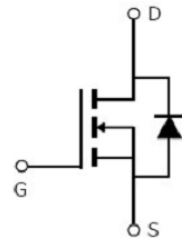


Main Product Characteristics:

V_{DS}	500V
$R_{DS(on)}$	0.41 Ω (typ.)
I_D	13A


TO220F

Marking and pin Assignment

Schematic diagram
Features and Benefits:

- Advanced 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:

These N-Channel enhancement mode power field effect transistors are produced using silikron proprietary 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 switch mode power supplies.

Absolute max Rating:

Symbol	Parameter	Max.	Units
I_D @ TC = 25°C	Continuous Drain Current, V_{GS} @ 10V①	13	A
I_D @ TC = 100°C	Continuous Drain Current, V_{GS} @ 10V①	8	
I_{DM}	Pulsed Drain Current②	52	
P_D @ TC = 25°C	Power Dissipation③	50	W
	Linear Derating Factor	0.4	W/°C
V_{DS}	Drain-Source Voltage	500	V
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy @ L=29.2mH	865	mJ
I_{AS}	Avalanche Current @ L=29.2mH	7.7	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

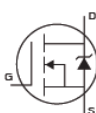
Thermal Resistance

Symbol	Characterizes	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ^③	—	2.5	°C/W
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ^④	—	62	°C/W
	Junction-to-Ambient (PCB mounted, steady-state) ^④	—	40	°C/W

Electrical Characterizes @ $T_A=25^\circ\text{C}$ unless otherwise specified

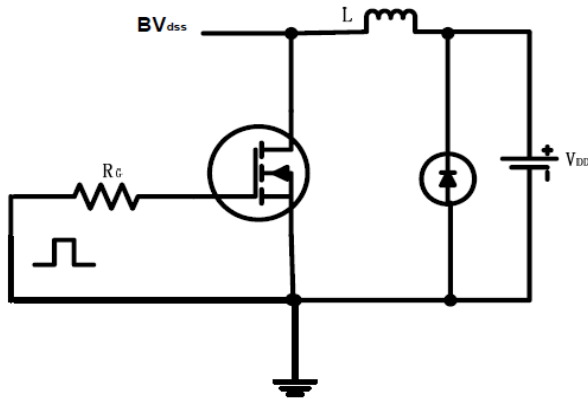
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	0.41	0.52	Ω	$V_{GS}=10V, I_D = 6.5A$
		—	0.93	—		$T_J = 125^\circ\text{C}$
$V_{GS(th)}$	Gate threshold voltage	2	—	4	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		—	2.01	—		$T_J = 125^\circ\text{C}$
I_{DSS}	Drain-to-Source leakage current	—	—	1	μA	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	50		$T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS} = 30V$
		—	—	-100		$V_{GS} = -30V$
Q_g	Total gate charge	—	30.1	—	nC	$I_D = 12A,$ $V_{DS}=300V,$ $V_{GS} = 10V$
Q_{gs}	Gate-to-Source charge	—	9.6	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	11.2	—		
$t_{d(on)}$	Turn-on delay time	—	18.9	—	nS	$V_{GS}=10V, V_{DS} = 300V,$ $R_L=50\Omega, R_{GEN}=15\Omega$ $I_D = 6A$
t_r	Rise time	—	23.8	—		
$t_{d(off)}$	Turn-Off delay time	—	61.0	—		
t_f	Fall time	—	25.3	—		
C_{iss}	Input capacitance	—	1491	—	pF	$V_{GS} = 0V$
C_{oss}	Output capacitance	—	203	—		$V_{DS} = 25V$
C_{rss}	Reverse transfer capacitance	—	2.1	—		$f = 1MHz$

