美浦森半导体
Msemitek

Halogen Free

RoHS LEAD FREE

SLF70R180E7C / SLP70R180E7C
700V N-Channel Multi-EPI Super-JMOSFET

General Description

This Power MOSFET is produced using Msemitek's advanced Superjunction MOSFET technology.
This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies.

Features

- 20A,700V@ $T_{J,max}$, $R_{DS(on)Typ}$=150mΩ@V_{GS} = 10V
- Low gate charge(typ. Qg =32.1nC)
- High ruggedness
- Ultra fast switching
- 100% avalanche tested
- Improved dv/dt capability

TO-220F

TO-220C

D

G

S
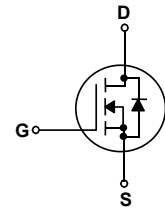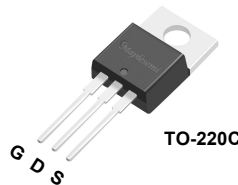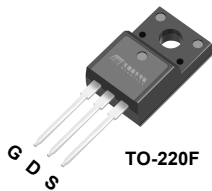
Absolute Maximum Ratings
T_C = 25°C unless otherwise noted

Symbol	Parameter		SLF70R180E7C / SLP70R180E7C		Units
V_{DSS}	Drain-Source Voltage		700		V
I_D	Drain Current * - Continuous (T_C = 25°C)		20		A
	- Continuous (T_C = 100°C)		12		A
I_{DM}	Drain Current * - Pulsed	(Note 1)	53		A
V_{GSS}	Gate-Source Voltage		±30		V
EAS	Single Pulsed Avalanche Energy	(Note 2)	103		mJ
I_{AR}	Avalanche Current	(Note 1)	4.0		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	1.62		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	20		V/ns
	MOSFET dv/dt		100		
P_D	Power Dissipation (T_C = 25°C)		36	120	W
	- Derate above 25°C		0.29	0.96	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		260		°C

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SLF70R180E7C / SLP70R180E7C		Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.47	1.04	°C/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	-		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	-	°C/W

Package Marking

Part Number	Top Marking	Package	Packing Method	MOQ	QTY
SLF70R180E7C	SLF70R180E7C	TO-220F	Tube	1000	5000
SLP70R180E7C	SLP70R180E7C	TO-220C	Tube	1000	5000

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1mA	700	--	--	V
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1mA, T_J = 150℃	700	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	--	--	1.0	uA
		V_{DS} =520 V, T_C = 125℃	--	2.0	--	uA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D =1.7mA	2.5	--	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 8.5A	--	150	180	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 400 V, V_{GS} = 0 V, f = 250KHz	--	1233	--	pF
C_{oss}	Output Capacitance		--	35	--	pF
C_{rss}	Reverse Transfer Capacitance		--	--	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 400 V, I_D = 8.5A, R_G = 10Ω,VGS = 10 V (Note 4, 5)	--	15	--	ns
t_r	Turn-On Rise Time		--	11	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	71	--	ns
t_f	Turn-Off Fall Time		--	11	--	ns
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 8.5A, V_{GS} = 10 V (Note 4, 5)	--	32.1	--	nC
Q_{gs}	Gate-Source Charge		--	6.8	--	nC
Q_{gd}	Gate-Drain Charge		--	16	--	nC
R_G	Gate Resistance	f = 1MHz		6.9		Ω
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	19	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	57	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S =8.5A	--	--	1.2	V
t_{rr}	Reverse Recovery Time	V_{DD} = 400 V, I_S =8.5A,	--	284	--	ns
Q_{rr}	Reverse Recovery Charge	dI_F / dt = 100 A/us (Note 4)	--	3.36	--	uC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. I_{AS} =4A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25℃
3. I_{SD} ≤ 8.5A, di/dt ≤ 100A/us, V_{DD} ≤400, Starting T_J = 25℃
4. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

