

NPN Triple Diffused Planar Silicon Transistor

KSC5338D

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
- Package Choice: TO-220
- This is a Pb-Free and a Halide Free Device

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

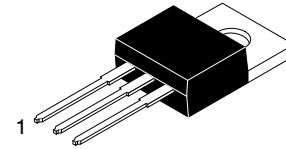
Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	1000	V
V_{CEO}	Collector-Emitter Voltage	450	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current (DC)	5	A
I_{CP}	Collector Current (Pulse) (Note 1)	10	A
I_B	Base Current (DC)	2	A
I_{BP}	Base Current (Pulse) (Note 1)	4	A
P_C	Power Dissipation ($T_C = 25^\circ\text{C}$)	75	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-55 to 150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

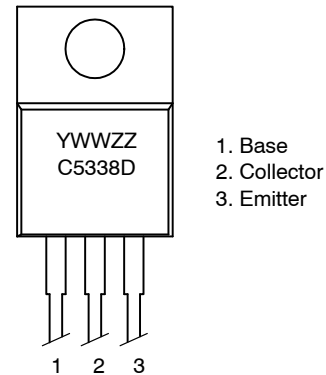
THERMAL CHARACTERISTICS

Symbol	Characteristic		Value	Unit
R _{θjc}	Thermal Resistance	Junction to Case	1.65	°C/W
R _{θja}		Junction to Ambient	62.5	°C/W
T _L	Maximum Lead Temperature for Soldering		270	°C



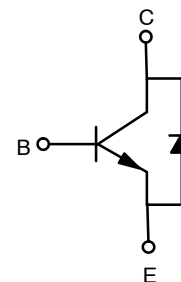
TO-220-3LD
CASE 340AT

MARKING DIAGRAM



YWW = Date Code (Year and Week)
 ZZ = Lot Code
 C5338D = Specific Device Code

EQUIVALENT CIRCUIT



ORDERING INFORMATION

Device	Package	Shipping
KSC5338D	TO-220-3LD	1200 Units / Bulk
KSC5338DTU	(Pb-Free, Halide Free)	1000 Units / Tube

