ON Semiconductor

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KA5x02xx-SERIES

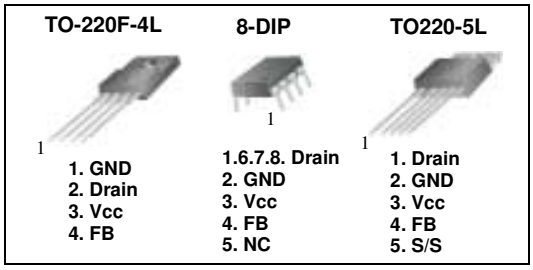
KA5H0265RC, KA5M0265R, KA5L0265R, KA5H02659RN/KA5M02659RN, KA5H0280R, KA5M0280R
Power Switch

Features

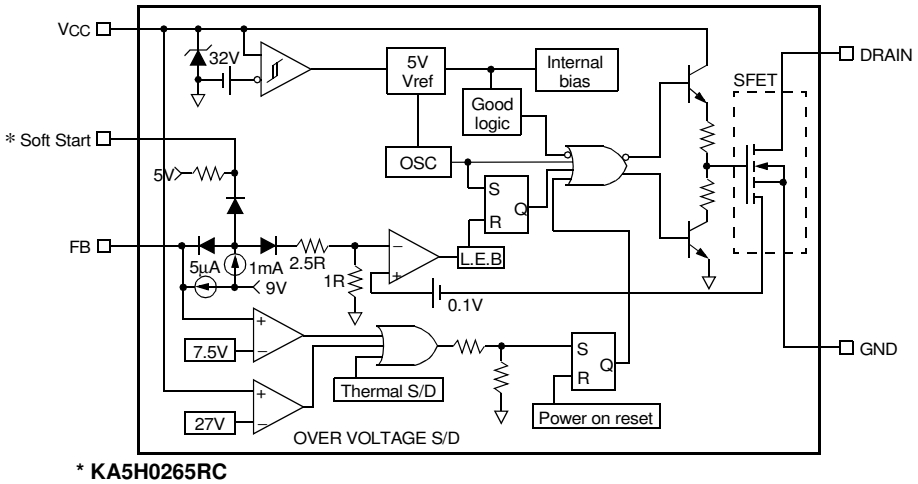
- Precision Fixed Operating Frequency (100/67/50kHz)
- Low Start-up Current (Typ. 100uA)
- Pulse by Pulse Current Limiting
- Over Load Protection
- Over Voltage Protection (Min. 25V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart Mode

Description

The Power Switch product family is specially designed for an off-line SMPS with minimal external components. The Power Switch consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection, over voltage protection, and temperature compensated precision current sources for loop compensation and fault protection circuitry-compared to discrete MOSFET and controller or R_{CC} switching converter solution. The Power Switch 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.



Internal Block Diagram



*** KA5H0265RC**

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October-2017, Rev. 2

Publication Order Number:
KA5L0265R/D

Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
KA5x0265xRx			
Drain-Gate Voltage (R_{GS}=1MΩ)	V_{DGR}	650	V
Gate-Source (GND) Voltage	V_{GS}	±30	V
Drain Current Pulsed (1)	I_{DM}	8.0	A_{DC}
Continuous Drain Current (T_C=25°C)	I_D	2.0	A_{DC}
Continuous Drain Current (T_C=100°C)	I_D	1.3	A_{DC}
Single Pulsed Avalanche Energy (2)	E_{AS}	68	mJ
Maximum Supply Voltage	$V_{CC,MAX}$	30	V
Analog Input Voltage Range	V_{FB}	-0.3 to V_{SD}	V
Total Power Dissipation	P_D	42	W
	Darting	0.33	W/°C
Operating Junction Temperature.	T_J	+160	°C
Operating Ambient Temperature.	T_A	-25 to +85	°C
Storage Temperature Range.	T_{STG}	-55 to +150	°C
KA5x0280R			
Drain-Gate Voltage (R_{GS}=1MΩ)	V_{DGR}	800	V
Gate-Source (GND) Voltage	V_{GS}	±30	V
Drain Current Pulsed (1)	I_{DM}	8.0	A_{DC}
Continuous Drain Current (T_C=25°C)	I_D	2.0	A_{DC}
Continuous Drain Current (T_C=100°C)	I_D	1.3	A_{DC}
Single Pulsed Avalanche Energy (2)	E_{AS}	90	mJ
Maximum Supply Voltage	$V_{CC,MAX}$	30	V
Analog Input Voltage Range	V_{FB}	-0.3 to V_{SD}	V
Total Power Dissipation	P_D	35	W
	Darting	0.28	W/°C
Operating Junction Temperature.	T_J	+160	°C
Operating Ambient Temperature.	T_A	-25 to +85	°C
Storage Temperature Range.	T_{STG}	-55 to +150	°C