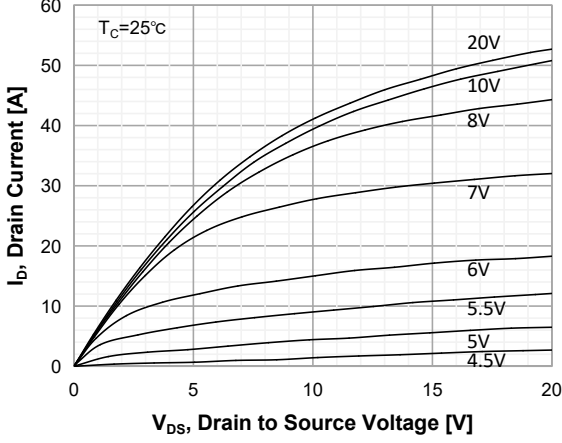# Typical Characteristics

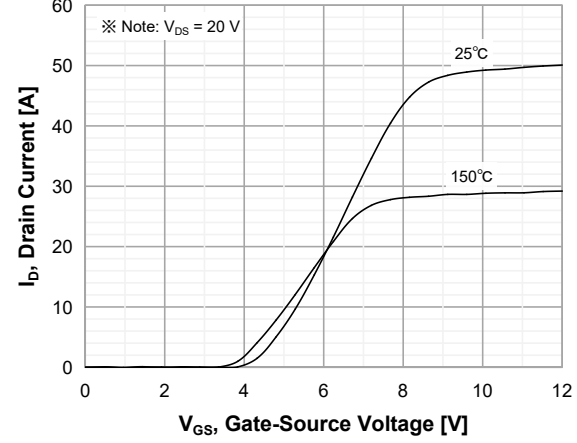Figure 1. On-Region Characteristics
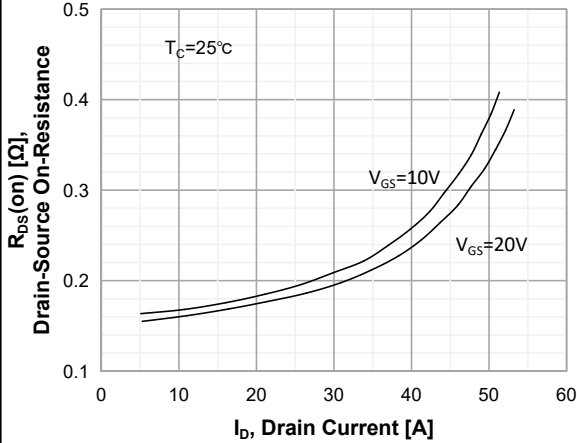

Figure 2. Transfer Characteristics

Figure 3. On-Resistance Variation vs
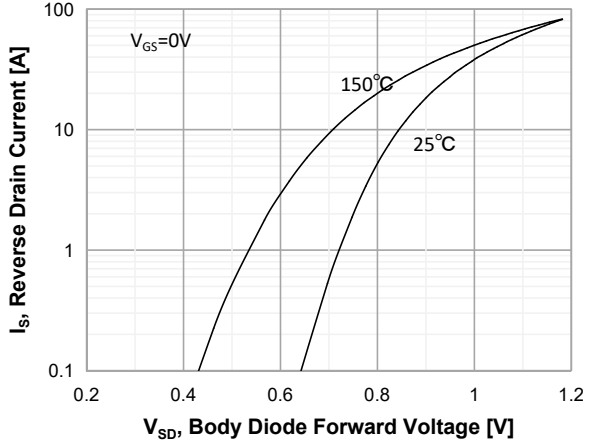Drain Current and Gate Voltage

Figure 4. Body Diode Forward Voltage
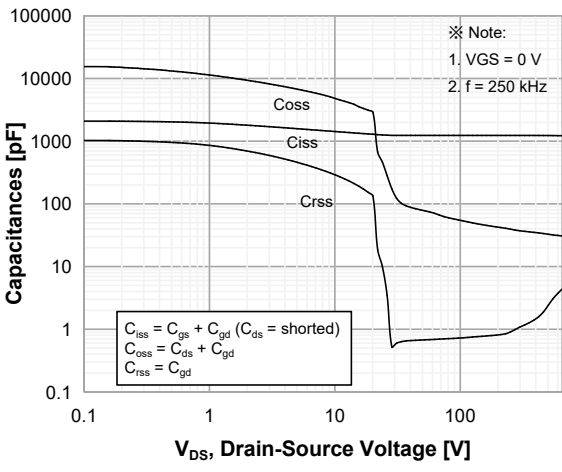Variation with Source Current
and Temperature

