FAIRCHILD SEMICONDUCTOR®

May 2010

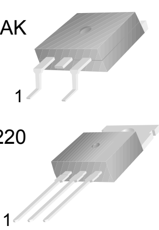
KSC5338D/KSC5338DW
NPN Triple Diffused Planar Silicon Transistor

Features

- High Voltage Power Switch Switching Application
- Wide Safe Operating Area
- Built-in Free-Wheeling Diode
- Suitable for Electronic Ballast Application
- Small Variance in Storage Time
- Two Package Choices : TO-220 or D^2-PAK

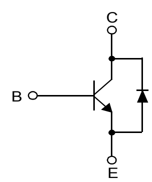
D^2-PAK

TO-220



1.Base 2.Collector 3.Emitter

Equivalent Circuit



Absolute Maximum Ratings T_a=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)	5	A
I_{CP}	*Collector Current (Pulse)	10	A
I_B	Base Current (DC)	2	A
I_{BP}	*Base Current (Pulse)	4	A
P_C	Power Dissipation (T_C=25°C)	75	W
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	- 55 to 150	°C

* Pulse Test : Pulse Width = 5ms, Duty Cycle ≤ 10%

Thermal Characteristics

Symbol	Parameter		Rating	Units
$R_{\theta jc}$	Thermal Resistance	Junction to Case	1.65	°C/W
$R_{\theta ja}$		Junction to Ambient	62.5	°C/W
T_L	Maximum Lead Temperature for Soldering		270	°C

Electrical Characteristics T_a=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			V
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C=5mA, I_B=0		450			V
BV_{EBO}	Emitter-Base Breakdown Voltage	I_E=1mA, I_C=0		12			V
I_{CBO}	Collector Cut-off Current	V_{CB}=800V, I_E=0				10	µA
I_{CES}	Collector Cut-off Current	V_{CES}=1000V, I_{EB}=0	T_a=25°C			100	µA
			T_a=125°C			500	µA
I_{CEO}	Collector Cut-off Current	V_{CE}=450V, I_B=0	T_a=25°C			100	µA
			T_a=125°C			500	µA
I_{EBO}	Emitter Cut-off Current	V_{EB}=10V, I_C=0				10	µA
h_{FE}	DC Current Gain	V_{CE}=1V, I_C=0.8A	T_a=25°C	15	25		
			T_a=125°C	10	14		
		V_{CE}=1V, I_C=2A	T_a=25°C	6	9		
			T_a=125°C	4	6		
		V_{CE}=2.5V, I_C=1A	T_a=25°C	18	25		
			T_a=125°C	14	18		
V_{CE}(sat)	Collector-Emitter Saturation Voltage	I_C=0.8A, I_B=0.08A	T_a=25°C		0.35	0.5	V
			T_a=125°C		0.55	0.75	V
		I_C=2A, I_B=0.4A	T_a=25°C		0.47	0.75	V
			T_a=125°C		0.9	1.1	V
		I_C=0.8A, I_B=0.04A	T_a=25°C		0.9	1.5	V
			T_a=125°C		1.8	2.5	V
		I_C=1A, I_B=0.2A	T_a=25°C		0.22	0.5	V
			T_a=125°C		0.3	0.6	V
V_{BE}(sat)	Base-Emitter Saturation Voltage	I_C=0.8A, I_B=0.08A	T_a=25°C		0.8	1.0	V
			T_a=125°C		0.65	0.9	V
		I_C=2A, I_B=0.4A	T_a=25°C		0.9	1.0	V
			T_a=125°C		0.8	0.9	V
C_{ib}	Input Capacitance	V_{EB}=10V, I_C=0.5A, f=1MHz			550	750	pF
C_{ob}	Output Capacitance	V_{CB}=10V, I_E=0, f=1MHz			60	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, I_C=1mA, I_E=0	T_a=25°C		0.86	1.3	V
			T_a=125°C		0.79		V
		I_F=2A	T_a=25°C		0.95	1.5	V
			T_a=125°C		0.88		V
t_{fr}	Diode Forward Recovery Time (di/dt=10A/µs)	I_F=0.4A I_F=1A I_F=2A			460 360 325		ns ns ns
$V_{CE(DSAT)}$	Dynamic Saturation Voltage	I_C=1A, I_{B1}=100mA V_{CC}=300V at 1 µs	T_a=25°C		8		V
			T_a=125°C		15		V
		I_C=1A, I_{B1}=100mA V_{CC}=300V at 3 µs	T_a=25°C		2.9		V
			T_a=125°C		8		V
		I_C=2A, I_{B1}=400mA V_{CC}=300V at 1 µs	T_a=25°C		9		V
			T_a=125°C		17		V
		I_C=2A, I_{B1}=400mA V_{CC}=300V at 3 µs	T_a=25°C		1.9		V
			T_a=125°C		8.5		V

