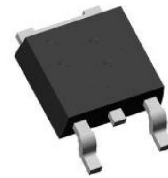
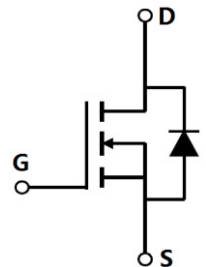


Main Product Characteristics

V_{DS}	600V
$R_{DS(on)}$	380mΩ (max.)
I_D	11A



TO-252(DPAK)



Schematic Diagram

Features and Benefits

- Advanced MOSFET process technology
- Ideal for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 100% avalanche rated



Description

SSF60R380D utilizes the latest trench techniques to achieve high cell density, low on-resistance and high repetitive avalanche rating. These features make this device extremely efficient and reliable for use in power switching applications and a wide variety of other applications.

Absolute Maximum Ratings ($T_j=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain Source Voltage	V_{DS}	600	V
Gate Source Voltage	V_{GS}	± 30	V
Continuous Drain Current ¹⁾	I_D	11	A
Continuous Drain Current ¹⁾ $T_j=100^{\circ}\text{C}$		7	
Pulsed Drain Current ²⁾	$I_{D,pulse}$	33	A
Power Dissipation ³⁾ for TO252	P_D	83	W
Single Pulsed Dvalanche Dnergy ⁵⁾	E_{AS}	272	mJ
MOSFET dv/dt Duggedness, $V_{DS}=0\dots 480\text{ V}$	dv/dt	50	V/ns
Reverse Diode dv/dt, $V_{DS}=0\dots 480\text{ V}$, $I_{SD}\leq I_D$	dv/dt	15	V/ns
Operation and Dstorage Temperature	T_{STG} , T_J	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-Case	$R_{\theta JC}$	1.5	°C/W
Thermal Resistance, Junction-Ambient ⁴⁾	$R_{\theta JA}$	62	°C/W

Electrical characteristics ($T_j=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Drain-Source Breakdown Voltage	BV_{DSS}	600	-	-	V	$V_{GS}=0\text{ V}$, $I_D=250\ \mu\text{A}$
		650	716	-		$V_{GS}=0\text{ V}$, $I_D=250\ \mu\text{A}$ $T_j=150\ ^\circ\text{C}$
Gate Threshold Voltage	$V_{GS(th)}$	2.0	-	4.0	V	$V_{DS}=V_{GS}$, $I_D=250\ \mu\text{A}$
Drain-Source On-State Resistance	$R_{DS(on)}$	-	0.33	0.38	Ω	$V_{GS}=10\text{ V}$, $I_D=5.5\text{ A}$
		-	0.83	-		$V_{GS}=10\text{ V}$, $I_D=5.5\text{ A}$, $T_j=150\ ^\circ\text{C}$
Gate-Source Leakage Current	I_{GSS}	-	-	100	nA	$V_{GS}=30\text{ V}$
		-	-	-100		$V_{GS}=-30\text{ V}$
Drain-Source Leakage Current	I_{DSS}	-	-	1	μA	$V_{DS}=600\text{ V}$, $V_{GS}=0\text{ V}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Input Capacitance	C_{iss}		690		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=1\text{ MHz}$
Output Capacitance	C_{oss}		57		pF	
Reverse Transfer Capacitance	C_{rss}		2.47		pF	
Turn-On Delay Time	$t_{d(on)}$		26		ns	$V_{GS}=10\text{ V}$, $V_{DS}=380\text{ V}$, $R_G=25\ \Omega$, $I_D=11\text{ A}$
Rise Time	t_r		28.3		ns	
Turn-Off Delay Time	$t_{d(off)}$		34		ns	
Fall Time	t_f		33.2		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Total Gate Charge	Q_g		13		nC	$I_D=11\text{ A}$, $V_{DS}=480\text{ V}$, $V_{GS}=10\text{ V}$
Gate-Source Charge	Q_{gs}		3.6		nC	
Gate-Drain Charge	Q_{gd}		5.6		nC	
Gate Plateau Voltage	V_{plateau}		5.6		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Diode Forward Current	I_S			11	A	$V_{GS}<V_{th}$
Pulsed Source Current	I_{SP}			33		
Diode Forward Voltage	V_{SD}			1.3	V	$I_S=11\text{ A}$, $V_{GS}=0\text{ V}$
Reverse Recovery Time	t_{rr}		266		ns	$V_R=400\text{ V}$, $I_S=11\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse Recovery Charge	Q_{rr}		2.8		μC	
Peak Reverse Recovery Current	I_{rrm}		19.6		A	

Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=50\text{ V}$, $R_G=25\text{ }\Omega$, $L=10.8\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

Typical Characteristic Curves

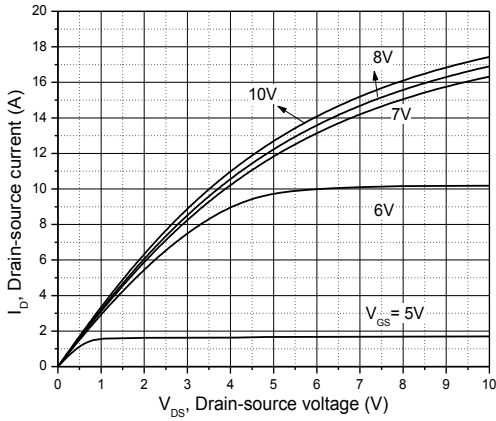


Figure 1, Typ. output characteristics

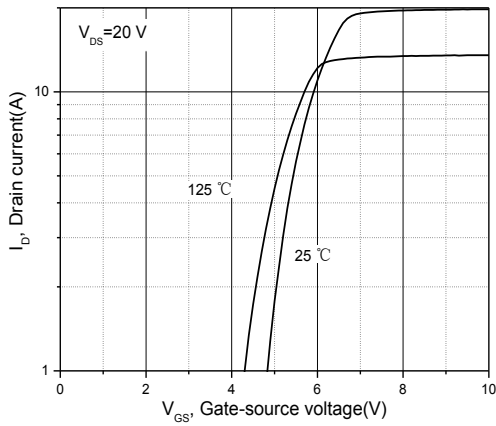


Figure 2, Typ. transfer characteristics

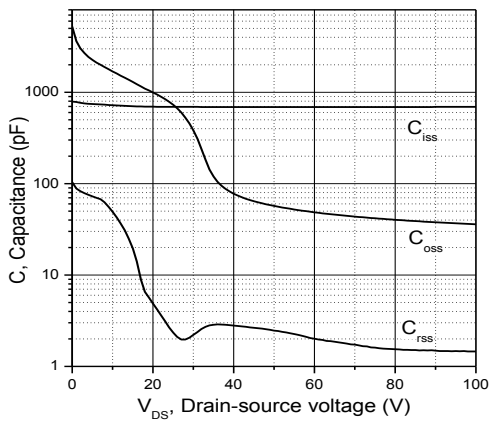


