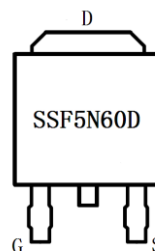
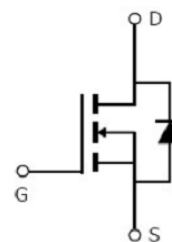


**Main Product Characteristics:**

$V_{DSS}$	600V
$R_{DS(on)}$	1.88 $\Omega$ (typ.)
$I_D$	5A


**TO-252**

**Marking and pin Assignment**

**Schematic diagram**
**Features and Benefits:**

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature


**Description:**

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

**Absolute max Rating:**

Symbol	Parameter	Max.	Units
$I_D$ @ TC = 25°C	Continuous Drain Current, $V_{GS}$ @ 10V <sup>①</sup>	5	A
$I_D$ @ TC = 100°C	Continuous Drain Current, $V_{GS}$ @ 10V <sup>①</sup>	3.1	
$I_{DM}$	Pulsed Drain Current <sup>②</sup>	20	
$P_D$ @TC = 25°C	Power Dissipation <sup>③</sup>	144	W
	Linear Derating Factor	0.96	W/°C
$V_{DS}$	Drain-Source Voltage	600	V
$V_{GS}$	Gate-to-Source Voltage	± 30	V
$E_{AS}$	Single Pulse Avalanche Energy @ L=6.4mH	180	mJ
$I_{AS}$	Avalanche Current @ L=6.4mH	7.5	A
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

## Thermal Resistance

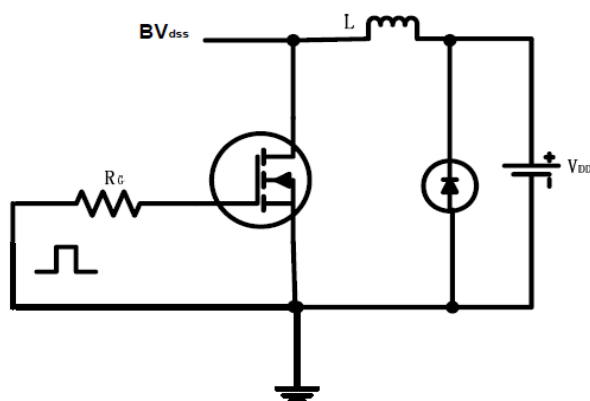
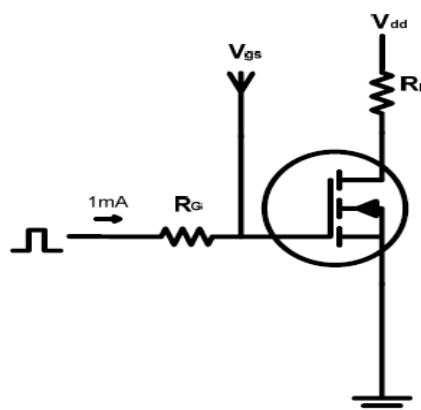
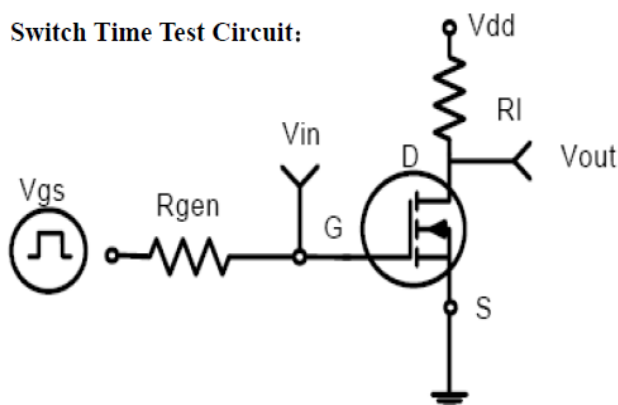
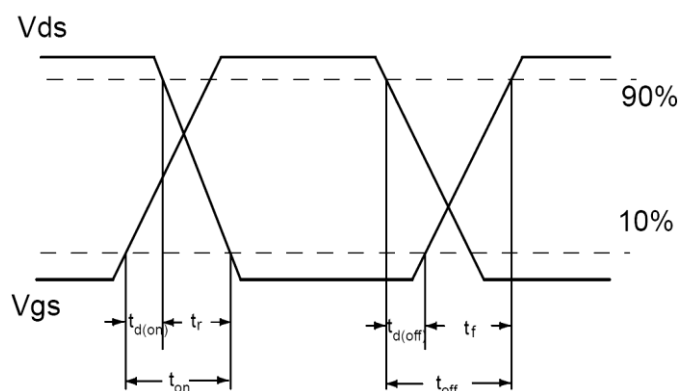
Symbol	Characterizes	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case <sup>③</sup>	—	1.04	°C/W
$R_{\theta JA}$	Junction-to-ambient ( $t \leq 10s$ ) <sup>④</sup>	—	110	°C/W

