Maplesemi

CB-FET

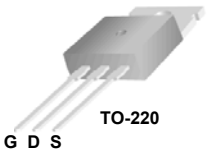
SLP60R280SJ / SLF60R280SJ
600V N-Channel MOSFET

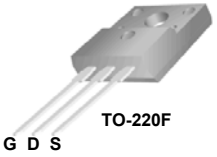
General Description

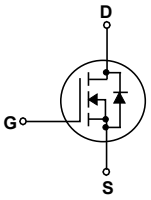
This Power MOSFET is produced using Maple semi's Advanced Super-Junction technology.
This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.
These devices are well suited for AC/DC power conversion in switching mode operation for higher efficiency.

Features

- 15A, 600V, $R_{DS(on)\ typ.}$ = 0.25Ω@V_{GS} = 10 V
- Low gate charge (typical 43nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability







Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		SLP60R280SJ	SLF60R280SJ	Units
V_{DSS}	Drain-Source Voltage		600		V
I_D	Drain Current - Continuous (T_C = 25℃)		15	15 *	A
	- Continuous (T_C = 100℃)		9.4	9.4 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	45	45 *	A
V_{GSS}	Gate-Source Voltage		±30		V
EAS	Single Pulsed Avalanche Energy	(Note 2)	110		mJ
I_{AR}	Avalanche Current	(Note 1)	2.1		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	0.32		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.0		V/ns
P_D	Power Dissipation (T_C = 25℃)		156	34	W
	- Derate above 25℃		1.67	0.3	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		300		℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	SLP60R280SJ	SLF60R280SJ	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.6	3.6	℃/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	80	℃/W

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 = 250 uA	600	--	--	V
$\triangle BV_{DSS}$ / $\triangle T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 uA, Referenced to 25℃	--	0.6	--	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℃	--	--	10	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 = 250 uA	2.5	--	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 7.5 A	--	0.25	0.28	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 7.5 A (Note 4)	--	16	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	800	--	pF
C_{oss}	Output Capacitance		--	180	--	pF
C_{rss}	Reverse Transfer Capacitance		--	8	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 400 V, I_D = 6.5A, R_G = 20 Ω (Note 4, 5)	--	13	--	ns
t_r	Turn-On Rise Time		--	11	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	100	--	ns
t_f	Turn-Off Fall Time		--	12	--	ns
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 6.5 A, V_{GS} = 10 V (Note 4, 5)	--	43	--	nC
Q_{gs}	Gate-Source Charge		--	5	--	nC
Q_{gd}	Gate-Drain Charge		--	22	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	12	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	40	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 6.5 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 6.5 A, dI_F / dt = 100 A/us (Note 4)	--	345	--	ns
Q_{rr}	Reverse Recovery Charge		--	4.5	--	uC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=50mL, I_{AS} = 2.1A, V_{DD} = 150V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤15A, di/dt ≤ 200A/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

