

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
-60V	5.5mΩ@-10V	-130A
	7.5mΩ@-4.5V	


合肥矽普半导体

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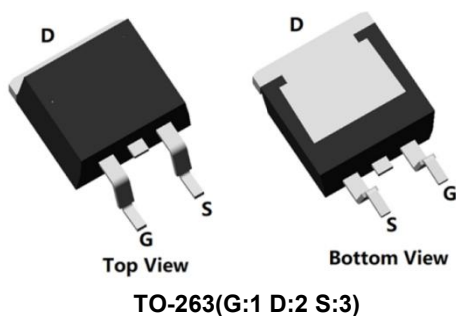
Feature

- Fast Switching
- Low Gate Charge and Rdson
- 100% Single Pulse avalanche energy Test

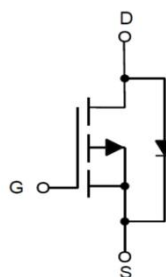
Applications

- Power switching application
- DC-DC Converter
- Power Management

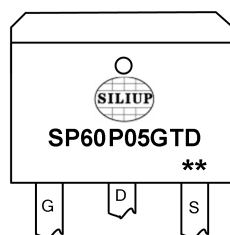
Package



Circuit diagram



Marking



SP60P05GTD : Product code
 ** : Week code

Order Information

Device	Package	Unit/Tape
SP60P05GTD	TO-263	800

**Absolute maximum ratings (Ta=25°C, unless otherwise noted)**

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Tc=25°C)	I_D	-130	A
Continuous Drain Current (Tc=100°C)	I_D	-87	A
Pulse Drain Current Tested	I_{DM}	-520	A
Single pulsed avalanche energy ¹	E_{AS}	1092	mJ
Maximum Power Dissipation (Tc=25°C)	P_D	153	W
Maximum Power Dissipation (Tc=100°C)	P_D	61	W
Thermal Resistance-Junction to Case	$R_{\theta JC}$	0.82	°C/W
Maximum Junction Temperature	T_J	-55 to 150	°C
Storage Temperature Range	T_{STG}	-55 to 150	°C

Electrical characteristics (Ta=25°C, unless otherwise noted)

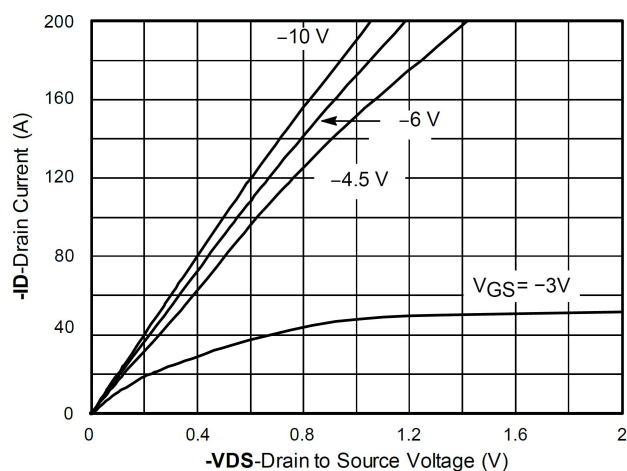
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=-250uA	-60	-	-	V
Drain-Source Leakage Current	IDSS	VDS=-48V , VGS=0V , TJ=25℃	-	-	-1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=-250uA	-1.6	-2.0	-2.5	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=-10V , ID=-30A	-	5.5	7.4	mΩ
		VGS=-4.5V , ID=-30A	-	7.5	10.0	
Gate Resistance	RG	VDS=-30V , VGS=0V , f=1MHz	-	2.08	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=-30V , VGS=0V , f=1MHz	-	5208	-	pF
Output Capacitance	Coss		-	922	-	
Reverse Transfer Capacitance	Crss		-	84	-	
Total Gate Charge	Qg	VDS=-30V , VGS=-10V , ID=-20A	-	76	-	nC
Gate-Source Charge	Qgs		-	20	-	
Gate-Drain Charge	Qgd		-	14	-	
Gate Plateau Voltage	Vplateau		-	-3.8	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=-30V , VGS=-10V , RG=3Ω , ID=-20A	-	20	-	ns
Rise Time	Tr		-	12	-	
Turn-Off Delay Time	Td(off)		-	42	-	
Fall Time	Tf		-	12	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=-1A , TJ=25℃	-	-	-1.2	V
Diode Continuous Current	IS		-	-	-130	A
Reverse recover time	Trr	IS=-40A , di/dt=200A/us , TJ=25℃	-	72	-	ns
Reverse recovery charge	Qrr		-	88	-	nC

