ON Semiconductor

Is Now

To learn more about onsemi™, please visit our website at www.onsemi.com

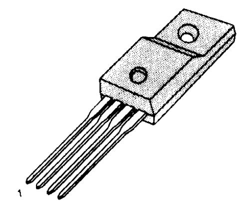
Preliminary

KA5L0380R

S P S

The SPS product family is specially designed for an off-line SMPS with minimal external components. The SPS consist of high voltage power SenseFET and current mode PWM IC.
Included PWM controller features integrated fixed frequency oscillator, under voltage lock-out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shutdown protection, over voltage protection, and temperature compensated precision current sources for loop compensation and fault protection circuitry. Compared to discrete MOSFET and PWM controller or RCC solution, a SPS can reduce total component count, design size, weight and at the same time increase efficiency, productivity, and system reliability.
It has a basic platform well suited for cost-effective design in either a flyback converter or a forward converter.

TO-220F-4L



1. GND 2. Drain 3. Vcc 4. FB

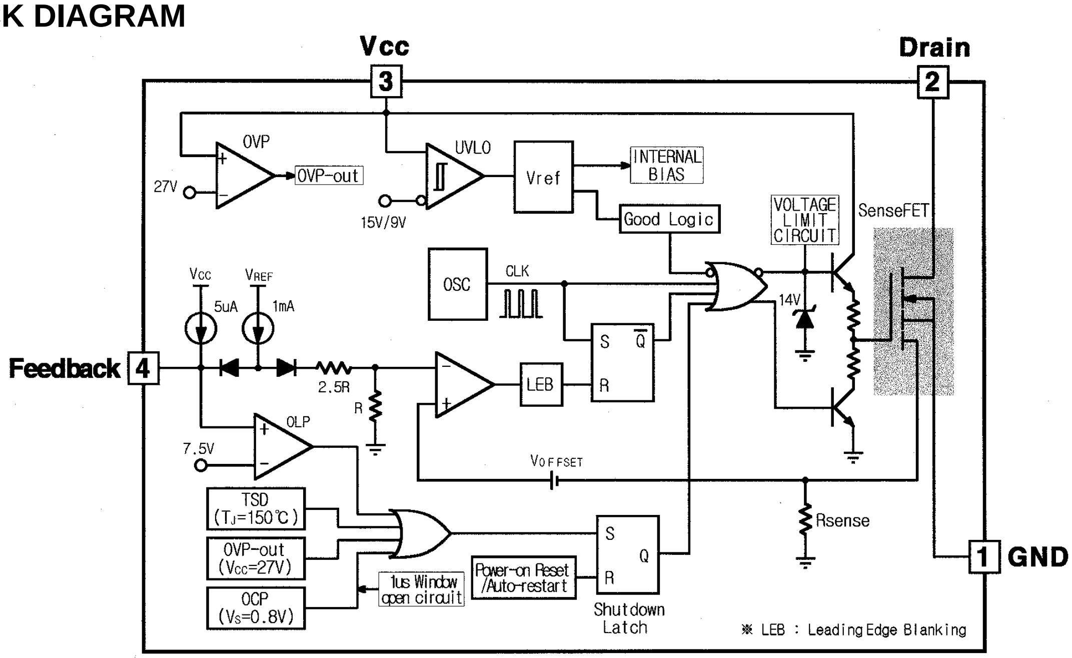
FEATURES

- Precision fixed operating frequency (50kHz)
- Low start-up current (Typ. 100mA)
- Pulse by pulse current limiting
- Over current protection
- Over voltage protection (Min. 25V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- Auto-restart mode