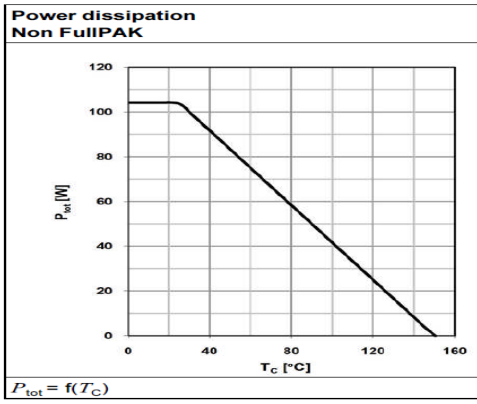


Figure 1. Power Dissipation for SLP60R280SJ

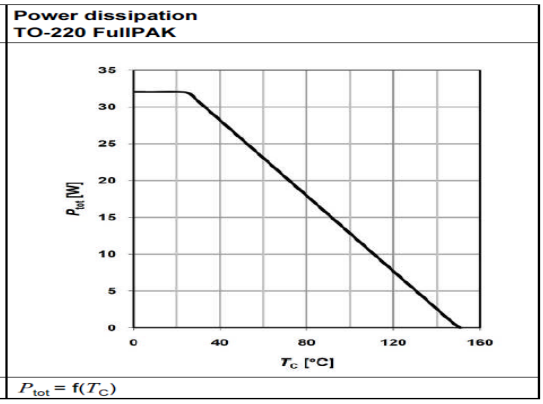


Figure 2. Power Dissipation for SLF60R280SJ

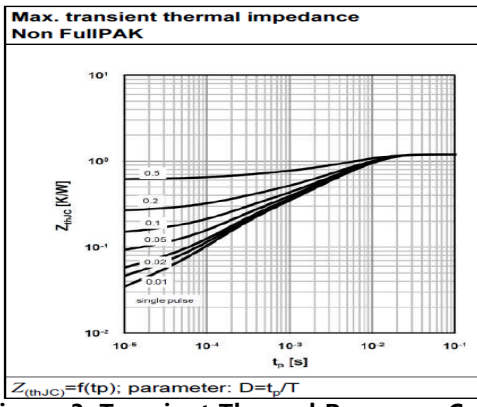


Figure 3. Transient Thermal Response Curve for SLP60R280SJ

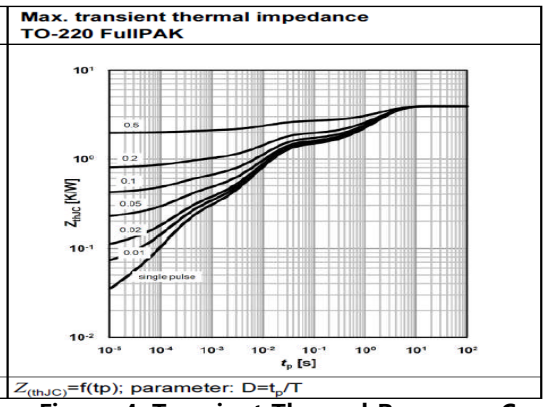


Figure 4. Transient Thermal Response Curve for SLF60R280SJ

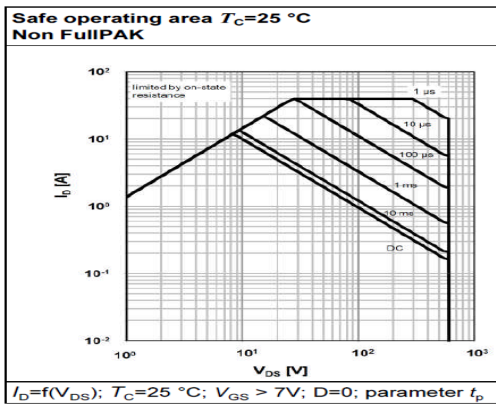


Figure 5. Maximum Safe Operating Area for SLP60R280SJ@25℃

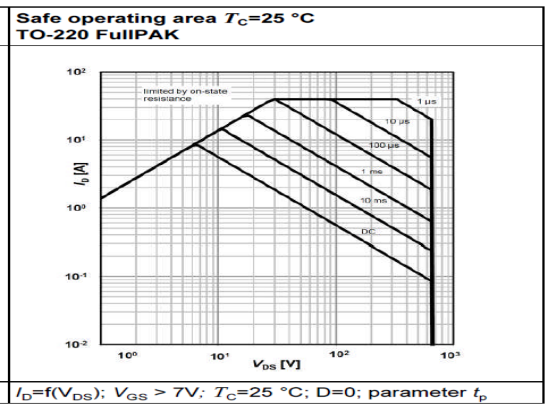
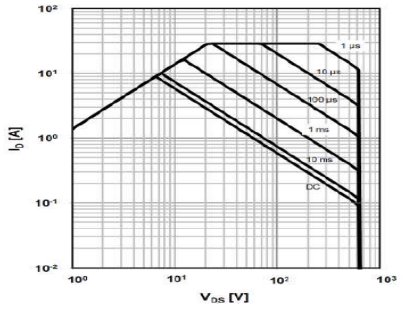