Figure 3, Typ. capacitances

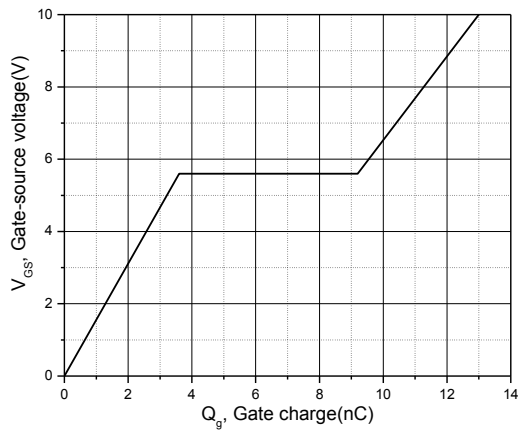


Figure 4, Typ. gate charge

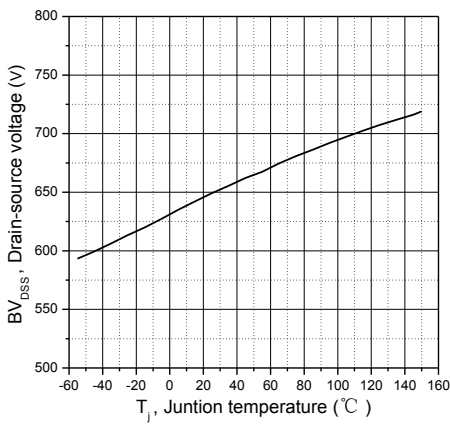


Figure 5, Drain-source breakdown voltage

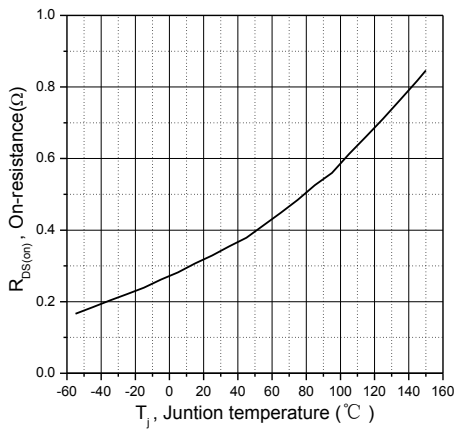


Figure 6, Drain-source on-state resistance

Typical Characteristic Curves

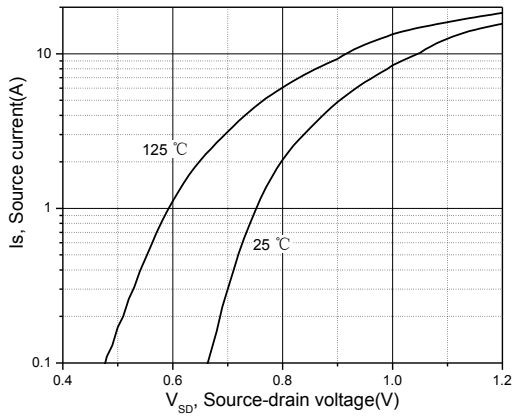


Figure 7, Forward characteristic of body diode