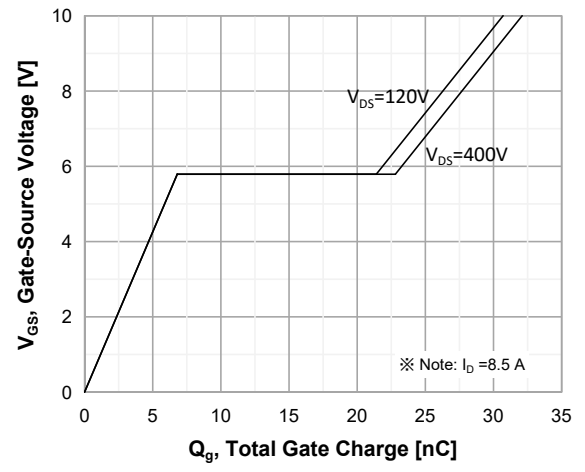

Figure 5. Capacitance Characteristics

Figure 6. Gate Charge Characteristics
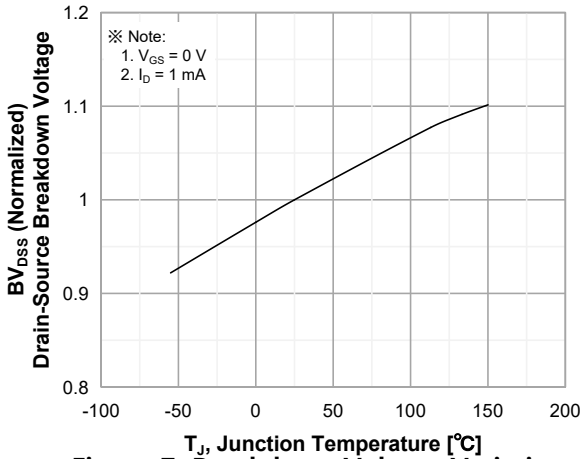
Typical Characteristics (Continued)

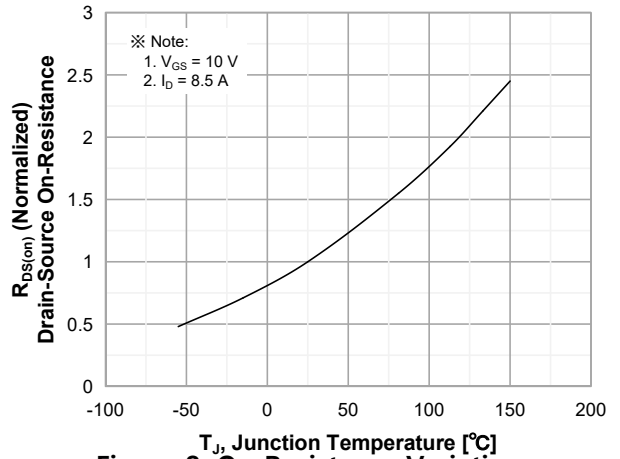**Figure 7. Breakdown Voltage Variation vs Temperature**

※ Note:
1. V_{GS} = 0 V
2. I_D = 1 mA

Figure 8. On-Resistance Variation vs Temperature

※ Note:
1. V_{GS} = 10 V
2. I_D = 8.5 A
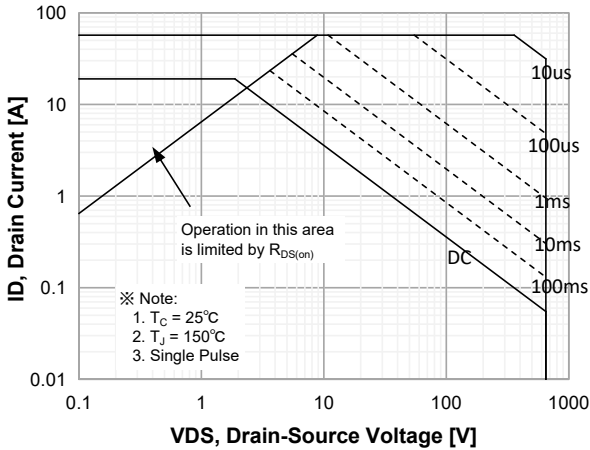
Figure 9. Maximum Safe Operating Area