Note:

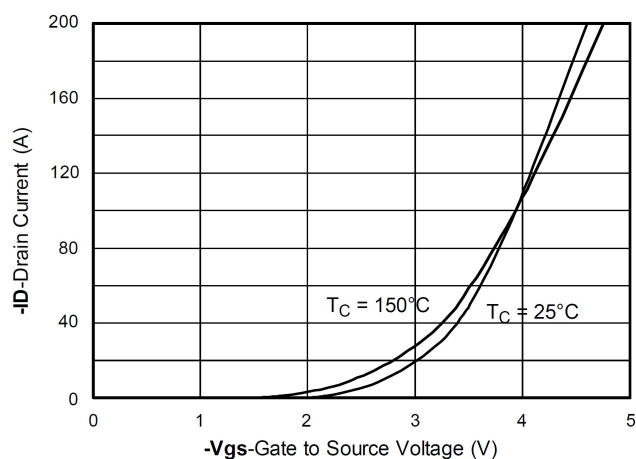
1. The EAS test condition is $V_{DD}=-30V$, $V_{GS}=-10V$, $L=0.5mH$, $R_g=25\Omega$;



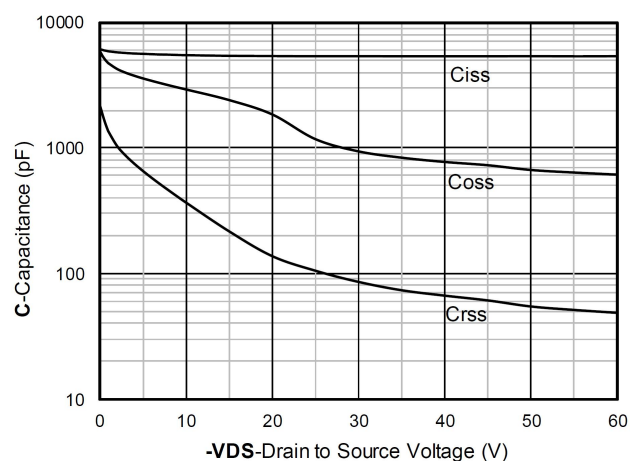
Typical Characteristics



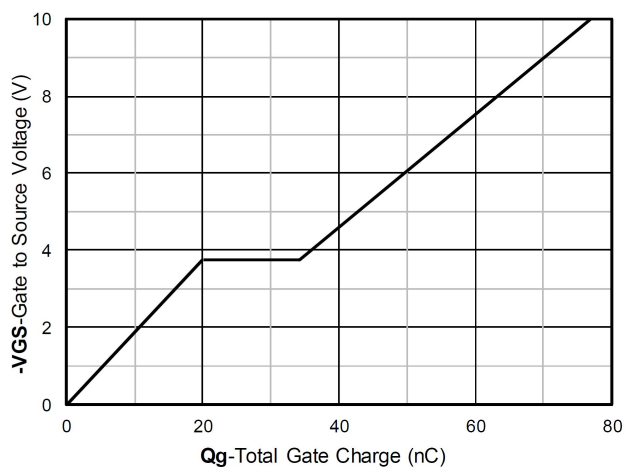
Output Characteristics



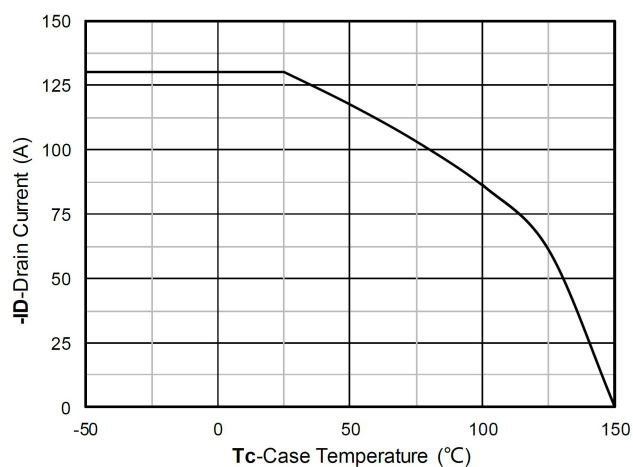