Source-Drain Ratings and Characteristics

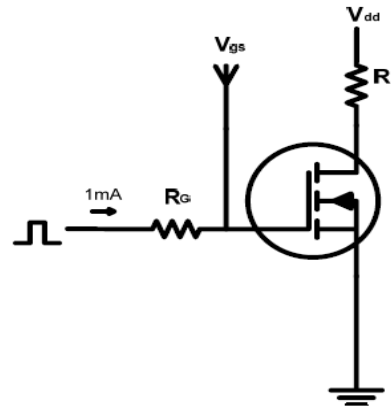
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	13	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	52	A	
V_{SD}	Diode Forward Voltage	—	0.92	1.4	V	$I_S=13A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	—	585	—	ns	$T_J = 25^\circ\text{C}, I_F = 12A,$ $di/dt = 100A/\mu s$
Q_{rr}	Reverse Recovery Charge	—	5489	—	nc	

Test circuits and Waveforms

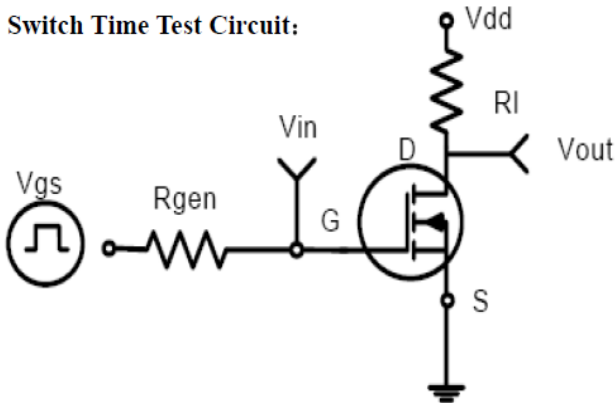
EAS test circuits:



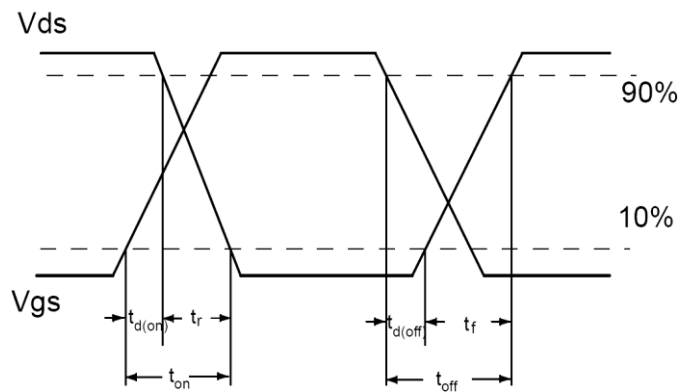
Gate charge test circuit:



Switch Time Test Circuit:



Switch Waveforms:



Notes:

- ①The maximum current rating is limited by bond-wires.
- ②Repetitive rating; pulse width limited by max. junction temperature.
- ③The power dissipation P_D is based on max. junction temperature, using junction-to-case thermal resistance.
- ④The 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 $T_A = 25^\circ\text{C}$