KSC5338D

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Units
BV _{CBO}	Collector–Base Breakdown Voltage	I _C = 1 mA, I _E = 0		1000	–	–	V
BV _{CEO}	Collector–Emitter Breakdown Voltage	I _C = 5 mA, I _B = 0		450	–	–	V
BV _{EBO}	Emitter–Base Breakdown Voltage	I _E = 1 mA, I _C = 0		12	–	–	V
I _{CBO}	Collector Cut–off Current	V _{CB} = 800 V, I _E = 0		–	–	10	μA
I _{CES}	Collector Cut–off Current	V _{CES} = 1000 V, I _{EB} = 0	T _a = 25°C	–	–	100	μA
			T _a = 125°C	–	–	500	μA
I _{CEO}	Collector Cut–off Current	V _{CE} = 450 V, I _B = 0	T _a = 25°C	–	–	100	μA
			T _a = 125°C	–	–	500	μA
I _{EBO}	Emitter Cut–off Current	V _{EB} = 10 V, I _C = 0		–	–	10	μA
h _{FE}	DC Current Gain	V _{CE} = 1 V, I _C = 0.8 A	T _a = 25°C	15	25	–	
			T _a = 125C	10	14	–	
		V _{CE} = 1 V, I _C = 2 A	T _a = 25°C	6	9	–	
			T _a = 125°C	4	6	–	
		V _{CE} = 2.5 V, I _C = 1 A	T _a = 25°C	18	25	–	
			T _a = 125°C	14	18	–	
V _{CE(sat)}	Collector–Emitter Saturation Voltage	I _C = 0.8 A, I _B = 0.08 A	T _a = 25°C	–	0.35	0.5	V
			T _a = 125°C	–	0.55	0.75	V
		I _C = 2 A, I _B = 0.4 A	T _a = 25°C	–	0.47	0.75	V
			T _a = 125°C	–	0.9	1.1	V
		I _C = 0.8 A, I _B = 0.04 A	T _a = 25°C	–	0.9	1.5	V
			T _a = 125°C	–	1.8	2.5	V
		I _C = 1 A, I _B = 0.2 A	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 = 0.8 A, I _B = 0.08 A	T _a = 25°C	–	0.8	1.0	V
			T _a = 125°C	–	0.65	0.9	V
		I _C = 2 A, I _B = 0.4 A	T _a = 25°C	–	0.9	1.0	V
			T _a = 125°C	–	0.8	0.9	V
C _{ib}	Input Capacitance	V _{EB} = 10 V, I _C = 0.5 A, f = 1 MHz		–	550	750	pF
C _{ob}	Output Capacitance	V _{CB} = 10 V, I _E = 0, f = 1 MHz		–	60	100	pF
f _T	Current Gain Bandwidth Product	I _C = 0.5 A, V _{CE} = 10 V		–	11	–	MHz
V _F	Diode Forward Voltage	I _F = 1 A, I _C = 1 mA, I _E = 0	T _a = 25°C	–	0.86	1.3	V
			T _a = 125°C	–	0.79	–	V
		I _F = 2 A	T _a = 25°C	–	0.95	1.5	V
			T _a = 125°C	–	0.88	–	V
t _{fr}	Diode Forward Recovery Time (di/dt = 10 A/μs)	I _F = 0.4 A		–	460	–	ns
		I _F = 1 A		–	360	–	
		I _F = 2 A		–	325	–	
V _{CE(DSAT)}	Dynamic Saturation Voltage	I _C = 1 A, I _{B1} = 100 mA V _{CC} = 300 V at 1 μs	T _a = 25°C	–	8	–	V
			T _a = 125°C	–	15	–	V
		I _C = 1 A, I _{B1} = 100 mA V _{CC} = 300 V at 3 μs	T _a = 25°C	–	2.9	–	V