Transfer Characteristics



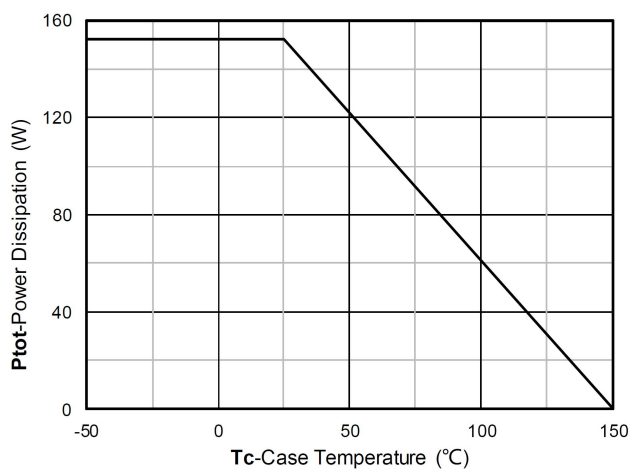
Capacitance Characteristics



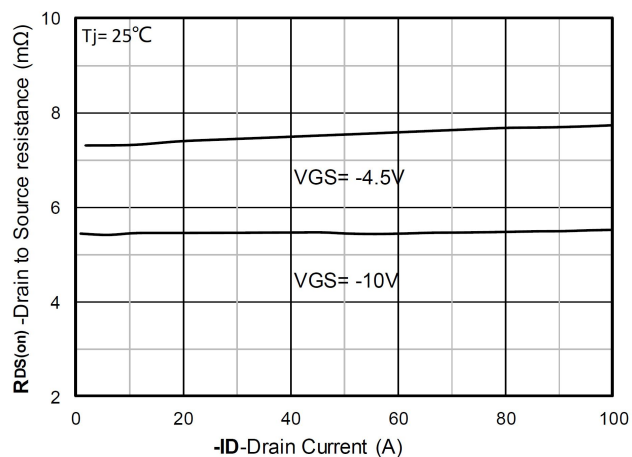
Gate Charge



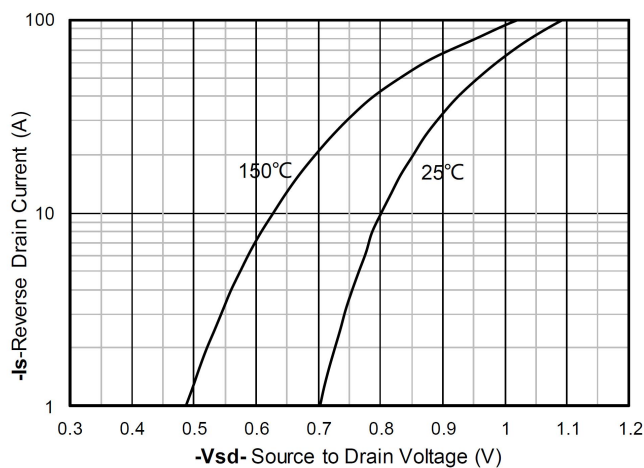
Current dissipation



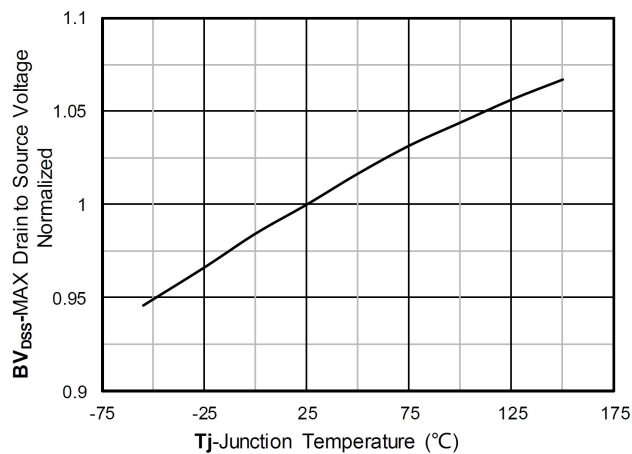
Power dissipation



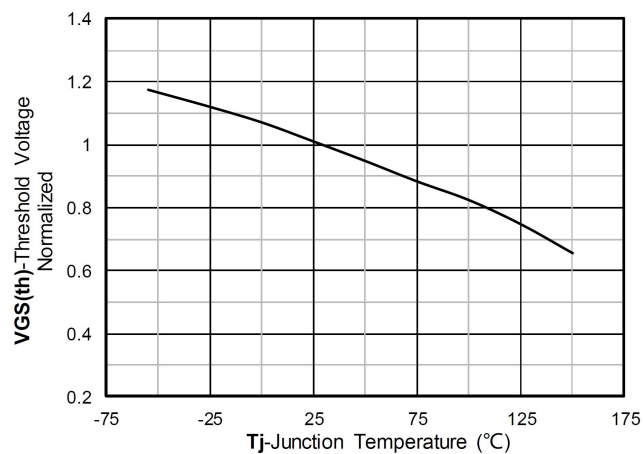