Electrical Characteristics (Continued) T_a=25°C unless otherwise noted

Symbol	Parameter	Test Condition		Min	Typ.	Max.	Units
RESISTIVE LOAD SWITCHING (D.C ≤ 10%, Pulse Width=40µs)							
t_{ON}	Turn On Time	I_C=2.5A, I_{B1}=500mA, I_{B2}=-1A, V_{CC}=250V, R_L = 100Ω			500	750	ns
t_{STG}	Storage Time			1.2		1.5	µs
t_F	Fall Time				100	200	ns
t_{ON}	Turn On Time	I_C=2A, I_{B1}=400mA, I_{B2}=-1A, V_{CC}=300V, R_L = 150Ω	T_a=25°C		100	150	ns
			T_a=125°C		150		ns
t_{STG}	Storage Time		T_a=25°C		1.4	2.2	µs
			T_a=125°C		1.7		µs
t_F	Fall Time		T_a=25°C		90	150	ns
			T_a=125°C		150		ns
t_{ON}	Turn On Time	I_C=2.5A, I_{B1}=500mA, I_{B2}=-5mA, V_{CC}=300V, R_L = 120Ω	T_a=25°C		120	150	ns
			T_a=125°C		150		ns
t_{STG}	Storage Time		T_a=25°C	1.8		2.1	µs
			T_a=125°C		2.6		µs
t_F	Fall Time		T_a=25°C		110	150	ns
			T_a=125°C		160		ns
INDUCTIVE LOAD SWITCHING (V_{CC}=15V)							
t_{STG}	Storage Time	I_C=2.5A, I_{B1}=500mA, I_{B2}=-0.5A, V_Z=350V, L_C=300µH	T_a=25°C		1.9	2.2	µs
			T_a=125°C		2.4		µs
t_F	Fall Time		T_a=25°C		160	200	ns
			T_a=125°C		330		ns
t_C	Cross-over Time		T_a=25°C		350	500	ns
			T_a=125°C		750		ns
t_{STG}	Storage Time	I_C=2A, I_{B1}=400mA, I_{B2}=-0.4A, V_Z=300V, L_C=200µH	T_a=25°C	1.95		2.25	µs
			T_a=125°C		2.9		µs
t_F	Fall Time		T_a=25°C		120	150	ns
			T_a=125°C		270		ns
t_C	Cross-over Time		T_a=25°C		300	450	ns
			T_a=125°C		700		ns
t_{STG}	Storage Time	I_C=1A, I_{B1}=100mA, I_{B2}=-0.5A, V_Z=300V, L_C=200µH	T_a=25°C		0.6	0.8	µs
			T_a=125°C		1.0		µs
t_F	Fall Time		T_a=25°C		70		ns
			T_a=125°C		110		ns
t_C	Cross-over Time		T_a=25°C		80	130	ns
			T_a=125°C		170		ns

