Halogen Free

RoHS LEAD FREE

SLP65R170E7 / SLF65R170E7

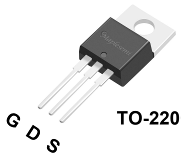
650V N-Channel MOSFET

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

- 22A, 650V, $R_{DS(on)}$ =170mΩ@V_{GS} = 10 V
- Low gate charge(typ. Qg = 30.2nC)
- High ruggedness Ultra
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



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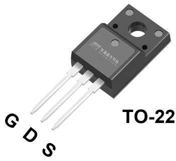

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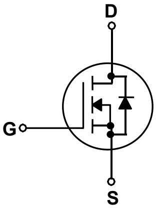


Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter	SLP65R170E7 / SLF65R170E7	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous (T_C = 25℃)	22 *	A
	- Continuous (T_C = 100℃)	12*	A
I_{DM}	Drain Current - Pulsed (Note 1)	57 *	A
V_{GSS}	Gate-Source Voltage	±30	V
EAS	Single Pulsed Avalanche Energy (Note 2)	985	mJ
I_{AR}	Avalanche Current (Note 1)	4	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℃)	36	W
	- Derate above 25℃	0.29	W/℃
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	260	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SLP65R170E7 / SLF65R170E7	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.5	℃/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	-	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	℃/W

Electrical Characteristics

T_C = 25°C unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1mA	650	--	--	V
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1mA,TJ = 150℃	650	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600 V, V_{GS} = 0 V	--	--	1	uA
		V_{DS} =480 V, T_C = 125℃	--	2	--	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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	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 = 10 A	--	150	170	mΩ

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 400 V, V_{GS} = 0 V, f = 250KHz	--	1240	--	pF
C_{oss}	Output Capacitance		--	34	--	pF
C_{rss}	Reverse Transfer Capacitance		--	--	--	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 400 V, I_D = 10 A, R_G = 10 Ω,VGS = 10 V (Note 4, 5)	--	12	--	ns
t_r	Turn-On Rise Time		--	8	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	53	--	ns
t_f	Turn-Off Fall Time		--	10	--	ns
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 10 A, V_{GS} = 10 V (Note 4, 5)	--	30.2	--	nC
Q_{gs}	Gate-Source Charge		--	5.8	--	nC
Q_{gd}	Gate-Drain Charge		--	15.4	--	nC
R_G	Gate Resistance	f = 1MHz		1.3		Ω

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	22	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 = 10 A	--	--	1.2	V
t_{rr}	Reverse Recovery Time	V_{DD} = 400 V, I_S = 10A,	--	274	--	ns
Q_{rr}	Reverse Recovery Charge	dI_F / dt = 100 A/us (Note 4)	--	3.33	--	uC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=79mH I_{AS} = I_D, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ I_D di/dt ≤ 200A/us, V_{DD} ≤400, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