Operation in this area is limited by $R_{DS(on)}$

※ Note:
1. T_C = 25℃
2. T_J = 150℃
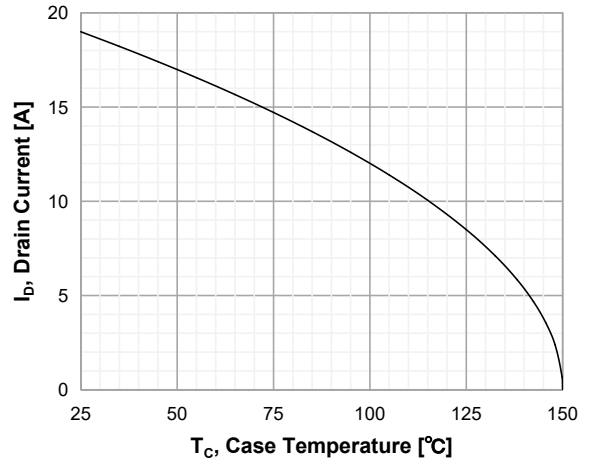3. Single Pulse

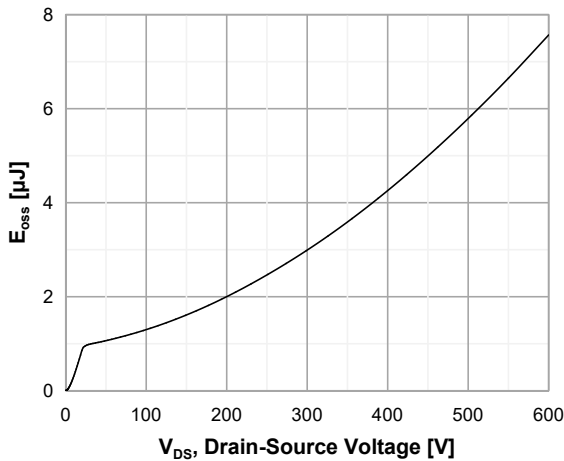

Figure 10. Maximum Drain Current vs. Case Temperature

Figure 11.E_{oss} vs. Drain to Source Voltage
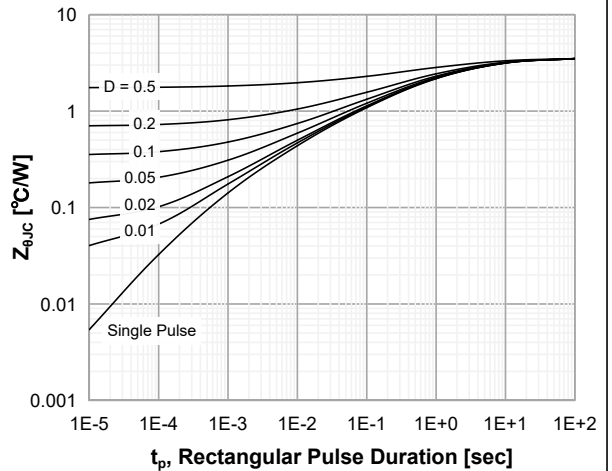
Figure 12.Transient Thermal Response Curve
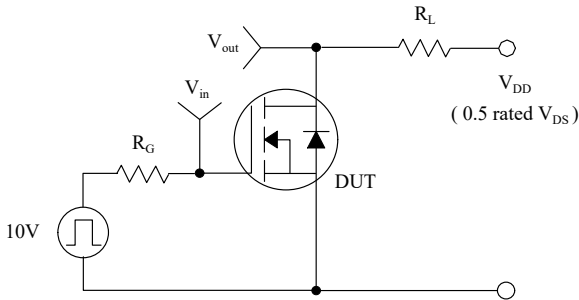