Figure 6. Maximum Safe Operating Area for SLF60R280SJ@25℃

Typical Characteristics (Continued)

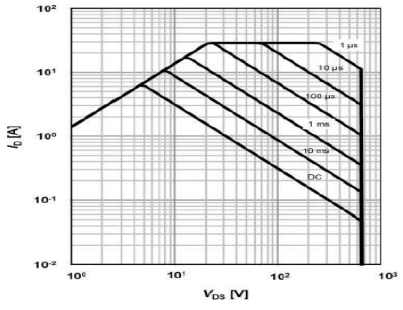
Safe operating area T_C=80 °C
Non FullPAK



I_D=f(V_{DS}); V_{GS} > 7V; T_C=80 °C; D=0; parameter t_p

Figure 7. Maximum Safe Operating Area for SLP60R280SJ@80℃

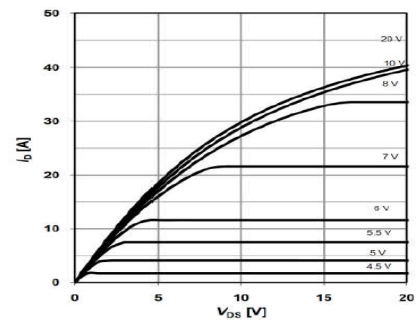
Safe operating area T_C=80 °C
TO-220 FullPAK



I_D=f(V_{DS}); V_{GS} > 7V; T_C=80 °C; D=0; parameter t_p

Figure 8. Maximum Safe Operating Area for SLP60R280SJ@80℃

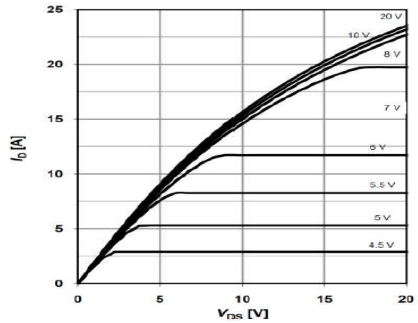
Typ. output characteristics T_C=25 °C



I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Figure 9. Output Characteristics@25℃

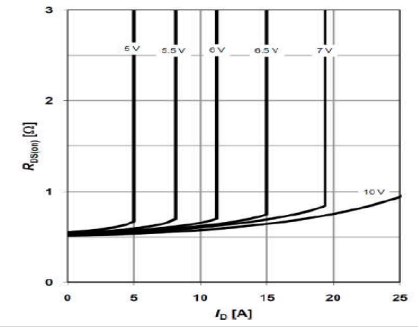
Typ. output characteristics T_j=125 °C



I_D=f(V_{DS}); T_j=125 °C; parameter: V_{GS}

Figure 10. Output Characteristics@125℃

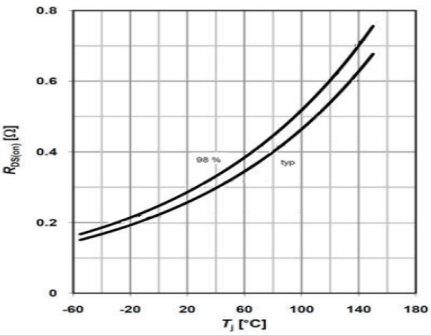
Typ. drain-source on-state resistance



$R_{DS(on)}$=f(I_D); T_j=125 °C; parameter: V_{GS}

Figure 11. On-Resistance Variation vs Drain Current and Gate Voltage@125℃

Drain-source on-state resistance

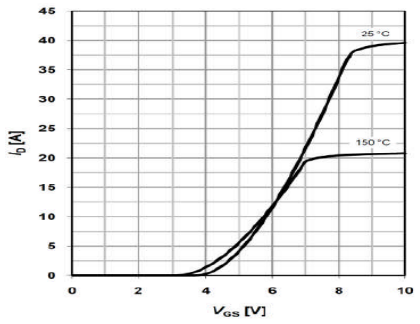


$R_{DS(on)}$=f(T_j); I_D=4.4 A; V_{GS}=10 V

Figure 12. On-Resistance Variation vs Temperature

Typical Characteristics (Continued)