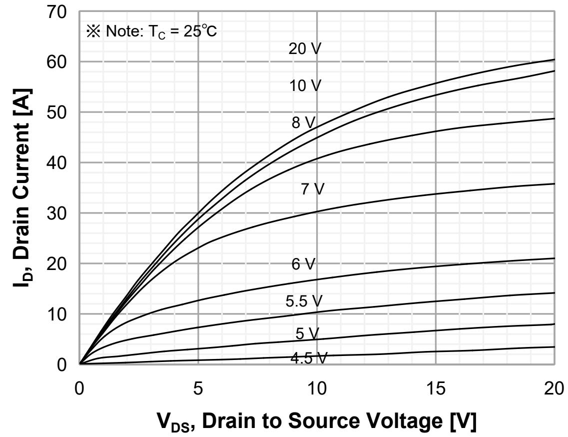


Figure 1. On-Region Characteristics

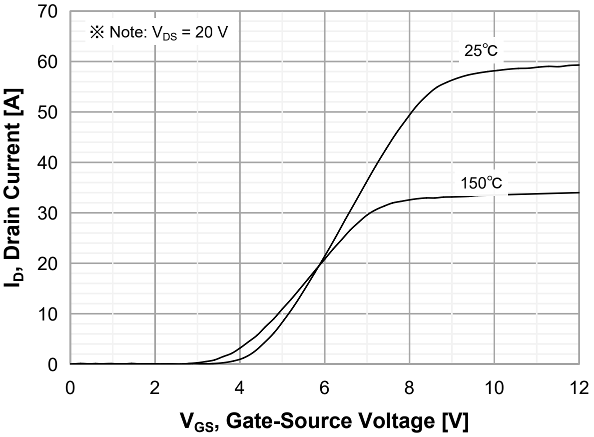


Figure 2. Transfer Characteristics

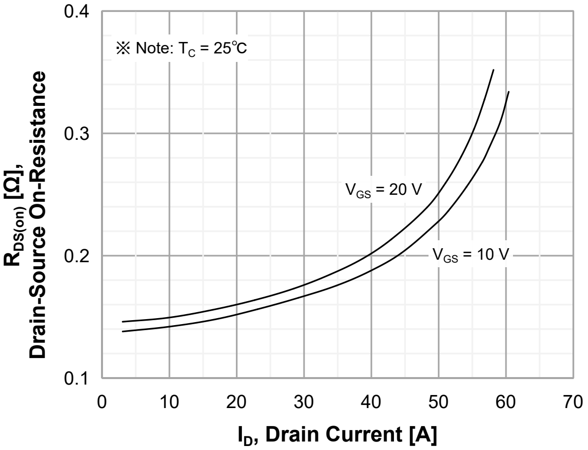


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

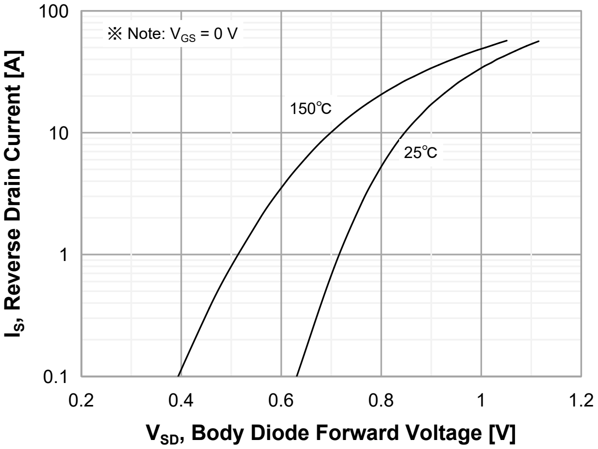


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

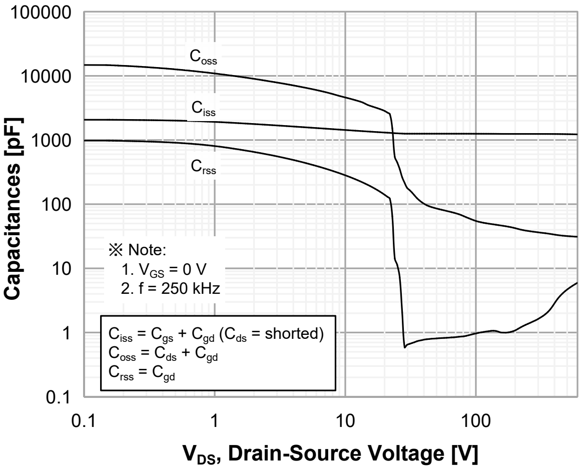


