

SLF65R380E7

650V N-Channel Power MOSFET

General Description

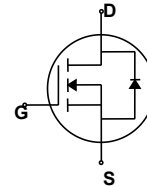
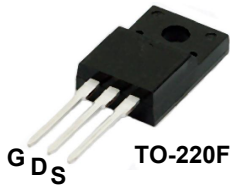
This Power MOSFET is produced using Maple semi's Advanced Super-Junction technology.

This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for AC/DC power conversion in switching mode operation for higher efficiency.

Features

- 11A, 650V, $R_{DS(on)max} = 380m\Omega @ V_{GS} = 10V$
- Low gate charge (typical 15.5nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	SLF65R380E7	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	11	A
		7	A
I_{DM}	Drain Current - Pulsed (Note 1)	28.8	A
V_{GSS}	Gate-Source Voltage	± 30	V
EAS	Single Pulsed Avalanche Energy (Note 2)	483	mJ
I_{AR}	Avalanche Current (Note 1)	11	A
E_{AR}	Repetitive Avalanche Energy	6.25	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	20	V/ns
	MOSFET dv/dt	100	
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	28	W
		0.22	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SLF65R380E7	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4.5	$^\circ\text{C}/\text{W}$
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ\text{C}/\text{W}$

Package Marking

Part Number	Top Marking	Package	Packing Method	MOQ	QTY
SLF65R380E7	SLF65R380E7	TO-220F	Tube	1000	5000

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	650	--	--	V
		$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 150^\circ\text{C}$	650	--	--	
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	uA
		$V_{DS} = 480\text{ V}, T_C = 125^\circ\text{C}$	--	2	--	uA
I _{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 0.8\text{ mA}$	2.5	--	4.5	V
R _{DS(on)}	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 4.0\text{ A}$	--	318	380	mΩ
R _g	Gate resistance	F=1MHZ	--	1.0	--	Ω

Dynamic Characteristics

C _{iss}	Input Capacitance	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V},$ $f = 250\text{ KHz}$	--	628	--	pF
C _{oss}	Output Capacitance		--	20	--	pF
C _{o(tr)}	Time Related Output Capacitance	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	--	239	--	pF
C _{o(er)}	Energy Related Output Capacitance		--	30	--	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	$V_{DD} = 400\text{ V}, I_D = 4.0\text{ A},$ $R_G = 10\ \Omega$ (Note 4, 5)	--	8	--	ns
t _r	Turn-On Rise Time		--	7	--	ns
t _{d(off)}	Turn-Off Delay Time		--	30	--	ns
t _f	Turn-Off Fall Time		--	8	--	ns
Q _g	Total Gate Charge	$V_{DS} = 400\text{ V}, I_D = 4.0\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4, 5)	--	15.5	--	nC
Q _{gs}	Gate-Source Charge		--	3.0	--	nC
Q _{gd}	Gate-Drain Charge		--	7.9	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current	--	--	9.6	A	
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	28.8	A	
V _{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 4.0\text{ A}$	--	--	1.2	V
t _{rr}	Reverse Recovery Time	$V_{DD} = 400\text{ V}, I_S = 4.0\text{ A},$ $dI_F / dt = 100\text{ A/us}$ (Note 4)	--	221	--	ns
Q _{rr}	Reverse Recovery Charge		--	1.8	--	uC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 79 mH, I_{AS} = 2.5A, V_{DD} = 100V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 4A, di/dt ≤ 100A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