Typical electrical and thermal characteristics

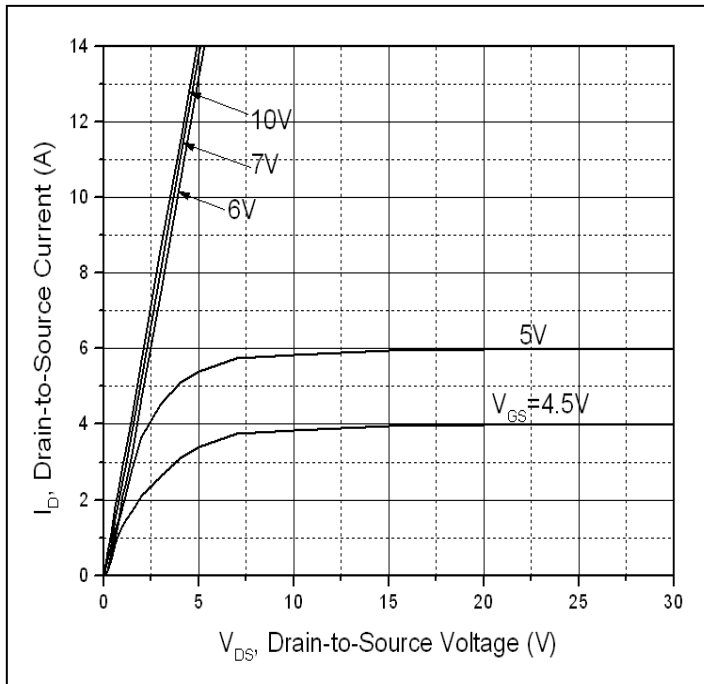


Figure 1: Typical Output Characteristics

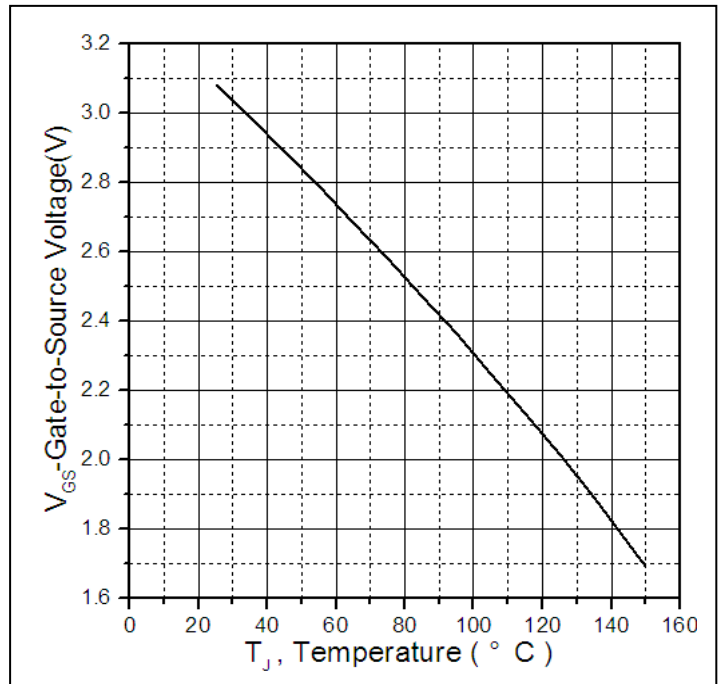


Figure 2: Gate to source cut-off voltage

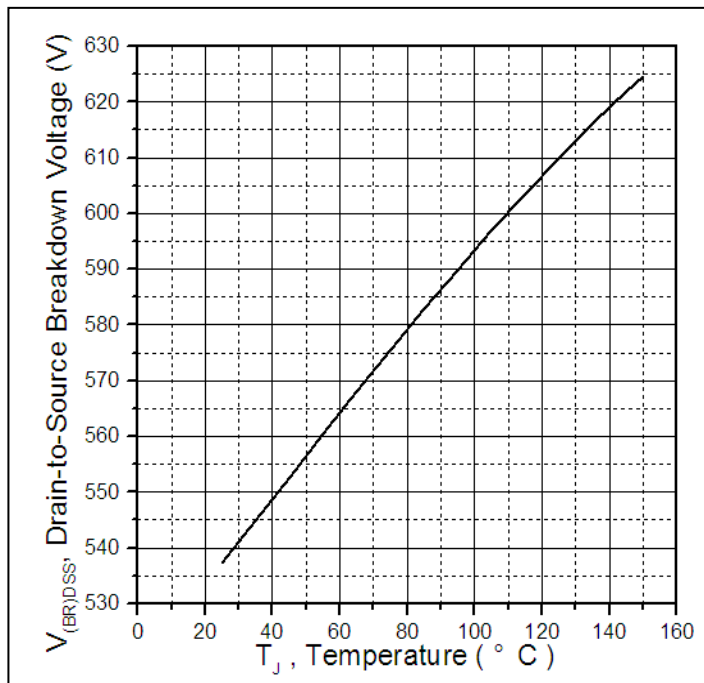