Figure 5. Capacitance Characteristics

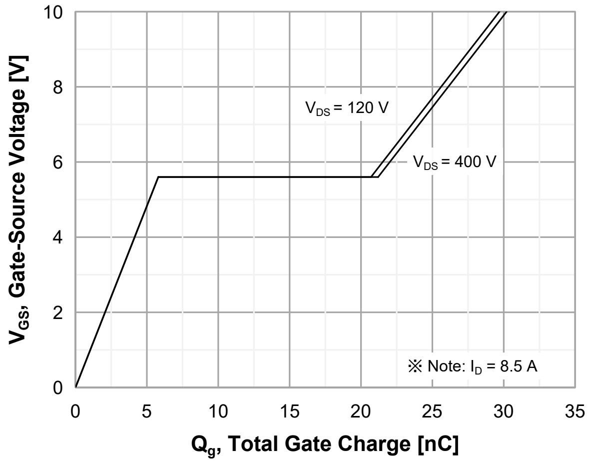


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

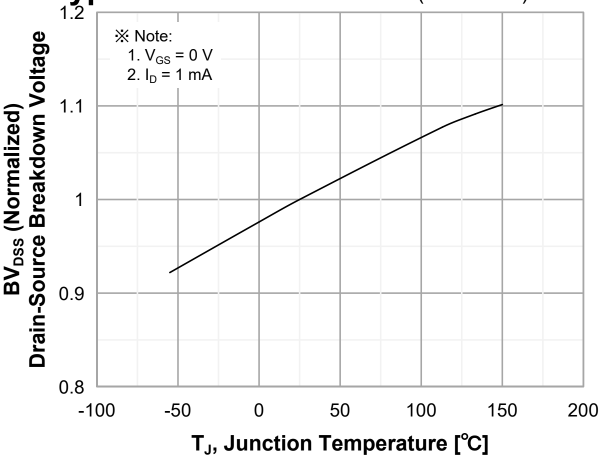


Figure 7. Breakdown Voltage Variation vs Temperature

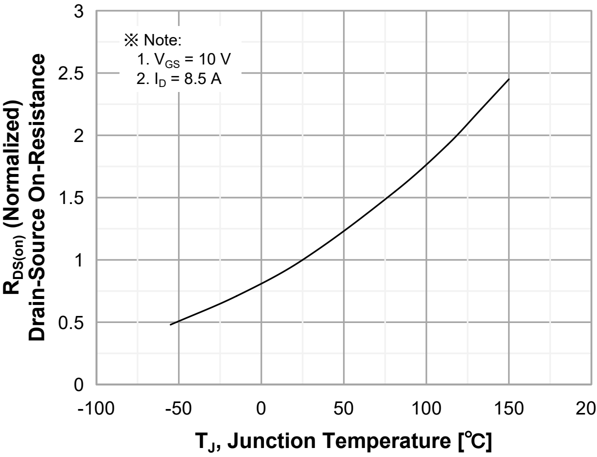


Figure 8. On-Resistance Variation vs Temperature

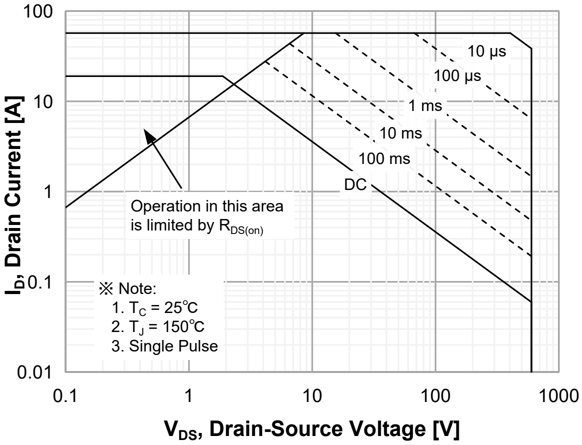


Figure 9. Maximum Safe Operating Area