$R_{DS(on)}$ VS Drain Current



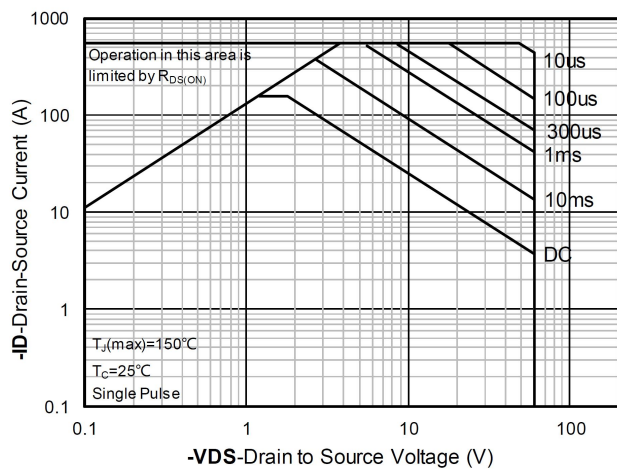
Forward characteristics of reverse diode



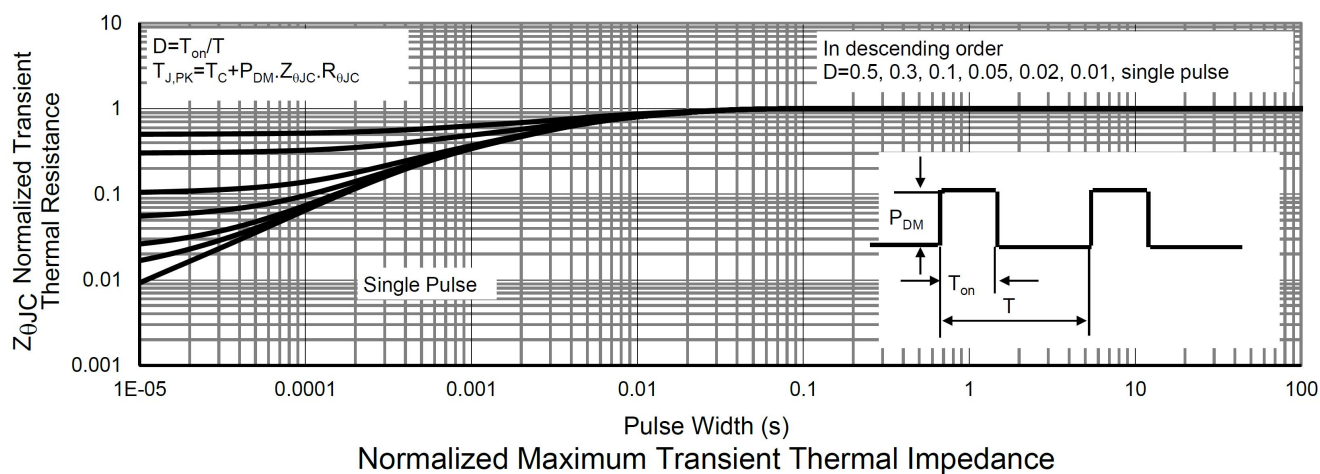
Normalized breakdown voltage



Normalized Threshold voltage



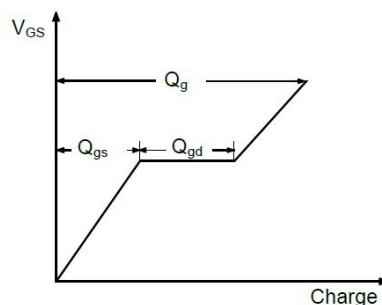
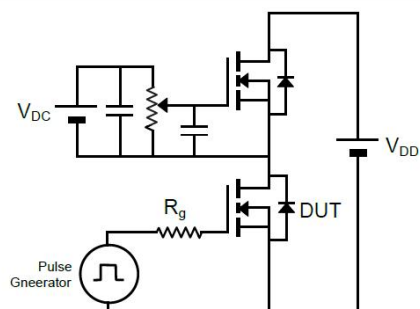
Safe Operation Area



