

•General Description

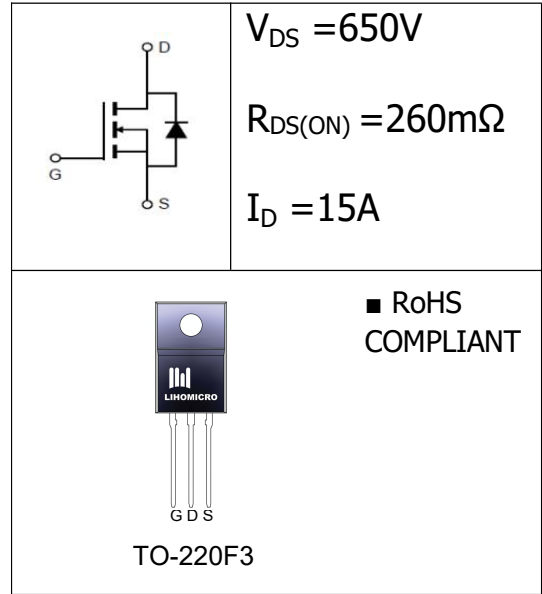
The SJ MOSFET LH65R260 has the low $R_{DS(on)}$, low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and power supplies.

•Features

- Much lower $R_{on} \cdot A$ performance for On-state efficiency
- Much lower FOM for fast switching efficiency

•Application

- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Power Supplies



•Ordering Information:

Part number	LH65R260
Package	TO-220F3
Basic ordering unit (pcs)	1000
Normal Package Material Ordering Code	LH65R260F3-T0220F3-TU
Halogen Free Ordering Code	LH65R260F3-T0220F3-TU-HF

•Absolute Maximum Ratings (TC = 25°C)

PARAMETER		SYMBOL	Value	UNIT
Drain-Source Breakdown Voltage		BV_{DSS}	650	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	TC = 25°C	I_D	15	A
	TC = 100°C		9	
Pulsed drain current (TC = 25°C, tp limited by Tjmax) ¹		$I_D \text{ pulse}$	45	A
Single Pulse Avalanche Energy ¹		I_{AR}	2.4	A
Single Pulse Avalanche Energy ²		E_{AS}	290	mJ
Repetitive Avalanche Energy ¹		E_{AR}	0.44	mJ
Power Dissipation (TC=25°C)		P_D	32	W
Operating Temperature and Storage Temperature Range		T_J/T_{STG}	-55~+150	°C
MOSFET dv/dt ruggedness, $V_{DS}=0 \dots 480V$		dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0 \dots 480V, I_{SD} \leq I_D$		dv/dt	15	V/ns

●Electronic Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	--	4.5	V
Drain-source On Resistance ³	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7.5A$	--	0.24	0.26	Ω
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V, T_J=25^\circ C$	--	--	1	μA
		$V_{DS}=650V, V_{GS}=0V, T_J=125^\circ C$	--	--	100	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30$	--	--	± 100	nA
Forward Transconductance ³	R_G	$f=1.0MHz$ open drain	--	--	12.5	S
Input Capacitance	C_{iss}	$V_{GS}=0V,$ $V_{DS}=100V$ $f=1.0MHz$	--	1202	--	pF
Output Capacitance	C_{oss}		--	43	--	
Reverse transfer Capacitance	C_{rss}		--	5	--	
Turn -Off Delay Time	$T_d(off)$	$V_{DD}=400V,$ $I_D=15.0A$ $R_G=25\Omega$	--	100	--	ns
Turn-on delay time	$T_d(on)$		--	25	--	
Rise time	T_r		--	63	--	
Fall time	T_f		--	50	--	
Total Gate Charge	Q_g	$I_D=15A,$ $V_{DS}=520V$ $V_{GS}=10V$	--	27	---	nC
Gate-to-Source Charge	Q_{gs}		--	5.5	--	
Gate-to-Drain Charge	Q_{gd}		--	10.5	---	
Continuous Diode Forward Current	I_S		--	--	15.0	A
Pulsed Diode Forward Current	I_{SM}		--	--	45.0	A
Diode Forward Voltage	V_{SD}	$T_J=25^\circ C, I_S=15.0A$ $V_{GS}=0V$	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	$V_{RR}=400V,$ $I_f=I_S$ $di_F/dt=100A/\mu s$	--	410	--	ns
Reverse Recovery Charge	Q_{rr}		--	4.1	--	μC
Peak Reverse Recovery Current	I_{RRM}		--	20	--	A

●Thermal Characteristics

PARAMETER	SYMBOL	MAX		UNIT
		TO-220F	TO-220	
Thermal Resistance Junction-case	R_{thJC}	3.9	1.2	$^\circ C/W$
Thermal Resistance Junction-ambient	R_{thJA}	80	62	$^\circ C/W$

Notes:

1.Repetitive Rating: Pulse width limited by maximum junction temperature.

