

One Watt Darlington Transistors

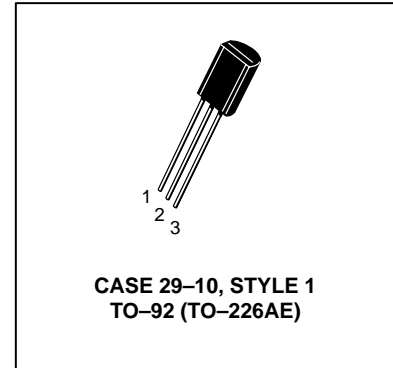
NPN Silicon

MPSW45 MPSW45A*

*ON Semiconductor Preferred Device

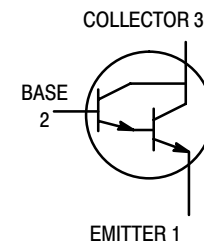
MAXIMUM RATINGS

Rating	Symbol	MPSW45	MPSW45A	Unit
Collector–Emitter Voltage	V_{CES}	40	50	Vdc
Collector–Base Voltage	V_{CBO}	50	60	Vdc
Emitter–Base Voltage	V_{EBO}	12	12	Vdc
Collector Current — Continuous	I_C	1.0	1.0	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.0 8.0		Watts mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	2.5 20		Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +150		$^\circ\text{C}$



THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	125	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	50	$^\circ\text{C}/\text{W}$



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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ($I_C = 100 \mu\text{Adc}, V_{BE} = 0$)	MPSW45 MPSW45A	$V_{(BR)CES}$	40 50	— —	Vdc
Collector–Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}, I_E = 0$)	MPSW45 MPSW45A	$V_{(BR)CBO}$	50 60	— —	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$)		$V_{(BR)EBO}$	12	—	Vdc
Collector Cutoff Current ($V_{CB} = 30 \text{Vdc}, I_E = 0$) ($V_{CB} = 40 \text{Vdc}, I_E = 0$)	MPSW45 MPSW45A	I_{CBO}	— —	100 100	nAdc
Emitter Cutoff Current ($V_{EB} = 10 \text{Vdc}, I_C = 0$)		I_{EBO}	—	100	nAdc

Preferred devices are ON Semiconductor recommended choices for future use and best overall value.

MPSW45 MPSW45A

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS⁽¹⁾				
DC Current Gain ($I_C = 200\text{ mAdc}$, $V_{CE} = 5.0\text{ Vdc}$) ($I_C = 500\text{ mAdc}$, $V_{CE} = 5.0\text{ Vdc}$) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	25,000 15,000 4,000	150,000 — —	—
Collector–Emitter Saturation Voltage ($I_C = 1.0\text{ Adc}$, $I_B = 2.0\text{ mAdc}$)	$V_{CE(sat)}$	—	1.5	Vdc
Base–Emitter Saturation Voltage ($I_C = 1.0\text{ Adc}$, $I_B = 2.0\text{ mAdc}$)	$V_{BE(sat)}$	—	2.0	Vdc
Base–Emitter On Voltage ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$)	$V_{BE(on)}$	—	2.0	Vdc

SMALL–SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product ($I_C = 200\text{ mAdc}$, $V_{CE} = 5.0\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	100	—	MHz
Collector–Base Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{cb}	—	6.0	pF

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$; Duty Cycle $\leq 2.0\%$.

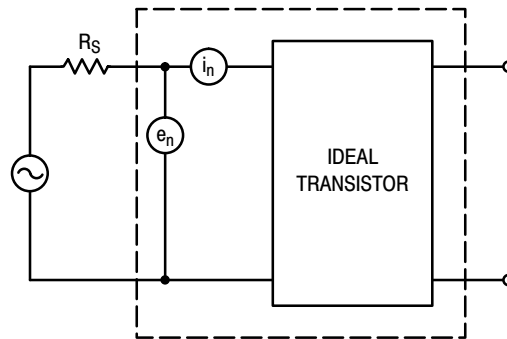


Figure 1. Transistor Noise Model

MPSW45 MPSW45A

NOISE CHARACTERISTICS

($V_{CE} = 5.0 \text{ Vdc}$, $T_A = 25^\circ\text{C}$)

