DEC 2009

SemiHow
Know-How for Semiconductor

SPGP0365A/SPGN0365A

VER : Preliminary

(SEMIHOW POWER SWITCH)

FEATURES

- ❑ Variable frequency operation
- ❑ Low Start-up Current(Typ.100uA)
- ❑ Pulse by Pulse Current Limiting
- ❑ Over Current Protection
- ❑ Over Voltage Protection (Min. 20)
- ❑ Internal Thermal Shutdown Function
- ❑ Under Voltage Lockout
- ❑ Internal High Voltage Sense FET
- ❑ Auto-Restart Mode
- ❑ Frequency Modulation for low EMI
- ❑ Advanced Burst-Mode Operation

APPLICATION

- ❑ SMPS for STB, SVR, DVD & DVCD
- ❑ SMPS for Printer, Facsimile & Scanner
- ❑ Adaptor

SPGP0365A	SPGN0365A
TO-220F-4L	8-DIP
	
1. GND 2. Drain 3. V_{CC} 4. FB	1.6.7.8 Drain 2. GND 3. V_{CC} 4. FB 5. NC

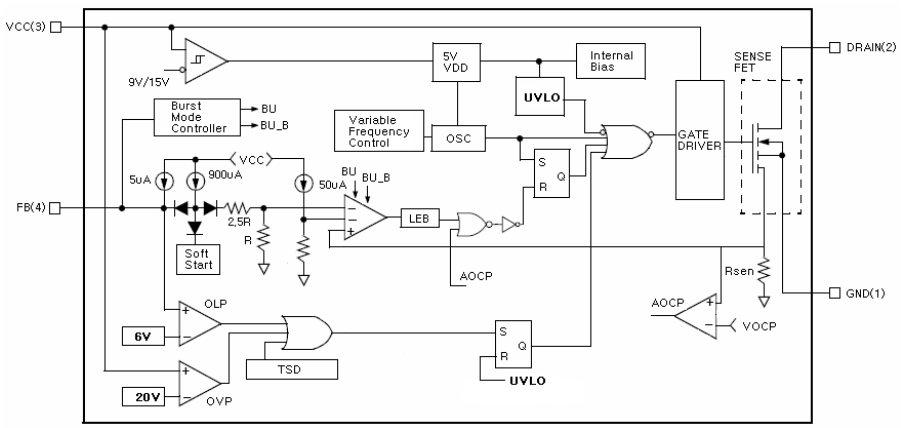
DESCRIPTION

The SemiHow Power Switch product family is specially designed for an off-line SMPS with minimal external components.

The SemiHow Power Switch consists of a high voltage power SenseFET and a current mode PWM IC.

It has a basic platform well suited for the cost effective design in either a flyback converter

INTERNAL BLOCK DIAGRAM



Absolute Maximum Ratings T_C=25℃ unless otherwise specified

SPGP0365A

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current – Continuous (T_C = 25℃)	3.0	A
	Drain Current – Continuous (T_C = 100℃)	2.4	A
V_{GD}	Gate - source Voltage	±30	V
I_{DM}	Drain Current – Pulsed (Note 1)	12	A
V_{GS}	Gate-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	358	mJ
$V_{CC(MAX)}$	Maximum Supply voltage	20	V
V_{FB}	Analog Input Voltage Range	-0.3 To V_{SD}	V
P_D	Power Dissipation (T_C = 25℃)	75	W
	- Derate above 25℃	0.6	W/℃
T_J	Operating Junction Temperature	+160	℃
T_A	Operating Ambient Temperature	-25 to +85	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃

SPGN0365A

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current – Continuous (T_C = 25℃)	0.42	A
	Drain Current – Continuous (T_C = 100℃)	0.28	A
V_{GD}	Gate - source Voltage	±30	V
I_{DM}	Drain Current – Pulsed (Note 1)	3	A
V_{GS}	Gate-Source Voltage	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	127	mJ
$V_{CC(MAX)}$	Maximum Supply voltage	20	V
V_{FB}	Analog Input Voltage Range	-0.3 To V_{SD}	V
P_D	Power Dissipation (T_C = 25℃)	1.56	W
	- Derate above 25℃	0.0125	W/℃
T_J	Operating Junction Temperature	+160	℃
T_A	Operating Ambient Temperature	-25 to +85	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃

Electrical Characteristics (SenseFet Part)

