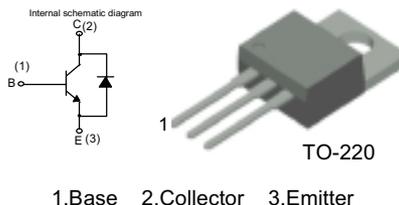**FAIRCHILD**

SEMICONDUCTOR ™

KSC5402D/KSC5402DT

High Voltage High Speed Power Switch Application

- Wide Safe Operating Area
- Built-in Free Wheeling Diode
- Suitable for Electronic Ballast Application
- Small Variance in Storage Time
- Two Package Choices; D-PAK or TO-220

Internal schematic diagram

C (2)

(1)

B

E (3)

1

TO-220

1.Base   2.Collector   3.Emitter

NPN Silicon Transistor Planar Silicon Transistor

Absolute Maximum Ratings T_C=25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	1000	V
V_{CEO}	Collector-Emitter Voltage	450	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current (DC)	2	A
I_{CP}	*Collector Current (Pulse)	5	A
I_B	Base Current (DC)	1	A
I_{BP}	*Base Current (Pulse)	2	A
P_C	Power Dissipation(T_C=25°C)	50	W
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	- 65 ~ 150	°C

* Pulse Test: Pulse Width=5ms, Duty Cycle $\leq$ 10%

Thermal Characteristics T_C=25°C unless otherwise noted

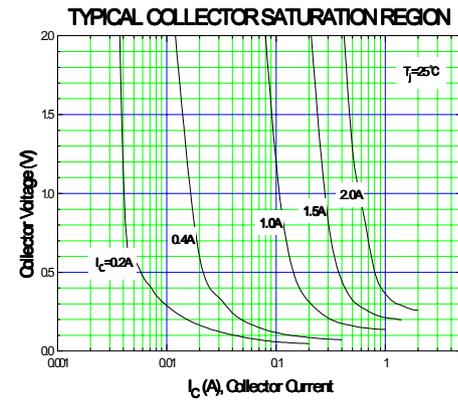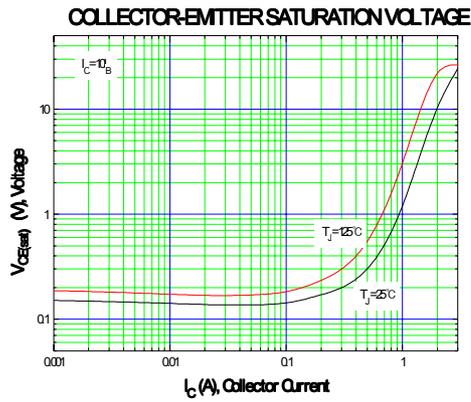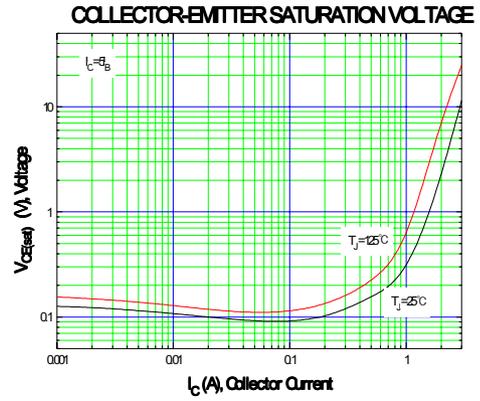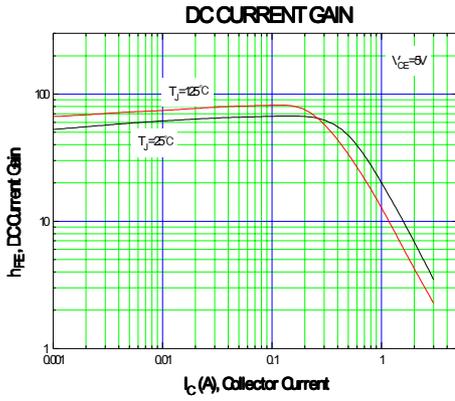| Symbol	Characteristics		Rating	Unit
$R_{\theta jc}$	Thermal Resistance	Junction to Case	2.5	°C/W
$R_{\theta ja}$		Junction to Ambient	62.5	
T_L	Maximum Lead Temperature for Soldering Purpose ; 1/8" from Case for 5 Seconds		270	

