

Dual N-Channel Enhancement Mode MOSFET

Features

- **Dual N**
60V/0.26A
 $R_{DS(ON)} = 2.2 \Omega$ (max.)@ $V_{GS} = 10V$
 $R_{DS(ON)} = 2.6 \Omega$ (max.)@ $V_{GS} = 4.5V$
ESD Protection
- Reliable and Rugged
- Lead Free and Green Devices Available
(RoHS Compliant)
- Moisture Sensitivity Level MSL 1
(per JEDEC J-STD-020D)

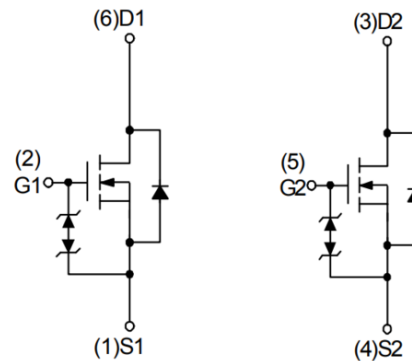
Applications

- Load switch.
- High-speed line driver.
- Switching circuits.

Pin Description

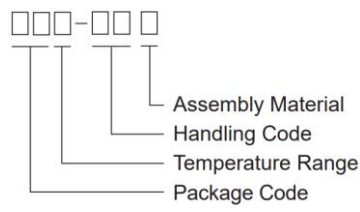


SOT-363



N Channel MOSFET

Ordering and Marking Information

SM1660DS □□□-□□□  Assembly Material Handling Code Temperature Range Package Code	SM1660DS CS  X - Lot Code
Package Code - CS : SOT-363 Operating Junction Temperature Range - C : -55 to 150°C	Handling Code - TR : Tape and Reel Assembly Material - G : Halogen and Lead Free Device

Note : SINOPOWER lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. SINOPOWER lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. SINOPOWER defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

SINOPOWER reserves the right to make changes to improve reliability or manufacturability without notice and advise customers to obtain the latest version of relevant information to verify before placing orders.

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Condition	Dual N	Unit
V_{DS}	Drain-Source Voltage	$T_A=25^{\circ}\text{C}$	60	V
V_{GS}	Gate-Source Voltage		± 20	
T_J	Maximum Junction Temperature		150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range		-55 to 150	
I_S	Diode Continuous Forward Current	$T_C=25^{\circ}\text{C}$	0.1	A
I_D	Continuous Drain Current	$T_A=25^{\circ}\text{C}$	0.26	
		$T_A=70^{\circ}\text{C}$	0.21	
I_{DM}^a	Pulse Drain Current	$T_A=25^{\circ}\text{C}$	1	
P_D	Maximum Power Dissipation	$T_A=25^{\circ}\text{C}$	0.25	W
		$T_A=70^{\circ}\text{C}$	0.16	
$R_{\theta JA}^b$	Thermal Resistance-Junction to Ambient	Steady State	500	$^{\circ}\text{C/W}$

Note a : Pulse width is limited by maximum junction temperature

Note b : Surface mounted on 1in² pad area.

Dual N Electrical Characteristics ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