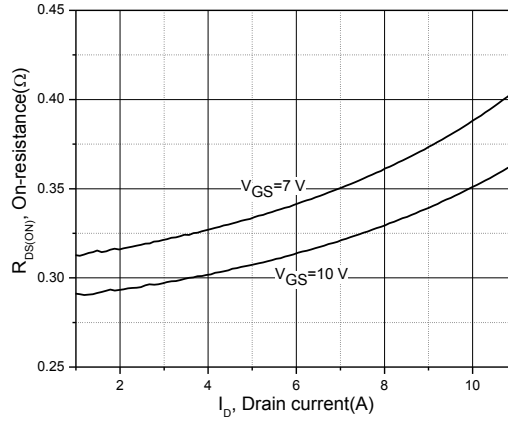


Figure 8, Drain-source on-state resistance

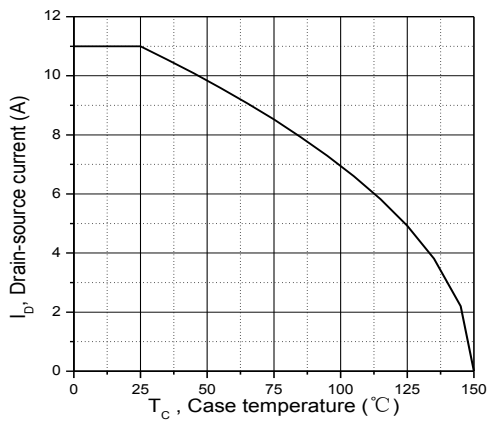


Figure 9, Drain current

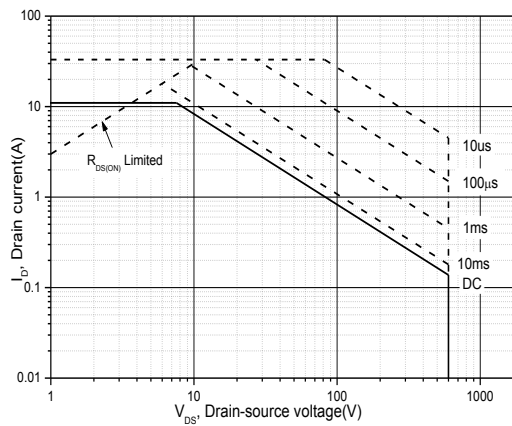


Figure 10, Safe operation area for
 $T_C = 25\text{ °C}$

Test Circuits and Waveforms

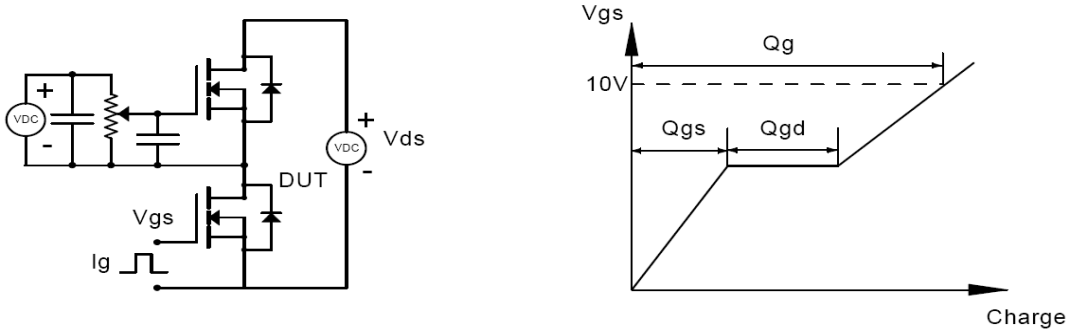


Figure 1, Gate charge test circuit & waveform

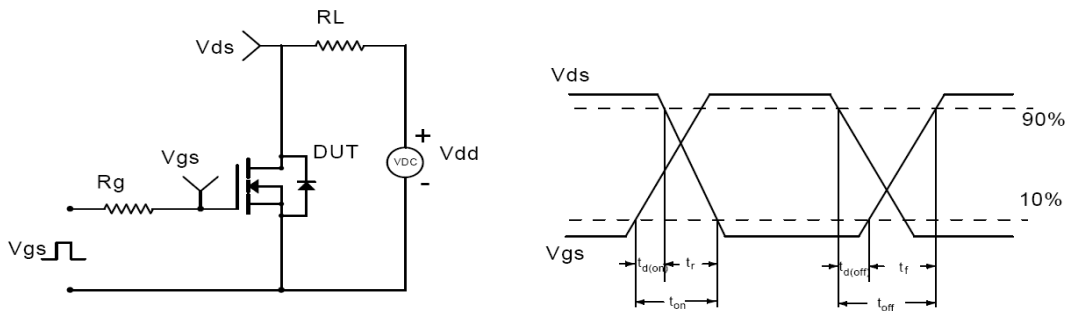