Electrical Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Units
BV_{CBO}	Collector-Base Breakdown Voltage	I_C=1mA, I_E=0		1000	1090		V
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C=5mA, I_B=0		450	525		V
BV_{EBO}	Emitter-Base Breakdown Voltage	I_E=1mA, I_C=0		12	14		V
I_{CES}	Collector Cut-off Current	V_{CES}=1000V, I_{EB}=0	T_C=25°C		0.03	100	μA
			T_C=125°C		1.2	500	
I_{CEO}	Collector Cut-off Current	V_{CE}=450V, V_B=0	T_C=25°C		0.3	100	μA
			T_C=125°C		15	500	
I_{EBO}	Emitter Cut-off Current	V_{EB}=10V, I_C=0			0.01	100	μA
h_{FE}	DC Current Gain	V_{CE}=1V, I_C=0.4A	T_C=25°C	14	29		
			T_C=125°C	8	17		
		V_{CE}=1V, I_C=1A	T_C=25°C	6	9		
			T_C=125°C	4	6		
V_{CE}(sat)	Collector-Emitter Saturation Voltage	I_C=0.4, I_B=0.04A	T_C=25°C		0.25	0.6	
			T_C=125°C		0.4	1.0	
		I_C=1A, I_B=0.2A	T_C=25°C		0.3	0.75	V
			T_C=125°C		0.65	1.2	V
V_{BE}(sat)	Base-Emitter Saturation Voltage	I_C=0.4A, I_B=0.04A	T_C=25°C		0.78	1.0	V
			T_C=125°C		0.65	0.9	V
		I_C=1A, I_B=0.2A	T_C=25°C		0.85	1.1	V
			T_C=125°C		0.75	1.0	V
C_{ib}	Input Capacitance	V_{EB}=8V, I_C=0, f=1MHz			330	500	pF
C_{ob}	Output Capacitance	V_{CB}=10V, I_E=0, f=1MHz			35	100	pF
f_T	Current Gain Bandwidth Product	I_C=0.5A, V_{CE}=10V			11		MHz
V_F	Diode Forward Voltage	I_F=1A	T_C=25°C		0.86	1.5	V
		I_F=0.2A	T_C=25°C		0.75	1.2	V
			T_C=125°C		0.6		V
		I_F=0.4A	T_C=25°C		0.8	1.3	V
			T_C=125°C		0.65		V

KSC5402D/KSC5402DT appears in the right margin as vertical text.

Electrical Characteristics T_C=25°C unless otherwise noted

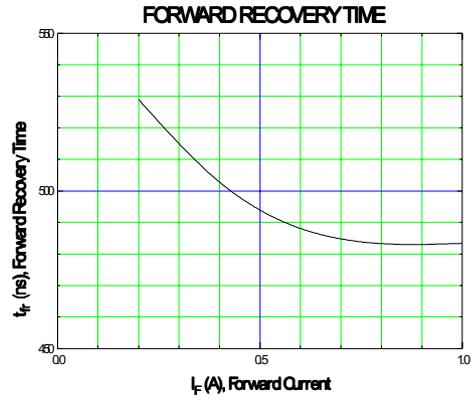| Symbol	Parameter	Test Condition		Min	Typ.	Max.	Units
t_{fr}	Diode Froward Recvery Time (di/dt=10A/μs)	I_F=0.2A			540		ns
		I_F=0.4A			520		ns
		I_F=1A			480		ns
V_{CE}(DSAT)	Dynamic Saturation Voltage	I_C=0.4A, I_{B1}=40mA V_{CC}=300V	@ 1μs		7.5		V
			@ 3μs		2.5		V
		I_C=1A, I_{B1}=200mA V_{CC}=300	@ 1μs		11.5		V
			@ 3μs		1.5		V
RESISTIVE LOAD SWITCHING (D.C $\leq$ 10%, Pulse Width=20μs)							
t_{ON}	Turn ON Time	I_C=1A, I_{B1}=200mA I_{B2}=150mA V_{CC}=300V R_L = 300Ω	T_C=25°C		110	150	ns
			T_C=125°C		135		ns
t_{STG}	Storage Time		T_C=25°C	0.95		1.25	μs
			T_C=125°C		1.4		μs
INDUCTIVE LOAD SWITCHING (V_{CC}=15V)							
t_{ON}	Turn ON Time	I_C=0.4A, I_{B1}=40mA I_{B2}=200mA, Vz=300V L_C=200H	T_C=25°C		0.56	0.65	μs
			T_C=125°C		0.7		μs
t_{STG}	Storage Time		T_C=25°C		60	175	ns
			T_C=125°C		75		ns
t_F	Fall Time		T_C=25°C		90	175	ns
			T_C=125°C		90		ns
t_{ON}	Turn ON Time	I_C=0.8A, I_{B1}=160mA I_{B2}=160mA, Vz=300V L_C=200H	T_C=25°C			2.75	μs
			T_C=125°C		3		μs
t_{STG}	Storage Time		T_C=25°C		110	175	ns
			T_C=125°C		180		ns
t_F	Fall Time		T_C=25°C		125	350	ns
			T_C=125°C		185		ns
t_{ON}	Turn ON Time	I_C=1A, I_{B1}=200mA, I_{B2}=500mA, V_Z=300V L_C=200μH	T_C=25°C		1.1	1.2	μs
			T_C=125°C		1.35	150	μs
T_{STG}	Storage Time		T_C=25°C		105		ns
			T_C=125°C		75		ns
t_F	Fall Time		T_C=25°C		125	150	ns
			T_C=125°C		100		ns