Figure 3: Drain-to-Source Breakdown Voltage Vs. Case Temperature

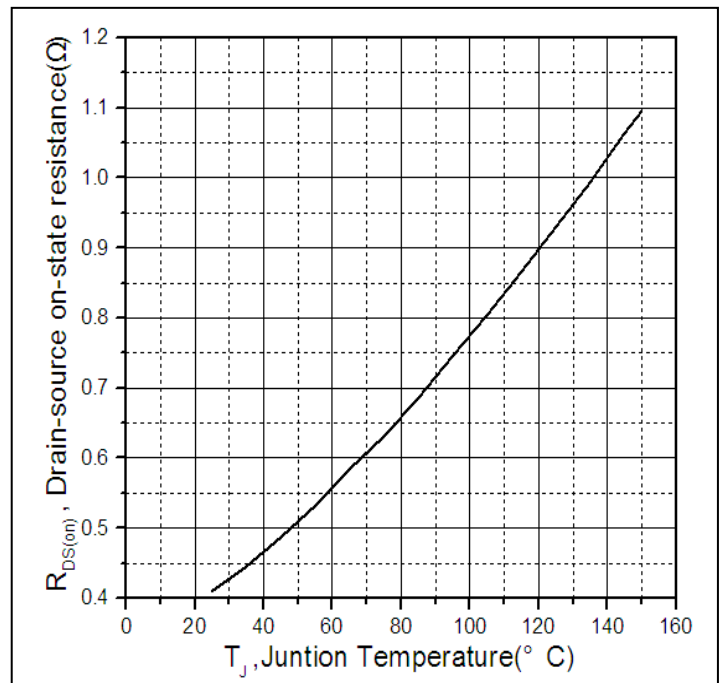


Figure 4: Normalized On-Resistance Vs. Case Temperature

Typical electrical and thermal characteristics

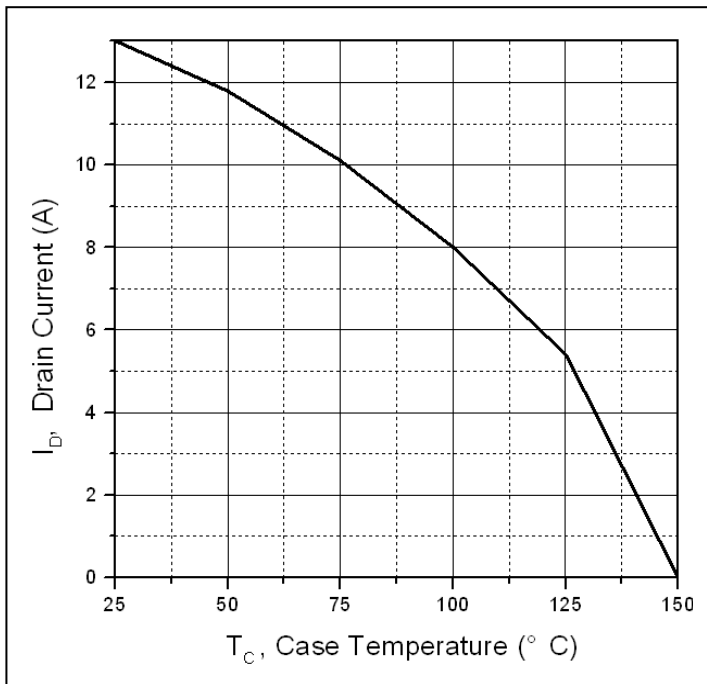