2. $I_{AS}=1.8A, V_{DD}=50V, R_G=25\Omega$, Starting $T_J=25^\circ C$

3. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

• **Typical Characteristics** $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics

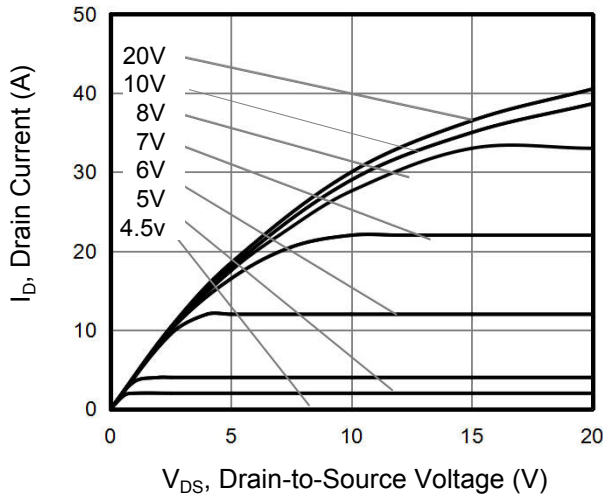


Figure 2. Transfer Characteristics

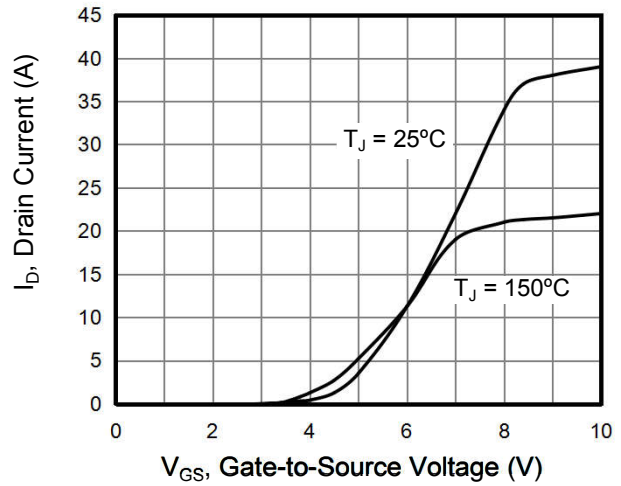