Typical Characteristics

STATIC CHARACTERISTIC

DC CURRENT GAIN

DC CURRENT GAIN

COLLECTOR-EMITTER SATURATION VOLTAGE

COLLECTOR-EMITTER SATURATION VOLTAGE

TYPICAL COLLECTOR SATURATION REGION

Typical Characteristics (continued)

BASE-EMITTER SATURATION VOLTAGE

$V_{BE(sat)}$ (V), Voltage vs I_C (A), Collector Current

$I_C = 9I_B$

$T_J = 25°C$

$T_J = 125°C$

BASE-EMITTER SATURATION VOLTAGE

$V_{BE(sat)}$ (V), Voltage vs I_C (A), Collector Current

$I_C = 10I_B$

$T_J = 25°C$

$T_J = 125°C$

DIODE FORWARD VOLTAGE

V_{FD} (V), Voltage vs I_{FD} (A), Current

$T_J = 25°C$

$T_J = 125°C$

FORWARD RECOVERY TIME

t_{fr} (ns), Forward Recovery Time vs I_F (A), Forward Current

CAPACITANCE

Capacitance (pF) vs Reverse Voltage (V)

$f = 1MHz$

C_{ib}

C_{ob}

RESISTIVE SWITCHING TIME, t_{on}

t_{on} (ns), Time vs I_C (A), Collector Current

$I_C = 9I_{B1} = 2I_{B2}$
$V_{CC} = 300V$
$PW = 40\mu s$

$T_J = 125°C$

$T_J = 25°C$

Typical Characteristics (continued)

RESISTIVE SWITCHING TIME, t_{off}

INDUCTIVE SWITCHING TIME, t_{si}

INDUCTIVE SWITCHING TIME, t_{fi}

INDUCTIVE SWITCHING TIME, t_c

INDUCTIVE SWITCHING TIME, t_{si}

INDUCTIVE SWITCHING TIME, t_{fi}

Typical Characteristics (continued)

INDUCTIVE SWITCHING TIME , t_c

$I_C=5I_{B1}=5I_{B2}$
$V_{CC}=15V$
$V_z=300V$
$L_C=200\mu H$

$T_J=125°C$

$T_J=25°C$

t_c (ns), Time

I_C (A), Collector Current

INDUCTIVE SWITCHING TIME , t_{si}

$T_J=125°C$

$T_J=25°C$

$I_C=5I_{B1}=2I_{B2}$
$V_{CC}=15V$
$V_z=300V$
$L_C=200\mu H$

t_{si} (μs), Time

I_C (A), Collector Current

INDUCTIVE SWITCHING TIME , t_{fi}

$I_C=5I_{B1}=2I_{B2}$
$V_{CC}=15V$
$V_z=300V$
$L_C=200\mu H$

$T_J=25°C$

$T_J=125°C$

t_{fi} (ns), Time

I_C (A), Collector Current

INDUCTIVE SWITCHING TIME , t_c

$I_C=5I_{B1}=2I_{B2}$
$V_{CC}=15V$
$V_z=300V$
$L_C=200\mu H$

$T_J=25°C$

$T_J=125°C$

t_c (ns), Time

I_C (A), Collector Current

FORWARD BIAS SAFE OPERATING AREA

$1\mu s$

$5\mu s$

$5ms$

$1ms$

DC

I_C (A), Collector Current

V_{CE} (V), Collector Emitter Voltage

POWER DERATING

P_C (W), Power Dissipation

T_C (°C), Case Temperature

Package Dimensions

TO-220

9.90 ±0.20

(8.70)

ø3.60 ±0.10

(1.70)

1.30 ±0.10

2.80 ±0.10

9.20 ±0.20

(1.46)

(3.70)

(3.00)

15.90 ±0.20

18.95MAX.

13.08 ±0.20

(1.00)

(45°)

10.08 ±0.30

1.27 ±0.10

1.52 ±0.10

0.80 ±0.10

2.54TYP
[2.54 ±0.20]

2.54TYP
[2.54 ±0.20]

10.00 ±0.20

4.50 ±0.20

1.30 +0.10 −0.05

0.50 +0.10 −0.05

2.40 ±0.20

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