			T _a = 125°C	–	8	–	V
		I _C = 2 A, I _{B1} = 400 mA V _{CC} = 300 V at 1 μs	T _a = 25°C	–	9	–	V
			T _a = 125°C	–	17	–	V
		I _C = 2 A, I _{B1} = 400 mA V _{CC} = 300 V at 3 μs	T _a = 25°C	–	1.9	–	V
			T _a = 125°C	–	8.5	–	V

KSC5338D

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
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RESISTIVE LOAD SWITCHING (D.C. $\leq 10\%$, Pulse Width = 40 μs)

t _{ON}	Turn On Time	I _C = 2.5 A, I _{B1} = 500 mA, I _{B2} = -1 A, V _{CC} = 250 V, R _L = 100 Ω		–	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 = 2 A, I _{B1} = 400 mA, I _{B2} = -1 A, V _{CC} = 300 V, R _L = 150 Ω	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		T _a = 25°C	–	120	150	ns
			T _a = 125°C	–	150	–	ns
t _{STG}	Storage Time	T _a = 25C°	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 ($V_{CC} = 15\text{ V}$)

t_{STG}	Storage Time	$I_C = 2.5\text{ A}$, $I_{B1} = 500\text{ mA}$, $I_{B2} = -0.5\text{ A}$, $V_Z = 350\text{ V}$, $L_C = 300\ \mu\text{H}$	$T_a = 25^\circ\text{C}$	–	1.9	2.2	μs
			$T_a = 125^\circ\text{C}$	–	2.4	–	μs
t_F	Fall Time		$T_a = 25^\circ\text{C}$	–	160	200	ns
			$T_a = 125^\circ\text{C}$	–	330	–	ns
t_C	Cross-over Time		$T_a = 25^\circ\text{C}$	–	350	500	ns
			$T_a = 125^\circ\text{C}$	–	750	–	ns
t_{STG}	Storage Time	$I_C = 2\text{ A}$, $I_{B1} = 400\text{ mA}$, $I_{B2} = -0.4\text{ A}$, $V_Z = 300\text{ V}$, $L_C = 200\ \mu\text{H}$	$T_a = 25^\circ\text{C}$	1.95	–	2.25	μs
			$T_a = 125^\circ\text{C}$	–	2.9	–	μs
t_F	Fall Time		$T_a = 25^\circ\text{C}$	–	120	150	ns
			$T_a = 125^\circ\text{C}$	–	270	–	ns
t_C	Cross-over Time		$T_a = 25^\circ\text{C}$	–	300	450	ns
			$T_a = 125^\circ\text{C}$	–	700	–	ns
t_{STG}	Storage Time	$I_C = 1\text{ A}$, $I_{B1} = 100\text{ mA}$, $I_{B2} = -0.5\text{ A}$, $V_Z = 300\text{ V}$, $L_C = 200\ \mu\text{H}$	$T_a = 25^\circ\text{C}$	–	0.6	0.8	μs
			$T_a = 125^\circ\text{C}$	–	1.0	–	μs
t_F	Fall Time		$T_a = 25^\circ\text{C}$	–	70	–	ns
			$T_a = 125^\circ\text{C}$	–	110	–	ns
t_C	Cross-over Time		$T_a = 25^\circ\text{C}$	–	80	130	ns
			$T_a = 125^\circ\text{C}$	–	170	–	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