Figure 3. On-Resistance vs. Drain Current

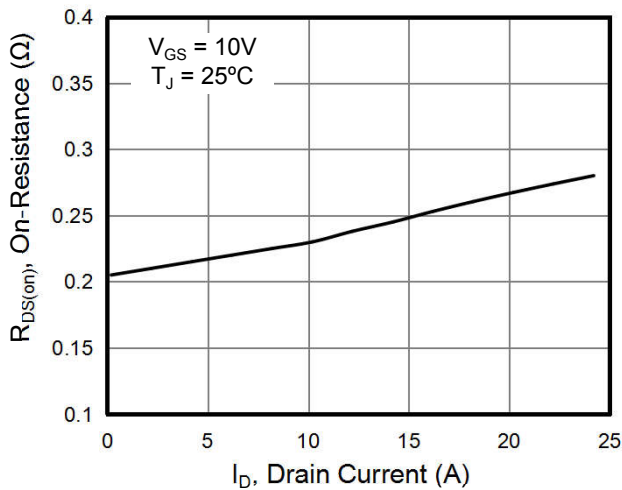


Figure 4. Capacitance

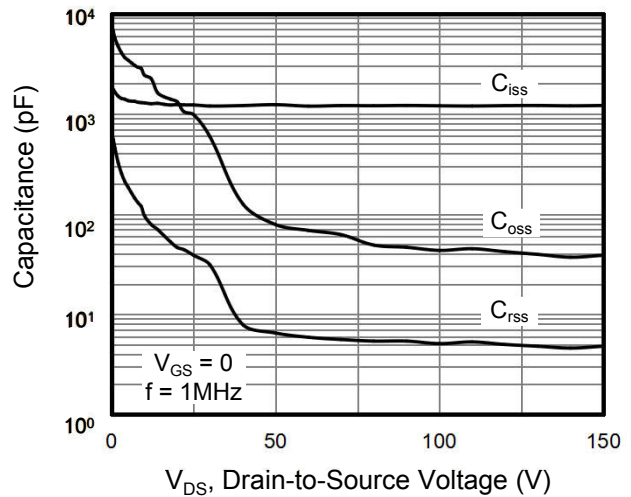


Figure 5. Gate Charge

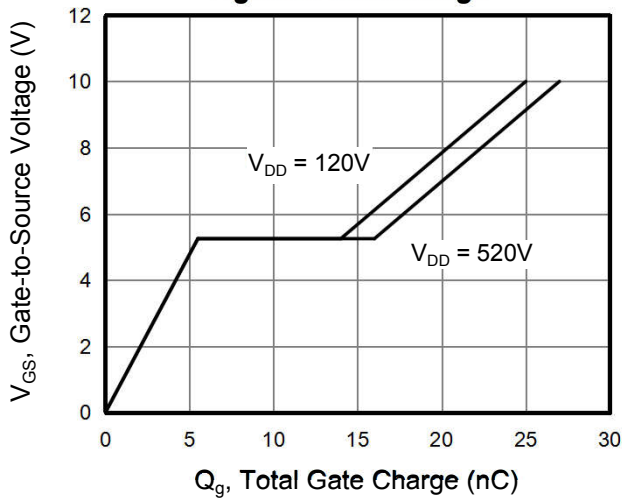
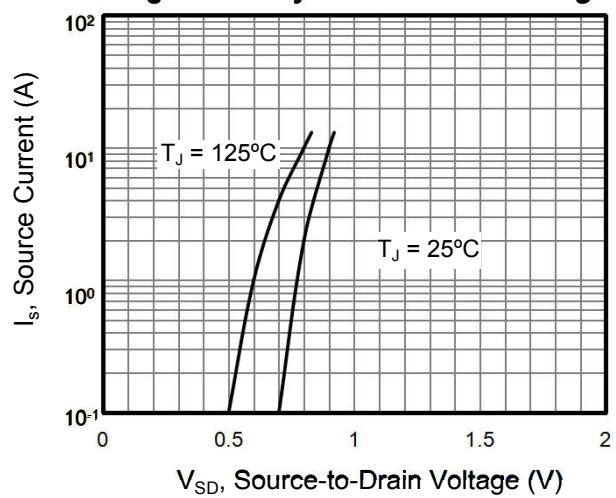


Figure 6. Body Diode Forward Voltage



● **Typical Characteristics**(cont.)