Typical Characteristics

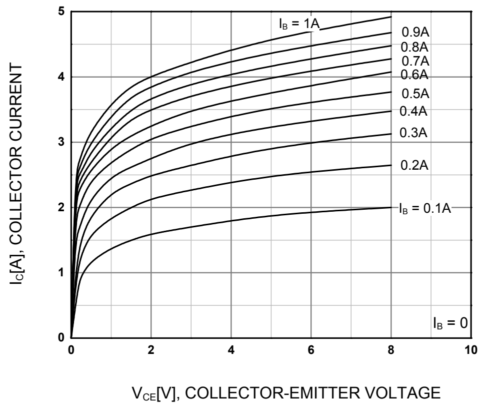


Figure 1. Static Characteristic

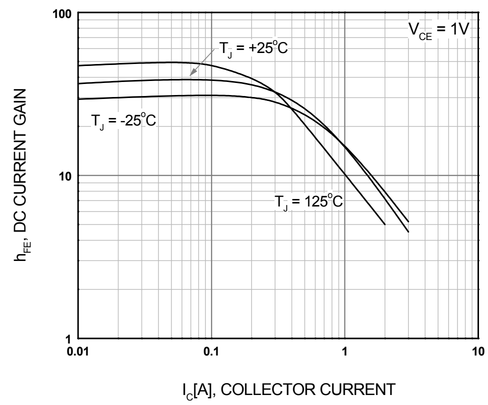


Figure 2. DC current Gain

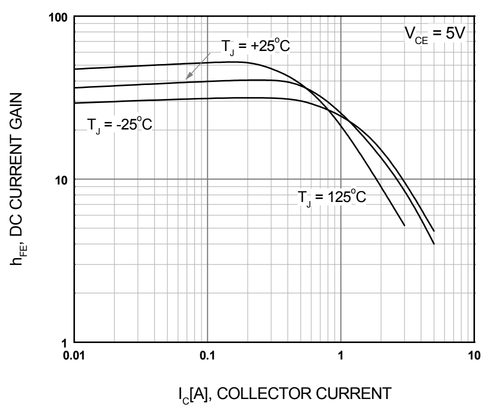


Figure 3. DC current Gain

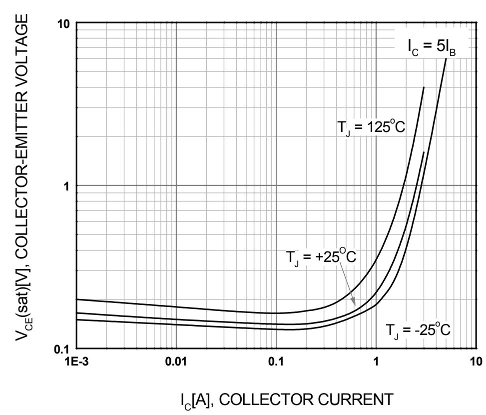


Figure 4. Collector-Emitter Saturation Voltage

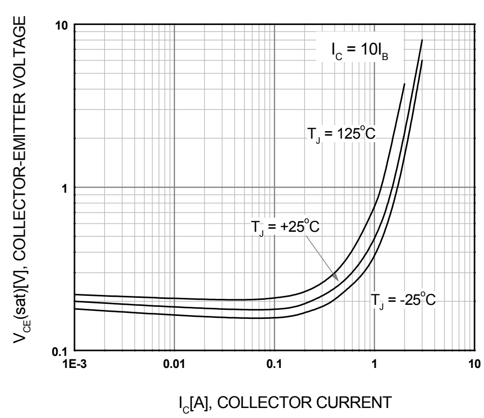


Figure 5. Collector-Emitter Saturation Voltage

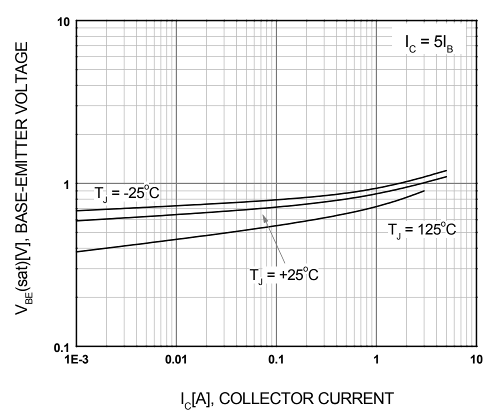


Figure 6. Base-Emitter Saturation Voltage

Typical Characteristics (Continued)