## Electrical Characterizes @ $T_A=25^\circ C$ unless otherwise specified

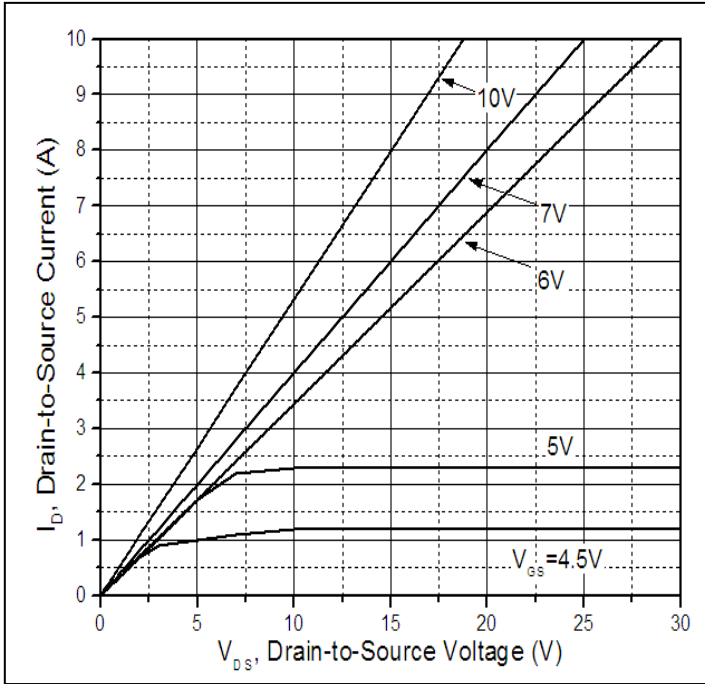
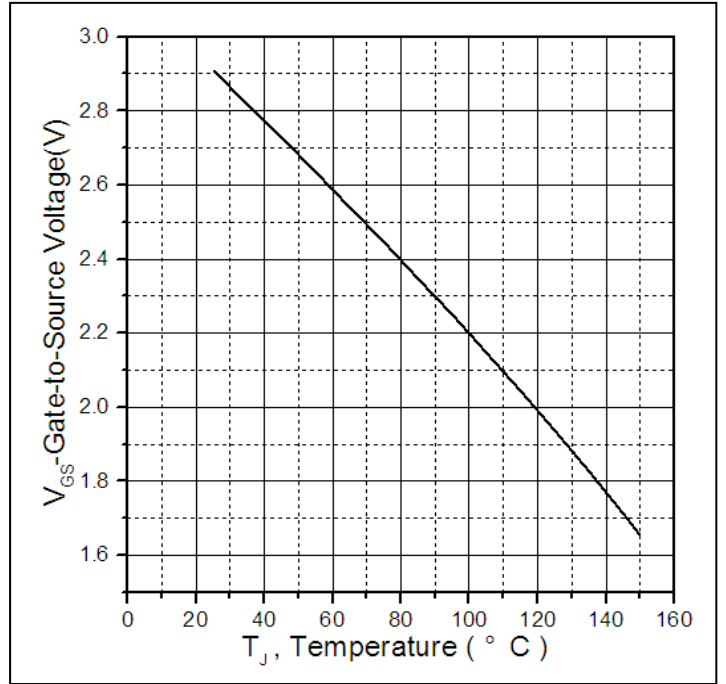
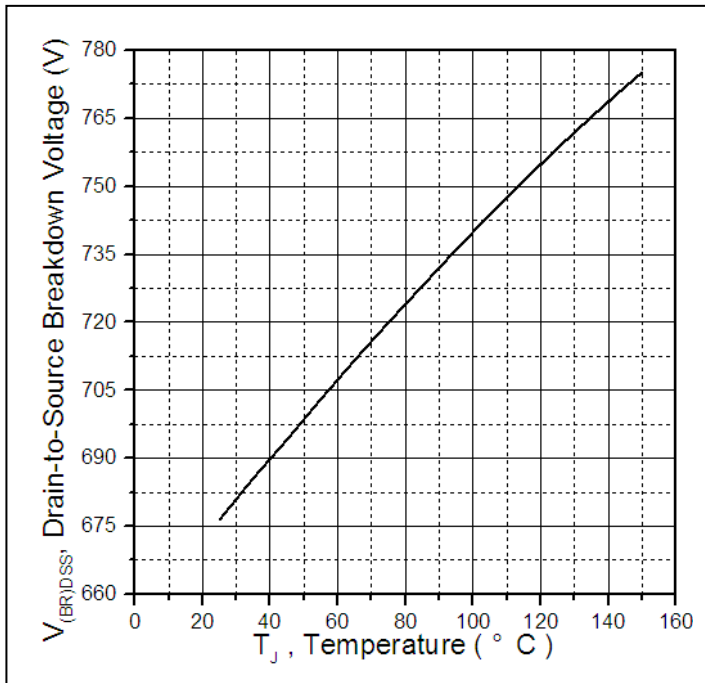
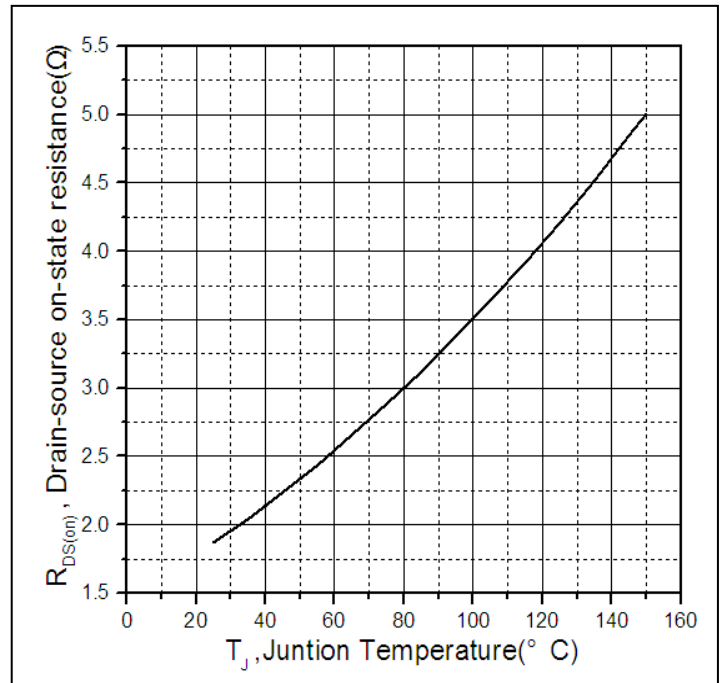
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	600	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.88	2.15	$\Omega$	$V_{GS}=10V, I_D = 2A$
		—	4.30	—		$T_J = 125^\circ C$
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		—	1.94	—		$T_J = 125^\circ C$
$I_{DSS}$	Drain-to-Source leakage current	—	—	1	$\mu A$	$V_{DS} = 600V, V_{GS} = 0V$
		—	—	50		$T_J = 125^\circ C$
$I_{GSS}$	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30V$
		—	—	-100		$V_{GS} = -30V$
$Q_g$	Total gate charge	—	10.35	—	nC	$I_D = 4A,$ $V_{DS}=300V,$ $V_{GS} = 10V$
$Q_{gs}$	Gate-to-Source charge	—	3.73	—		
$Q_{gd}$	Gate-to-Drain("Miller") charge	—	2.93	—		
$t_{d(on)}$	Turn-on delay time	—	10.7	—	ns	$V_{GS}=10V, V_{DS}=300V,$ $R_{GEN}=5\Omega, I_D=4A$
$t_r$	Rise time	—	7.1	—		
$t_{d(off)}$	Turn-Off delay time	—	15.2	—		
$t_f$	Fall time	—	7.2	—		
$C_{iss}$	Input capacitance	—	507	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output capacitance	—	68.0	—		$V_{DS} = 25V$
$C_{rss}$	Reverse transfer capacitance	—	2.13	—		$f = 1MHz$

## Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	5	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode)	—	—	20	A	
$V_{SD}$	Diode Forward Voltage	—	0.86	1.4	V	$I_S=4A, V_{GS}=0V$
$t_{rr}$	Reverse Recovery Time	—	851	—	ns	$T_J = 25^\circ C, I_F = 4A,$
$Q_{rr}$	Reverse Recovery Charge	—	2407	—	nC	$di/dt = 100A/\mu s$

**Test circuits and Waveforms**
**EAS test circuits:**

**Gate charge test circuit:**

**Switch Time Test Circuit:**

**Switch Waveforms:**

**Notes:**

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ C$
- ⑤ These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)} = 150^\circ C$ .

**Typical electrical and thermal characteristics**

**Figure 1: Typical Output Characteristics**

**Figure 2. Gate to source cut-off voltage**

**Figure 3. Drain-to-Source Breakdown Voltage vs. Case Temperature**

**Figure 4: Normalized On-Resistance Vs. Case Temperature**

Typical electrical and thermal characteristics

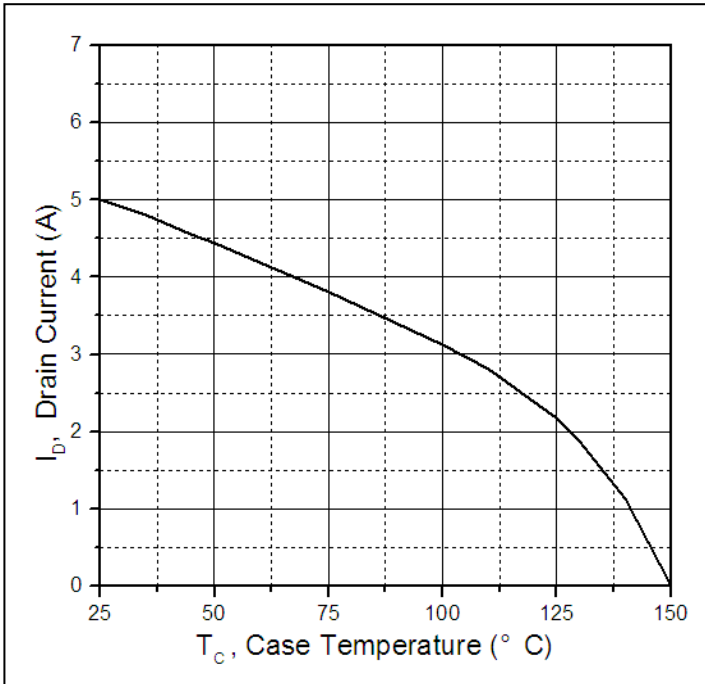


Figure 5. Maximum Drain Current Vs. Case Temperature

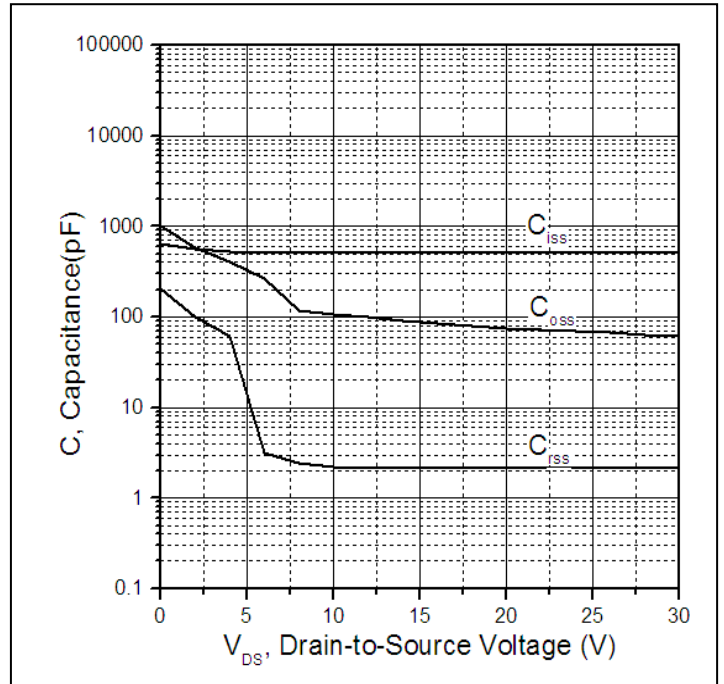


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

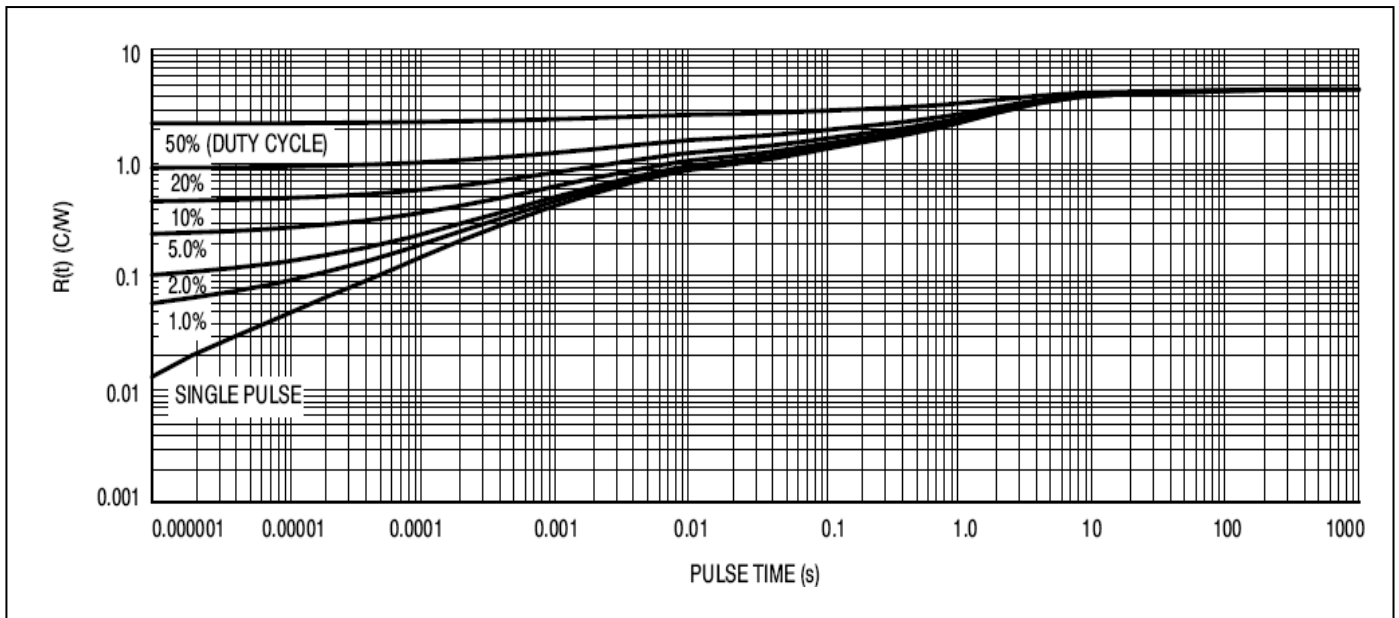
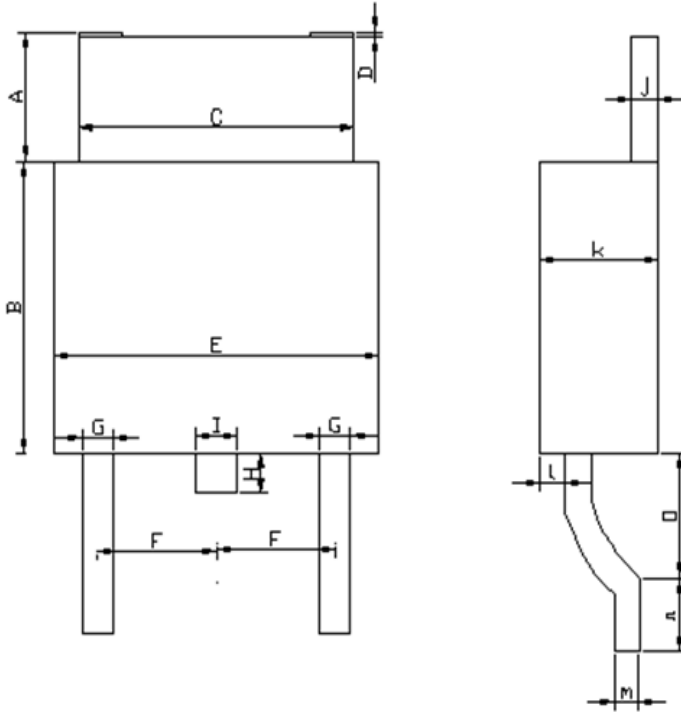