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Gate Charge Test Circuit & Waveform

Current Regulator

50KΩ

12V   200nF   300nF

Same Type
as DUT

V_{DS}

V_{GS}

DUT

3mA

R_1 R_2

Current Sampling (I_G)   Current Sampling (I_D)
Resistor   Resistor

V_{GS}

Q_g

10V

Q_{gs} Q_{gd}

Charge

Resistive Switching Test Circuit & Waveforms

V_{out} R_L

V_{in} V_{DD}
(0.5 rated V_{DS})

R_G

DUT

10V

V_{out} 90%

V_{in} 10%

$t_{d(on)}$ t_r $t_{d(off)}$ t_f

t_{on} t_{off}
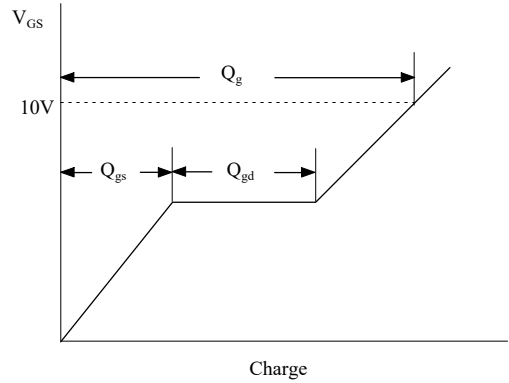
Unclamped Inductive Switching Test Circuit & Waveforms

L_L

V_{DS} I_D

Vary t_p to obtain
required peak I_D

R_G C V_{DD}

DUT

10V

t_p

$$E_{AS} = \frac{1}{2} L_L I_{AS}^2$$

BV_{DSS}

I_{AS}

$I_D(t)$

V_{DD} $V_{DS}(t)$

t_p Time
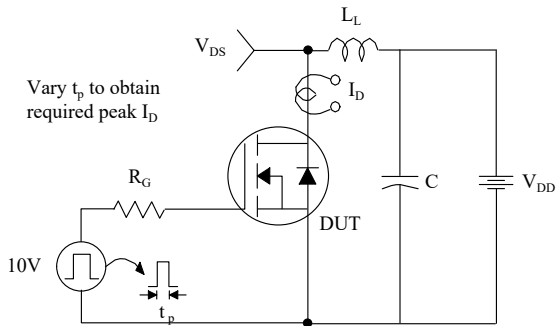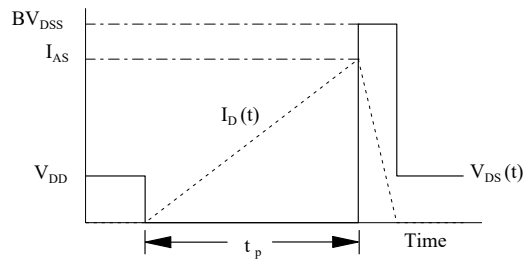
Peak Diode Recovery dv/dt Test Circuit & Waveforms

DUT

V_{DS}

+

--

I_S

L

Driver

V_{GS}

R_G

Same Type
as DUT

V_{DD}

V_{GS}

• dv/dt controlled by R$_G$
• I$_{SD}$ controlled by pulse period

V_{GS}
(Driver)

$$D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$$

10V

I_S
(DUT)

I_{FM} , Body Diode Forward Current

di/dt

I_{RM}

Body Diode Reverse Current

V_{DS}
(DUT)