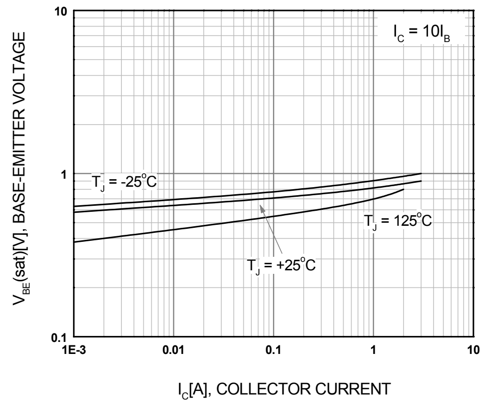


Figure 7. Base-Emitter Saturation Voltage

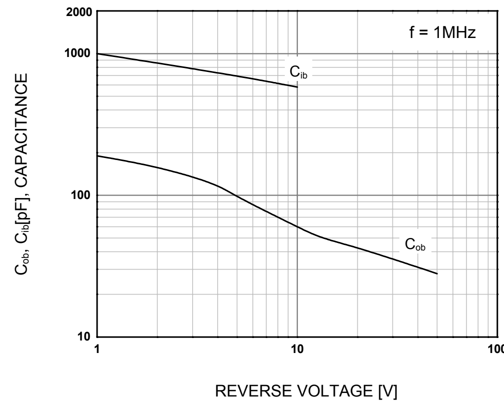


Figure 8. Collector Output Capacitance

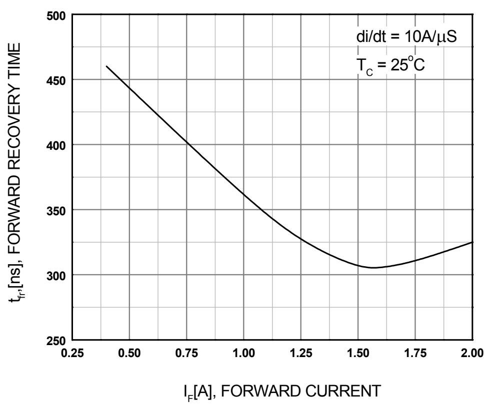


Figure 9. Forward Recovery Time

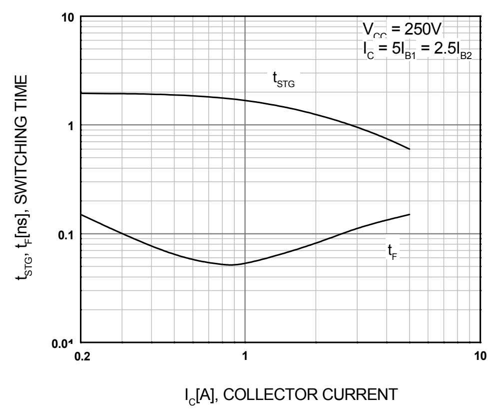


Figure 10. Switching Time

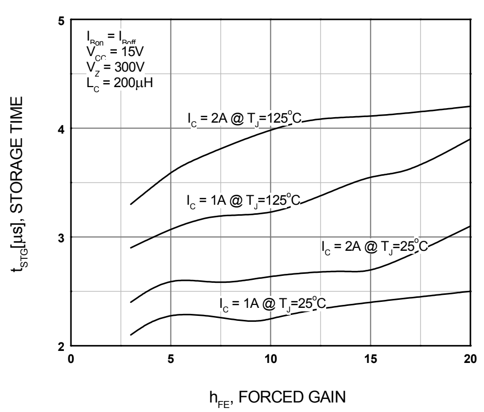


Figure 11. Induction Storage Time

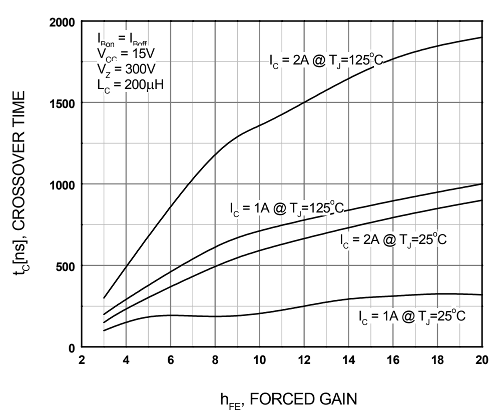


Figure 12. Inductive Crossover Time

Typical Characteristics (Continued)

