P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	- 20
$R_{DS(on)}$ (Ω) at V_{GS} = - 4.5 V	0.034
$R_{DS(on)}$ (Ω) at V_{GS} = - 2.5 V	0.046
$R_{DS(on)}$ (Ω) at V_{GS} = - 1.8 V	0.067
I_D (A)	- 5
Configuration	Single

FEATURES

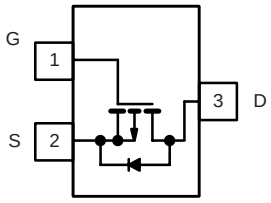
- **Halogen-free Option Available**
- Trench Power MOSFET

RoHS COMPLIANT
HALOGEN FREE

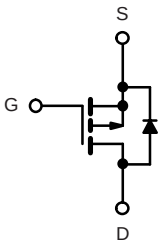
APPLICATIONS

- Load Switch for Portable Devices

TO-236
(SOT-23)



Top View



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Drain-Source Voltage		V_{DS}	- 20	V
Gate-Source Voltage		V_{GS}	± 8	
Continuous Drain Current	T_C = 25 °C	I_D	- 5	A
	T_C = 125 °C		- 3	
Continuous Source Current (Diode Conduction)		I_S	- 2.5	
Pulsed Drain Current[a]		I_{DM}	- 20	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	- 11	
Single Pulse Avalanche Energy		E_{AS}	6	mJ
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	2	W
	T_C = 125 °C		0.67	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		**SYMBOL**	**LIMIT**	**UNIT**
Junction-to-Ambient	PCB Mount[b]	R_{thJA}	175	°C/W
Junction-to-Foot (Drain)		R_{thJF}	75	

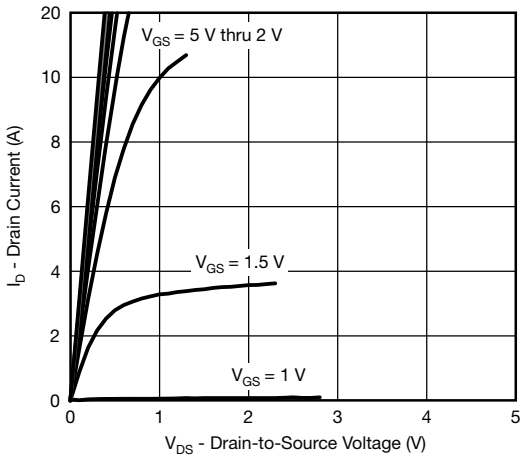
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA		- 20	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA		- 0.45	-	- 1	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = - 12 V	-	-	- 1	µA
		V_{GS} = 0 V	V_{DS} = - 12 V, T_J = 125 °C	-	-	- 50	
		V_{GS} = 0 V	V_{DS} = - 12 V, T_J = 175 °C	-	-	- 150	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = - 4.5 V	V_{DS} ≤ - 5 V	- 10	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V	I_D = - 3.5 A	-	0.034	-	Ω
		V_{GS} = - 4.5 V	I_D = - 3.5 A, T_J = 125 °C	-	0.066	-	
		V_{GS} = - 4.5 V	I_D = - 3.5 A, T_J = 175 °C	-	0.075	-	
		V_{GS} = - 2.5 V	I_D = - 3 A	-	0.046	-	
		V_{GS} = - 1.8 V	I_D = - 2 A	-	0.067	-	
Forward Transconductance[b]	g_{fs}	V_{DS} = - 5 V, I_D = - 1.6 A		-	7	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = - 6 V, f = 1 MHz	-	695	870	pF
Output Capacitance	C_{oss}			-	265	335	
Reverse Transfer Capacitance	C_{rss}			-	190	240	
Total Gate Charge[c]	Q_g	V_{GS} = - 4.5 V	V_{DS} = - 6 V, I_D = - 3.85 A	-	8.4	13	nC
Gate-Source Charge[c]	Q_{gs}			-	1	-	
Gate-Drain Charge[c]	Q_{gd}			-	2.4	-	
Gate Resistance	R_g	f = 1 MHz		4.1	8.2	12.3	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = - 6 V, R_L = 1.6 Ω I_D ≅ - 3.85 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		-	17	26	ns
Rise Time[c]	t_r			-	19	29	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	28	42	
Fall Time[c]	t_f			-	13	20	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	- 20	A
Forward Voltage	V_{SD}	I_F = - 2 A, V_{GS} = 0 V		-	- 0.8	- 1.2	V