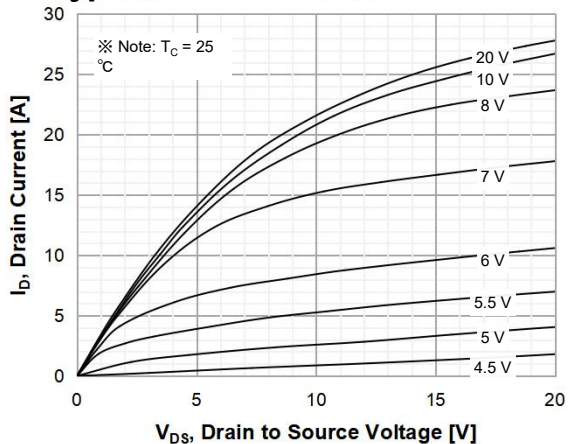


Figure 1. On-Region Characteristics

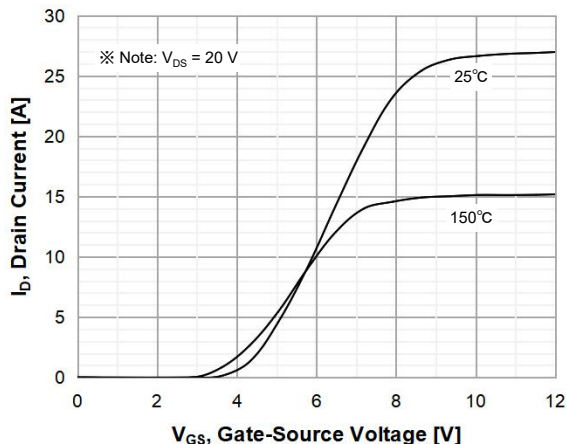


Figure 2. Transfer Characteristics

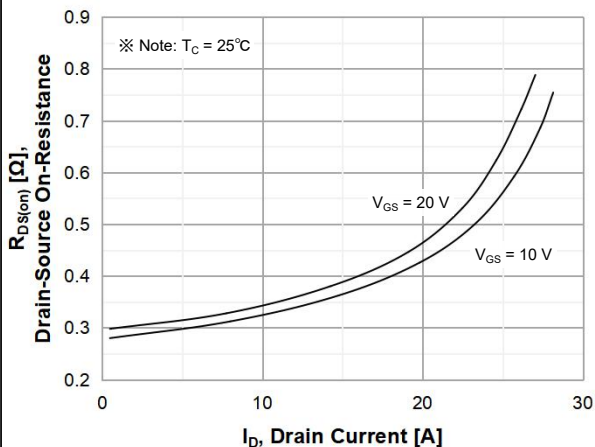


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

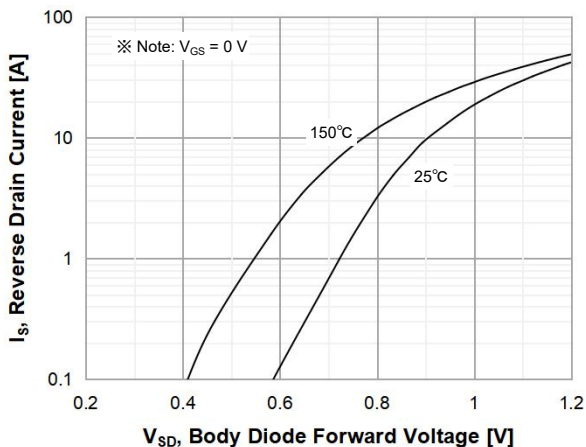


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

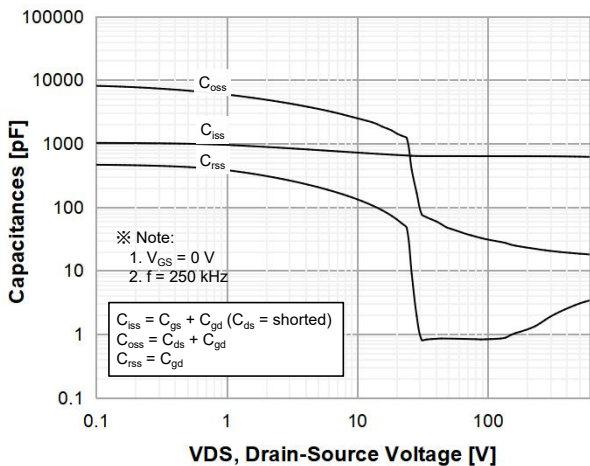