Note:

1. Repetitive rating: Pulse width limited by maximum junction temperature
2. L = 51mH, starting T_j = 25°C

Electrical Characteristics (SFET Part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
KA5x0265xRx						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=50μA	650	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=Max. Rating, V_{GS}=0V	-	-	50	μA
		V_{DS}=0.8Max. Rating, V_{GS}=0V, T_C=125°C	-	-	200	μA
Static Drain-Source on Resistance (Note)	$R_{DS(ON)}$	V_{GS}=10V, I_D=0.5A	-	5.0	6.0	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	-	550	-	pF
Output Capacitance	Coss		-	38	-	
Reverse Transfer Capacitance	Crss		-	17	-	
Turn on Delay Time	td(on)	V_{DD}=0.5B V_{DSS}, I_D=1.0A (MOSFET switching time is essentially independent of operating temperature)	-	20	-	nS
Rise Time	tr		-	15	-	
Turn Off Delay Time	td(off)		-	55	-	
Fall Time	tf		-	25	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	V_{GS}=10V, I_D=1.0A, V_{DS}=0.5B V_{DSS} (MOSFET switching time is essentially independent of operating temperature)	-	-	35	nC
Gate-Source Charge	Qgs		-	3	-	
Gate-Drain (Miller) Charge	Qgd		-	12	-	
KA5x0280R						
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	-	-	50	μA
		V_{DS}=0.8Max. Rating, V_{GS}=0V, T_C=125°C	-	-	200	μA
Static Drain-Source on Resistance (Note)	$R_{DS(ON)}$	V_{GS}=10V, I_D=0.5A	-	5.6	7.0	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	-	250	-	pF
Output Capacitance	Coss		-	52	-	
Reverse Transfer Capacitance	Crss		-	25	-	
Turn on Delay Time	td(on)	V_{DD}=0.5B V_{DSS}, I_D=1.0A (MOSFET switching time is essentially independent of operating temperature)	-	21	-	nS
Rise Time	tr		-	28	-	
Turn Off Delay Time	td(off)		-	77	-	
Fall Time	tf		-	24	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	V_{GS}=10V, I_D=1.0A, V_{DS}=0.5B V_{DSS} (MOSFET switching time is essentially independent of operating temperature)	-	-	60	nC
Gate-Source Charge	Qgs		-	15	-	
Gate-Drain (Miller) Charge	Qgd		-	20	-	

Note:

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

2. $S = \frac{1}{R}$

Electrical Characteristics (Control Part) (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start Threshold Voltage	V_{START}	V_{FB}=GND	14	15	16	V
Stop Threshold Voltage	V_{STOP}	V_{FB}=GND	8.2	8.8	9.4	V
OSCILLATOR SECTION						
Initial Accuracy	F_{OSC}	**KA5H0265xRx KA5H0280R**	90	100	110	kHz
Initial Accuracy	F_{OSC}	**KA5M0265xRx KA5M0280R**	61	67	73	kHz
Initial Accuracy	F_{OSC}	**KA5L0265R**	45	50	55	kHz
Frequency Change With Temperature (2)	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	Dmax	**KA5H0265xRx KA5H0280R**	62	67	72	%
Maximum Duty Cycle	Dmax	**KA5M0265xRx KA5M0280R KA5L0265R**	72	77	82	%
FEEDBACK SECTION						
Feedback Source Current	I_{FB}	Ta=25°C, 0V ≤ Vfb ≤ 3V	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	V_{SD}	Vfb ≤ 6.5V	6.9	7.5	8.1	V
Shutdown Delay Current	Idelay	Ta=25°C, 5V ≤ Vfb ≤ V_{SD}	4	5	6	µA
SOFT START SECTION						
Soft Start Voltage	V_{SS}	**KA5H0265RC**	4.7	5.0	5.3	V
Soft Start Current	I_{SS}		0.8	1.0	1.2	mA
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
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit	I_{OVER}	**KA5x02659RN**	0.79	0.9	1.01	A
Peak Current Limit	I_{OVER}	**KA5x0265Rx KA5x0280R**	1.05	1.2	1.34	A
PROTECTION SECTION						
Over Voltage Protection	V_{OVP}	V_{CC} ≥ 24V	25	27	29	V
Thermal Shutdown Temperature (1)	T_{SD}	-	140	160	-	°C
TOTAL DEVICE SECTION						
Start-up Current	I_{START}	V_{CC}=14V	-	100	170	µA
Operating Supply Current (Control Part Only)	I_{OPR}	V_{CC} ≤ 28	-	7	12	mA