ORDERING INFORMATION

Device	Package	Topr (°C)
KA5L0380R	TO-220F-4L	–25°C to +85°C

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Drain-source (GND) voltage (1)	V_{DSS}	800	V
Drain-Gate voltage (R_{GS}=1MΩ)	V_{DGR}	800	V
Gate-source (GND) voltage	V_{GS}	±30	V
Drain current pulsed (2)	I_{DM}	12	A_{DC}
Single pulsed avalanche energy (3)	E_{AS}	95	mJ
Avalanche current (4)	I_{AS}	–	A
Continuous drain current (T_C=25°C)	I_D	3.0	A_{DC}
Continuous drain current (T_C=100°C)	I_D	2.1	A_{DC}
Supply voltage	V_{CC}	30	V
Analog input voltage range	V_{FB}	–0.3 to V_{SD}	V
Total power dissipation	P_D (wt H/S)	35	W
	Derating	0.28	W/°C
Operating temperature	T_{OPR}	–25 to +85	°C
Storage temperature	T_{STG}	–55 to +150	°C

NOTES:
1. Tj=25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L=51mH, starting Tj=25°C
4. L=13uH, starting Tj=25°C

ELECTRICAL CHARACTERISTICS (SFET part)

(Ta=25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V, I_D=50μA	800	–	–	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=Max., Rating, V_{GS}=0V	–	–	250	μA
		V_{DS}=0.8Max., Rating, V_{GS}=0V, T_C=125°C	–	–	1000	μA
Static drain-source on resistance (note)	$R_{DS(ON)}$	V_{GS}=10V, I_D=0.5A	–	4	5	Ω
Forward transconductance (note)	gfs	V_{DS}=50V, I_D=0.5A	1.5	2.5	–	S
Input capacitance	Ciss	V_{GS}=0V, V_{DS}=25V, f=1MHz	–	779	–	pF
Output capacitance	Coss		–	75.6	–	
Reverse transfer capacitance	Crss		–	24.9	–	
Turn on delay time	td(on)	V_{DD}=0.5BV_{DSS}, I_D=1.0A (MOSFET switching time are essentially independent of operating temperature)	–	40	–	nS
Rise time	tr		–	95	–	
Turn off delay time	td(off)		–	150	–	
Fall time	tf		–	60	–	
Total gate charge (gate-source+gate-drain)	Qg	V_{GS}=10V, I_D=1.0A, V_{DS}=0.5BV_{DSS} (MOSFET switching time are essentially independent of operating temperature)	–	–	34	nC
Gate-source charge	Qgs		–	7.2	–	
Gate-drain (Miller) charge	Qgd		–	12.1	–	

NOTE: Pulse test: Pulse width ≤ 300μS, duty cycle ≤ 2%

ELECTRICAL CHARACTERISTICS (Control part)

(Ta=25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
REFERENCE SECTION						
Output voltage [1]	Vref	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability [1][2]	Vref/ΔT	–25°C≤Ta≤+85°C	–	0.3	0.6	mV/°C
OSCILLATOR SECTION						
Initial accuracy	F_{OSC}	Ta=25°C	45	50	55	kHz
Frequency change with temperature [2]	ΔF/ΔT	–25°C≤Ta≤+85°C	–	±5	±10	%
PWM SECTION						
Maximum duty cycle	Dmax	–	74	77	80	%
FEEDBACK SECTION						
Feedback source current	I_{FB}	Ta=25°C, 0V≤Vfb≤3V	0.7	0.9	1.1	mA
Shutdown delay current	Idelay	Ta=25°C, 5V≤Vfb≤V_{SD}	4	5	6	μA
OVER CURRENT PROTECTION SECTION						
Over current protection	I_L(max)	Max. inductor current	1.89	2.15	2.41	A
UVLO SECTION						
Start threshold voltage	Vth(H)	–	8.4	9	9.6	V
Minimum operating voltage	Vth(L)	After turn on	14	15	16	V
TOTAL STANDBY CURRENT SECTION						
Start current	I_{ST}	V_{CC}=14V	–	0.1	0.17	mA
Operating supply current (control part only)	I_{OPR}	V_{CC}≤28	–	7	12	mA
SHUTDOWN SECTION						
Shutdown Feedback voltage	V_{SD}	Vfb≥6.5V	6.9	7.5	8.1	V
Thermal shutdown temperature (Tj) [1]	T_{SD}	–	140	160	–	°C
Over voltage protection	V_{OVP}	V_{CC}≥24V	25	27	29	V

NOTES:
1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS (wafer test) process