Figure 2, Switching time test circuit & waveforms

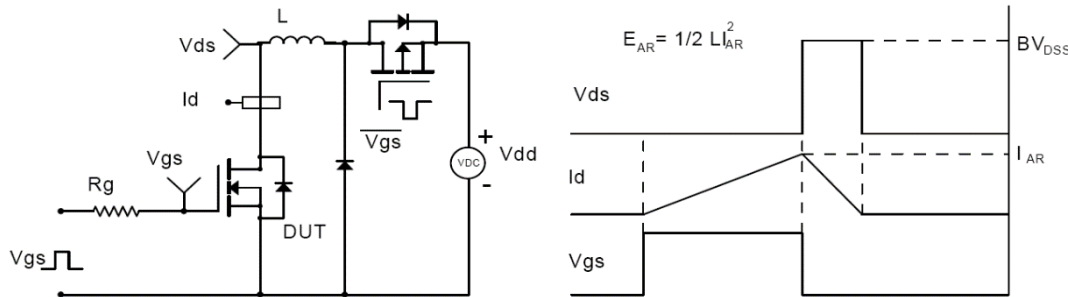


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

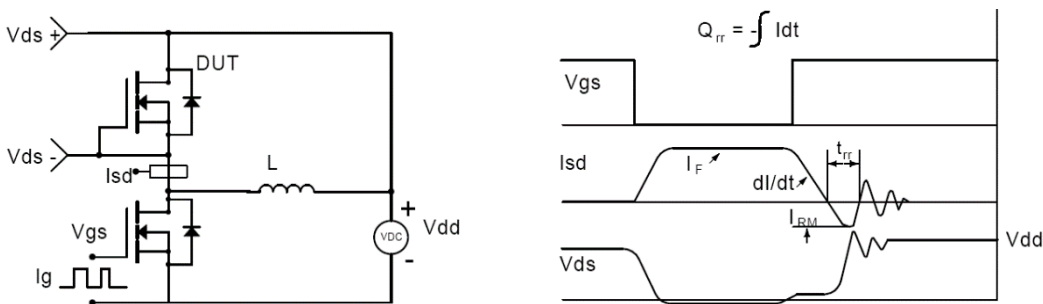
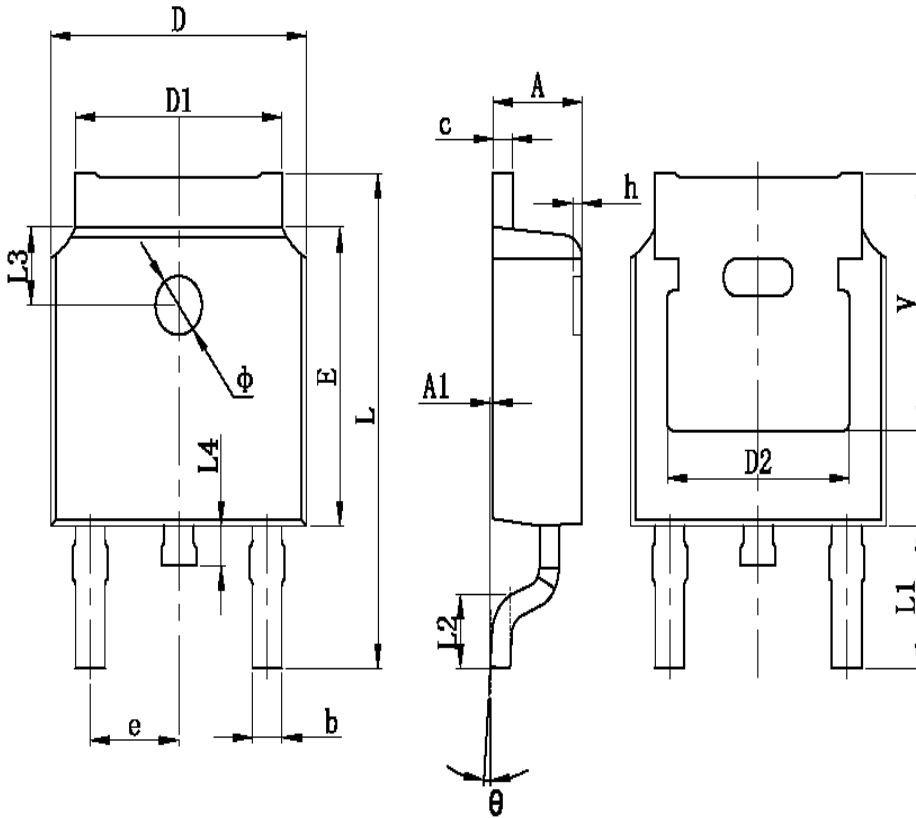


Figure 4, Diode reverse recovery test circuit & waveforms

Package Outline Dimensions TO-252



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	