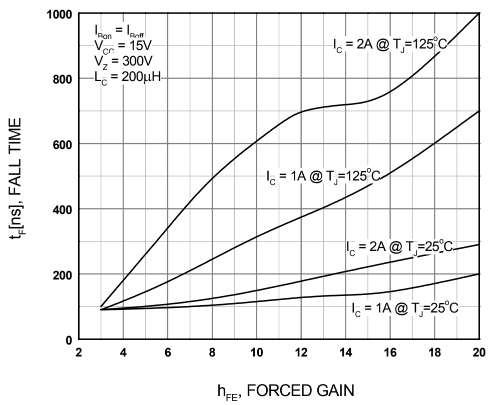


Figure 13. Inductive Fall Time

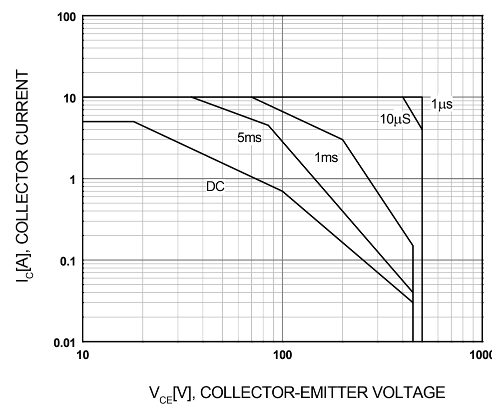


Figure 14. Safe Operating Area

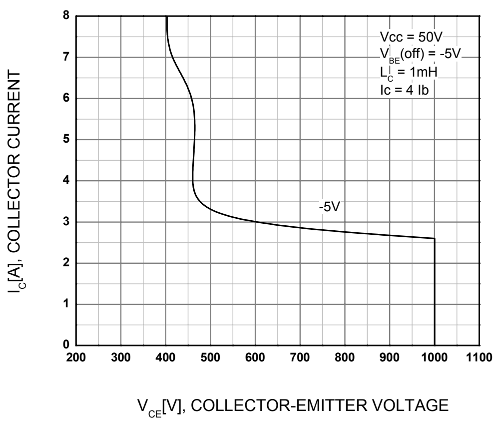


Figure 15. Reverse Bias Safe Operating

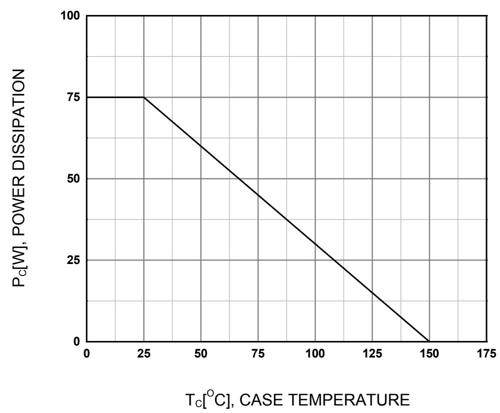


Figure 16. Power Derating

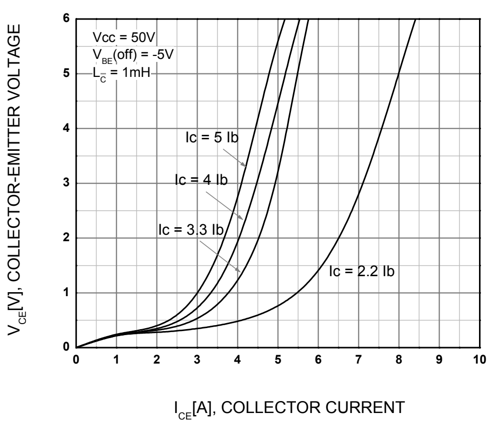
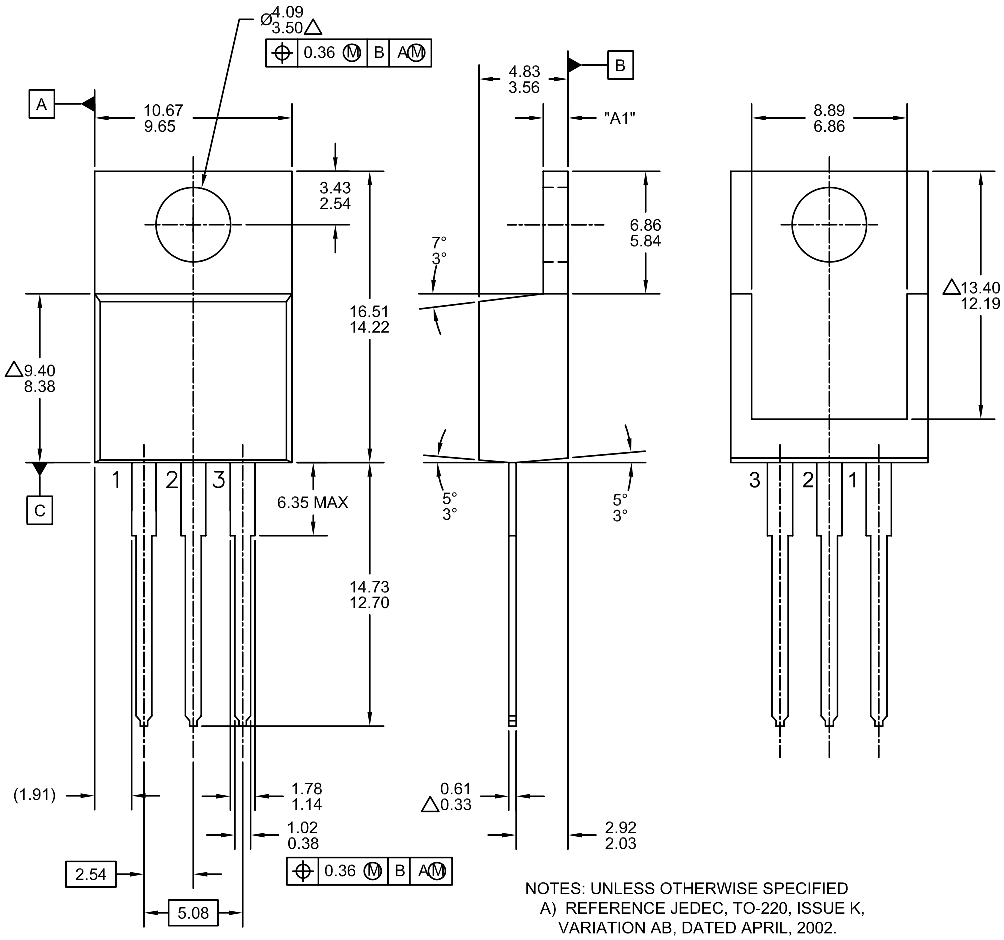
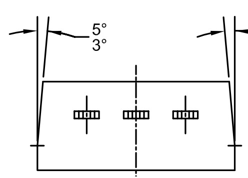


Figure 17. RBSOA Saturation

Physical Dimensions

TO-220





NOTES: UNLESS OTHERWISE SPECIFIED
A) REFERENCE JEDEC, TO-220, ISSUE K, VARIATION AB, DATED APRIL, 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5 - 1973
D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
E) DOES NOT COMPLY JEDEC STANDARD VALUE.
F) "A1" DIMENSIONS REPRESENT LIKE BELOW:
SINGLE GAUGE = 0.51 - 0.61
DUAL GAUGE = 1.14 - 1.40
G) DRAWING FILE NAME: TO220B03REV6

Dimensions in Millimeters

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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Datasheet Identification	Product Status	Definition
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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