

APPLICATION NOTE

Solder Mounted Packaged Transistors

INTRODUCTION

This document is a supplement to Cree's data sheet. It describes the recommended conditions under which Cree's packaged transistors are to be soldered into amplifiers.

SOLDER TEMPERATURES DEFINED

The maximum reflow temperature for metal-ceramic packaged transistors is 245 °C with a maximum dwell time of 30 seconds above 240 °C. Time maintained above 217 °C shall not exceed 150 seconds. Time between 150 °C and 200 °C during pre-heat shall not exceed 120 seconds. The maximum temperature ramp up and ramp down rates are 3 °C/sec and 6 °C/sec, respectively. Time from ambient to peak temperature shall not exceed 8 minutes. Devices shall be subjected to no more than 3 reflow cycles as defined above. All temperatures refer to the temperature measured at the top side of package body surface (top surface of the lid).

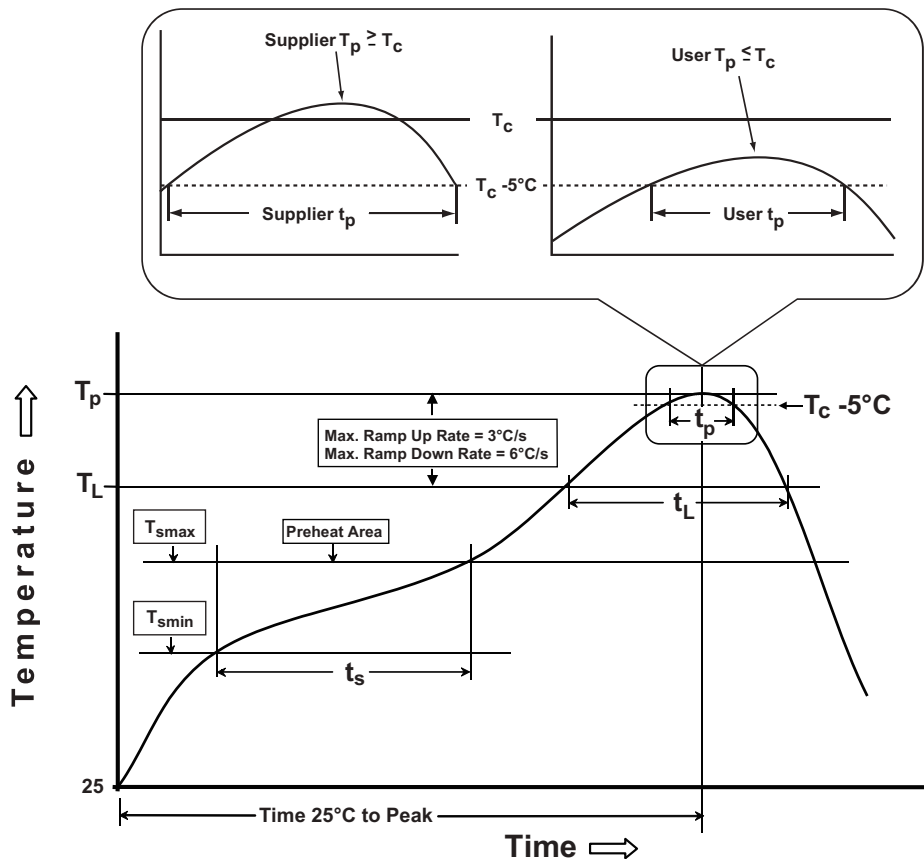


Figure 1 -Classical Profile¹.



SOLDER PROFILE DEFINITION

This table is adapted from JEDEC Standard¹ IPC/JEDEC J-STD-020D.1 as applicable to Cree’s GaN HEMT and SiC MESFET package-based transistors.

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak		
Temperature Min (T_{smin})	100 °C	150 °C
Temperature Max (T_{smax})	150 °C	200 °C
Time (t_s) from (T_{smin} to T_{smax})	60-120 seconds	60-120 seconds
Ramp-up rate (T_L to T_p)	3 °C / second max.	3 °C / second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body temperature (T_p)	220 °C	245 °C
Time (t_p)* within 5 °C of the specified classification temperature (T_c)	20* seconds	30* seconds
Ramp-down rate (T_p to T_L)	6 °C / second max.	6 °C / second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Table 1 -Profile Definition

* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

SOLDERING DEVICE PACKAGE TO A HEATSINK

One of the recommended solder types is Sn/Pb/Ag, 62/36/2 eutectic solder paste with an eutectic point of 179 °C. A screen printable solder paste with a wet thickness of 6 +/- 1 mils is standard. For Pb-free solder one recommendation is SAC305 (Sn 96.5, Ag 3.0, Cu 0.5). It is recommended to use flux coated preforms, coated with Kester 290 S flux, 1.5 % or equivalent. The interface must be free of voids in the solder.

Recommended preform sizes for Cree “pill” package transistors:

- 440109, 440196 - 15 mils thick preform (minimum of 8 mils solder thickness after reflow)

SOLDERING LEADS TO A PCB

One of the recommended solder types is Sn/Pb/Ag, 62/36/2 eutectic solder paste with an eutectic point of 179 °C. A screen printable solder paste with a wet thickness of 6 +/- 1 mils is standard. For Pb-free solder one recommendation is SAC305 (Sn 96.5, Ag 3.0, Cu 0.5).

REFERENCE

¹ Joint Industry Standard, “Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices.” IPC/JEDEC J-STD-020D.1. March 2008.