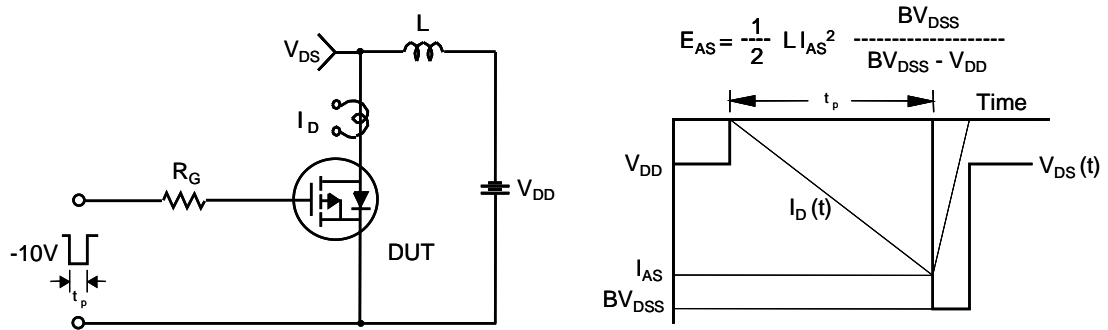
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

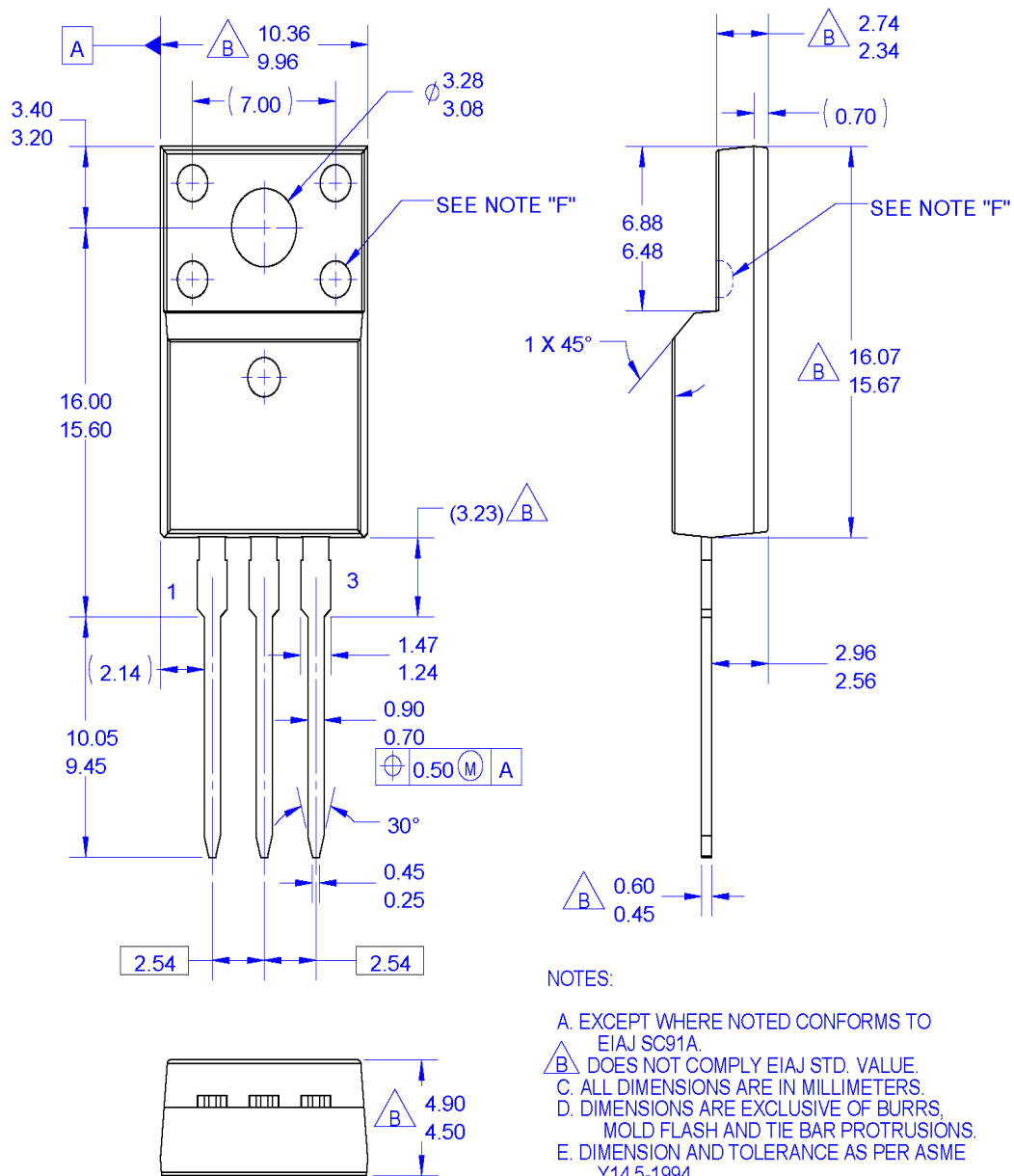


Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions

TO-220F



NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
 B. DOES NOT COMPLY EIAJ STD. VALUE.
 C. ALL DIMENSIONS ARE IN MILLIMETERS.
 D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
 E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
 F. OPTION 1 - WITH SUPPORT PIN HOLE.
 G. OPTION 2 - NO SUPPORT PIN HOLE.
 G. DRAWING FILE NAME: TO220M03REV3

Dimensions in Millimeters



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

2Cool™	FPS™	Sync-Lock™
AccuPower™	F-PFS™	SYSTEM GENERAL®*
AX-CAP®*	FRFET®	TinyBoost™
BitSiC™	Global Power ResourceSM	TinyBuck™
Build it Now™	Green Bridge™	TinyCalc™
CorePLUS™	Green FPS™	TinyLogic®
CorePOWER™	Green FPS™ e-Series™	TinyOPTO™
CROSSVOLT™	Gmax™	TinyPower™
CTL™	GTO™	TinyPWM™
Current Transfer Logic™	IntelliMAX™	TinyWire™
DEUXPEED®	ISOPLANAR™	TranSiC®
Dual Cool™	Marking Small Speakers Sound Louder and Better™	TriFault Detect™
EcoSPARK®	MegaBuck™	SmartMax™
EfficientMax™	MICROCOUPLER™	SMART START™
ESBC™	MicroFET™	Solutions for Your Success™
Fairchild®	MicroPak™	SPM®
Fairchild Semiconductor®	MicroPak2™	STEALTH™
FACT Quiet Series™	MillerDrive™	SuperFET®
FACT®	MotionMax™	SuperSOT™-3
FAST®	mWSaver™	SuperSOT™-6
FastvCore™	OptoHiT™	SuperSOT™-8
FETBench™	OPTOLOGIC®	SupreMOS®
	OPTOPLANAR®	SyncFET™
		ng our world, 1mW/W/kW at a time™
		SignalWise™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®
		SyncFET™
		Sync-Lock™
		SYSTEM GENERAL®*
		TinyBoost™
		TinyBuck™
		TinyCalc™
		TinyLogic®
		TinyOPTO™
		TinyPower™
		TinyPWM™
		TinyWire™
		TranSiC®
		TriFault Detect™
		SmartMax™
		SMART START™
		Solutions for Your Success™
		SPM®
		STEALTH™
		SuperFET®
		SuperSOT™-3
		SuperSOT™-6
		SuperSOT™-8
		SupreMOS®