Body Diode Recovery dv/dt

V_f

V_{DD}

Body Diode
Forward Voltage Drop

TO-220F OUTLINE

10. 16±0. 2

4. 70±0. 2

Φ3. 18±0. 2

2. 54±0. 2

15. 87±0. 3

12. 57±0. 2

6. 68±0. 3

1. 3±0. 2

2. 76±0. 2

0. 8±0. 2

12. 95±0. 4

0. 5±0. 1

2. 54±0. 2
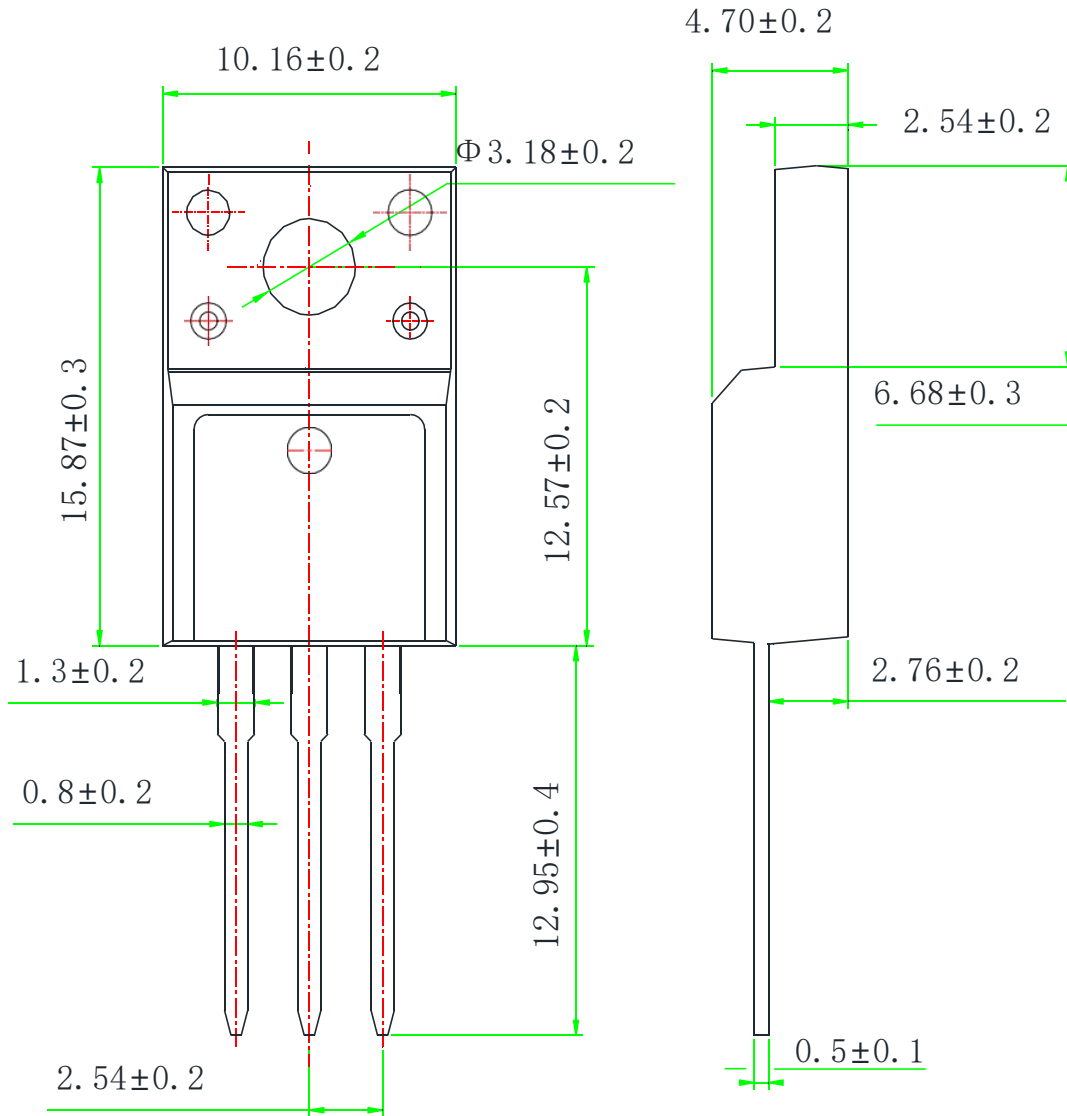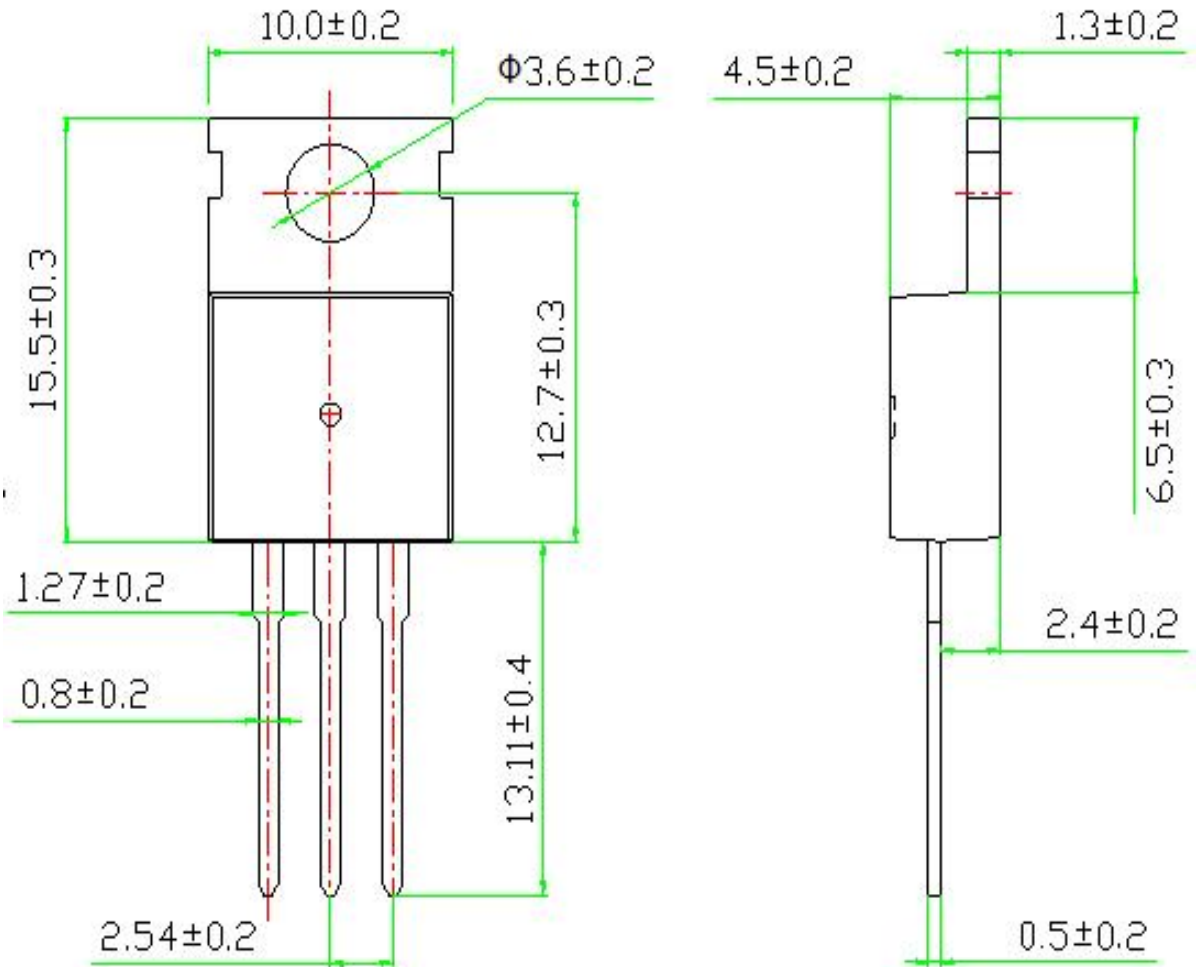
NOTE：
1The plastic package is not marked as smooth surfaceRa=0.1;Subglo
ssy surfaceRa=0.8
2.Undeclared tolerance±0.15,Unmarked filletRmax=0.25

TO-220C OUTLINE

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