Figure 5. Maximum Drain Current Vs. Case Temperature

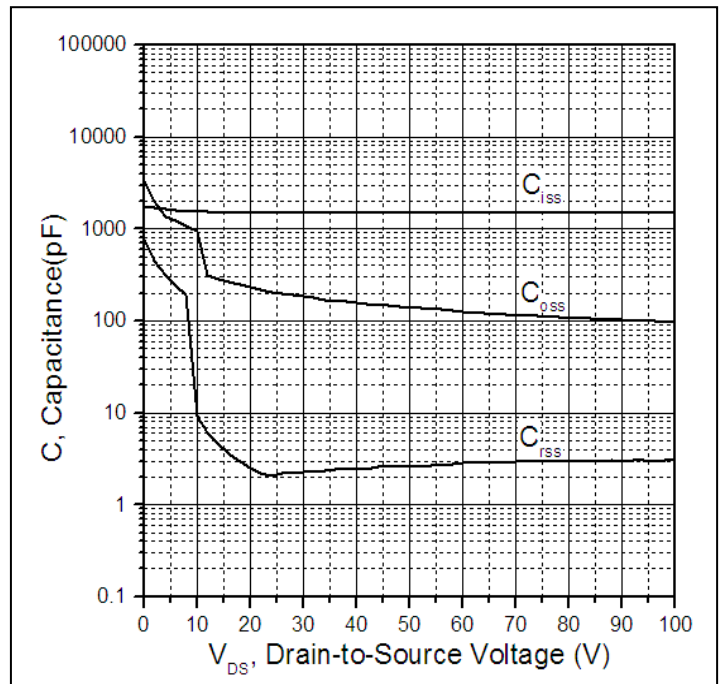


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

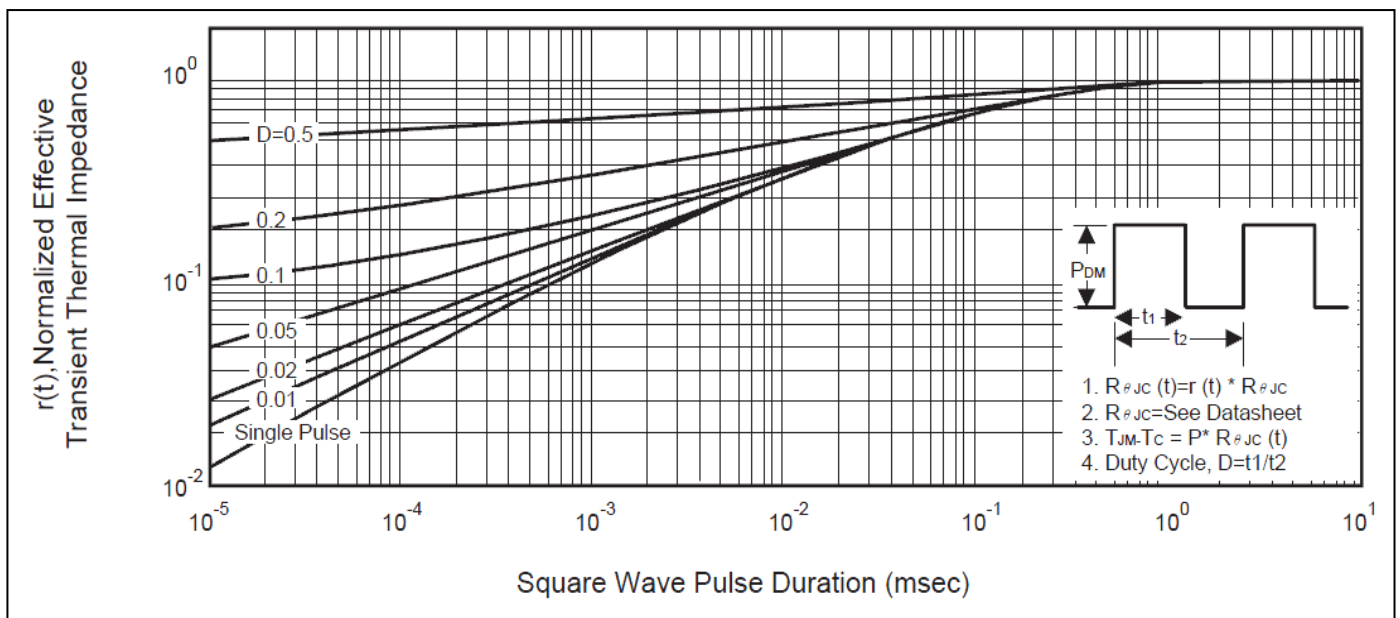
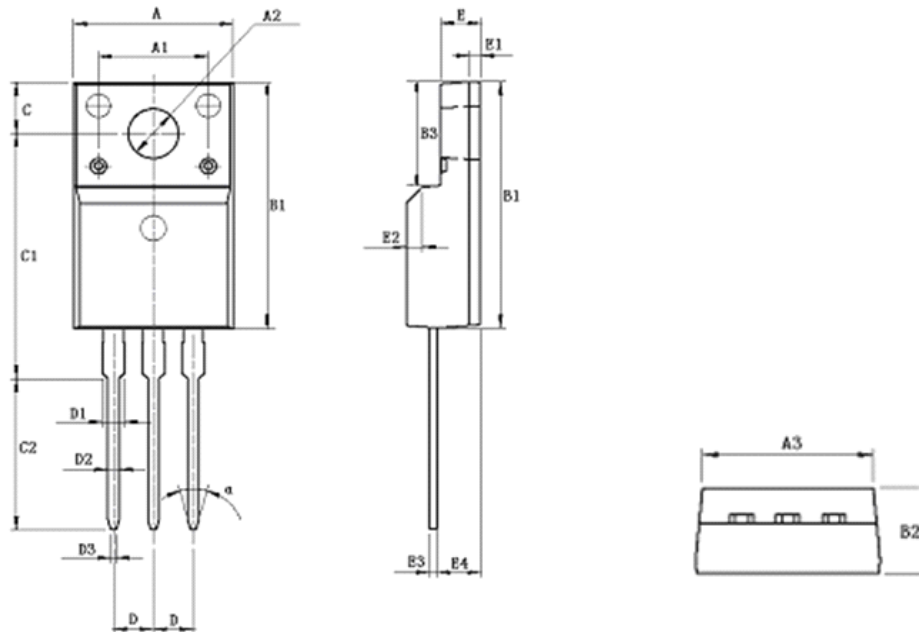