Figure 5. Capacitance Characteristics

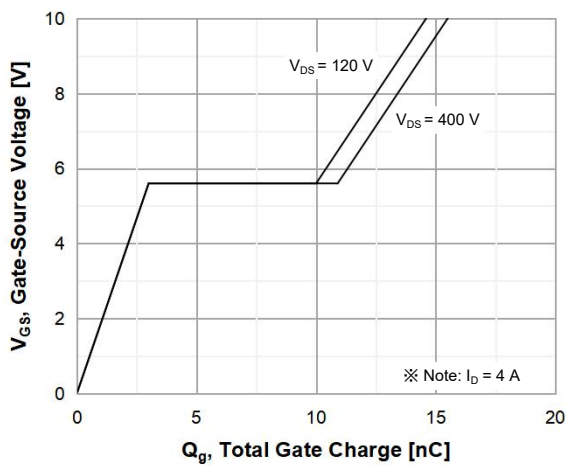


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

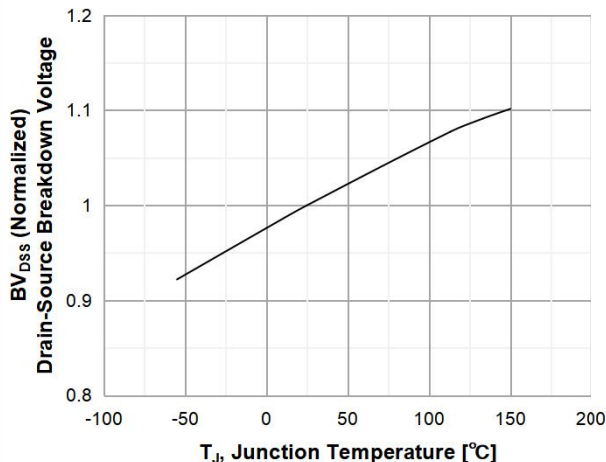


Figure 7. Breakdown Voltage Variation vs Temperature

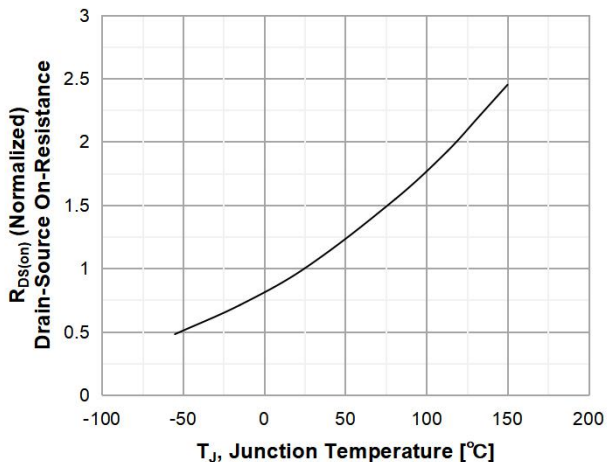


Figure 8. On-Resistance Variation vs Temperature

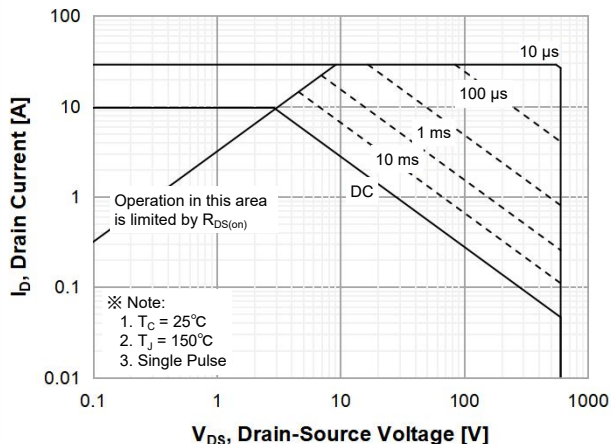


Figure 9. Maximum Safe Operating Area