Figure 7. On-Resistance vs. Junction Temperature

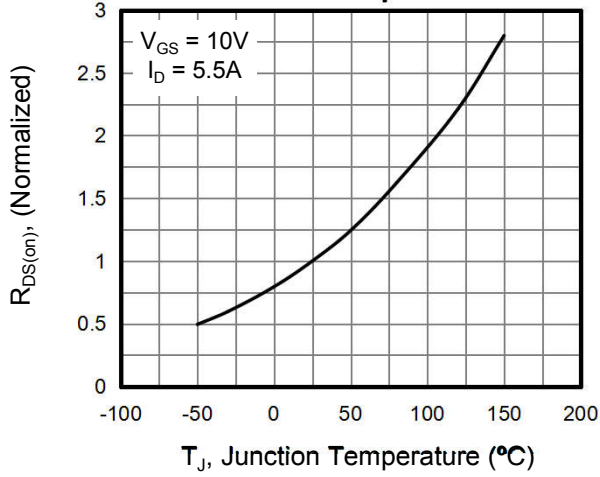


Figure 8. Threshold Voltage vs. Junction Temperature

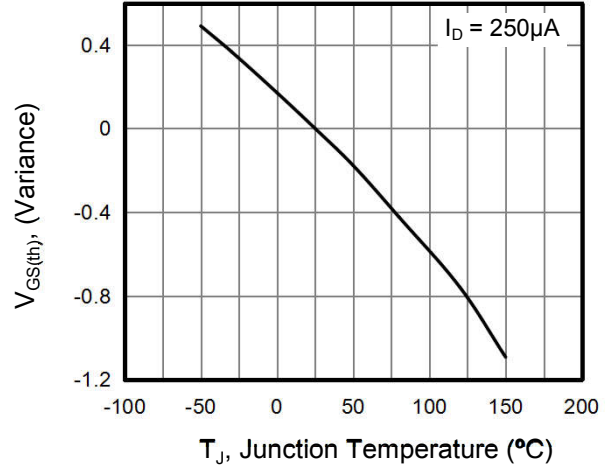


Figure 9. Breakdown voltage vs. Junction Temperature

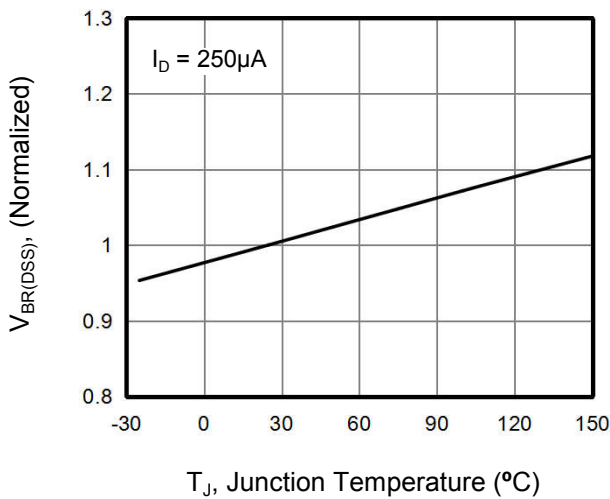


Figure 10. Transient Thermal Impedance

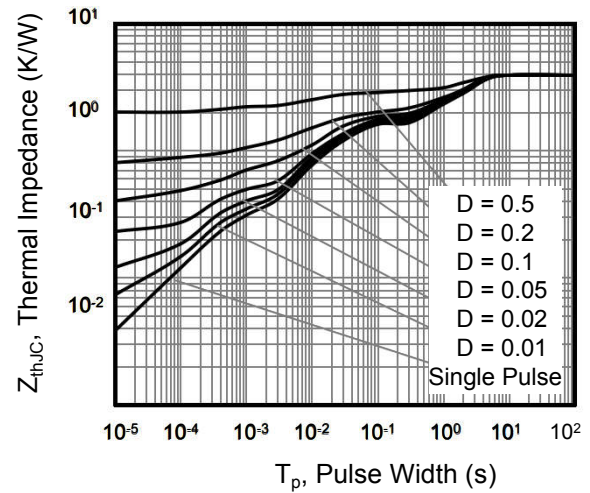
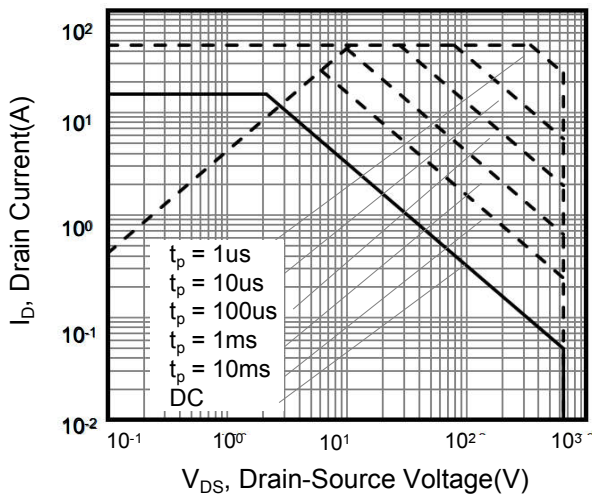