Note:

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

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

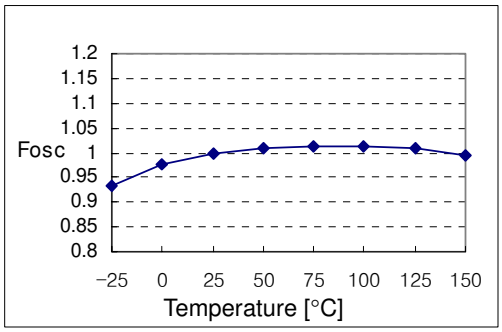


Figure 1. Operating Frequency

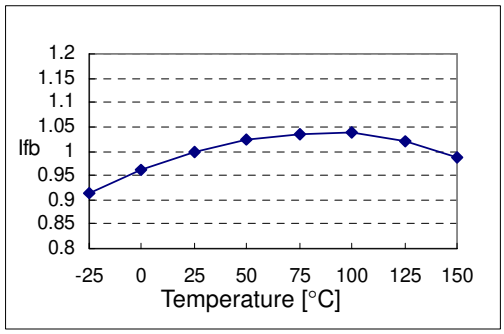


Figure 2. Feedback Source Current

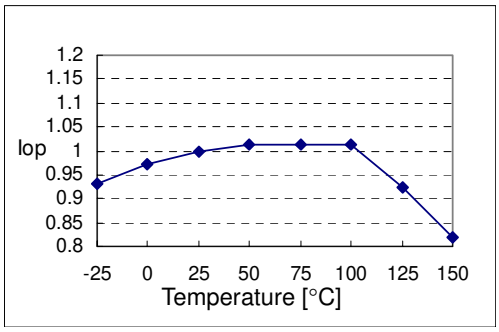


Figure 3. Operating Supply Current

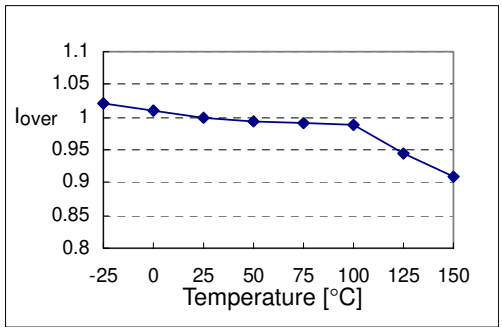


Figure 4. Peak Current Limit

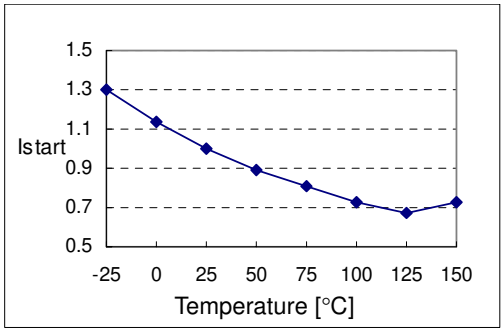


Figure 5. Start up Current

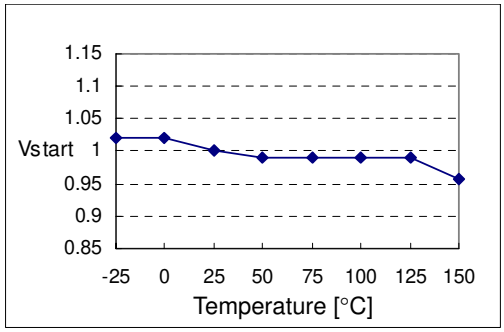


Figure 6. Start Threshold Voltage

Typical Performance Characteristics (Continued)