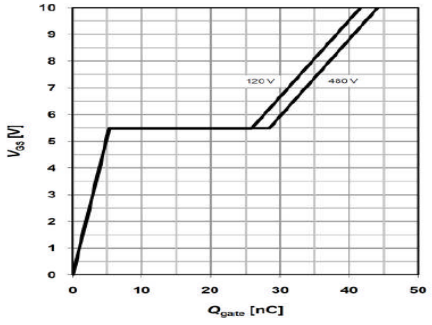
Typ. transfer characteristics



I_D=f(V_{GS}); V_{DS}=20V

Figure 13. Transfer Characteristics

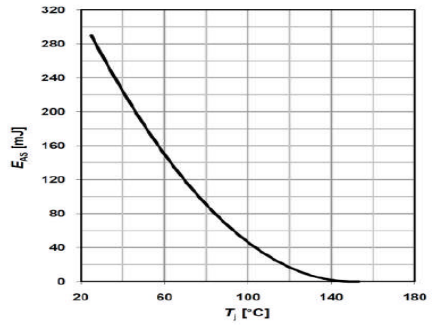
Typ. gate charge



V_{GS}=f(Q_{gate}), I_D=4.4 A pulsed

Figure 14. Gate Charge Characteristics

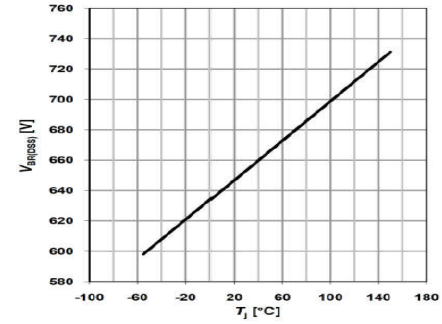
Avalanche energy



E_{AS}=f(T_j); I_D=2.4 A; V_{DD}=50 V

Figure 15. Avalanche Energy Characteristics

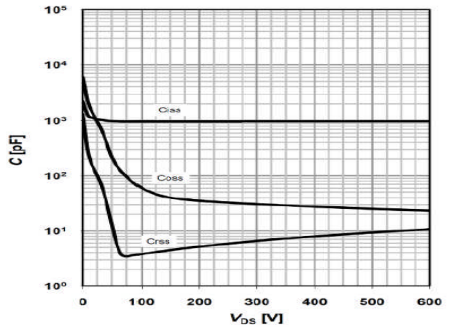
Drain-source breakdown voltage



$V_{BR(DSS)}$=f(T_j); I_D=0.25 mA

Figure 16. Breakdown Voltage Variation vs Temperature

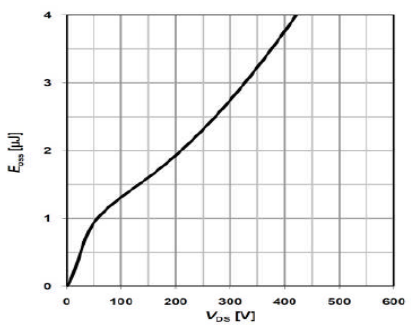
Typ. capacitances



C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Figure 17. Capacitance Characteristics

Typ. C_{oss} stored energy



E_{OSS}=f(V_{DS})

Figure 18. On-Resistance Variation vs Temperature

Typical Characteristics (Continued)