T_C=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
On Characteristics						
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 0.5 A	--	3.6	4.5	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 50 μA	650	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	--	--	50	μA
		V_{DS} = 520 V, T_C = 125℃	--	--	200	μA
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	950	1230	pF
C_{oss}	Output Capacitance		--	550	710	pF
C_{rss}	Reverse Transfer Capacitance		--	120	155	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	V_{DS} = 325 V, I_D = 1 A, R_G = 25 Ω (Note 4,5)	--	18	--	ns
T_r	Turn-On Rise Time		--	12	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	80	--	ns
t_f	Turn-Off Fall Time		--	22	--	ns
Q_g	Total Gate Charge	V_{DS} = 325V, I_D = 1 A, V_{GS} = 10 V (Note 4,5)	--	13	17	nC
Q_{gs}	Gate-Source Charge		--	2.0	--	nC
Q_{gd}	Gate-Drain Charge		--	5.5	--	nC

Notes ;

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=14.2mH, I_{AS}=9.5A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C
3. I_{SD}≤9.5A, di/dt≤200A/μs, V_{DD}≤BV_{DSS} , Starting T_J=25 °C
4. Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature

Electrical Characteristics (Control Part)

T_C=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
UVLO Section						
V_{START}	Start Threshold Voltage	V_{FB} = GND	14	15	16	V
V_{STOP}	Stop Threshold Voltage	V_{FB} = GND	8.4	9	9.6	V
Oscillator Section						
FOSC	Initial Accuracy		57	64	71	KHz
--	Frequency Change With Temperature (Note 2)	-25˚C ≤ Ta ≤ +85˚C	--	±5	±10	%
DMAX	Maximum Duty Cycle		73	77	82	%
FEEDBACK Section						
I_{FB}	Feedback Source Current	Ta=25˚C, 0V<Vfb<3V	0.7	0.9	1.1	mA
V_{SD}	Shutdown Feedback Voltage	Vfb>6.5V	5.4	6	6.6	V
Idelay	Shutdown Delay Current	Ta=25˚C, 5VδVfbδVSD	4	5	6	mA
Reference Section						
V_{REF}	Reference Output Voltage (Note 1)	Ta=25˚C	4.8	5	5.2	V
Vref/ΔT	Temperature Stability (Note 1 , 2)	-25˚C ≤ Ta ≤ +85˚C	--	0.3	0.6	mV/˚C
I_{OVER}	Peak Current Limit	Max. inductor current	1.62	2.0	2.38	A
Protection Section						
V_{OVP}	Over Voltage Protection	VCC > 20V	20	--	23	V
T_{SD}	Thermal Shutdown Temperature (Tj) (Note 1)	--	140	160	--	˚C
Protection Section						
I_{START}	Start-up Current	VCC = 14V	--	100	170	μA
I_{OP}	Operating Supply Current (Control Part Only)	VCC < 20V	--	3	6	mA

Notes ;

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

Typical Characteristics

(SPGP0365A)