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

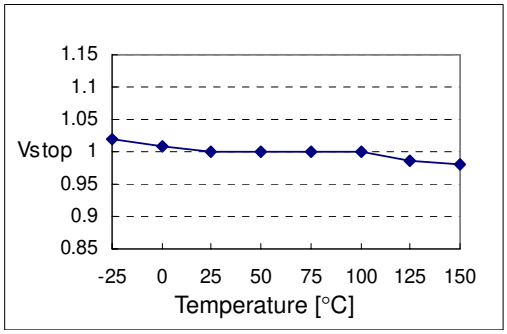


Figure 7. Stop Threshold Voltage

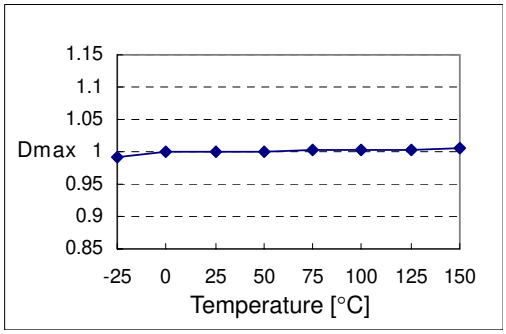


Figure 8. Maximum Duty Cycle

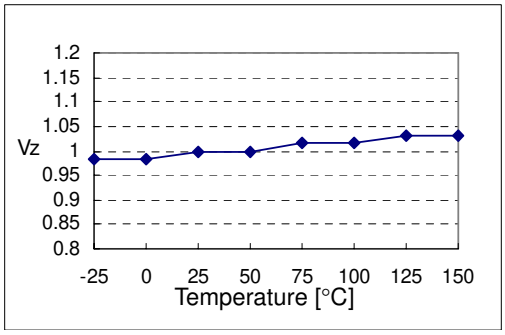


Figure 9. V_{CC} Zener Voltage

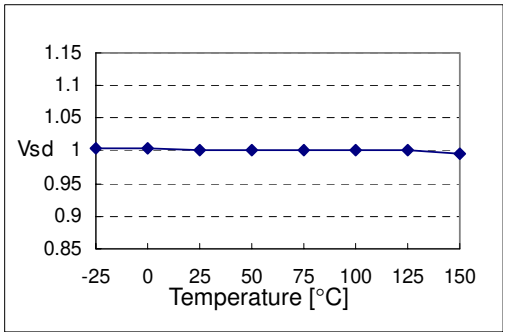


Figure 10. Shutdown Feedback Voltage

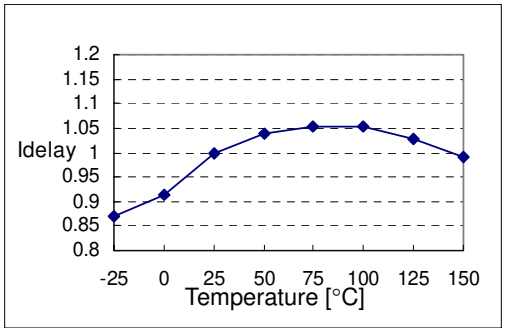


Figure 11. Shutdown Delay Current

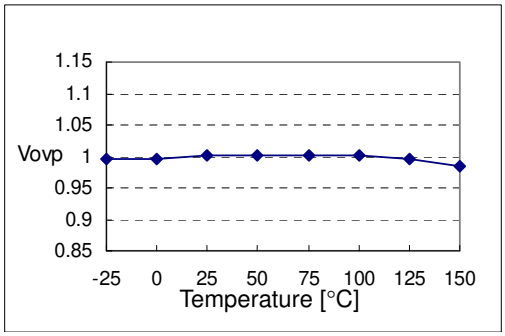


Figure 12. Over Voltage Protection

Typical Performance Characteristics (Continued)