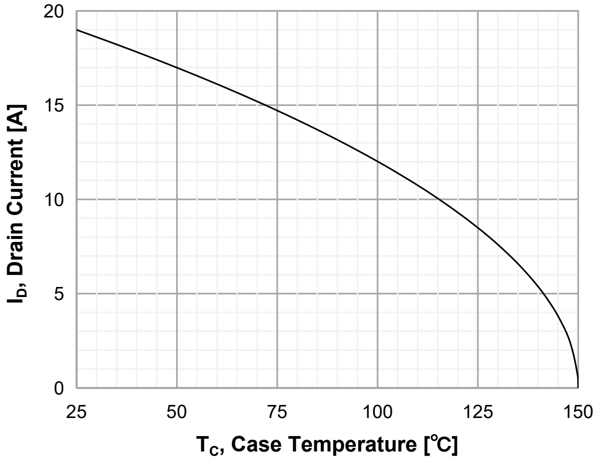


Figure 10. Maximum Drain Current vs. Case Temperature

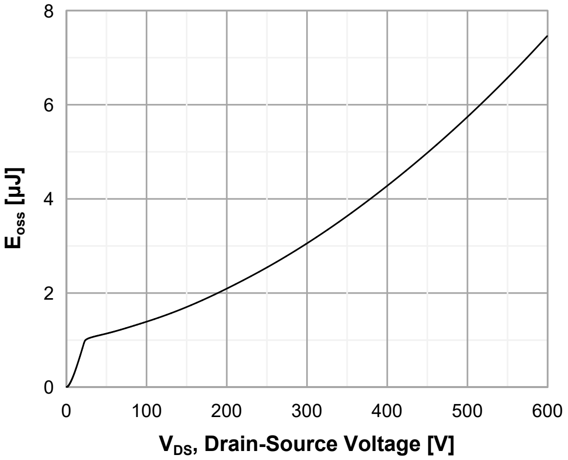


Figure 11.E_{oss} vs. Drain to Source Voltage

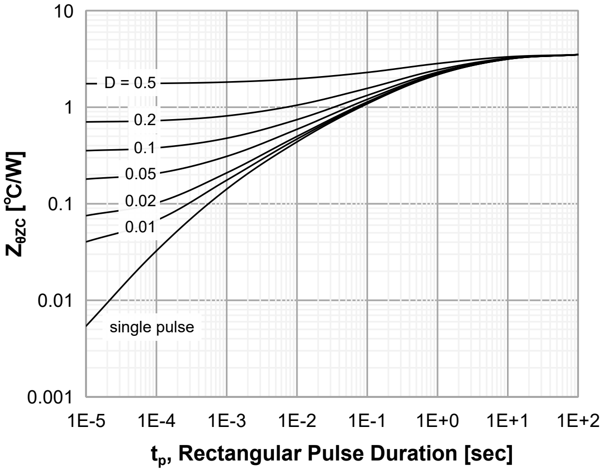
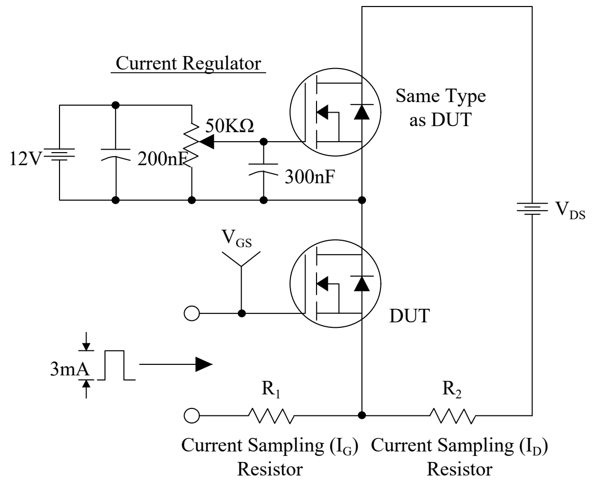
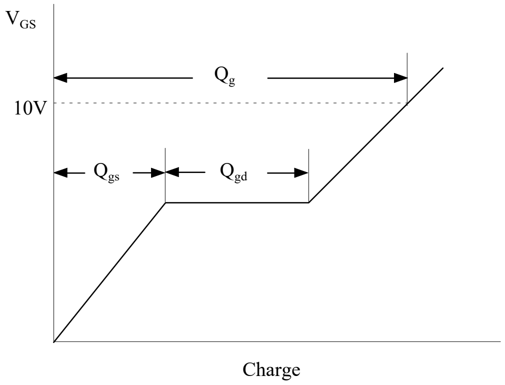


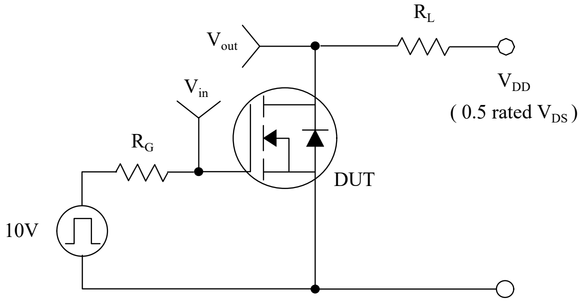
Figure 12.Transient Thermal Response Curve