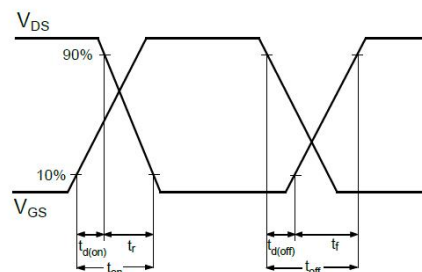
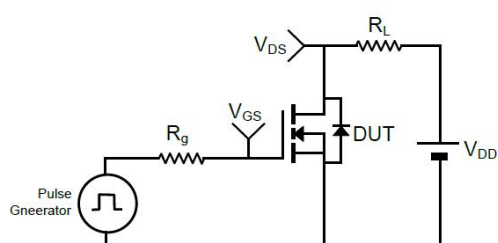


Test Circuit

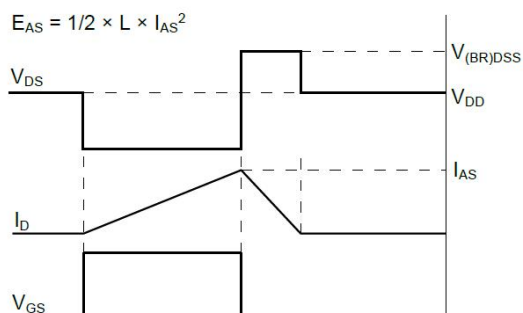
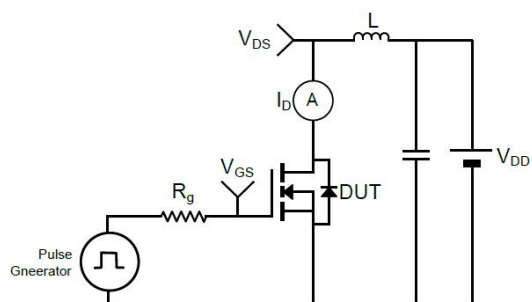
Gate Charge



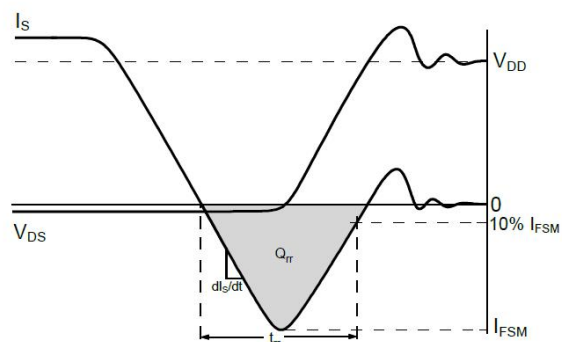
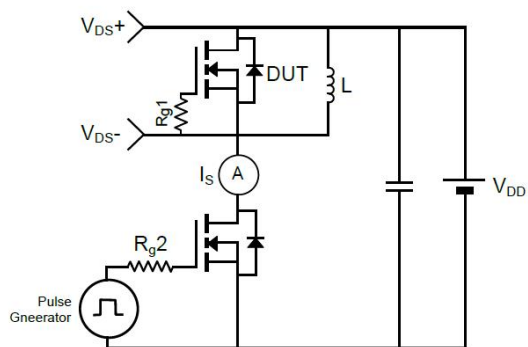
Resistive Load Switching Time