TYPICAL PERFORMANCE CHARACTERISTICS (SFET part)

Fig 1. Output Characteristics

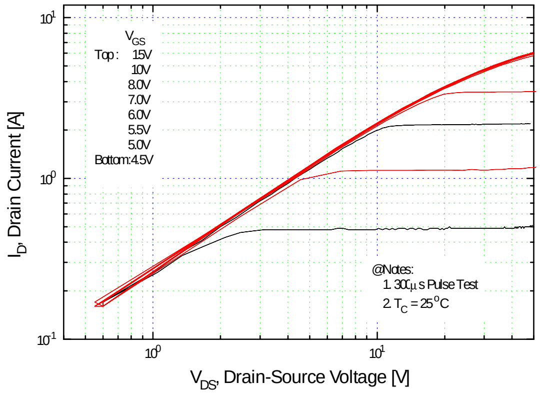


Fig. 2 Transfer Characteristics

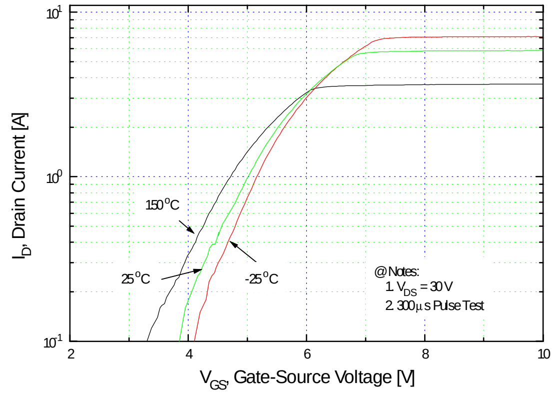


Fig. 3 On-Resistance vs. Drain Current

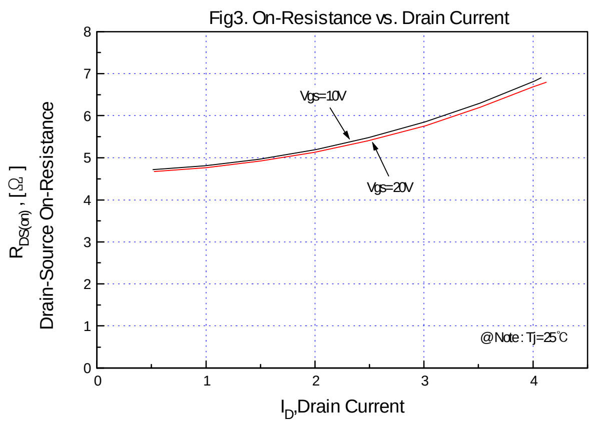


Fig. 4 Source-Drain Diode Forward Voltage

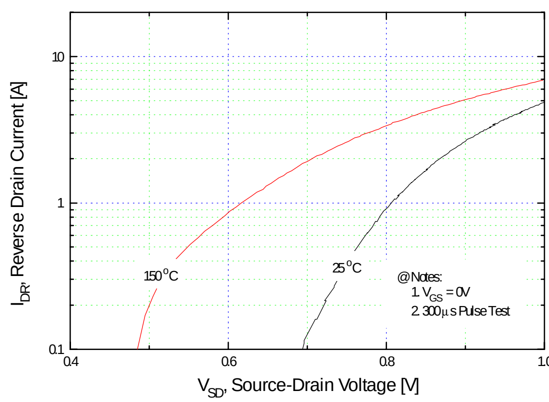


Fig.5 Capacitance vs. Drain-Source Voltage

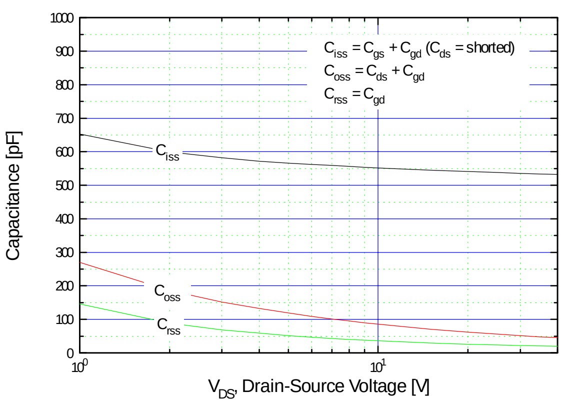
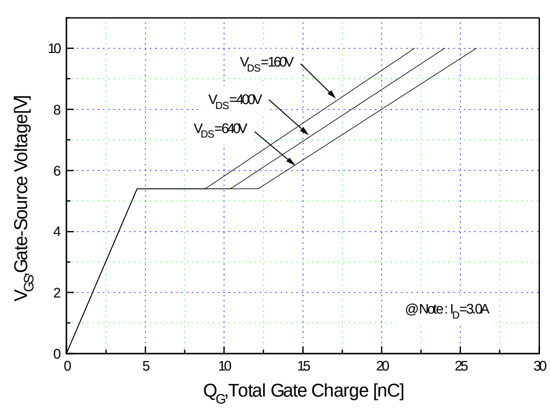