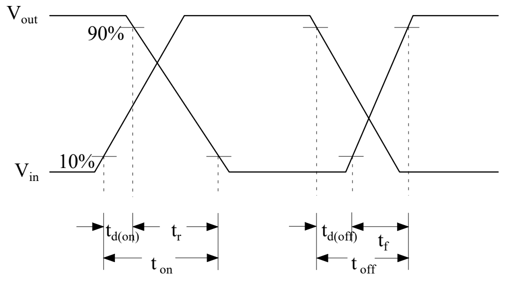
Gate Charge Test Circuit & Waveform



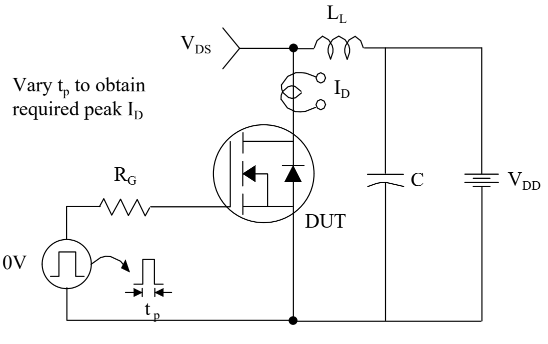


Resistive Switching Test Circuit & Waveforms

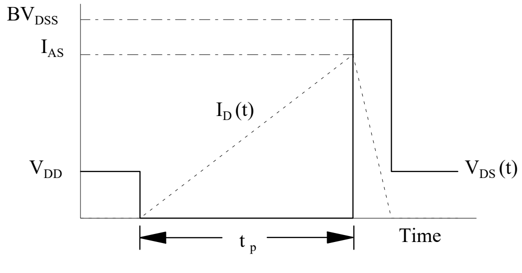




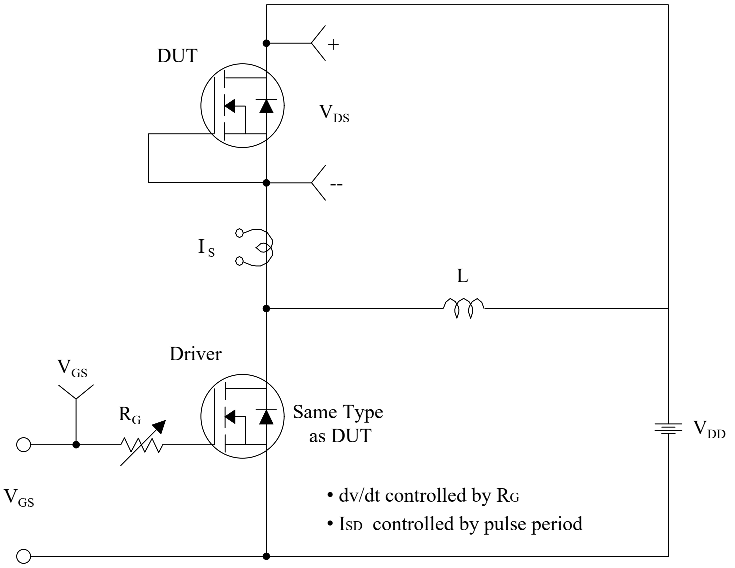
Unclamped Inductive Switching Test Circuit & Waveforms