Notes

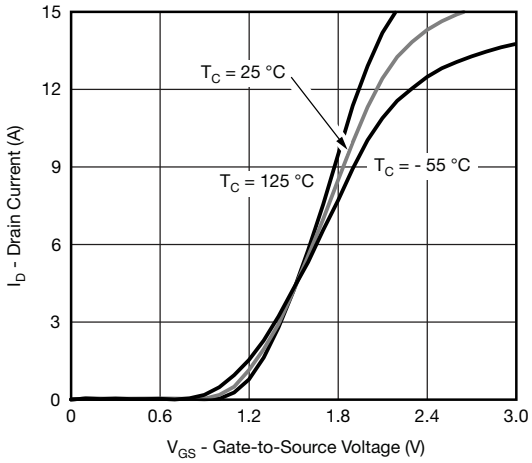
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

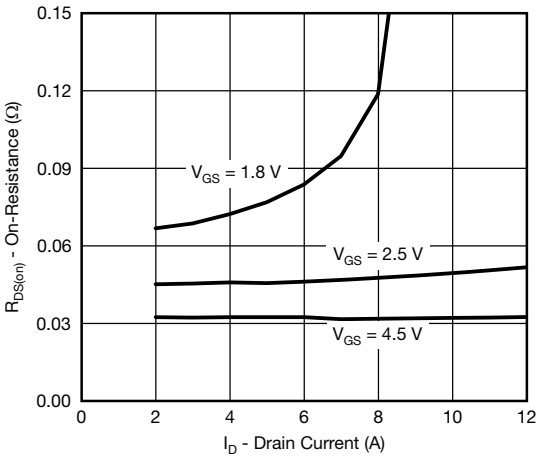
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