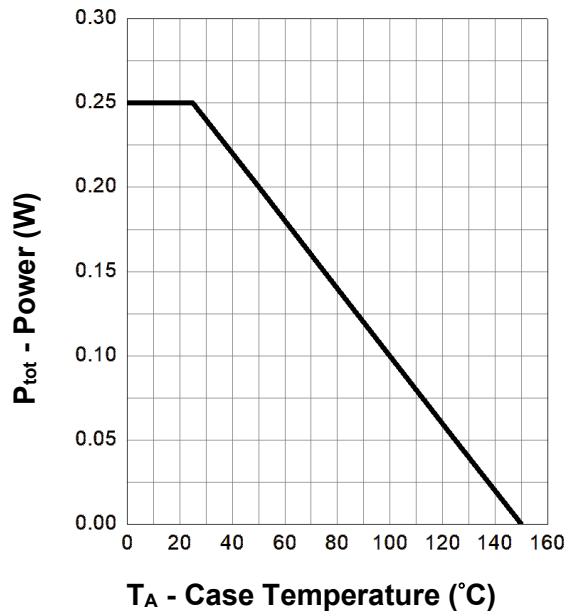
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V	-	-	1	μA
		V _{DS} =48V, V _{GS} =0V, T _J =85°C	-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	2	2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±10	μA
R _{DS(ON)} ^c	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =100mA	-	1.8	2.2	Ω
		V _{GS} =4.5V, I _{DS} =50mA	-	2	2.6	
Diode Characteristics						
V _{SD} ^c	Diode Forward Voltage	I _{SD} =100mA, V _{GS} =0V	-	0.8	1.3	V
t _{rr} ^d	Reverse Recovery Time	I _{SD} =1A, dI _{SD} /dt=100A/μs	-	13	-	ns
Q _{rr} ^d	Reverse Recovery Charge		-	8	-	nC
Dynamic Characteristicse ^d						
C _{iss}	Input Capacitance	V _{GS} =0V,V _{DS} =30V, Frequency=1.0MHz	-	24	32	pF
C _{oss}	Output Capacitance		-	5.5	-	
C _{rss}	Reverse Transfer Capacitance		-	2.5	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =30V,R _L =300Ω, I _{DS} =0.1A,V _{GEN} =10V,R _G =6Ω	-	3	6	ns
t _r	Turn-on Rise Time		-	7	13	
t _{d(OFF)}	Turn-off Delay Time		-	10	18	
t _f	Turn-off Fall Time		-	12	22	
Gate Charge Characteristics ^d						
Q _g	Total Gate Charge	V _{DS} =30V, V _{GS} =10V, I _{DS} =1A	-	1.6	2.3	nC
Q _{gs}	Gate-Source Charge		-	0.6	-	
Q _{gd}	Gate-Drain Charge		-	0.1	-	

Note c : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

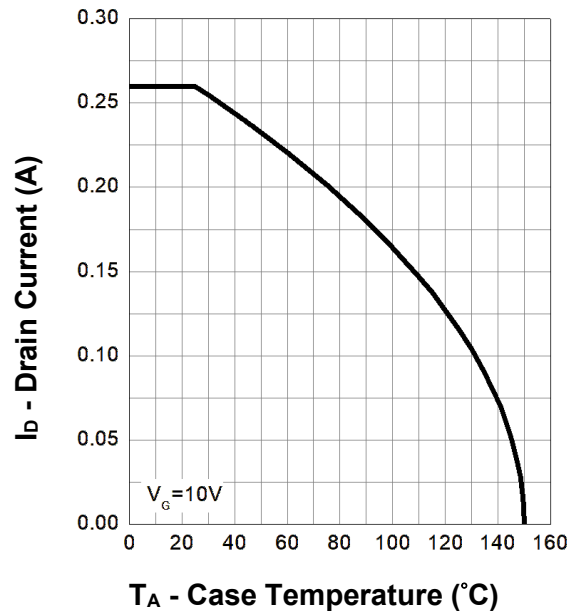
Note d : Guaranteed by design, not subject to production testing.