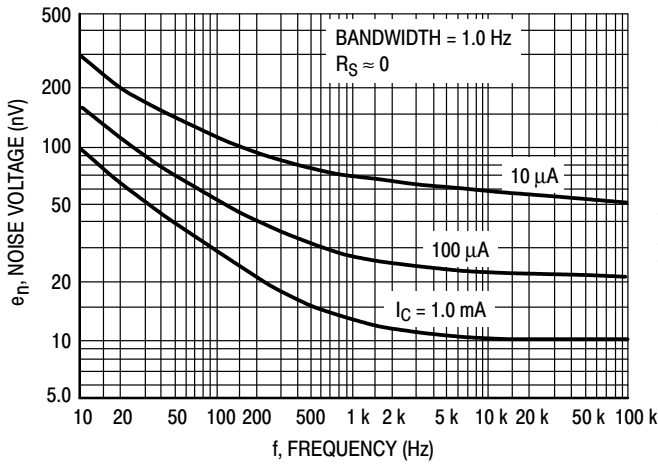


Figure 2. Noise Voltage

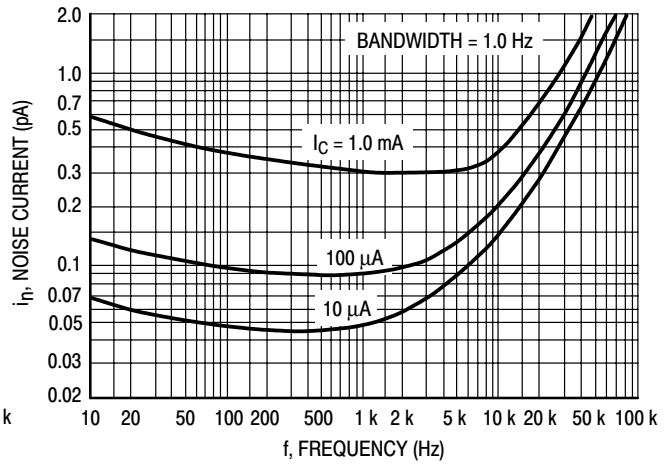


Figure 3. Noise Current

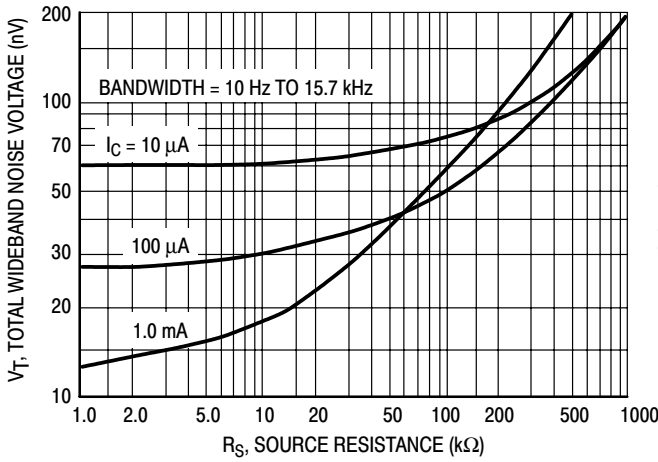


Figure 4. Total Wideband Noise Voltage

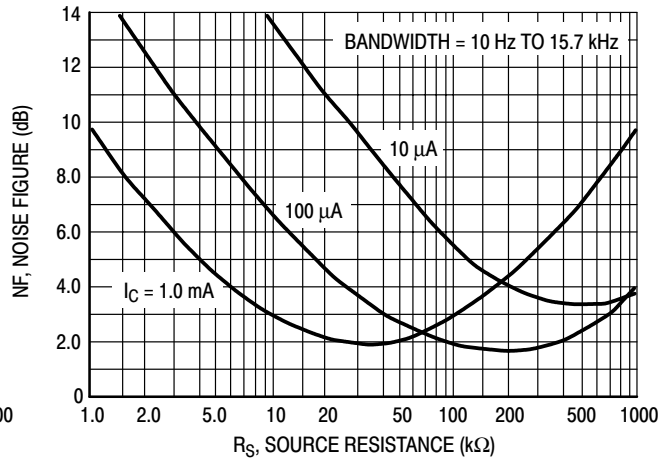


Figure 5. Wideband Noise Figure

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SMALL-SIGNAL CHARACTERISTICS