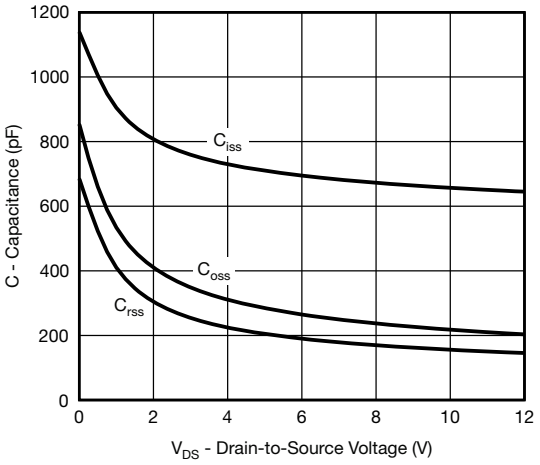
Output Characteristics



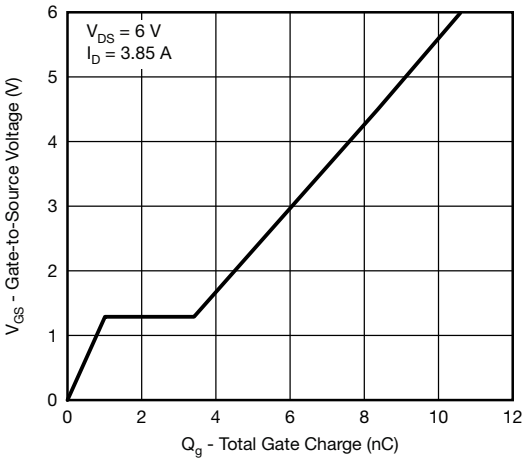
Transfer Characteristics



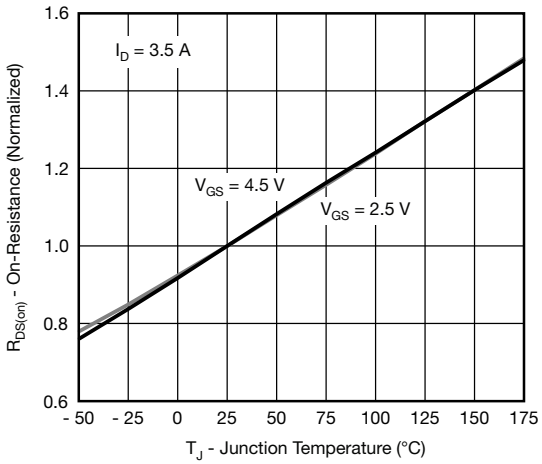
On-Resistance vs. Drain Current



Capacitance

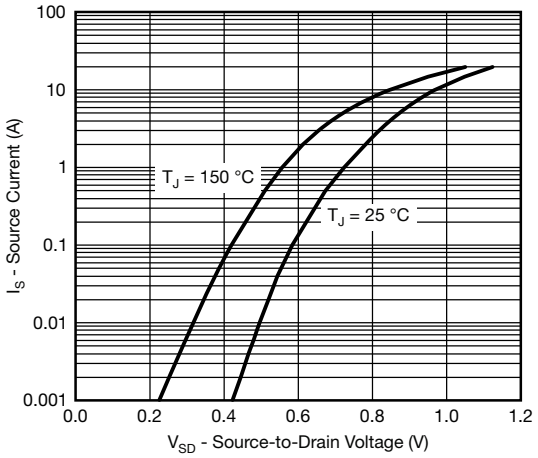


Gate Charge

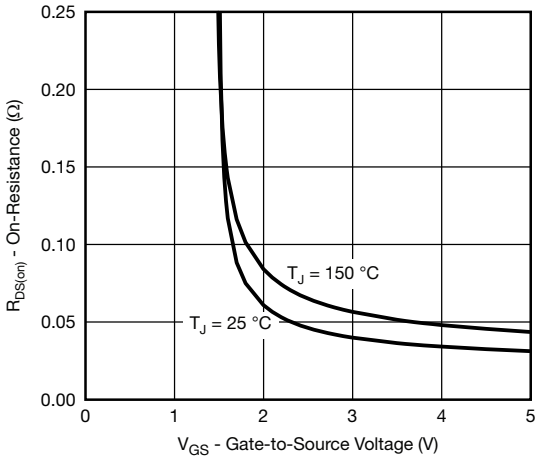


On-Resistance vs. Junction Temperature

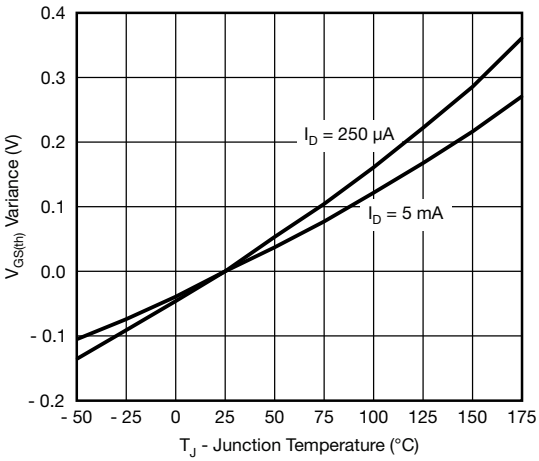
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



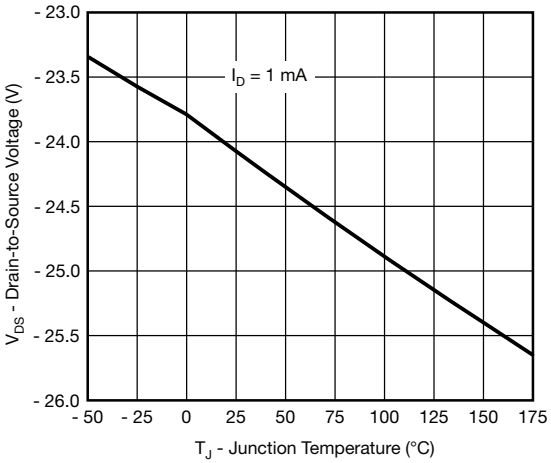
Source-Drain Diode Forward Voltage



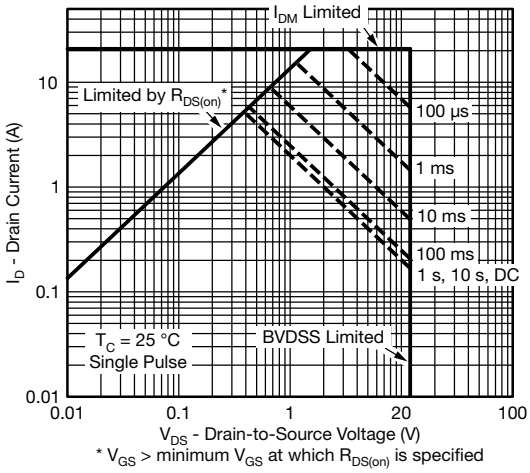
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