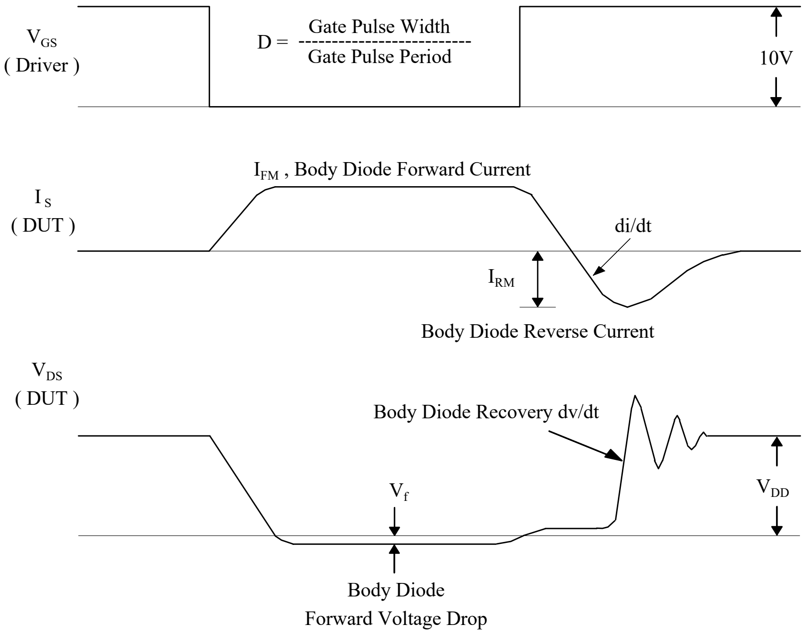
$$E_{AS} = \frac{1}{2} L_L I_{AS}^2$$



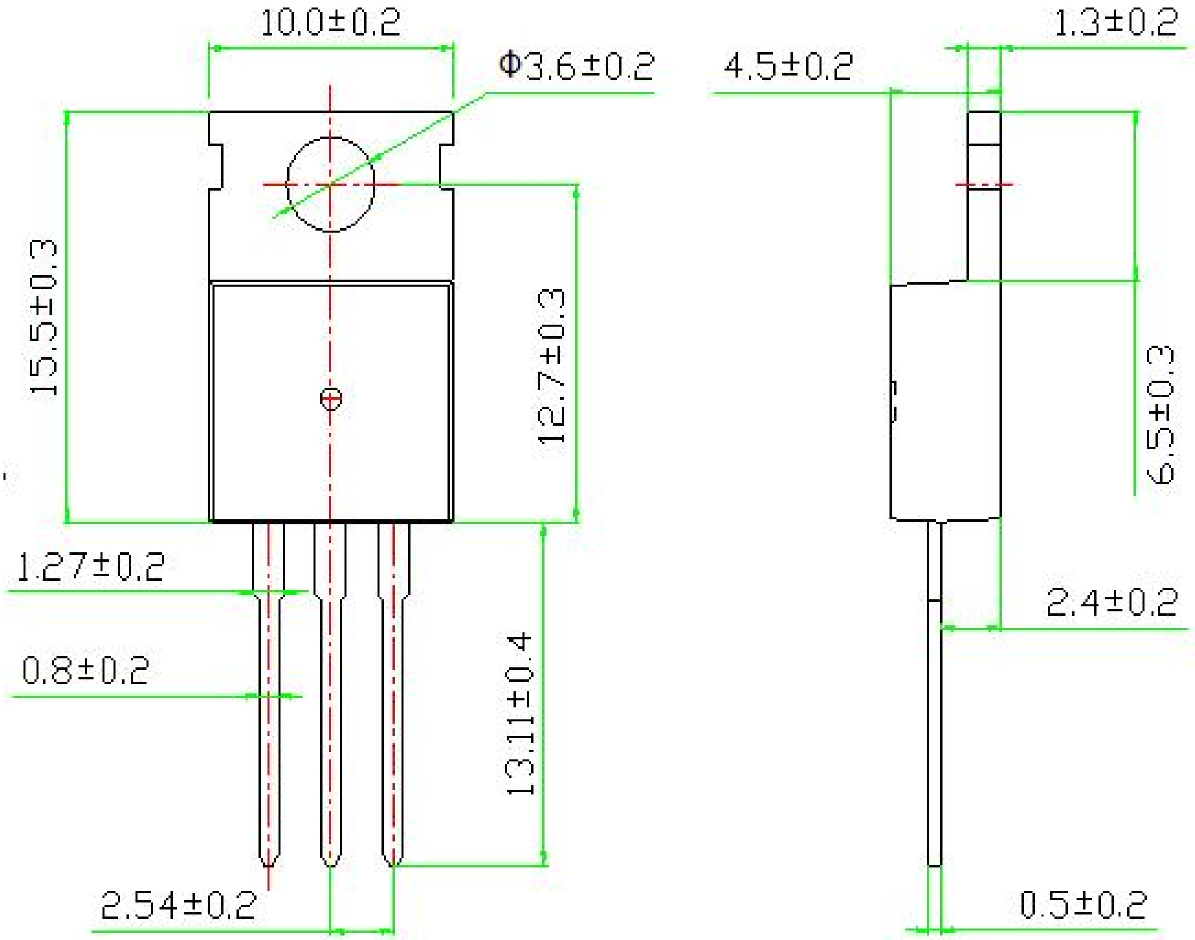
Peak Diode Recovery dv/dt Test Circuit & Waveforms