Figure 7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

**Mechanical Data:**
**TO-252 PACKAGE OUTLINE DIMENSION**


Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.400	0.900	1.400	0.016	0.035	0.055
B	5.350	5.850	6.350	0.211	0.230	0.250
C	4.800	5.300	5.800	0.189	0.209	0.228
D	0.980	0.100	1.020	0.039	0.004	0.040
E	5.800	6.300	6.800	0.228	0.248	0.268
F	2.200	2.300	2.400	0.087	0.091	0.094
G	0.600	0.700	0.800	0.024	0.028	0.031
H	0.200	0.700	1.200	0.008	0.028	0.047
I	0.700	0.800	0.900	0.028	0.031	0.035
J	0.408	0.508	0.608	0.016	0.020	0.024
K	2.050	2.300	2.550	0.081	0.091	0.100
L	0.550	0.800	1.050	0.022	0.031	0.041
M	0.408	0.508	0.608	0.016	0.020	0.024
N	1.050	1.300	1.550	0.041	0.051	0.061
O	1.250	1.500	1.750	0.049	0.059	0.069

**Ordering and Marking Information**
**Device Marking: SSF5N60D**

**Package (Available)**  
**TO-252 (DPAK)**  
**Operating Temperature Range**  
**C : -55 to 150 °C**

**Devices per Unit**

Package Type	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Carton Box	Units/Carton Box
TO-252	80	50	4000	10	40000

**Reliability Test Program**

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	$T_j=125^{\circ}\text{C}$ to $150^{\circ}\text{C}$ @ 80% of Max $V_{DSS}/V_{CES}/V_R$	168 hours 500 hours 1000 hours	3 lots x 77 devices
High Temperature Gate Bias(HTGB)	$T_j=150^{\circ}\text{C}$ @ 100% of Max $V_{GSS}$	168 hours 500 hours 1000 hours	3 lots x 77 devices

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