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

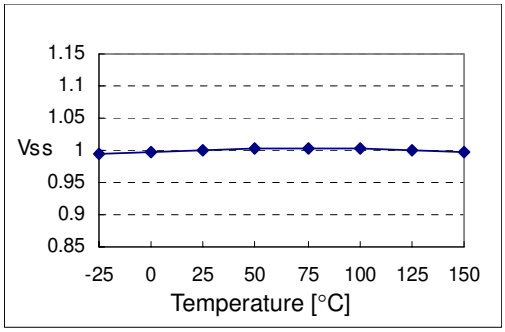


Figure13. Soft Start Voltage

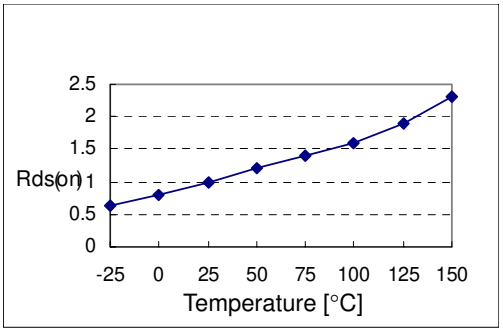
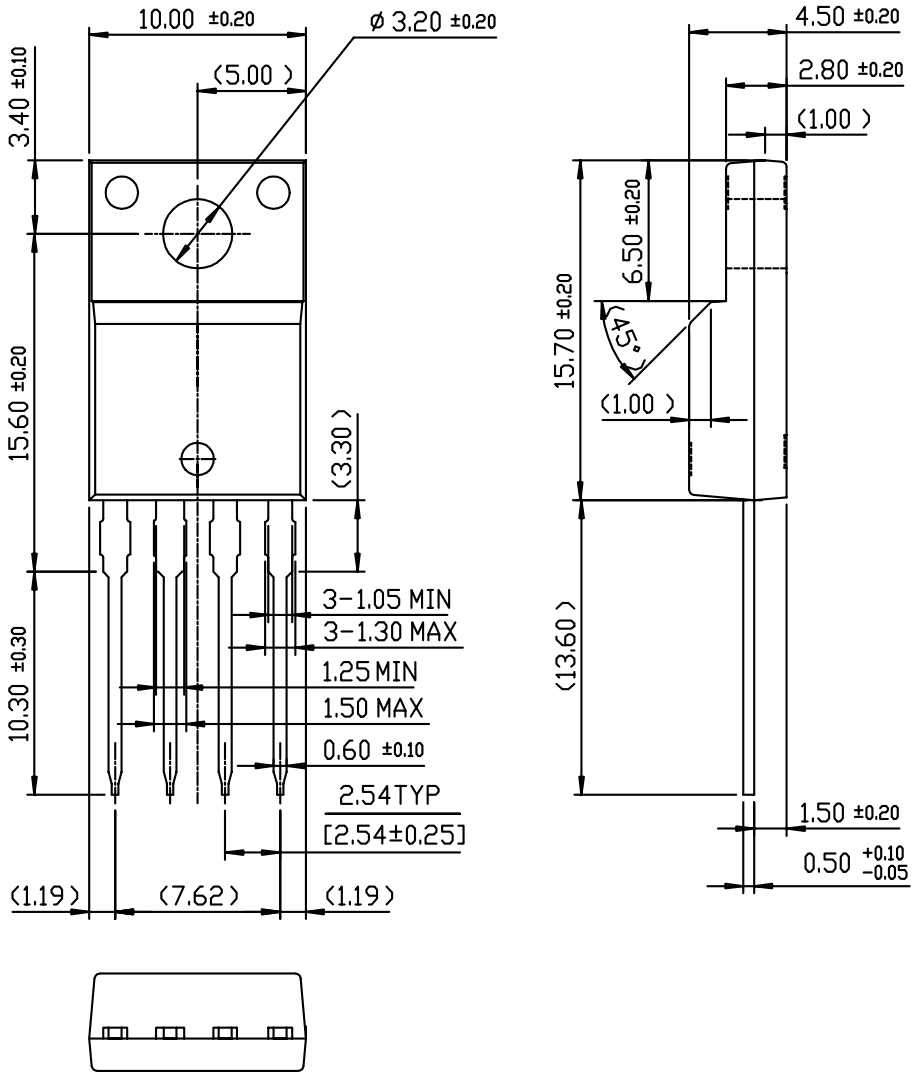