Figure 11. Safe operation area



• **Test Circuit and Waves**

Figure A: Gate Charge Test Circuit and Waveform

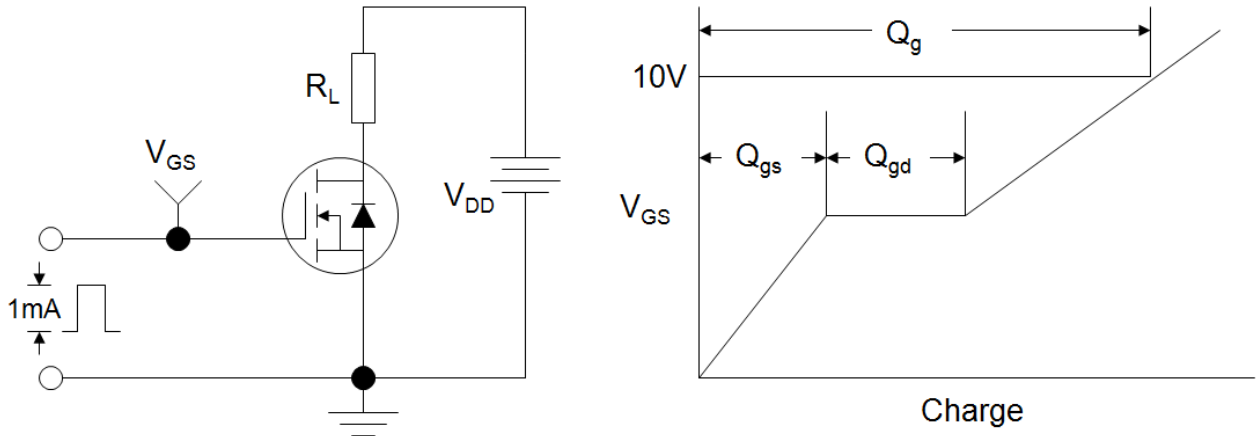


Figure B: Resistive Switching Test Circuit and Waveform

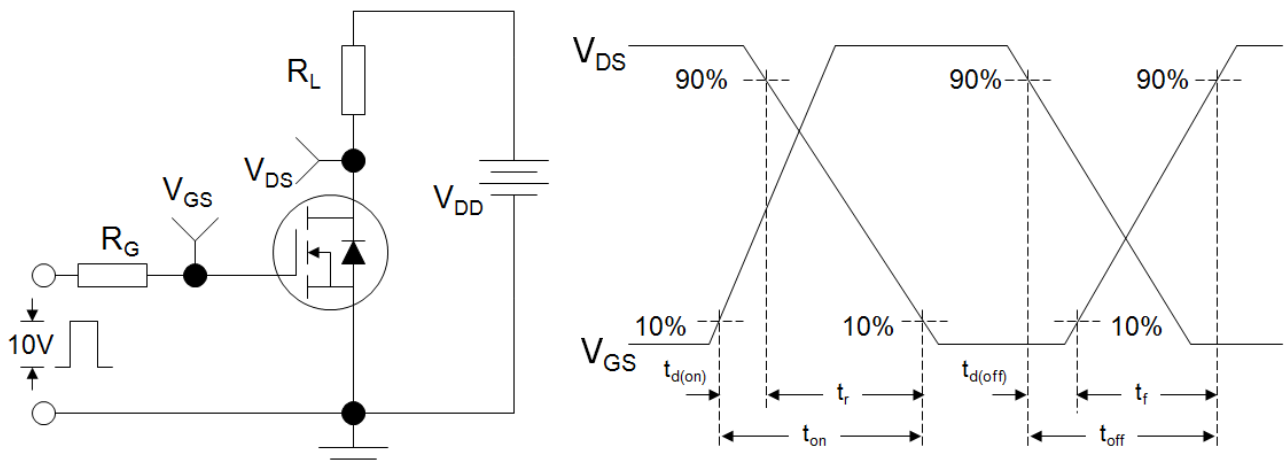
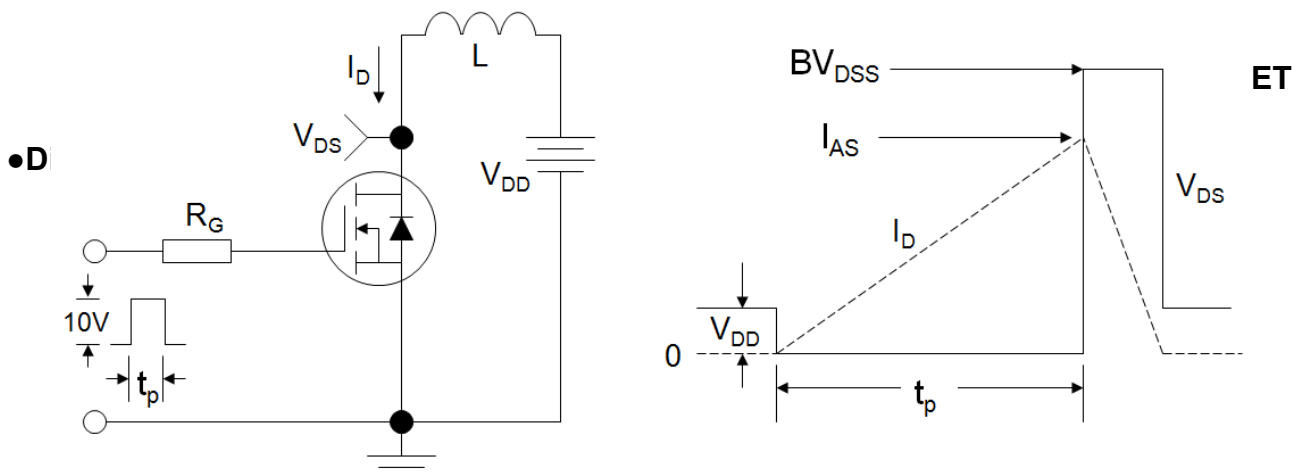