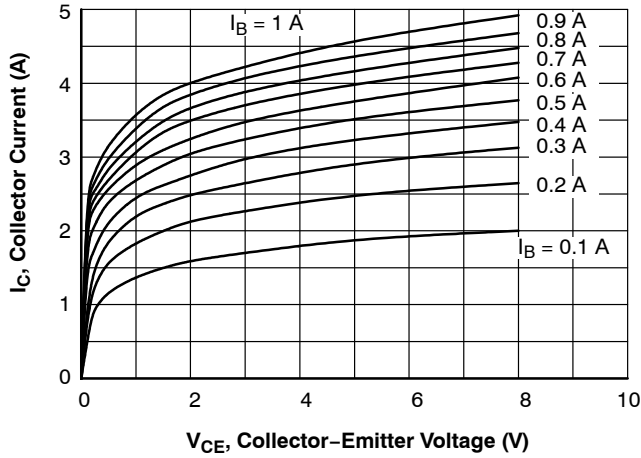


Figure 1. Static Characteristic

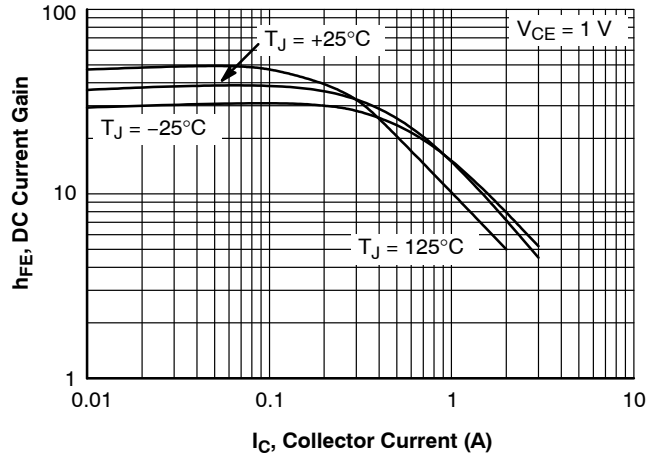


Figure 2. DC Current Gain

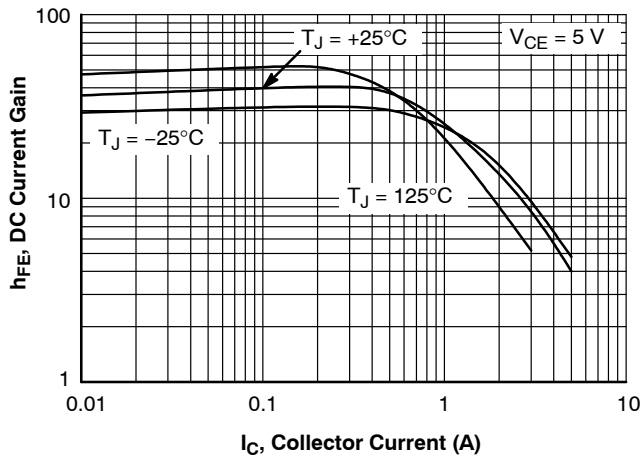


Figure 3. DC Current Gain

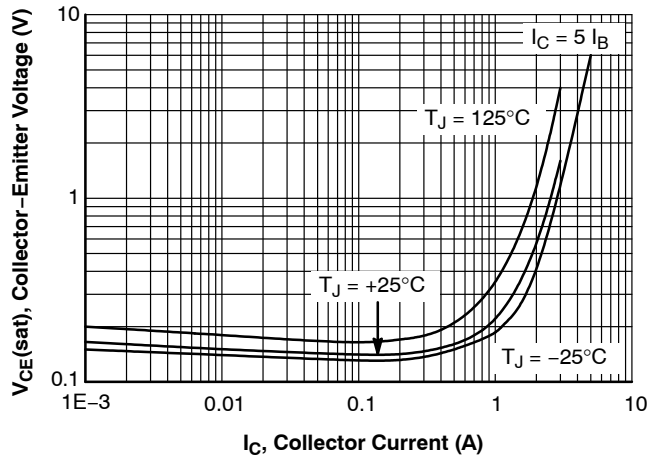


Figure 4. Collector-Emitter Saturation Voltage

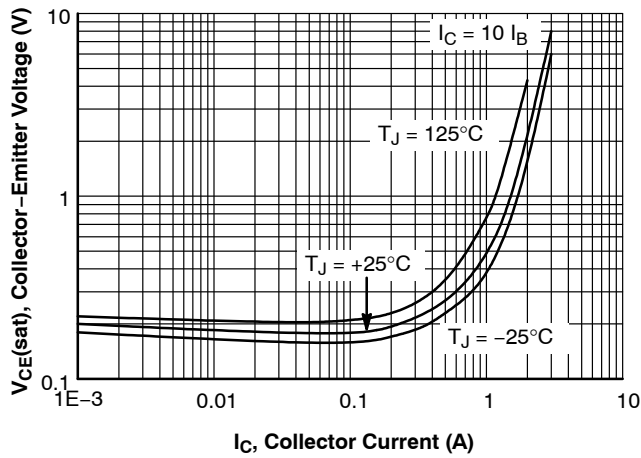


Figure 5. Collector-Emitter Saturation Voltage

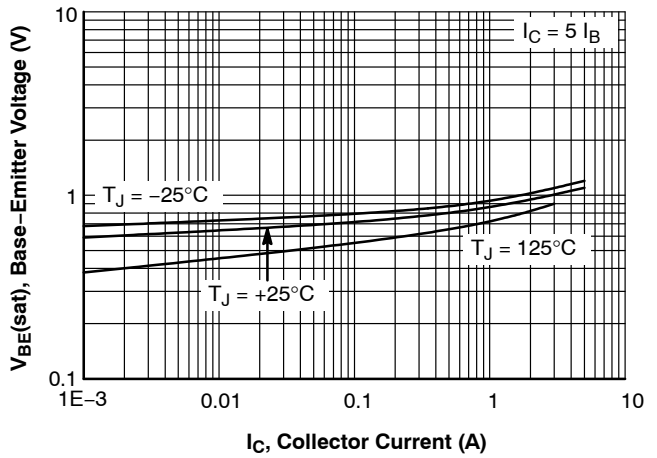


Figure 6. Base-Emitter Saturation Voltage

TYPICAL CHARACTERISTICS (continued)