Dual N Typical Operating Characteristics

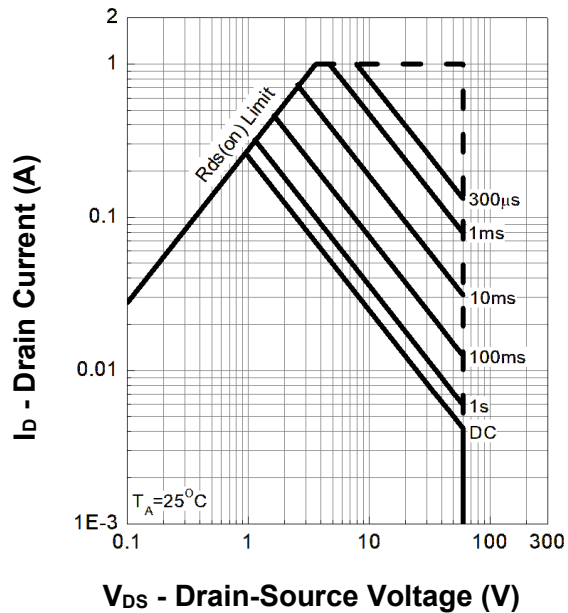
Power Dissipation



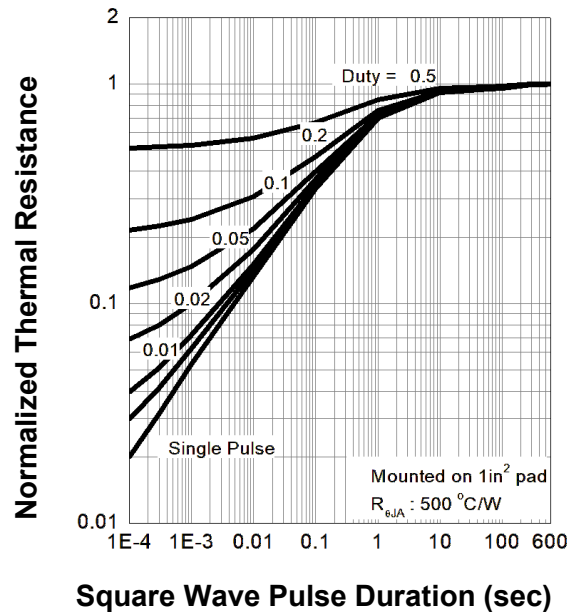
Drain Current



Safe Operation Area

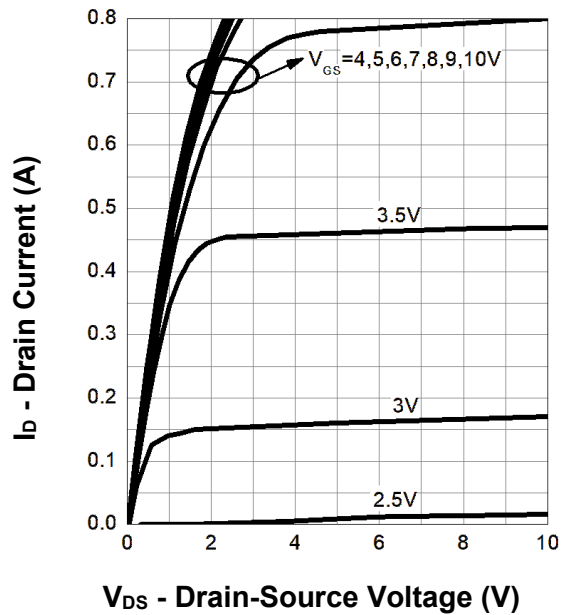


Thermal Transient Impedance

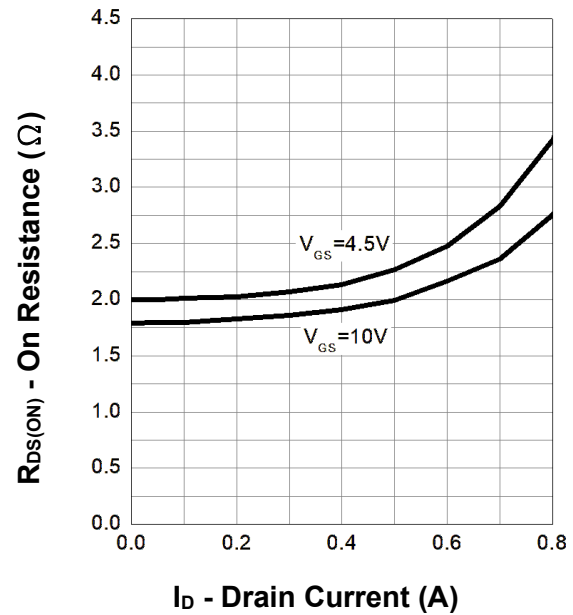


Dual N Typical Operating Characteristics(Cont.)