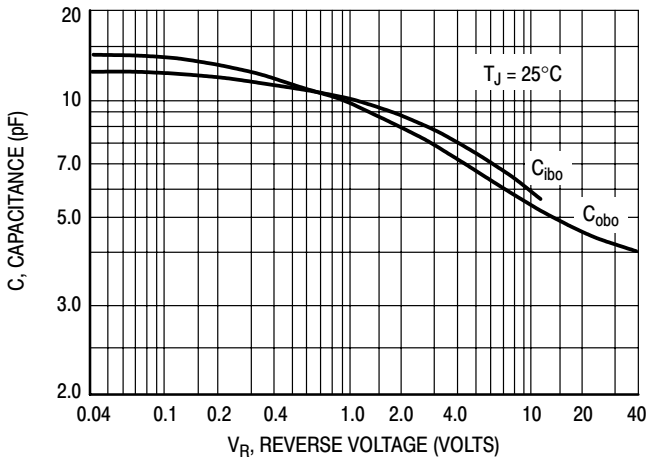


Figure 6. Capacitance

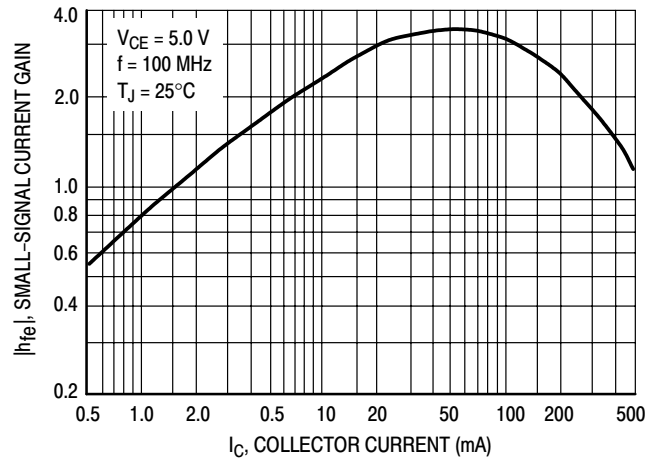


Figure 7. High Frequency Current Gain

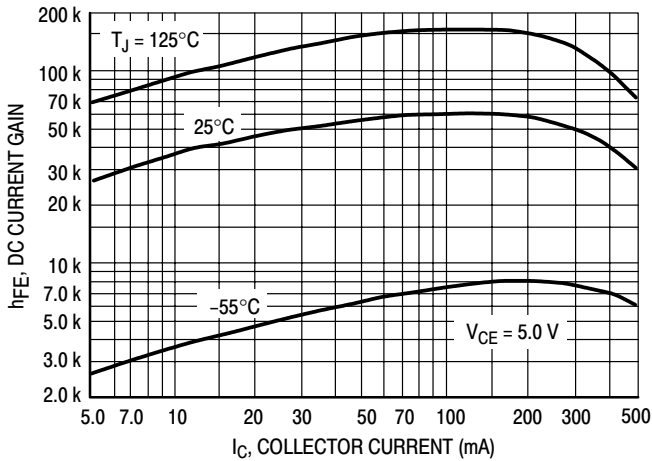


Figure 8. DC Current Gain

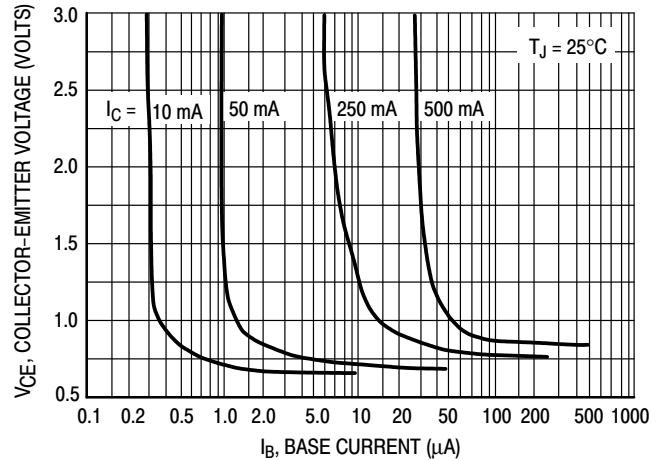


Figure 9. Collector Saturation Region

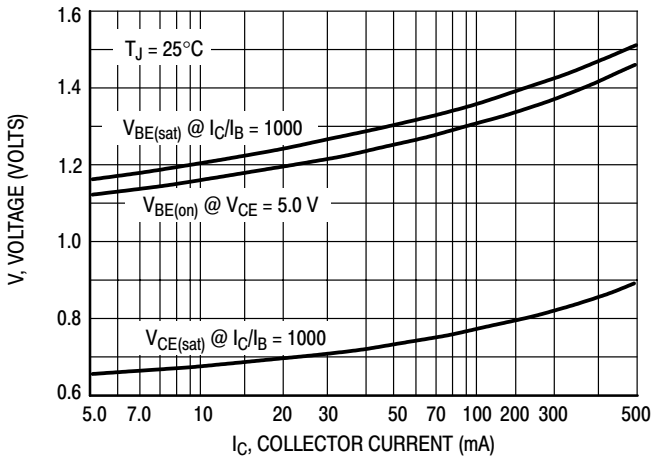


Figure 10. "On" Voltages