Fig. 6 Gate Charge vs. Gate-Source Voltage



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

Fig. 7 Breakdown Voltage vs. Temperature

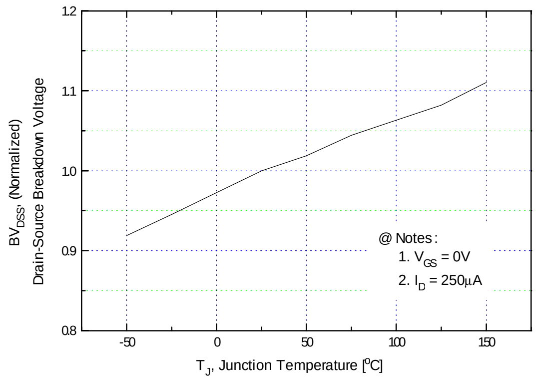


Fig. 8 On-Resistance vs. Temperature

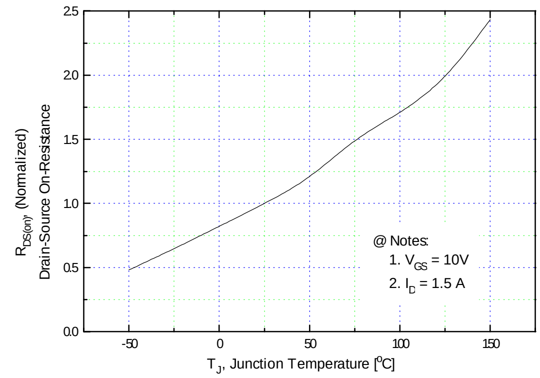


Fig. 9 Max. Safe Operating Area

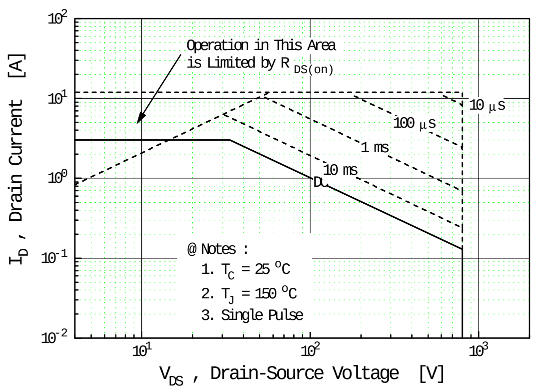


Fig. 10 Max. Drain Current vs. Case Temperature

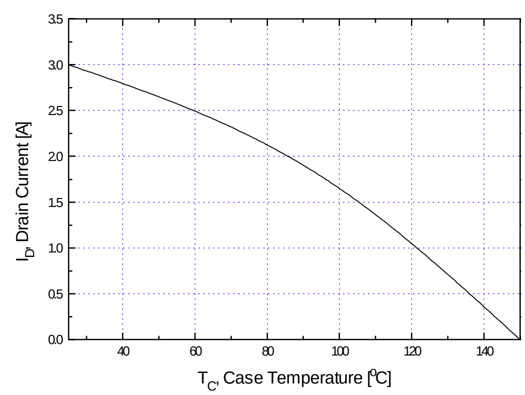
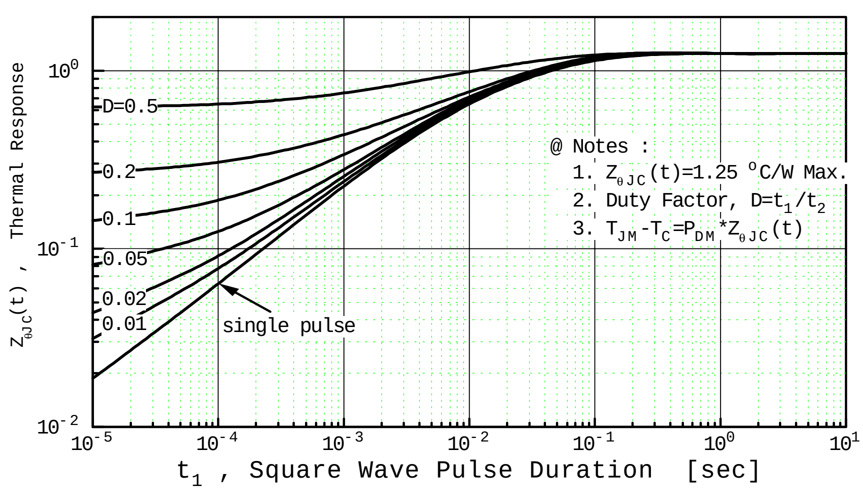
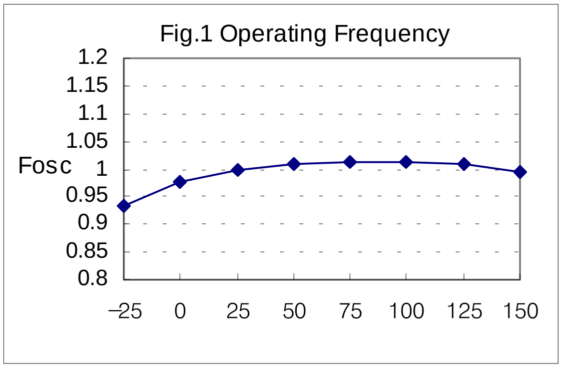
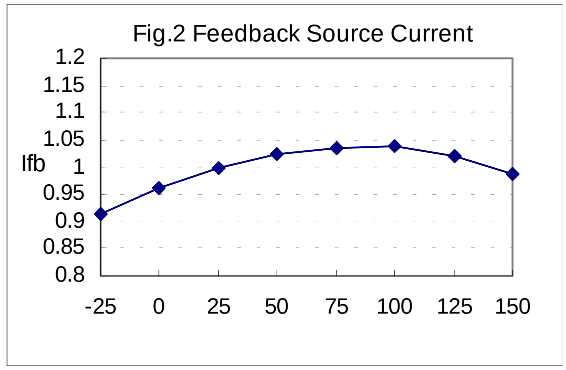