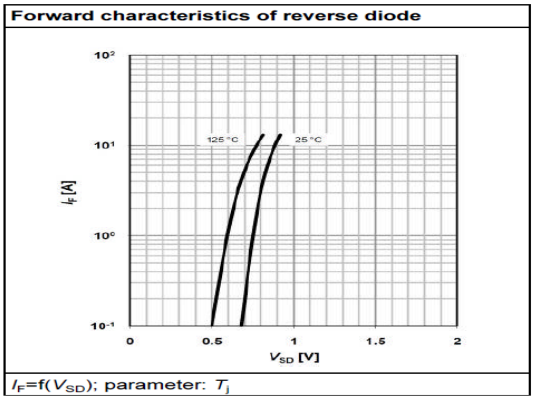
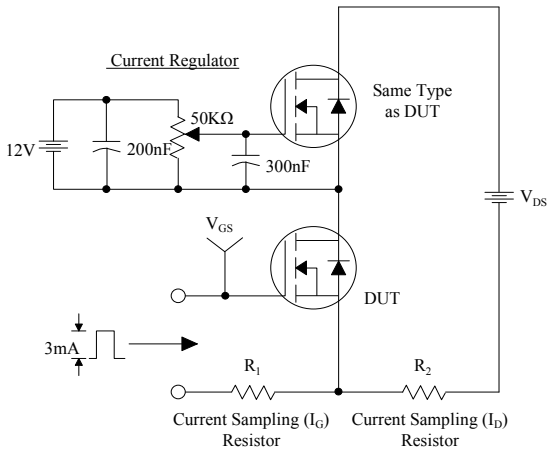
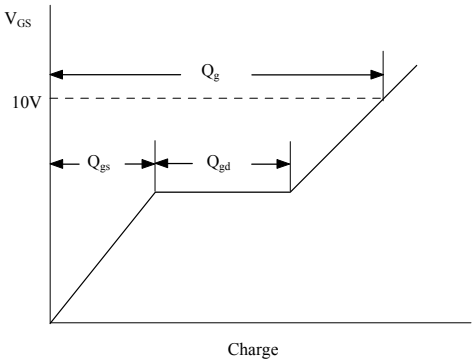


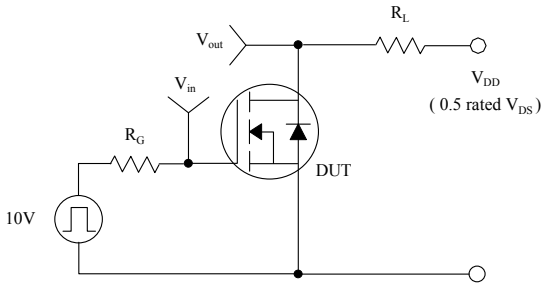
Figure 19. Body Diode Forward Voltage Variation with Source Current and Temperature

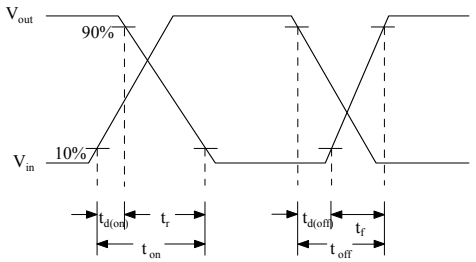
Gate Charge Test Circuit & Waveform



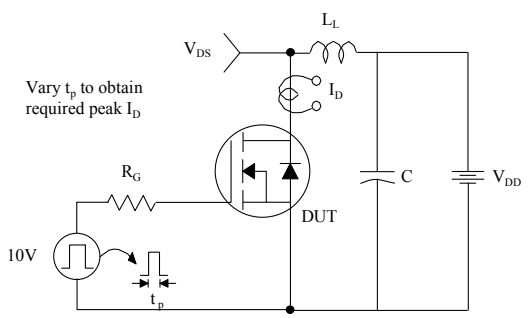


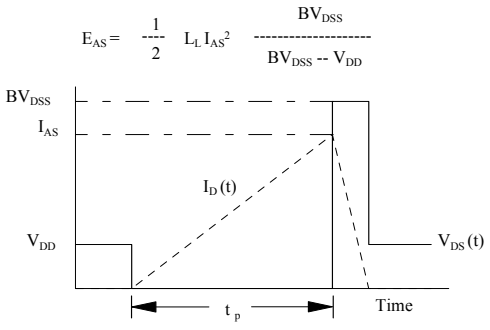
Resistive Switching Test Circuit & Waveforms





Unclamped Inductive Switching Test Circuit & Waveforms





Peak Diode Recovery dv/dt Test Circuit & Waveforms