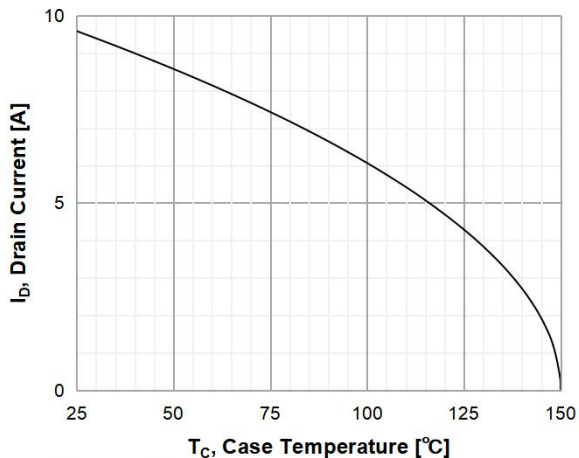


Figure 10. Maximum Drain Current vs Case Temperature

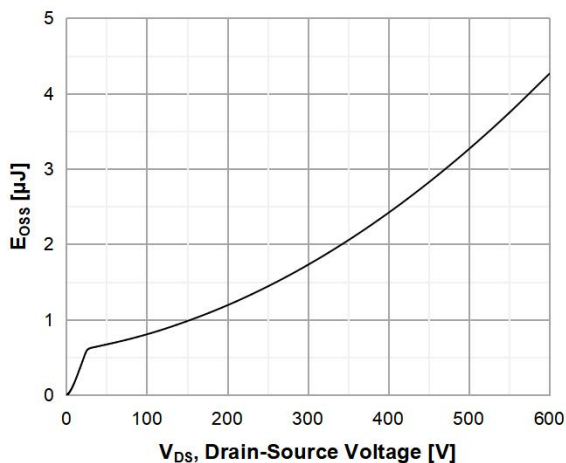


Figure 11. E_{OSS} vs. Drain to Source Voltage

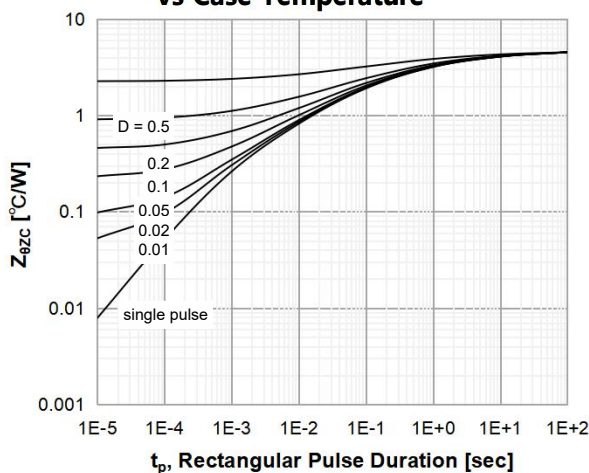
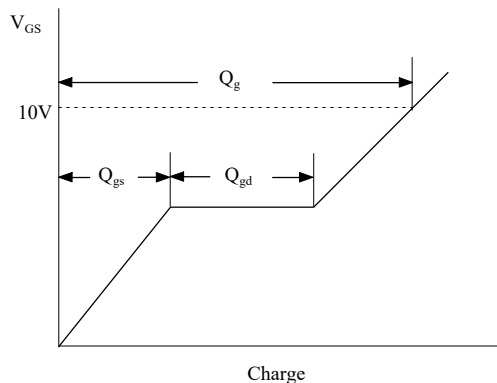
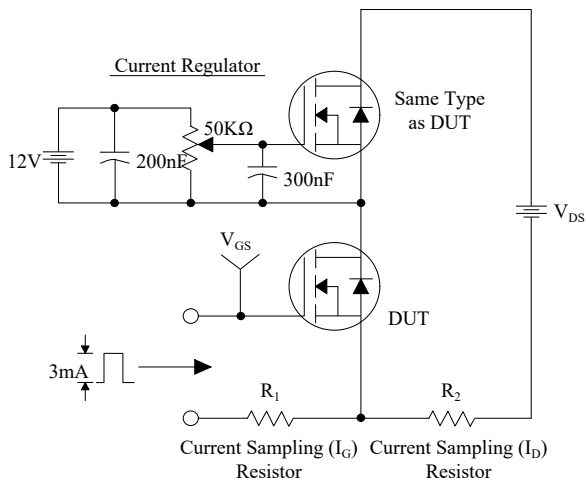
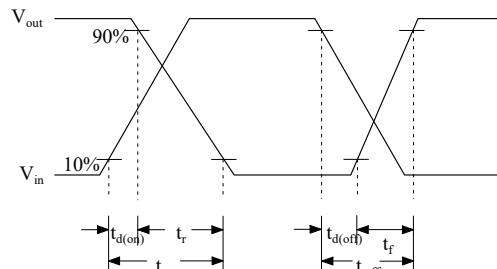
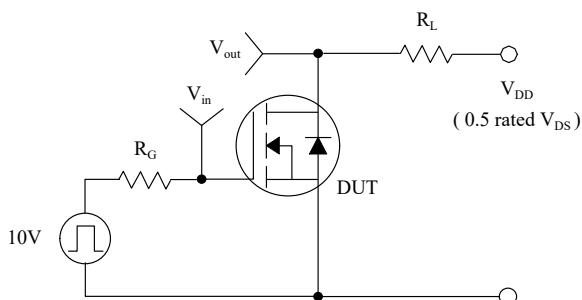