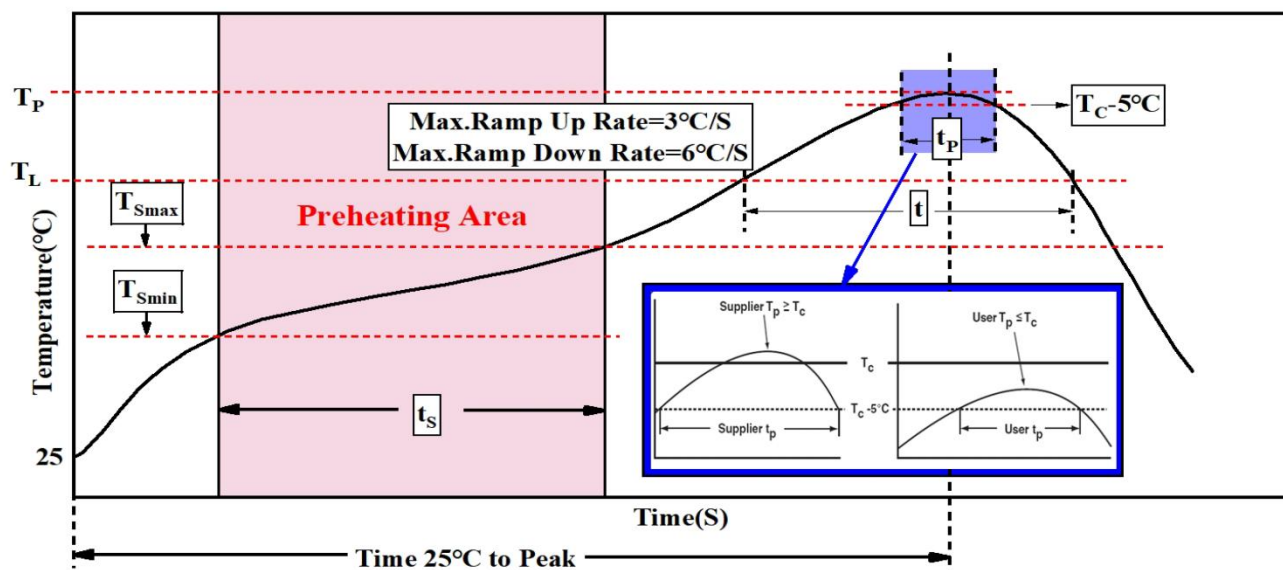
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



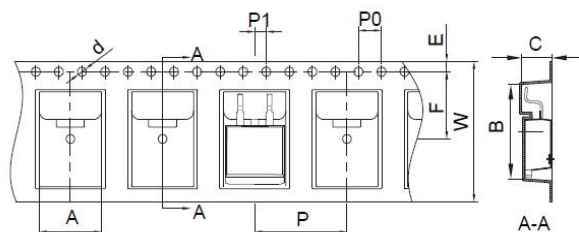
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{Smin})	100°C	150°C
Temperature max (T_{Smax})	150°C	200°C
Time (T_{Smin} to T_{Smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{Smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217°C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature e (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

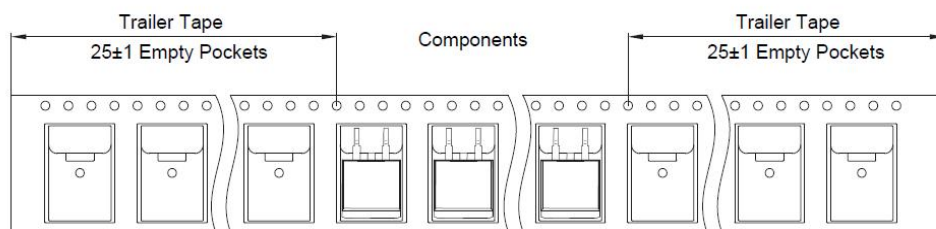
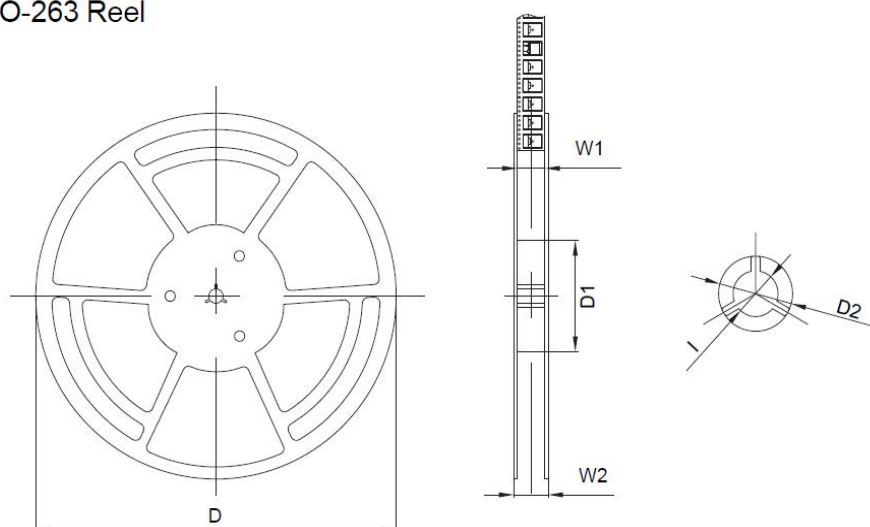
Table 2. Pb-free Process – Classification Temperatures (T_C)