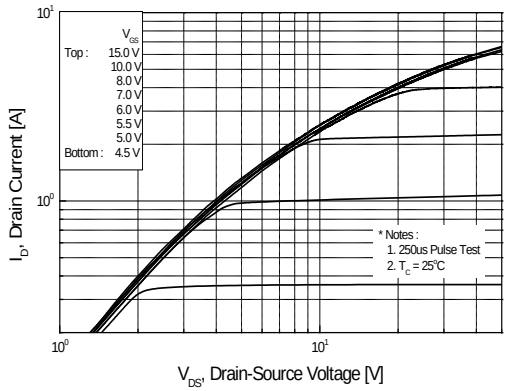


Figure 1. On Region Characteristics

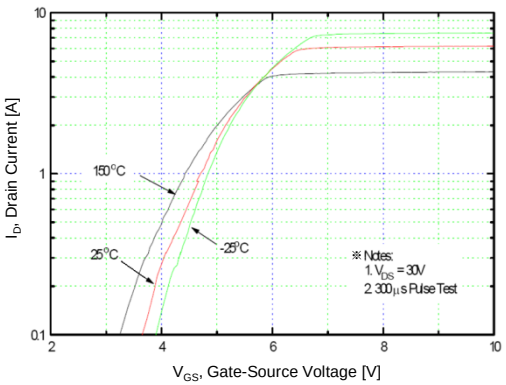


Figure 2. Transfer Characteristics

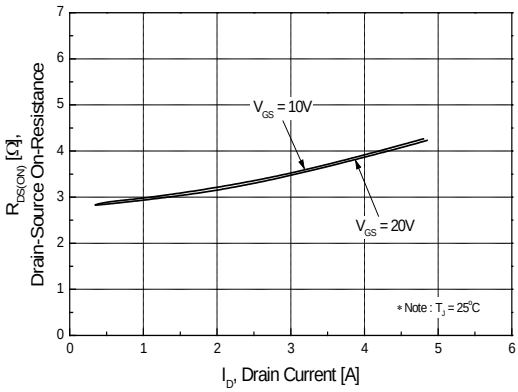


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

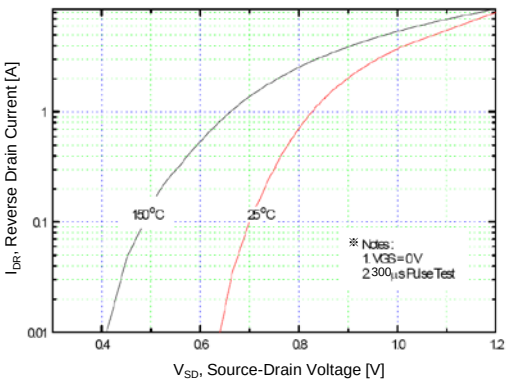


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

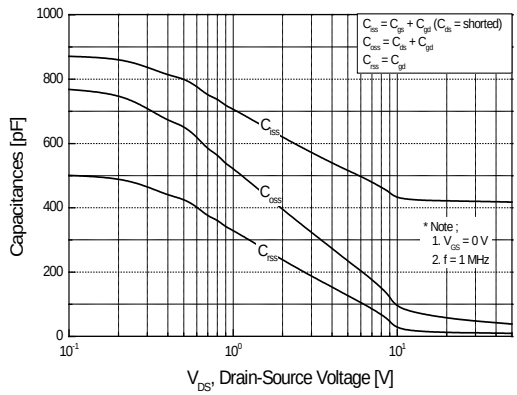


Figure 5. Capacitance Characteristics

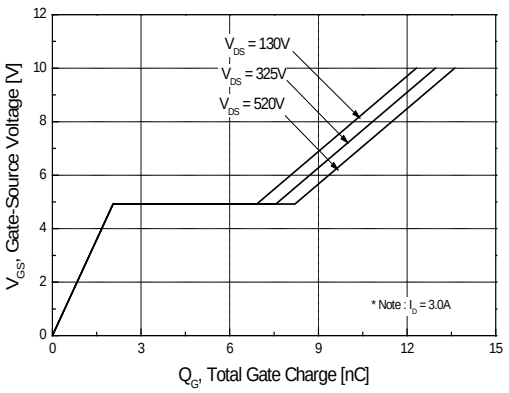


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

(SPGP0365A)