Figure 12. Transient Thermal Response Curve

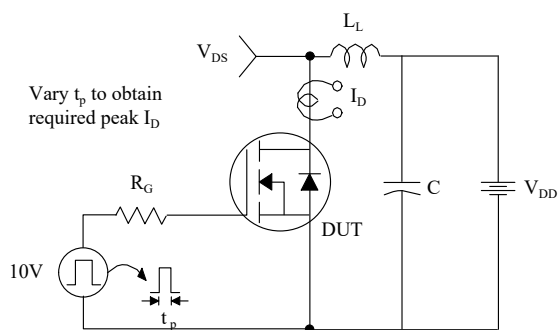
Gate Charge Test Circuit & Waveform



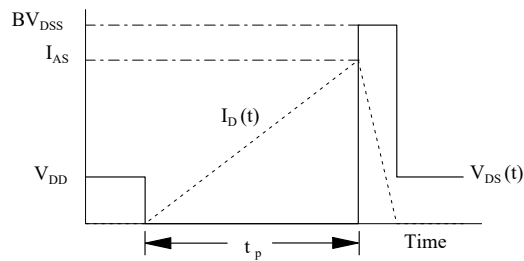
Resistive Switching Test Circuit & Waveforms



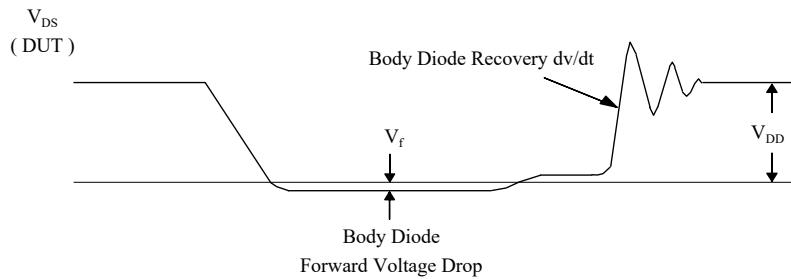
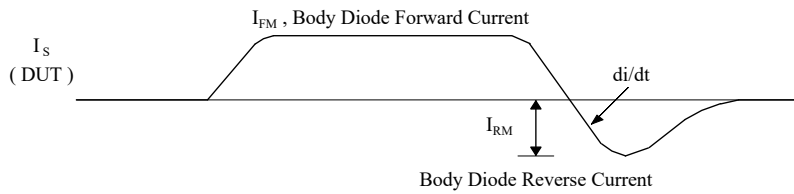
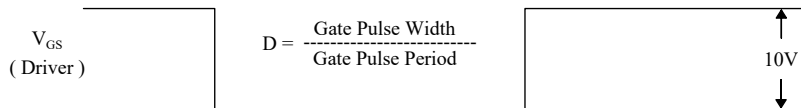
Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L_L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



Peak Diode Recovery dv/dt Test Circuit & Waveforms



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