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

TO-263 Reel Information

Packaging Description:

TO-263 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Hear Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 800 units per 13" or 33.0 cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

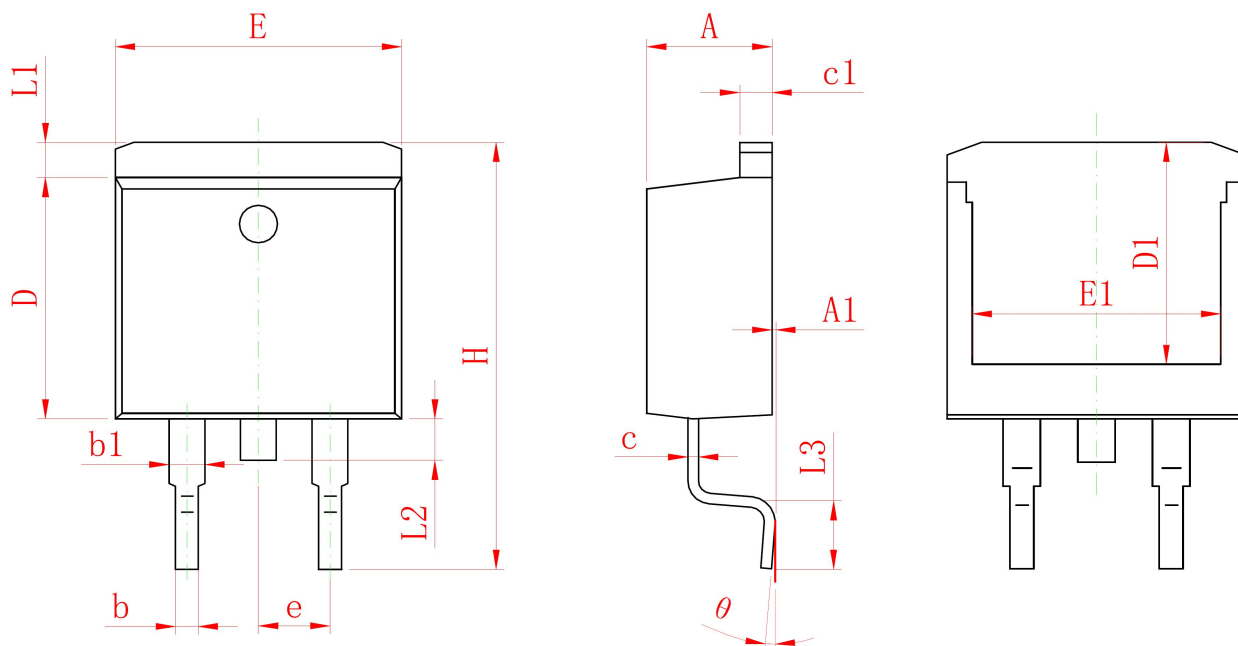
Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
TO-263	10.80	16.13	5.21	Φ1.55	1.75	11.50	4.00	16.00	2.00	24.00

TO-263 Tape Leader and Trailer

TO-263 Reel


Dimensions are in millimeter						
Reel	D	D1	D2	W1	W2	I
13" Dia	330.00	100.00	Φ21.00	24.40	30.40	Φ13.00

Reel	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)
800 pcs	13 inch	1600 pcs	360×360×65	8000 pcs	378×358×382

TO-263 Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.40	4.67
A1	0.02	0.23
b	0.70	0.90
b1	1.21	1.40
c	0.40	0.60
c1	1.25	1.45
D	9.00	9.30
D1	8.10 REF	
E	9.70	10.20
E1	7.00	8.20
e	2.54 TYP.	
H	14.80	15.40
L1	1.10	1.40
L2	1.10	1.70
L3	2.10	2.50
θ	0°	9°