- dv/dt controlled by RG
- ISD controlled by pulse period



TO-220C OUTLINE



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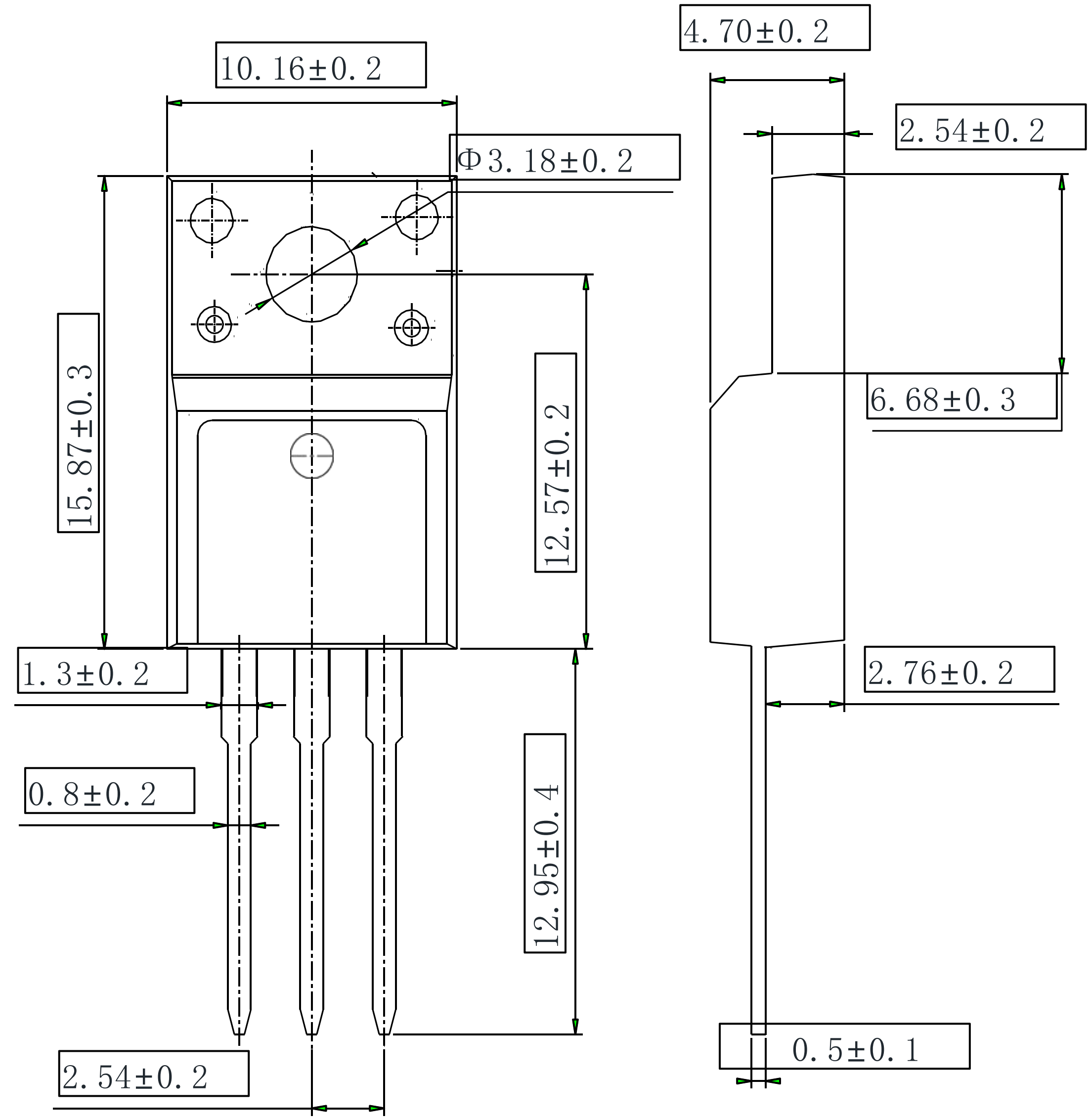
DWGNO		PAGE	1 OF 1	CHECKED		
VERSION	Ver1.0	ISSUE DATE		APPROVED		

TO-220F OUTLINE



NOTE：

1The plastic package is not marked as smooth surfaceRa=0.1;Subglossy surfaceRa=0.8

2.Undeclared tolerance±0.15,Unmarked filletRmax=0.25

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