Figure C: Unclamped Inductive Switching Test Circuit and Waveform

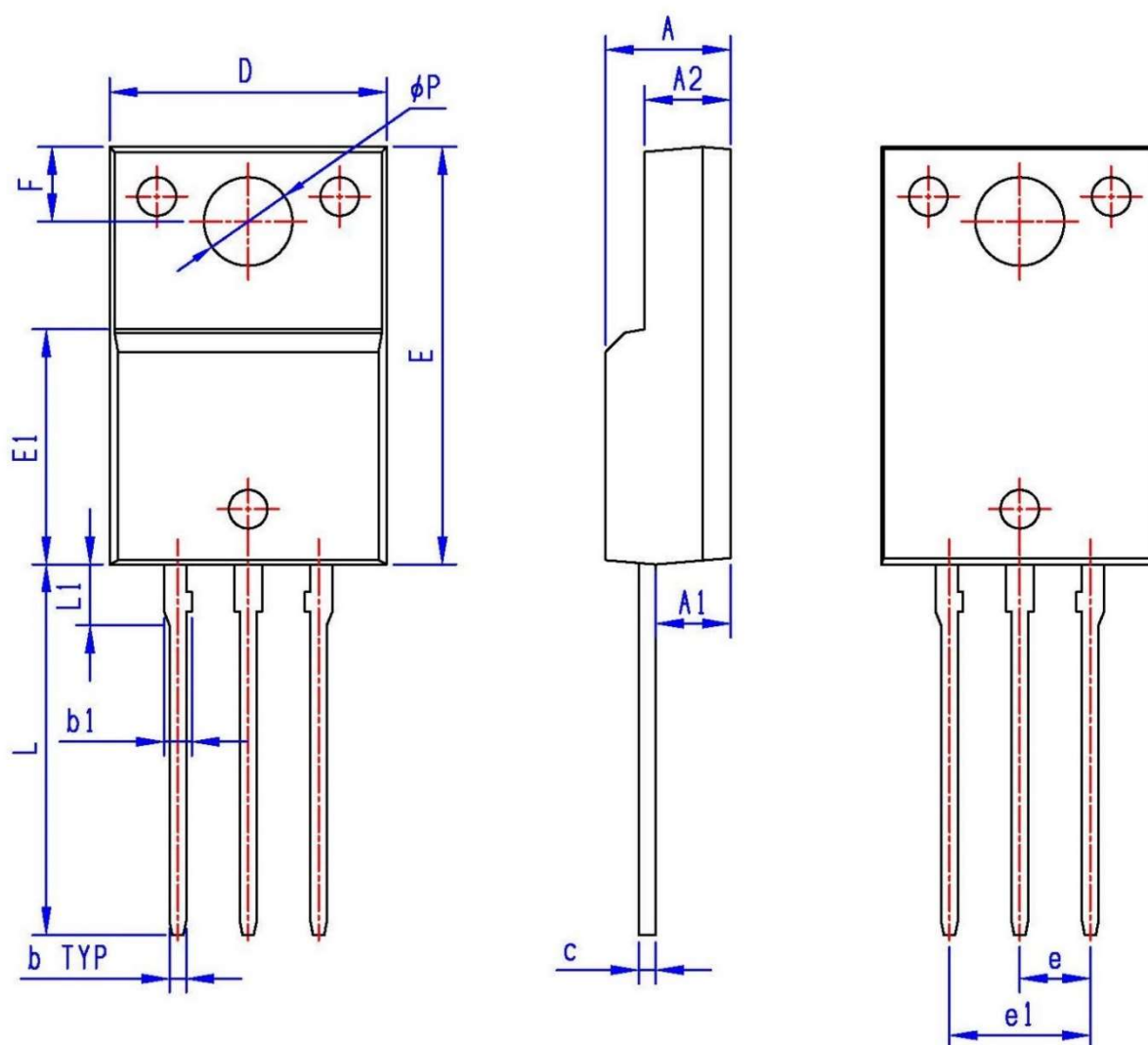


• **D**

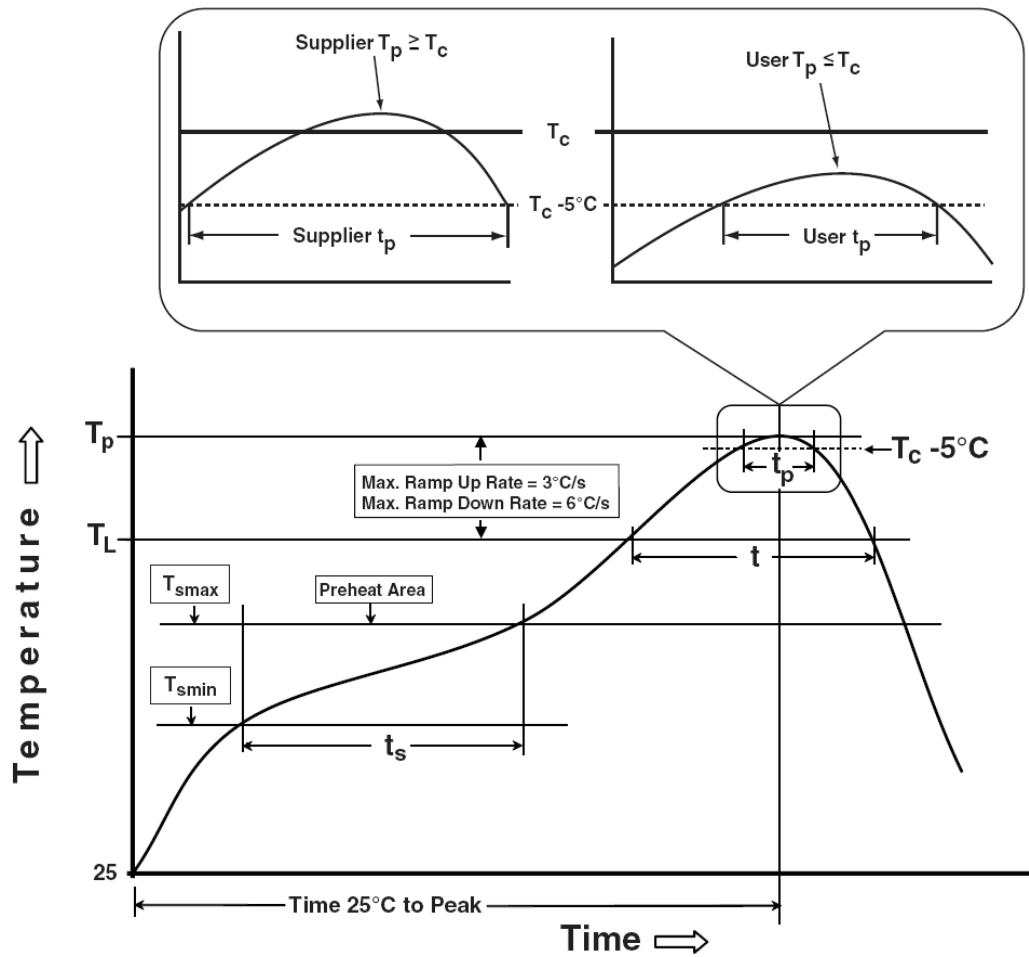
•Dimensions (TO-220F3)

Unit: mm

SYMBOL	min	max	SYMBOL	min	max
A	4.40	4.90	E	14.70	15.30
A1	2.40	3.00	e	2.40	2.70
A2	2.30	3.00	e1	4.95	5.25
b	0.50	0.80	L	12.40	14.20
b1	0.90	1.30	L1	1.80	2.20
c	0.40	0.70	∅P	2.90	3.50
D	9.80	10.50			
F	2.70	3.30			



● **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

Reliability Test Program

Test Item	Method	Description
Solder ability	JESD-22, B012	5 SEC., 245°C
HOLT	JESD-22, A108	1000 HRs, Bias@125°C
PCT	JESD-22, A102	168 HRs, 100% RH, 2ATM, 121°C
TCT	JESD-22, A104	500 Cycles, -65 ~ 150°C