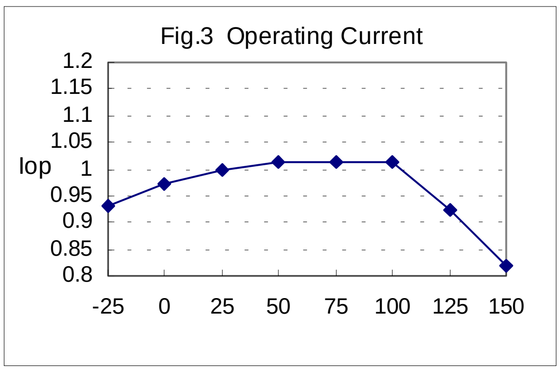
Fig. 11 Thermal Response

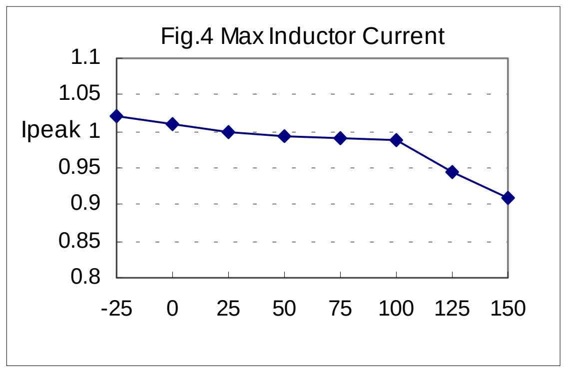


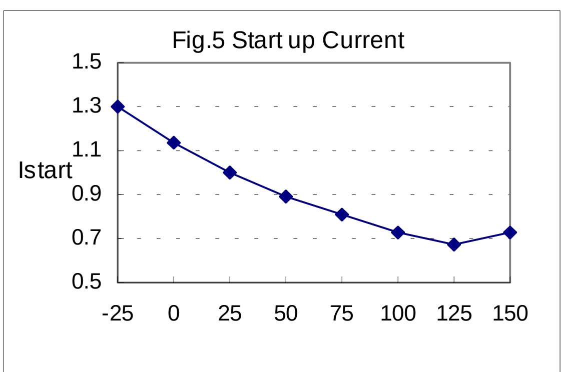
TYPICAL PERFORMANCE CHARACTERISTICS (Control part)