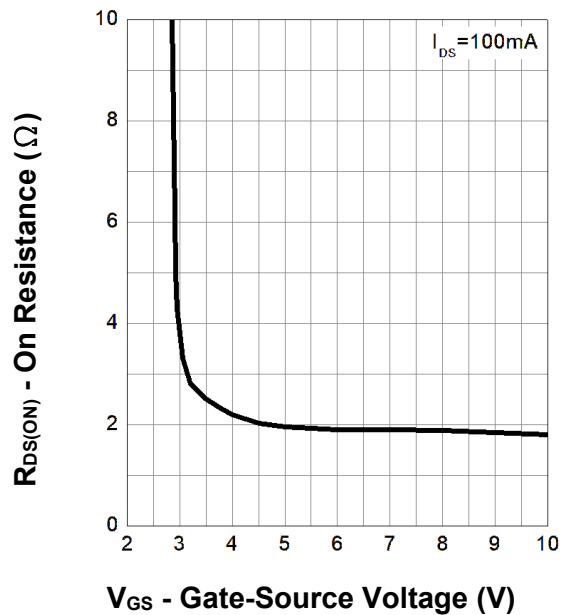
Output Characteristics



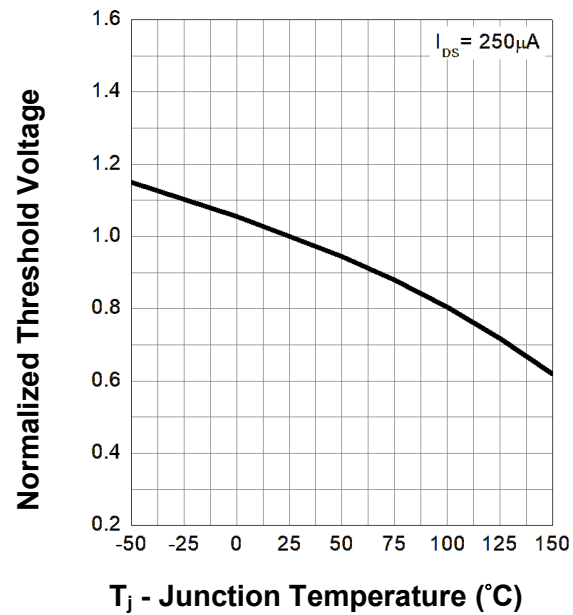
Drain-Source On Resistance



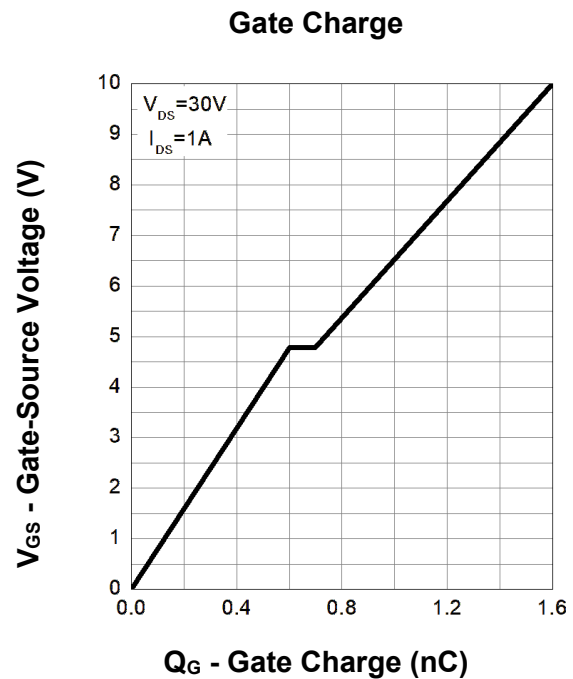
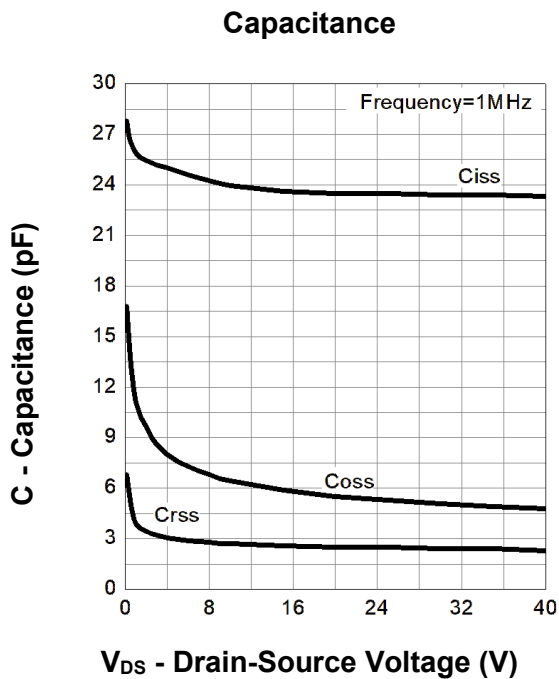
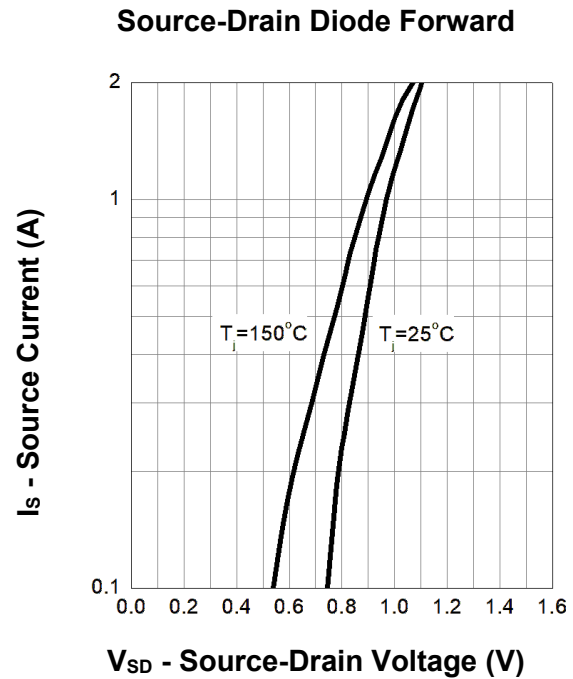
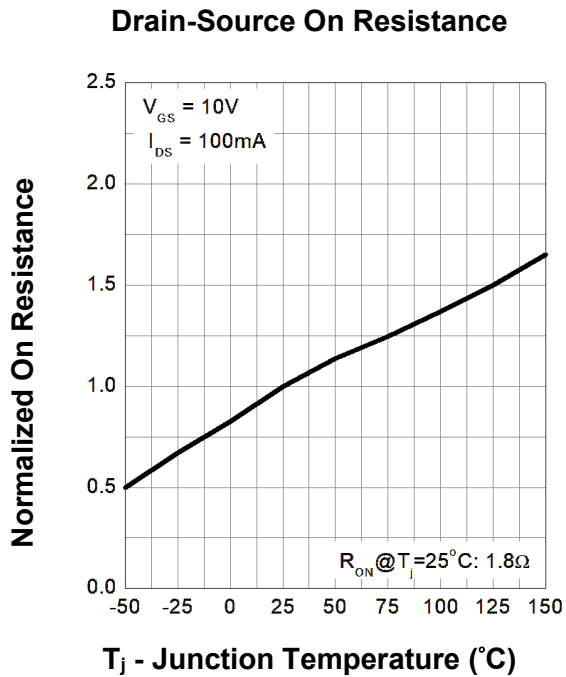
Gate-Source On Resistance