Figure7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Mechanical Data:
TO220F PACKAGE OUTLINE DIMENSION


Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	9.960	10.160	10.360	0.392	0.400	0.408
A1	7.000			0.276	0.000	0.000
A2	3.080	3.180	3.280	0.121	0.125	0.129
A3	9.260	9.460	9.660	0.365	0.372	0.380
B1	15.670	15.870	16.070	0.617	0.625	0.633
B2	4.500	4.700	4.900	0.177	0.185	0.193
B3	6.480	6.680	6.880	0.255	0.263	0.271
C	3.200	3.300	3.400	0.126	0.130	0.134
C1	15.600	15.800	16.000	0.614	0.622	0.630
C2	9.550	9.750	9.950	0.376	0.384	0.392
D	2.54 (TYP)			1.00 (TYP)		
D1	-	-	1.470	-	-	0.058
D2	0.700	0.800	0.900	0.028	0.031	0.035
D3	0.250	0.350	0.450	0.010	0.014	0.018
E	2.340	2.540	2.740	0.092	0.100	0.108
E1	0.700			0.028		
E2	1.0*45°			1.0*45°		
E3	0.450	0.500	0.600	0.018	0.020	0.024
E4	2.560	2.760	2.960	0.101	0.109	0.117
Θ	30°			30°		

Ordering and Marking Information**Device Marking: SSF13N50F**

Package (Available)
TO220F
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
TO220F	50	20	1000	6	6000

Reliability Test Program

Test Item	Conditions	Duration	Sample Size
High Temperature Reverse Bias(HTRB)	$T_j=125^{\circ}\text{C}$ to 150°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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