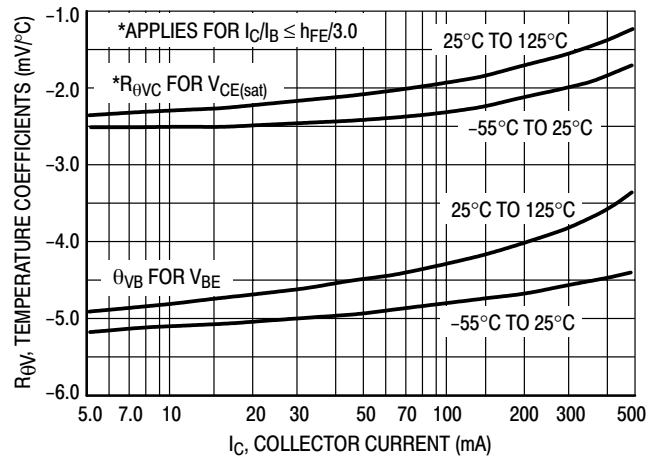


Figure 11. Temperature Coefficients

MPSW45 MPSW45A

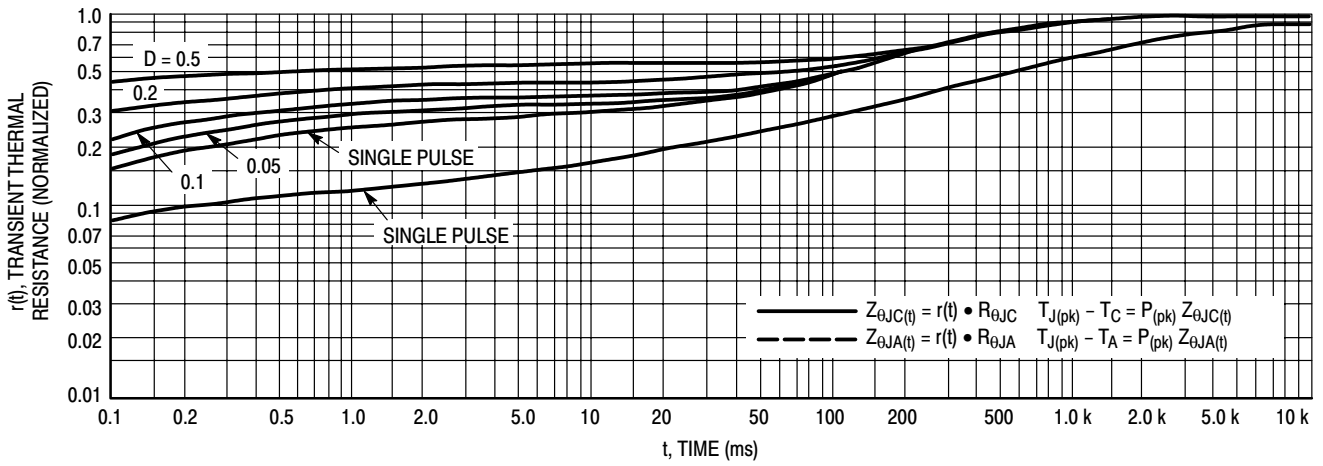


Figure 12. Thermal Response

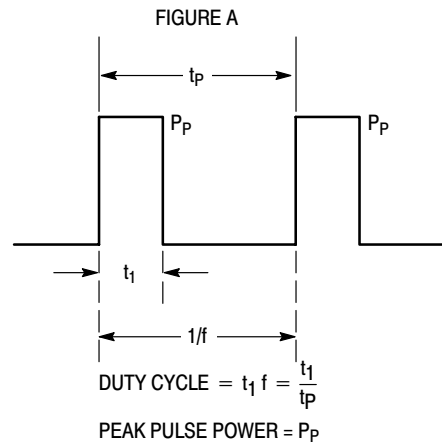
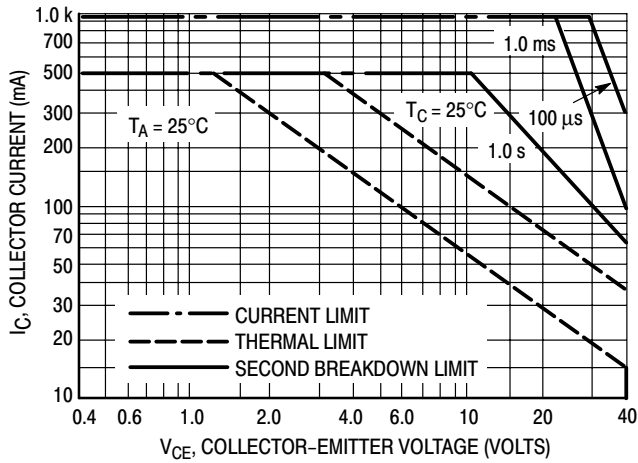


Figure 13. Active Region Safe Operating Area Design Note: Use of Transient Thermal Resistance Data