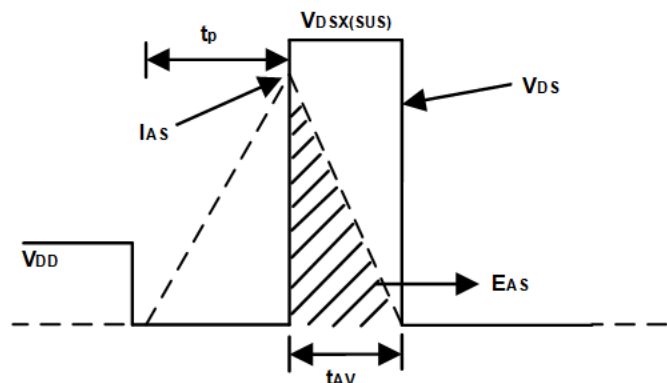
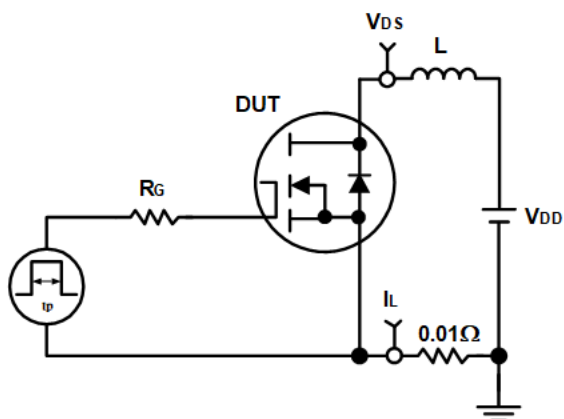
Gate Threshold Voltage