Figure 14. Static Drain-Source on Resistance

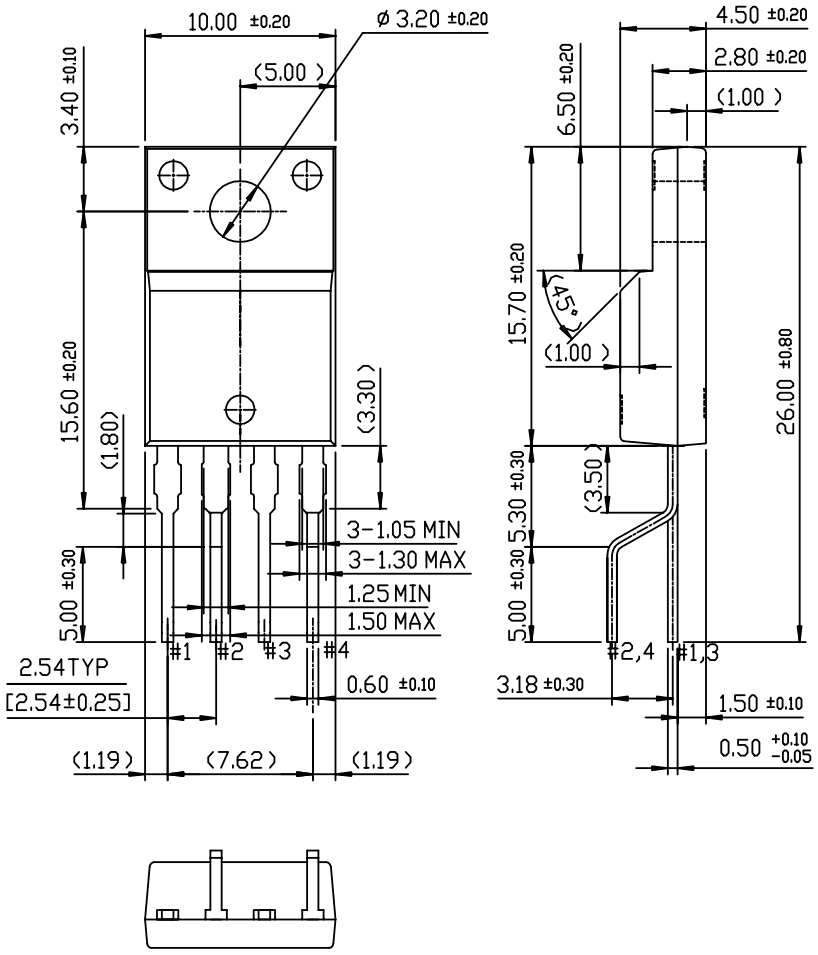
Package Dimensions

TO-220F-4L



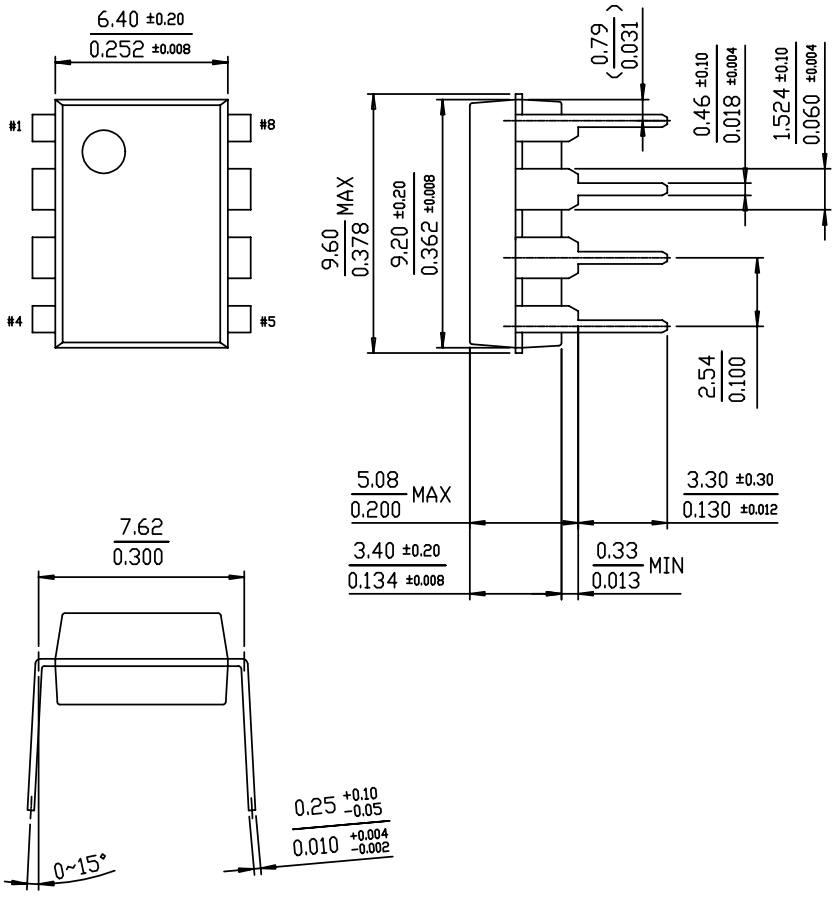
Package Dimensions (Continued)

TO-220F-4L(Forming)