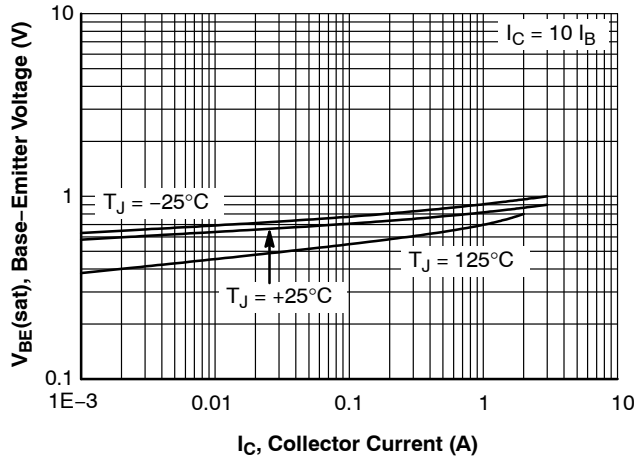


Figure 7. Base-Emitter Saturation Voltage

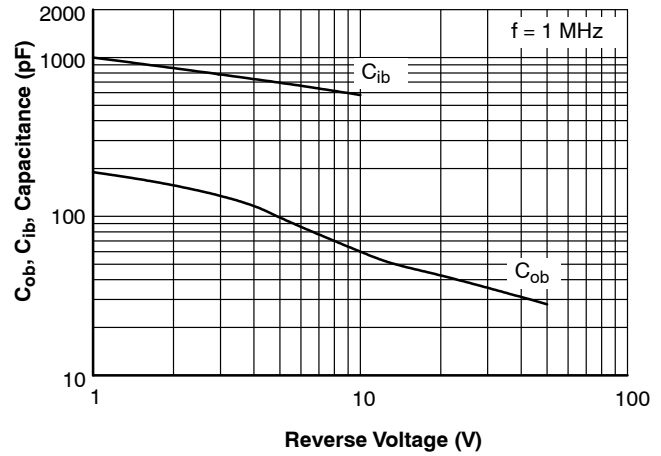


Figure 8. Collector Output Capacitance

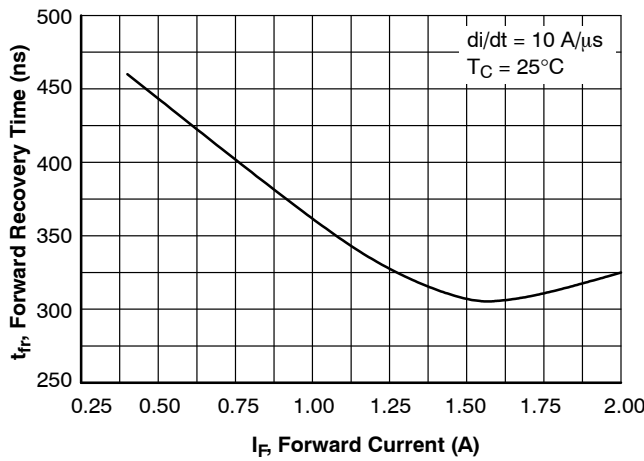


Figure 9. Forward Recovery Time

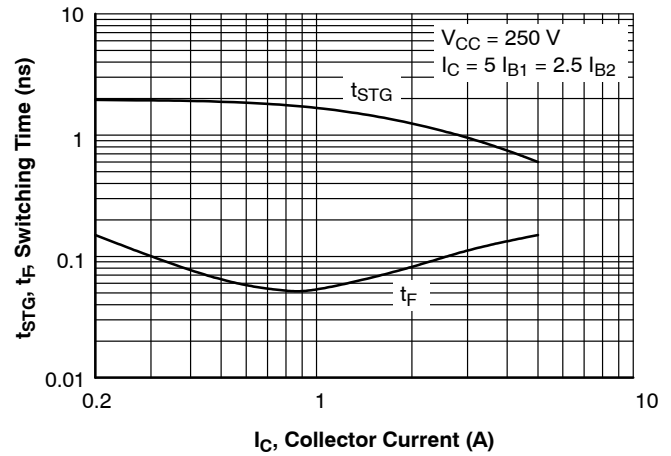


Figure 10. Switching Time

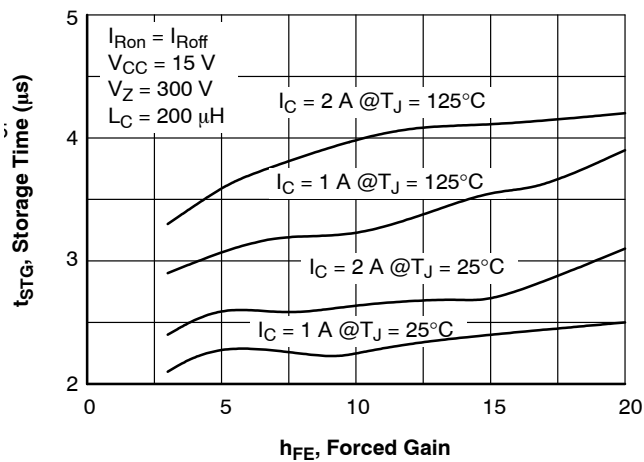


Figure 11. Induction Storage Time

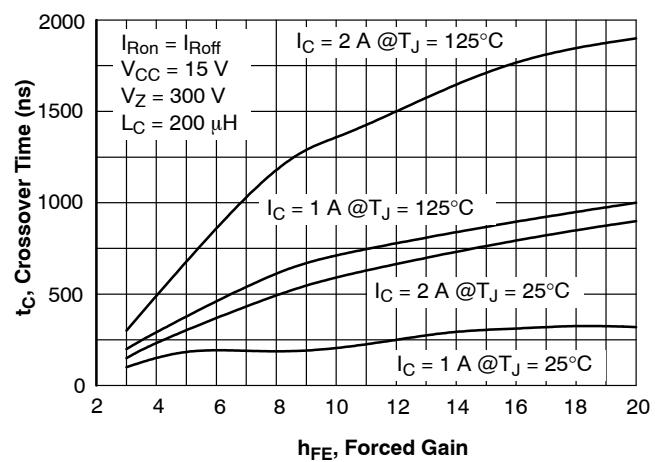


Figure 12. Inductive Crossover Time

TYPICAL CHARACTERISTICS (continued)