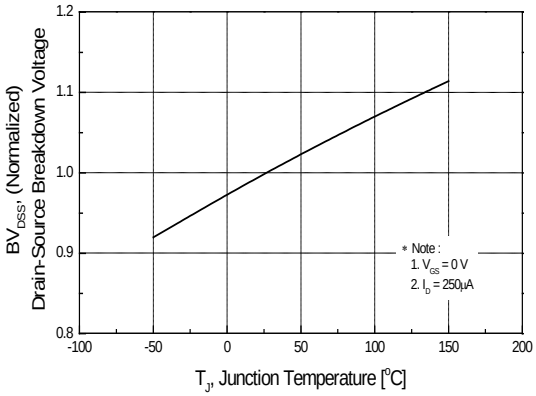


Figure 7. Breakdown Voltage Variation vs Temperature

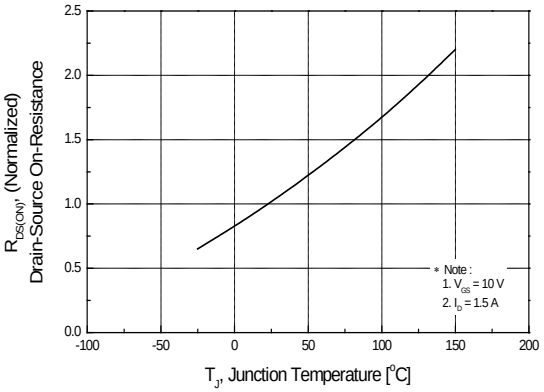


Figure 8. On-Resistance Variation vs Temperature

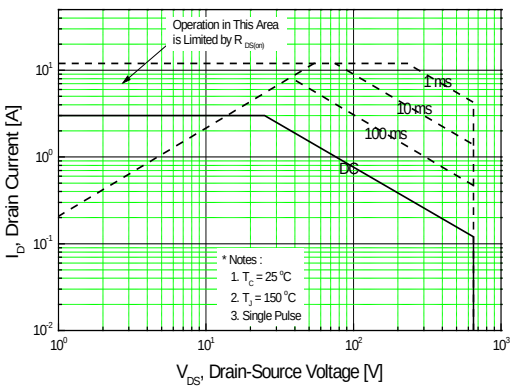


Figure 9. Maximum Safe Operating Area

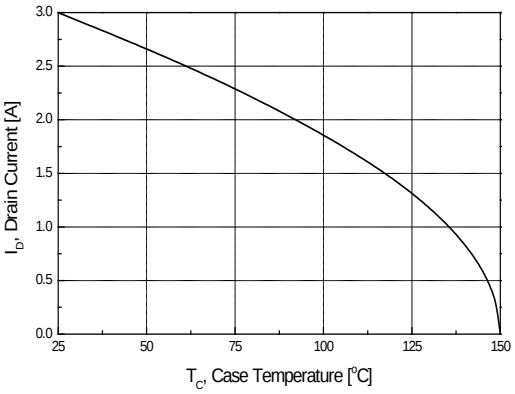


Figure 10. Maximum Drain Current vs Case Temperature

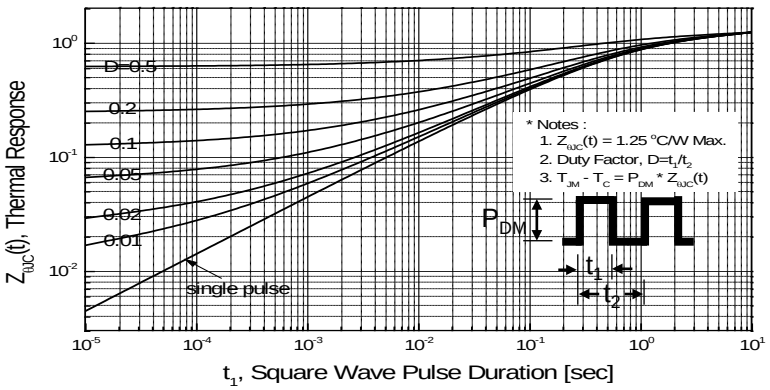
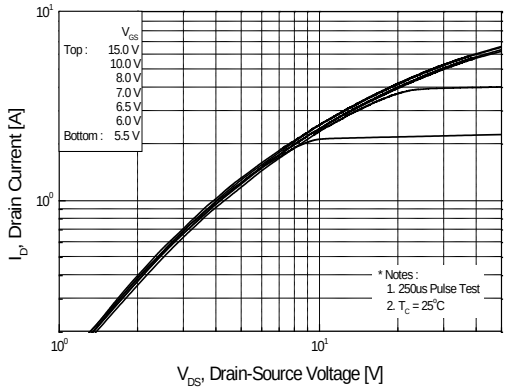


Figure 11. Transient Thermal Response Curve

Typical Characteristics

(SPGN0365A)



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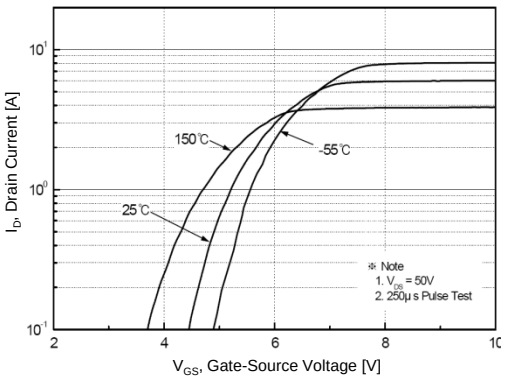
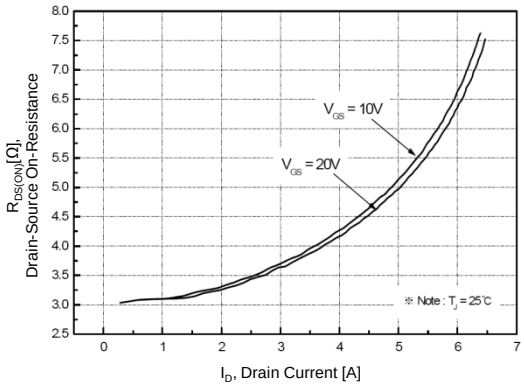