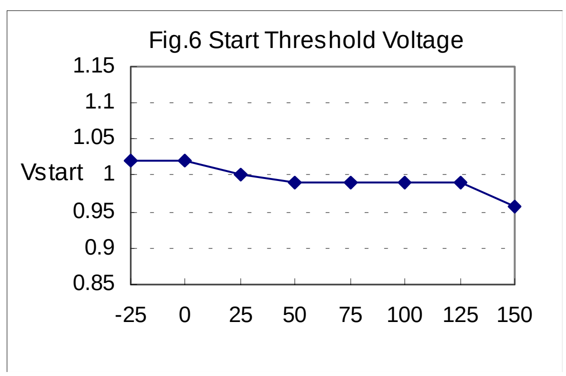






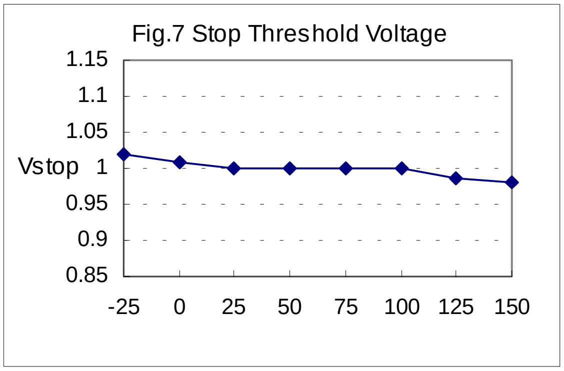


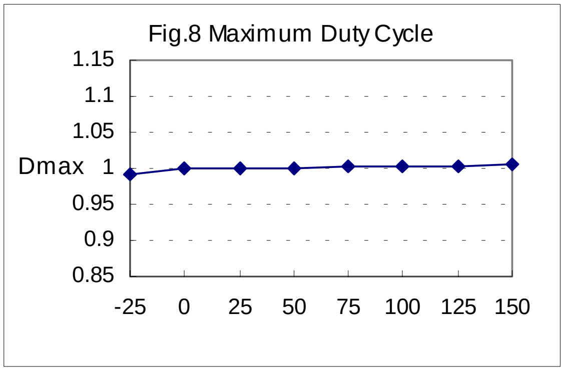


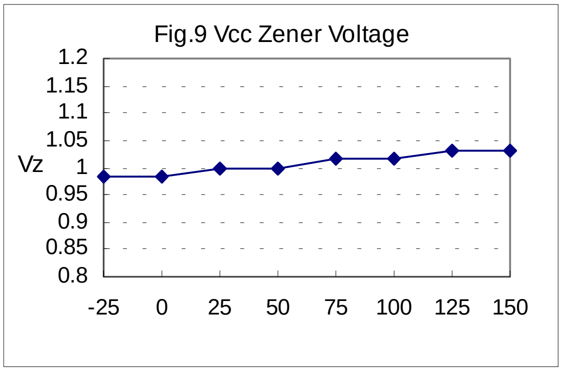


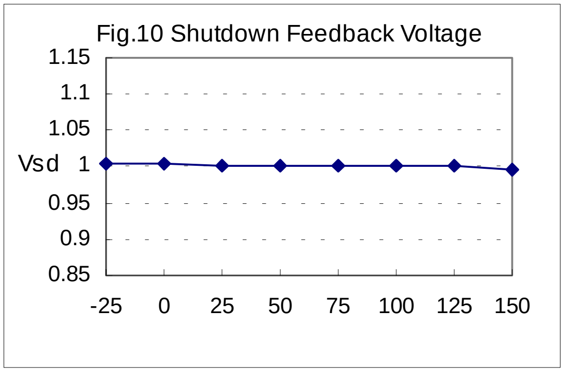
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

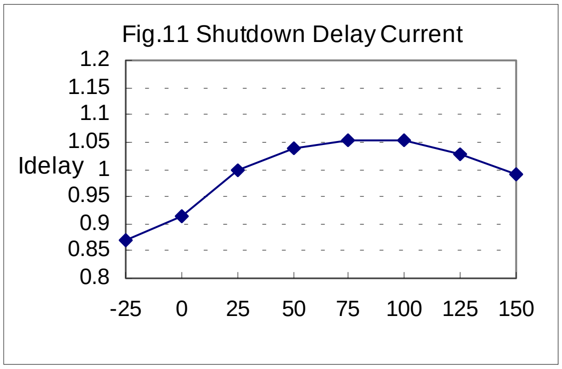