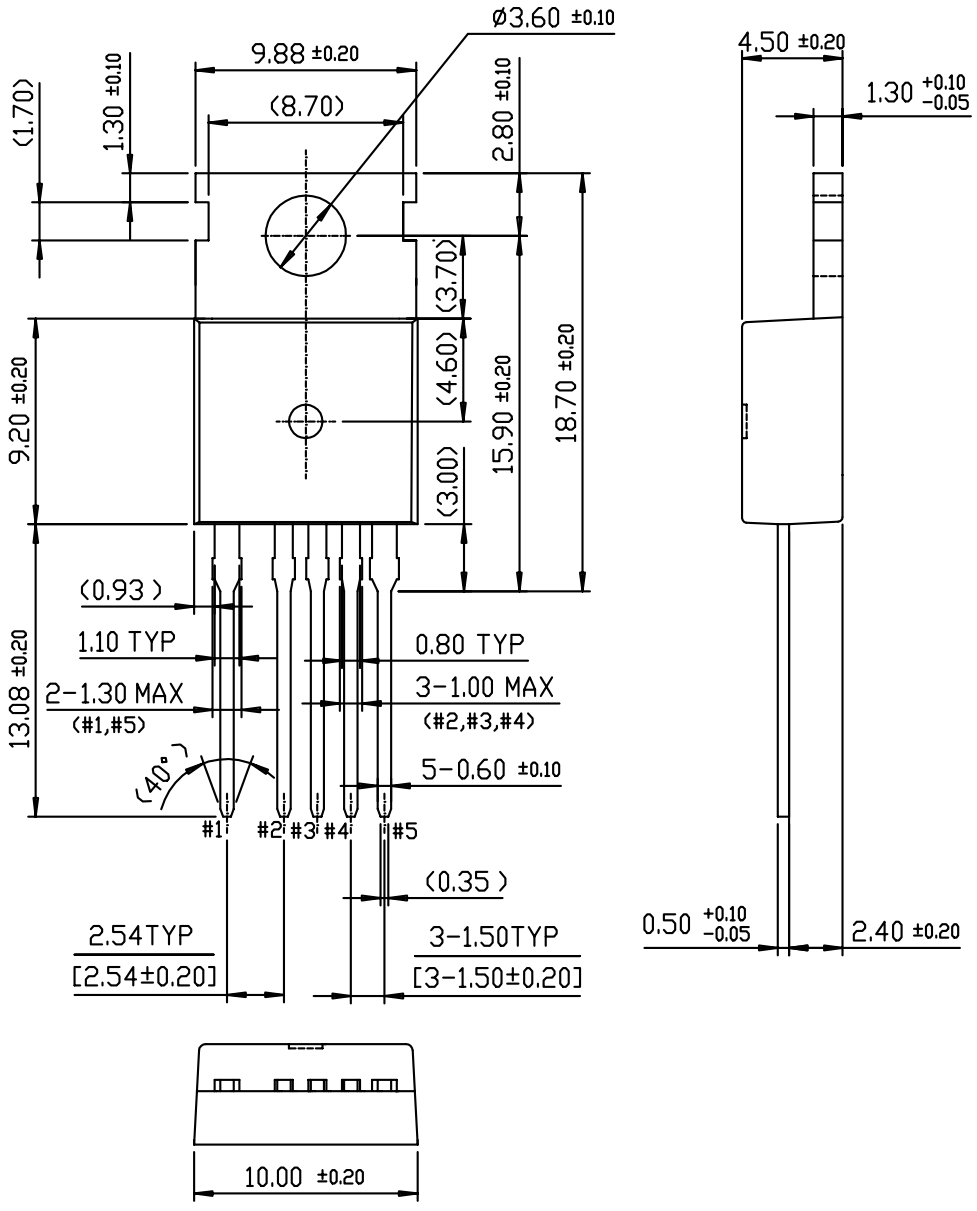
Package Dimensions (Continued)