Figure 2. Transfer Characteristics



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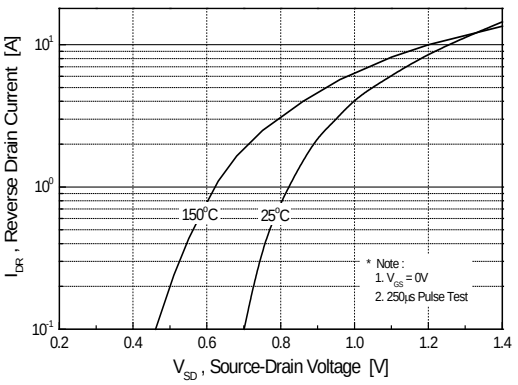

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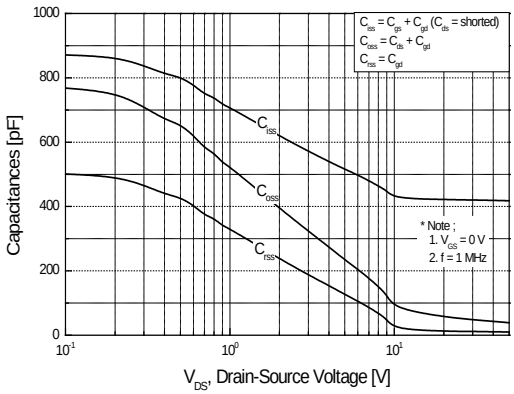

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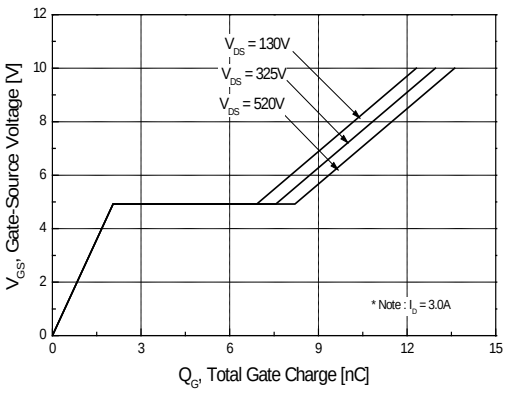


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

(SPGN0365A)

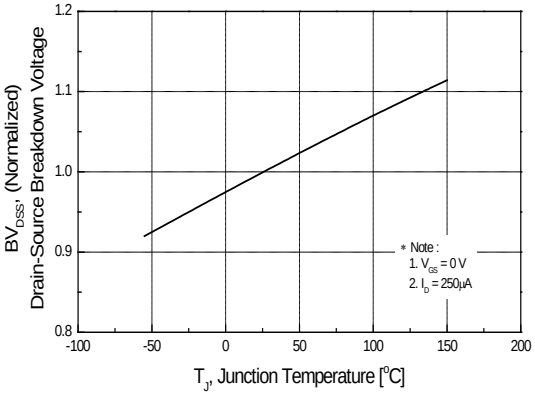
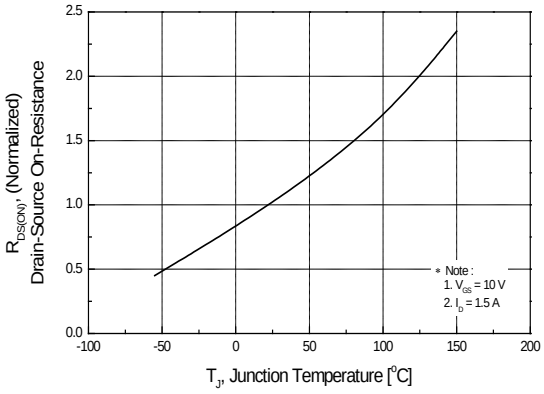


Figure 7. Breakdown Voltage Variation vs Temperature



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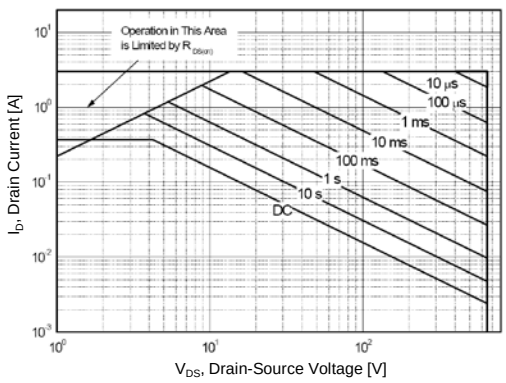