(These characteristic graphs are normalized at Ta=25°C)

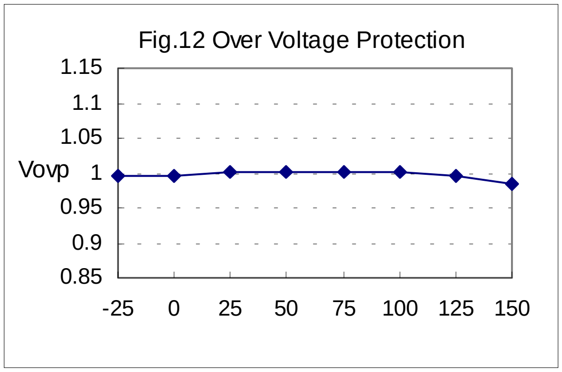






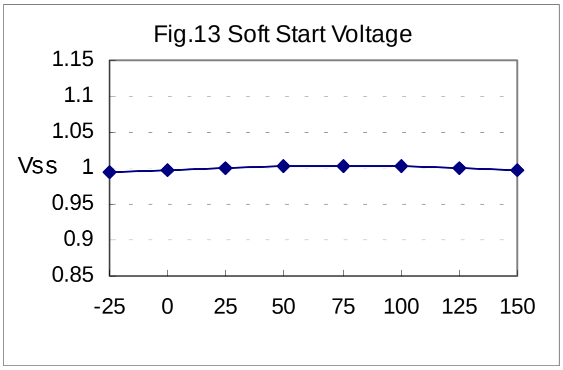


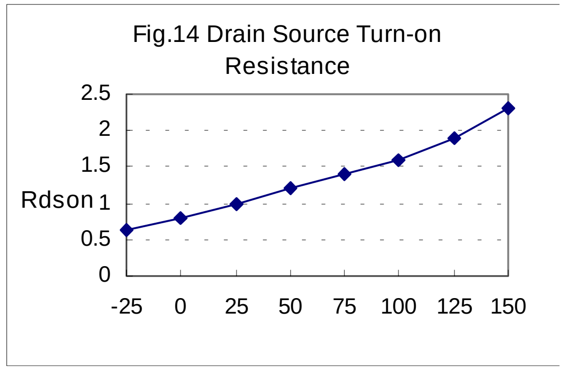




TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

(These characteristic graphs are normalized at Ta=25°C)





PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative