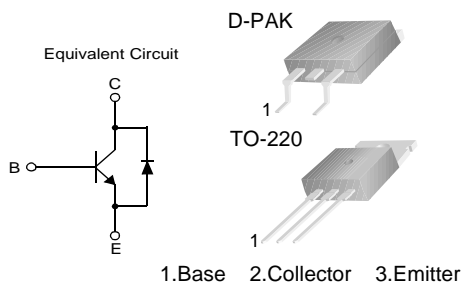


KSC5402D/KSC5402DT

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



NPN Silicon Transistor Planar Silicon Transistor

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ 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($T_C=25^\circ\text{C}$) : D-PAK * : TO-220	30 50	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature	- 65 ~ 150	$^\circ\text{C}$

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

Thermal Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Characteristics	Rating		Unit	
		TO-220	D-PAK		
$R_{\theta jc}$	Thermal Resistance	Junction to Case	2.5	4.17 *	$^\circ\text{C}/\text{W}$
$R_{\theta ja}$		Junction to Ambient	62.5	50	
T_L	Maximum Lead Temperature for Soldering Purpose ; 1/8" from Case for 5 Seconds		270	270	$^\circ\text{C}$

* Mounted on 1" square PCB (FR4 ro G-10 Material)

Electrical Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

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

Electrical Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

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

Typical Characteristics

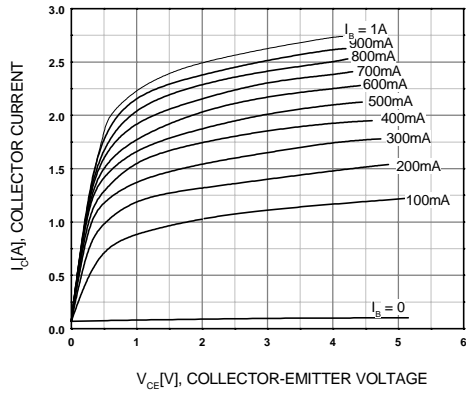


Figure 1. Static Characteristic

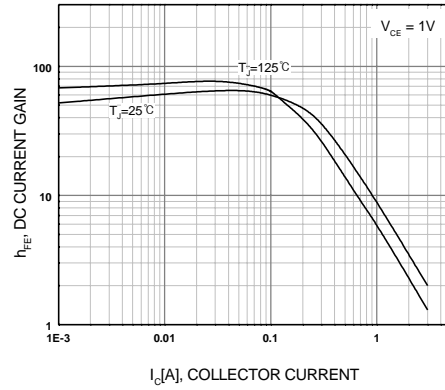


Figure 2. DC current Gain

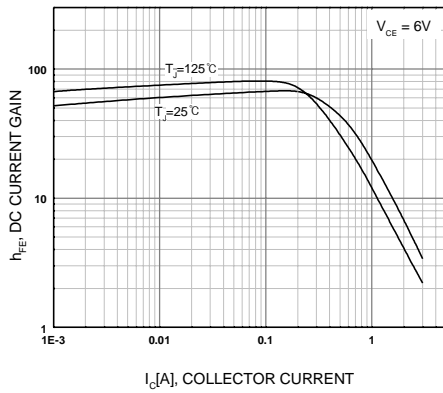


Figure 3. DC current Gain

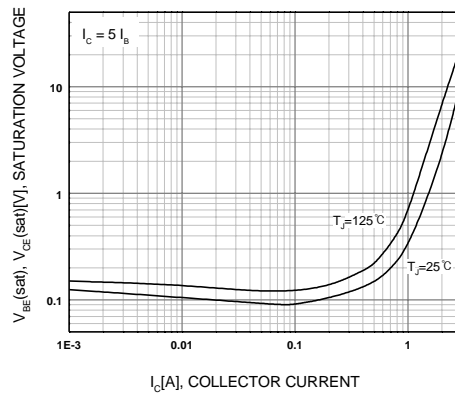


Figure 4. Collector-Emitter Saturation Voltage

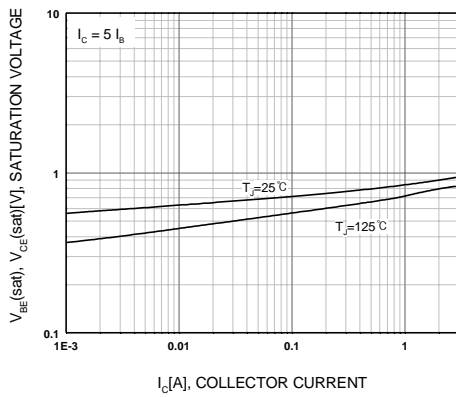


Figure 5. Base-Emitter Saturation Voltage

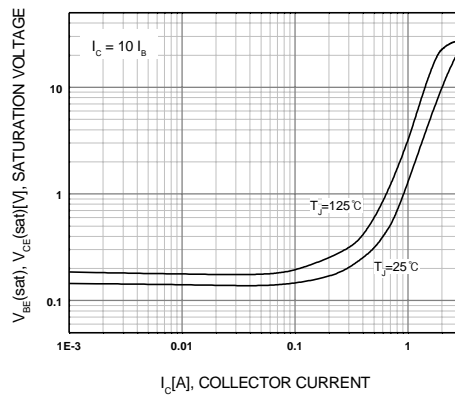


Figure 6. Collector-Emitter Saturation Voltage

Typical Characteristics (Continued)

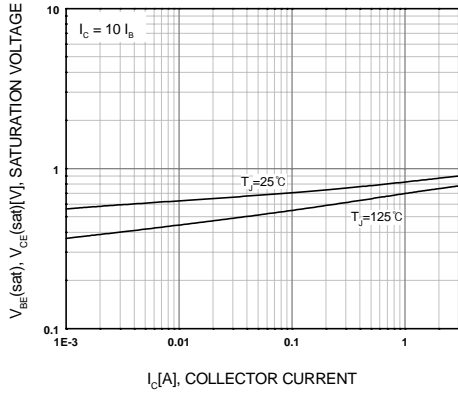


Figure 7. Base-Emitter Saturation Voltage

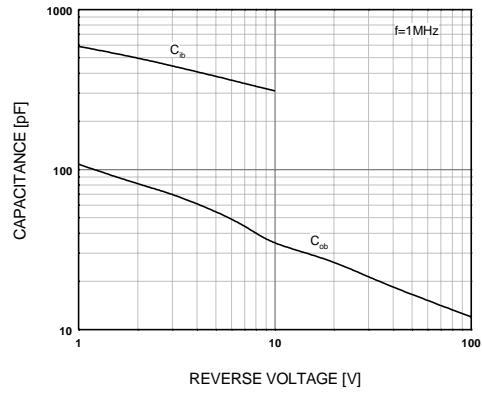


Figure 8. Collector Output Capacitance

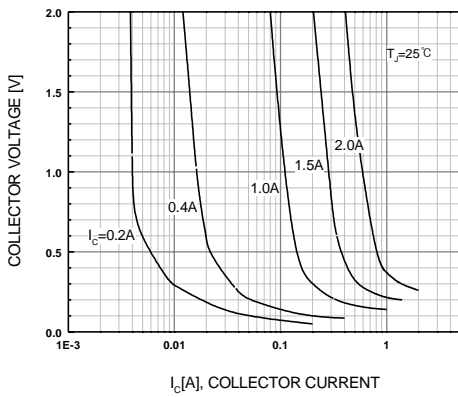


Figure 9. Typical Collector Saturation Region

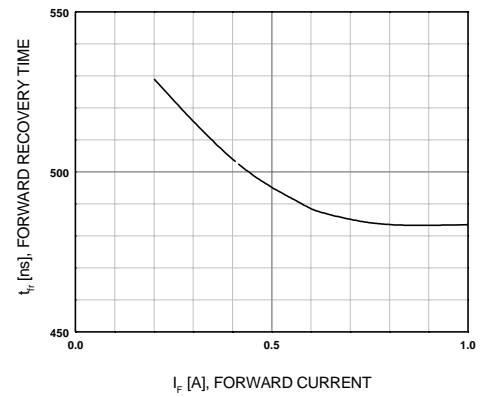


Figure 10. Forward Recovery Time

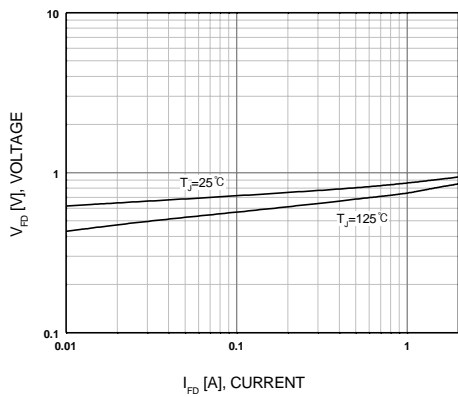


Figure 11. Diode Forward Voltage

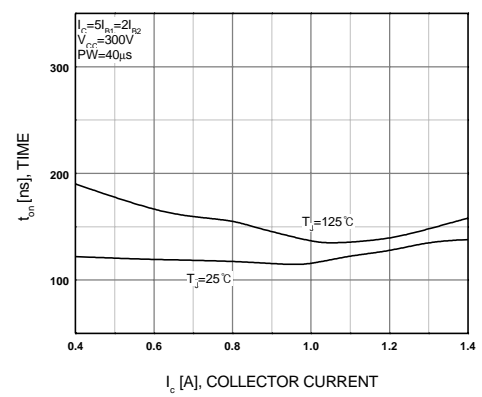


Figure 12. Resistive Switching Time, t_{on}

Typical Characteristics (Continued)

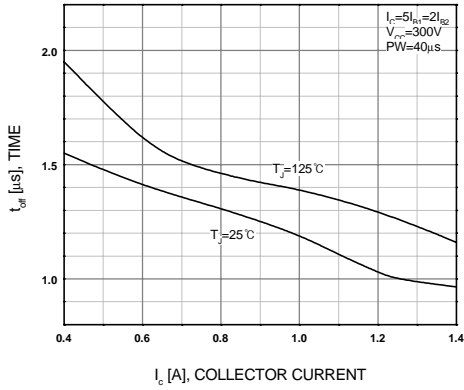


Figure 13. Resistive Switching Time, t_{off}

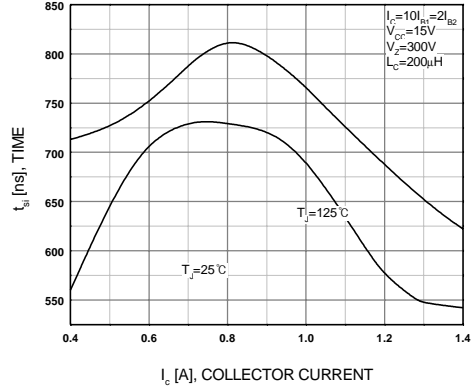


Figure 14. Inductive Switching Time, t_{si}

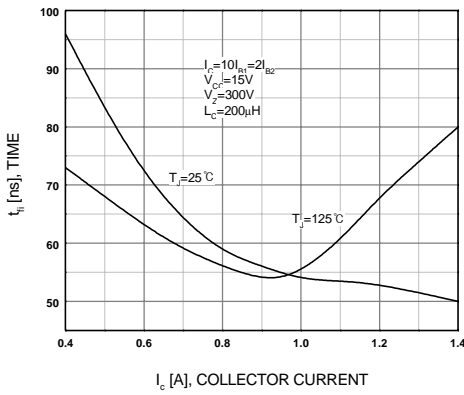


Figure 15. Inductive Switching Time, t_{fi}

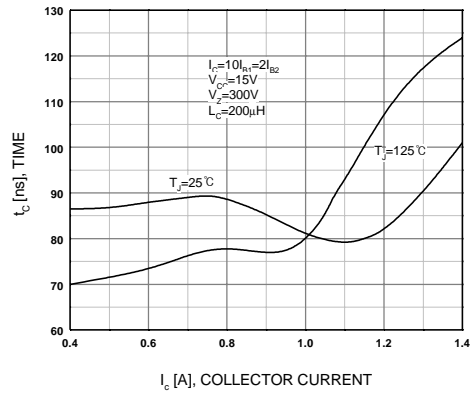


Figure 16. Inductive Switching Time, t_c

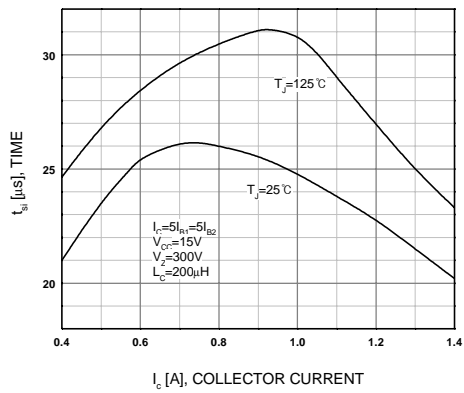


Figure 17. Inductive Switching Time, t_{si}

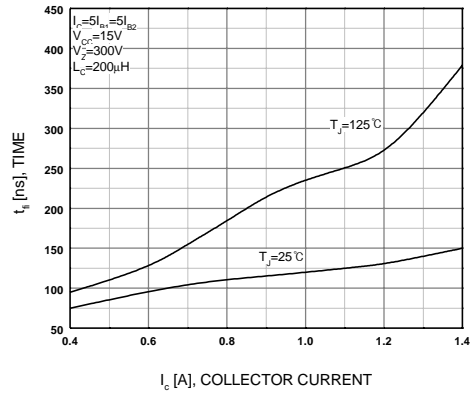


Figure 18. Inductive Switching Time, t_{fi}

Typical Characteristics (Continued)

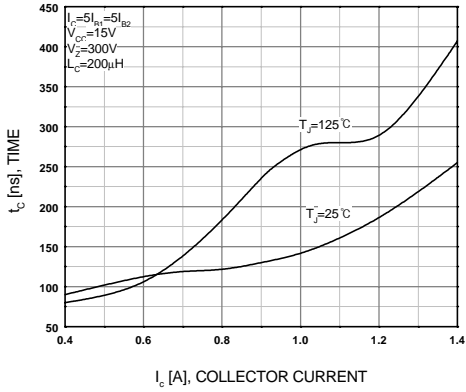


Figure 19. Inductive Switching Time, t_c

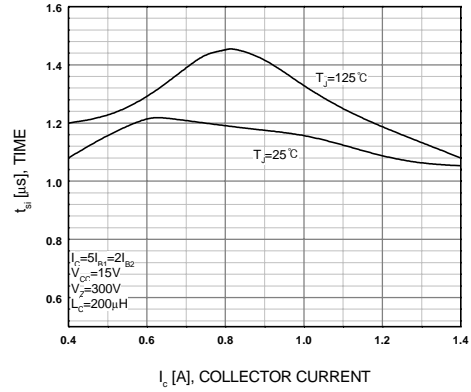


Figure 20. Inductive Switching Time, t_{si}

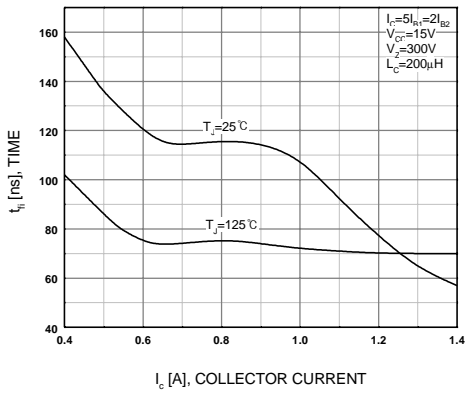


Figure 21. Inductive Switching Time, t_{fi}

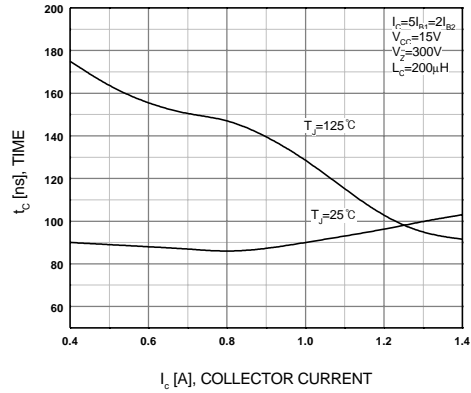


Figure 22. Inductive Switching Time, t_c

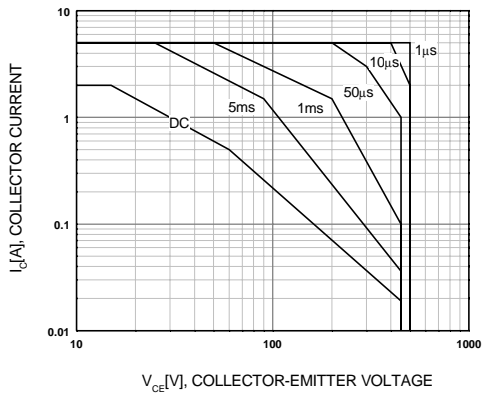


Figure 23. Forward Bias Safe Operating Area

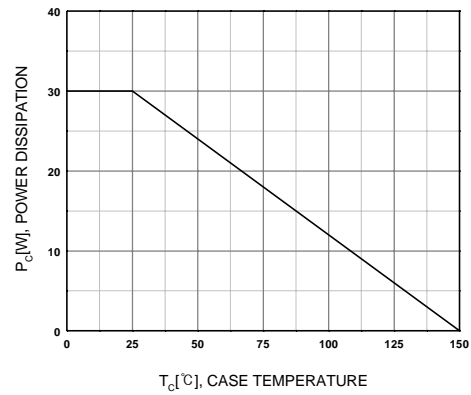
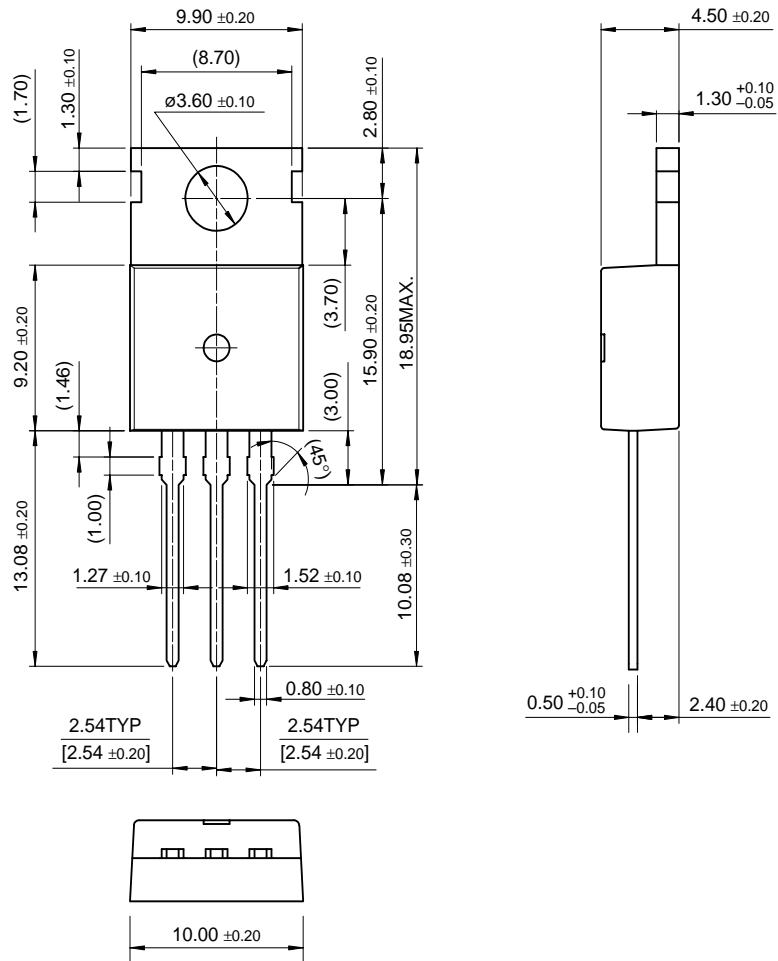


Figure 24. Power Derating

Package Dimensions

TO-220



Dimensions in Millimeters

KSC5402D/KSC5402DT

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