8-DIP



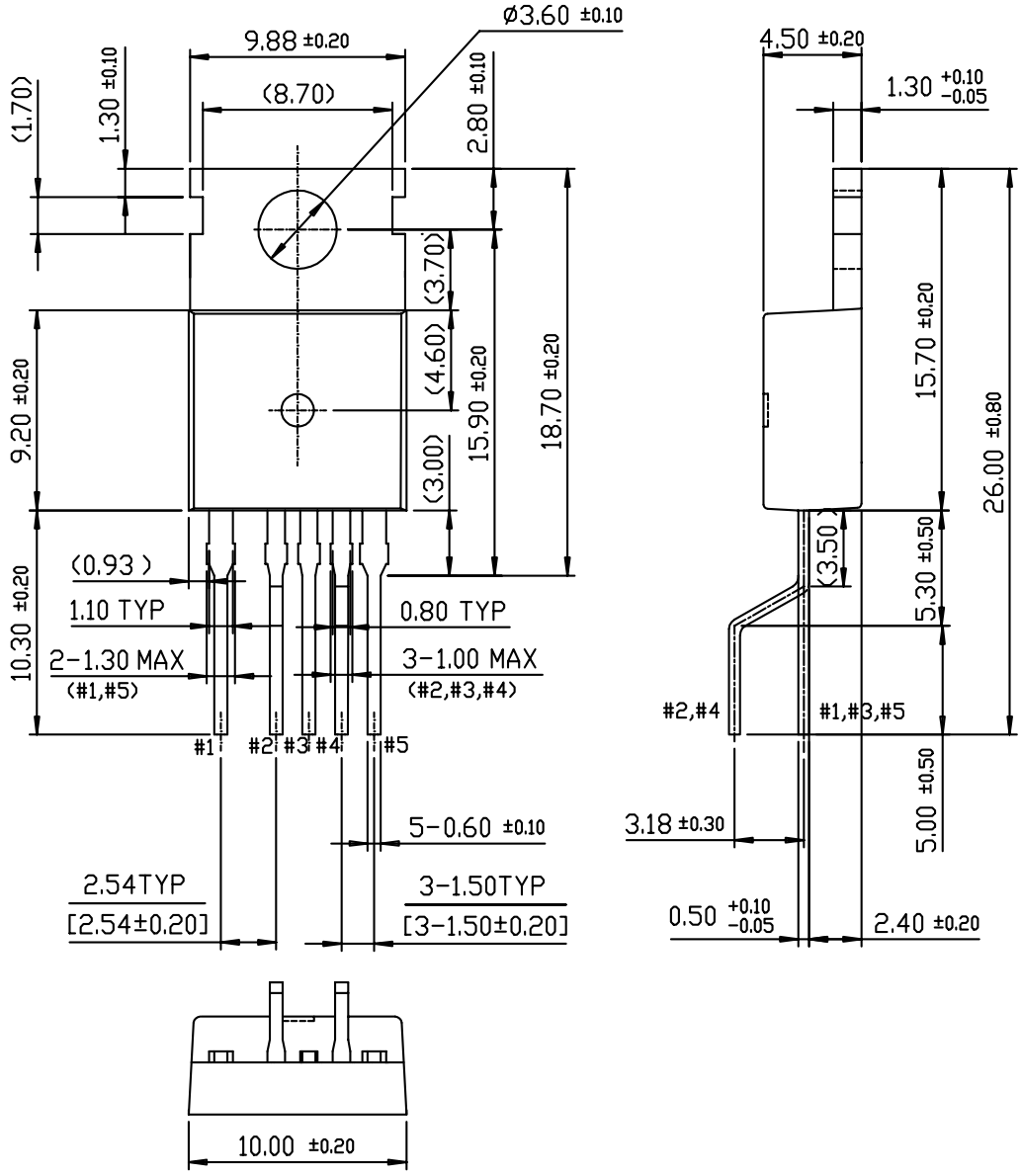
Package Dimensions (Continued)

TO-220-5L



Package Dimensions (Continued)

TO-220-5L(Forming)



Ordering Information

Product Number	Package	Marking Code	BV_{DSS}	F_{OSC}	$R_{DS(on)}$
KA5H0265RCTU	TO-220-5L	5H0265RC	650V	100kHz	5Ω
KA5H0265RCYDTU	TO-220-5L(Forming)				
KA5M0265RTU	TO-220F-4L	5M0265R	650V	67kHz	5Ω
KA5M0265RYDTU	TO-220F-4L(Forming)				
KA5L0265RTU	TO-220F-4L	5L0265R	650V	50kHz	5Ω
KA5L0265RYDTU	TO-220F-4L(Forming)				
Product Number	**Package**	**Marking Code**	**BV_{DSS}**	**F_{OSC}**	**$R_{DS(on)}$**
KA5H0280RTU	TO-220F-4L	5H0280R	800V	100kHz	5.6Ω
KA5H0280RYDTU	TO-220F-4L(Forming)				
KA5M0280RTU	TO-220F-4L	5M0280R	800V	67kHz	5.6Ω
KA5M0280RYDTU	TO-220F-4L(Forming)				
Product Number	**Package**	**Marking Code**	**BV_{DSS}**	**F_{OSC}**	**$R_{DS(on)}$**
KA5H02659RN	8-DIP	5H02659R	650V	100kHz	5Ω
KA5M02659RN	8-DIP	5M02659R	650V	67kHz	5Ω

TU : Non Forming Type
YDTU : Forming Type

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