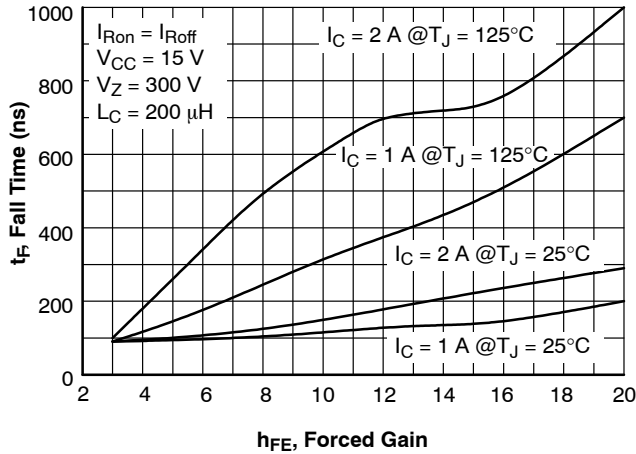


Figure 13. Inductive Fall Time

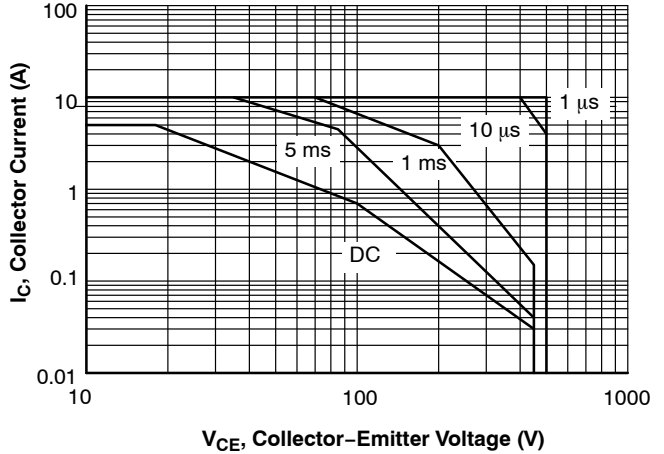


Figure 14. Safe Operating Area

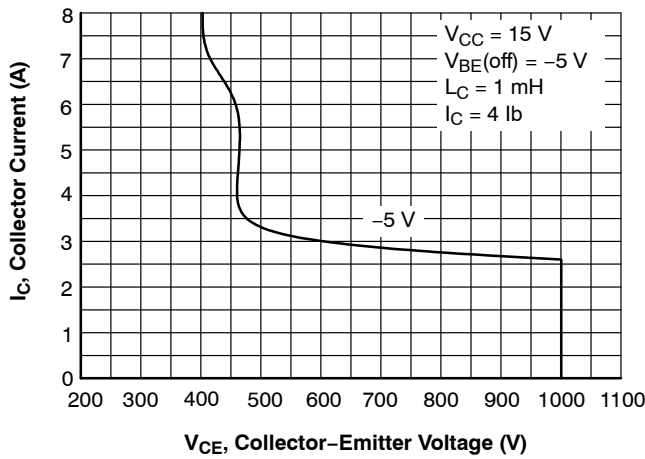


Figure 15. Reverse Bias Safe Operating

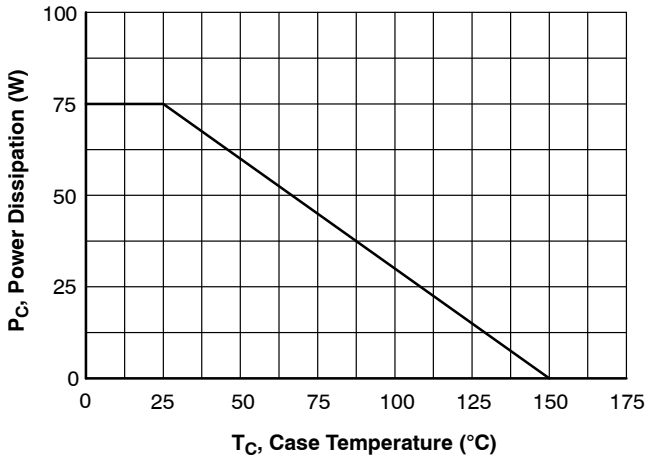


Figure 16. Power Derating

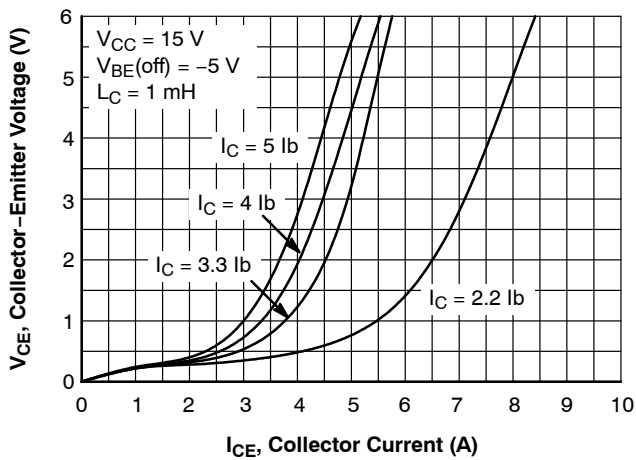


Figure 17. RBSOA Saturation



TO-220-3LD
CASE 340AT
ISSUE B

DATE 08 AUG 2022

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.00	--	4.70
A1	SEE NOTE "F"		
A2	2.10	--	2.85
b	0.55	--	1.00
b2	1.10	--	1.62
b4	1.42	--	1.62
c	0.36	--	0.60
D	13.90	--	16.30
D1	8.13	--	9.40
D2	11.50	--	14.30
D3	15.42	--	16.51
E	9.65	--	10.67
E1	7.59	--	8.65
e	2.40	--	2.67
H1	6.06	--	6.69
L	12.70	--	14.04
L1	2.70	--	4.10
P	3.50	--	4.00
Q	2.50	--	3.40
z	2.13 REF		
z1	2.06 REF		
θ	3°	--	5°

IF PRESENT, SEE NOTE "D"

GENERIC
MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



NOTES:

- A) REFERENCE JEDEC, TO-220, VARIATION AB
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [].
- D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
- E) DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS AS BELOW:
SINGLE GAUGE = 0.51 - 0.61
DUAL GAUGE = 1.10 - 1.45
- PRESENCE IS SUPPLIER DEPENDENT
- H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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DESCRIPTION:	TO-220-3LD	PAGE 1 OF 1

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