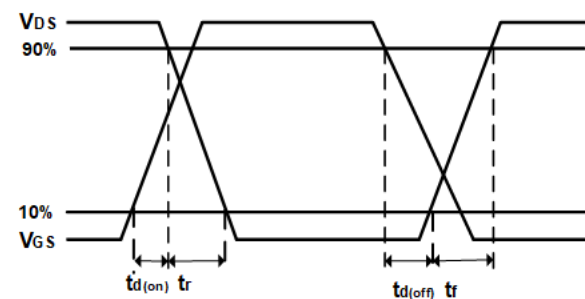
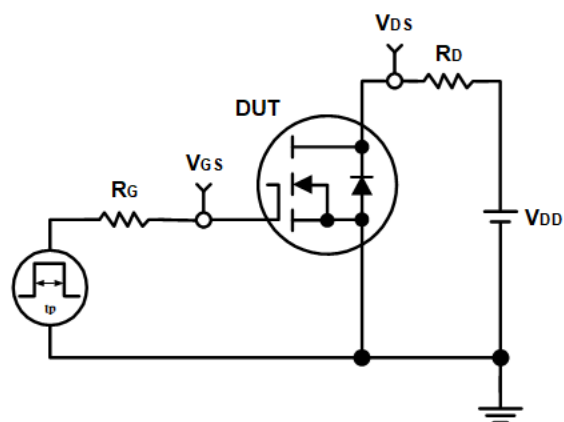
Dual N Typical Operating Characteristics(Cont.)



Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



Disclaimer

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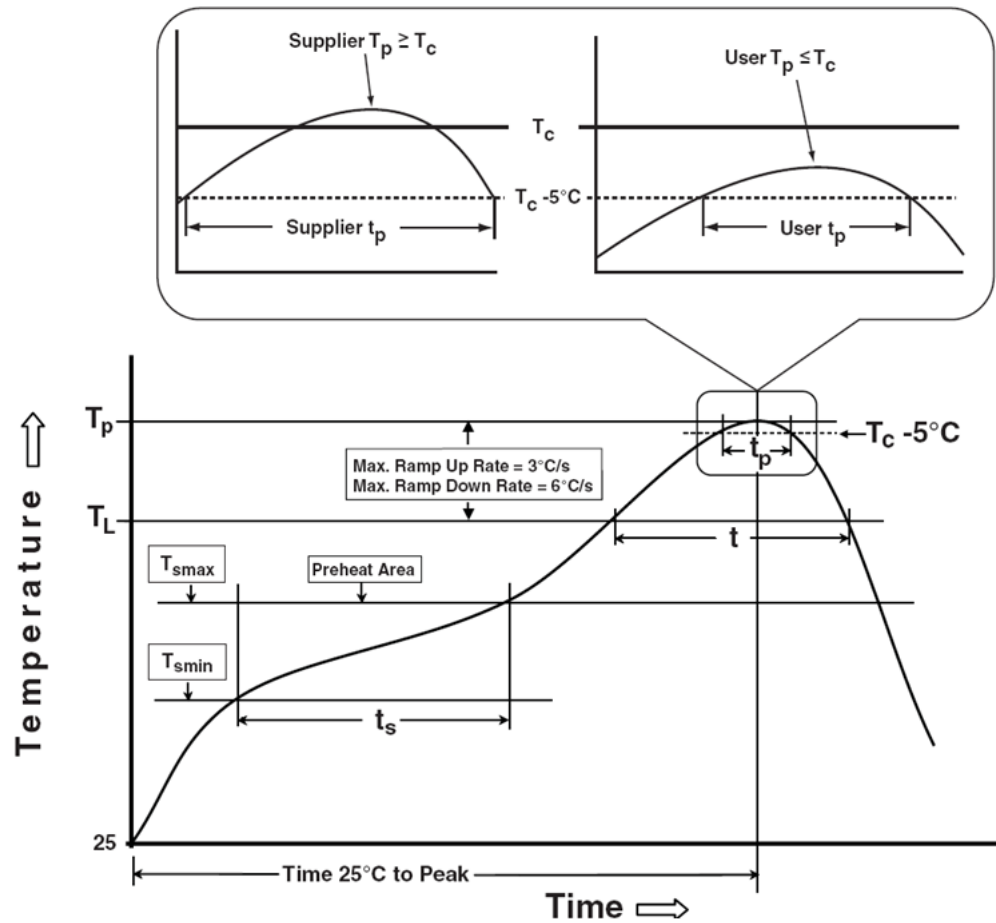
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Classification Profile



Classification Reflow Profiles

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_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_p)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum.		
** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

Customer Service

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