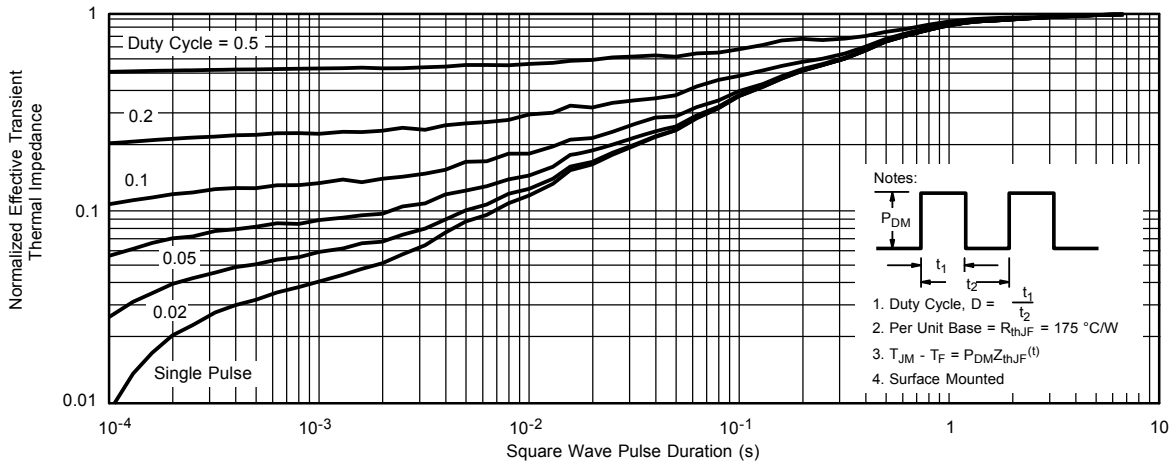


Drain Source Breakdown vs. Junction Temperature

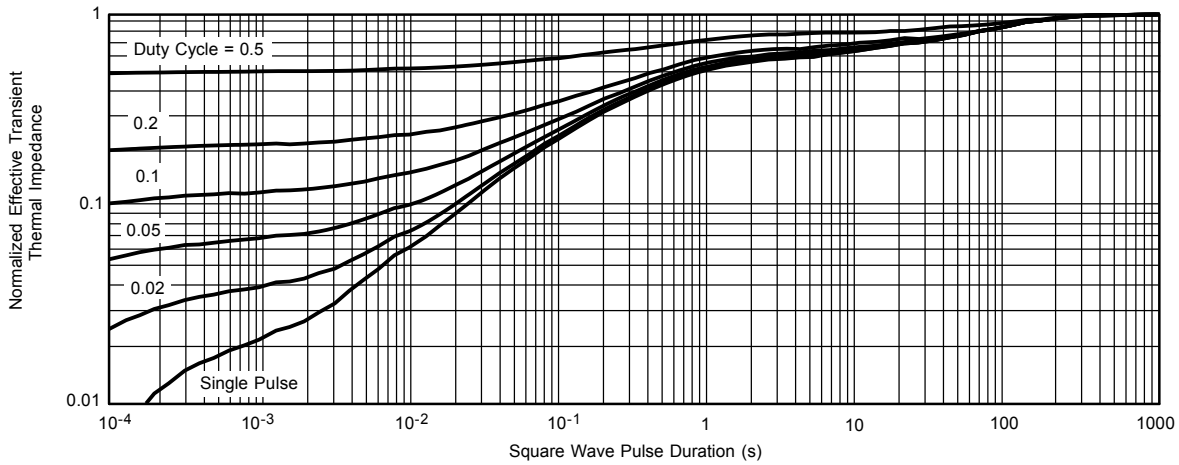


Safe Operating Area

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Foot



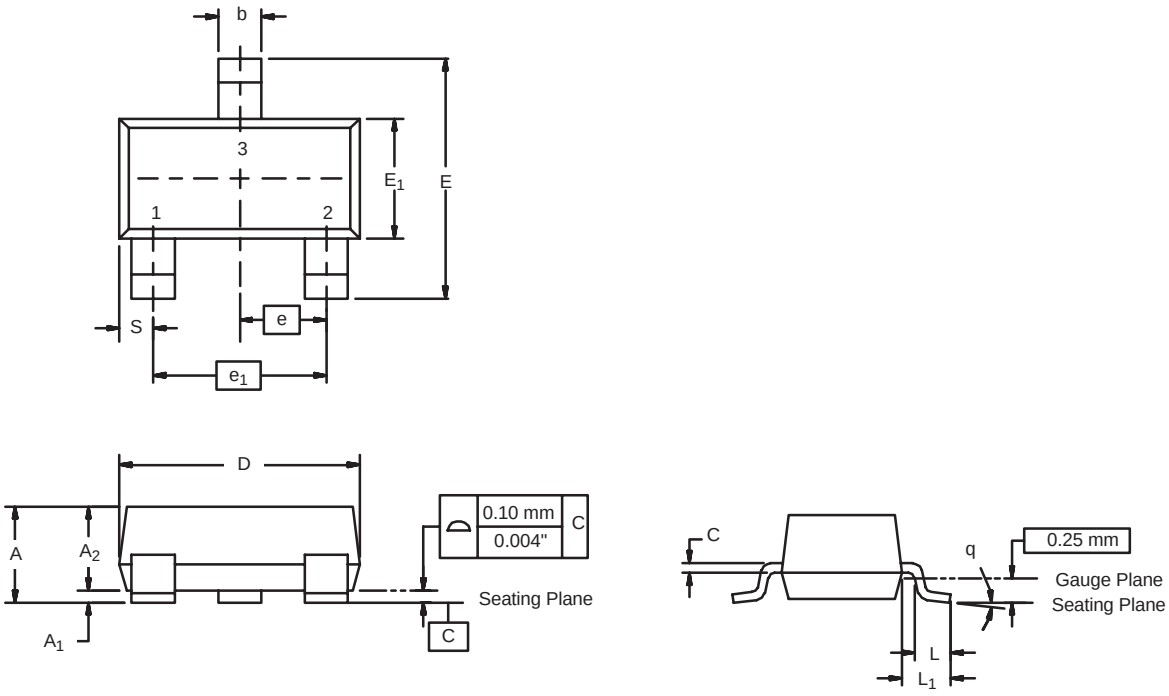
Normalized Thermal Transient Impedance, Junction-to-Ambient

Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Foot (25 ℃)

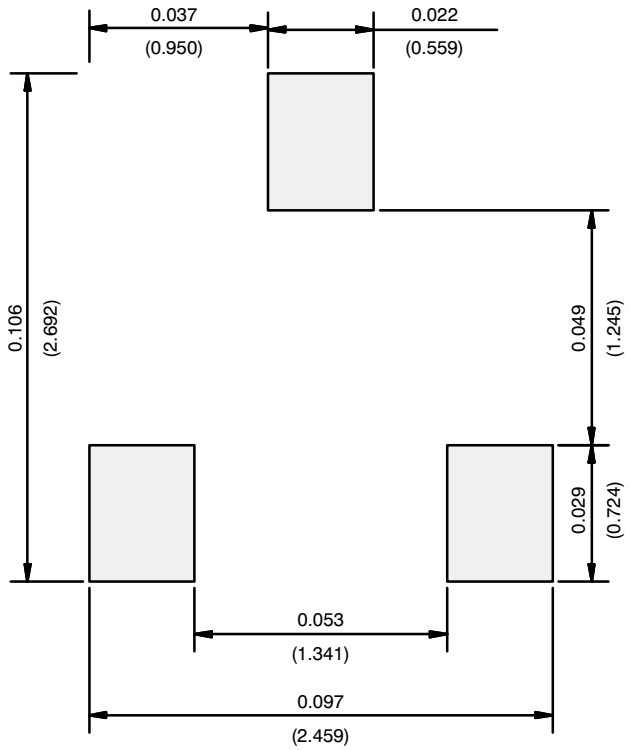
  are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A_1	0.01	0.10	0.0004	0.004
A_2	0.88	1.02	0.0346	0.040
b	0.35	0.50	0.014	0.020
c	0.085	0.18	0.003	0.007
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.083	0.104
E_1	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e_1	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L_1	0.64 Ref		0.025 Ref	
S	0.50 Ref		0.020 Ref	
q	3°	8°	3°	8°
ECN: S-03946-Rev. K, 09-Jul-01 DWG: 5479				

RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads
Dimensions in Inches/(mm)

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APPLICATION NOTE

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