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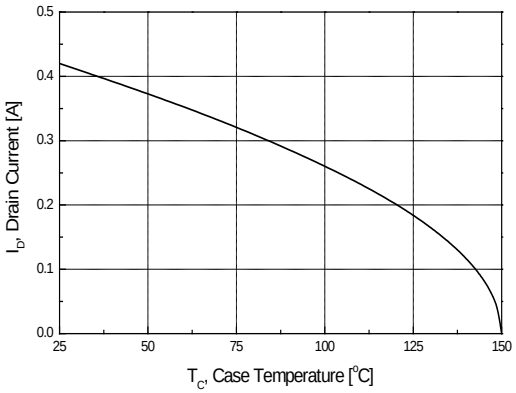

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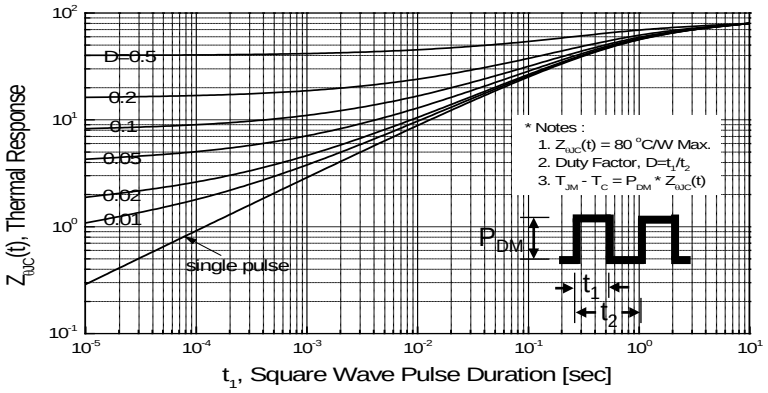

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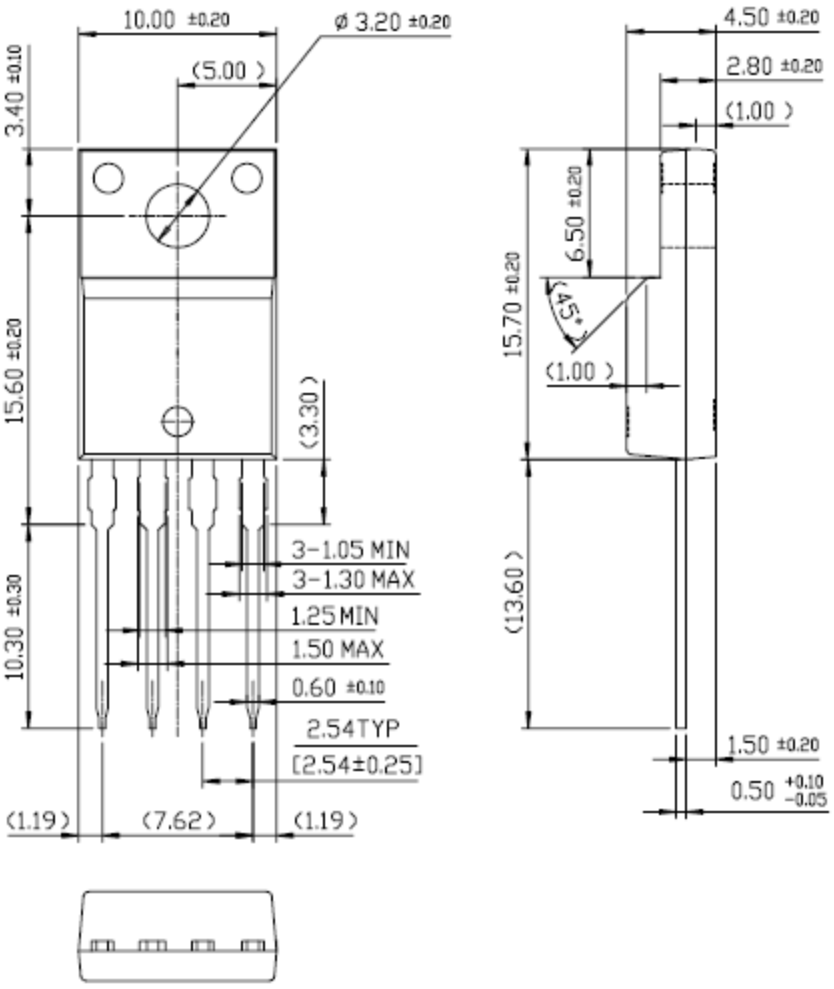
Package Dimension

TO-220F-4L



8-DIP