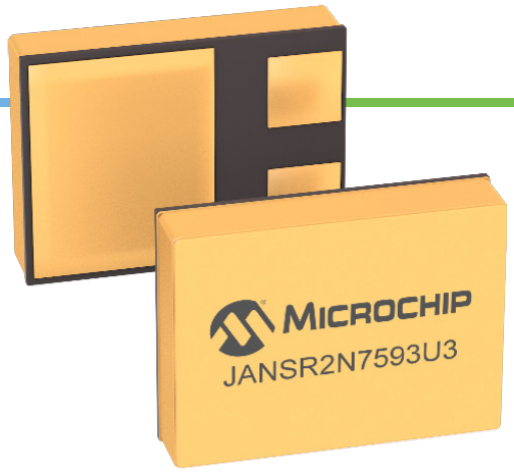
Radiation-Hardened MOSFET Qualified for Commercial and Military Satellites and Space Power Solutions

JANSR2N7593U3 M6 Technology



Summary

Power supplies in space applications operate in environments that require enhanced radiation technology to withstand extreme particle interactions and solar and electromagnetic events. These events degrade space-based systems and disrupt operations. To meet this requirement, Microchip Technology Inc. has qualified the M6 JANSR2N7593U3 radiation-hardened 250V, 0.21 Ohm RDS(on), Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) for commercial aerospace and defense space applications.

Microchip's radiation-hardened M6 JANSR2N7593U3 MOSFET provides the primary switching element in power conversion circuits including point-of-load converters, DC-DC converters, motor drives and controls and general-purpose switching. The MOSFET withstands the harsh environments of space, extends reliability of power circuitry and meets all requirements of MIL-PRF19500/746 with enhanced performance. Microchip completed testing for Defense Logistics Agency (DLA) review and qualification for the device's sourcing in the U.S. military supply chain.

The M6 JANSR2N7593U3 MOSFET is designed for future satellite system designs and can also serve as an alternate source in existing systems. The device can withstand Total Ionizing Dose (TID) up to 100 krad and 300 krad and Single Event Effects (SEE) with Linear Energy Transfer (LET) up to 87 MeV/mg/cm2. It provides 100 percent wafer lot radiation hardness assurance in validation tests.

Additional normal axis SEE testing with Bragg depth at the bottom of the Epi showed great results.

Features

The following are key features of the JANSR2N7593U3 (MRH25N12U3) device:

- Low RDS(on)
- Fast switching
- Single-event hardened
- Low gate charge
- Simple drive
- Ease of paralleling
- Hermetically sealed
- Surface-mount design
- Ceramic package
- ESD rating: Class 3B MIL-STD-750, TM 1020

Applications

The JANSR2N7593U3 (MRH25N12U3) device is designed for the following applications:

- DC–DC converters
- Motor control
- Switch mode power supplies

Absolute Maximum Ratings

The following table shows the absolute maximum ratings of the JANSR2N7593U3 (MRH25N12U3) device.

Table 1-1. Absolute Maximum Ratings

Symbol	Parameter	Ratings	Unit
VDSS	Drain-source voltage	250	V
ID	Continuous drain current at TC = 25 °C	12.4	A
	Continuous drain current at TC = 100 °C	7.8	
IDM	Pulsed drain current	49.6	
VGS	Gate-source voltage	±20	V
dv/dt	Peak diode recovery	5.0	V/ns
PD	Max power dissipation at TC = 25°C	75	W
	Linear derating factor	0.60	W/°C
TJ, TSTG	Operating junction and storage temperature range	–55 to +150	°C
TL	Soldering temperature for 5 seconds (1.6 mm from case)	300	
WT	Package weight	1.0 (Typical)	g

Electrical Performance

The following table shows the static characteristics of the JANSR2N7593U3 (MRH25N12U3) device.

Table 1-2. Static Characteristics (TA = +25°C) unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
VBR(DSS)	Drain-source breakdown voltage	VGS = 0V, ID = 1.0 mA	250			V
RDS(on)	Drain-source on resistance	VGS = 12V, ID = 7.8 A			0.210	Ω
VGS(th)	Gate-source threshold voltage	VGS = VDS, ID = 1.0 mA	2.0		4.0	V
gfs	Forward transconductance	VDS = 15V, IDS = 7.8A	8.8			S
IDSS	Zero-gate voltage drain current	VDS = 200V	TA = 25 °C		10	µA
		VGS = 0V	TA = 125 °C		25	
IGSS	Gate-source leakage current	VGS = ±20V			±100	nA
Qg	Total gate charge	VGS = 12V		30	50	nC

For More Information

Products Search: https://www.microchip.com/en-us/products/power-management/power-mosfets

Parametric Search: https://www.microchip.com/en-us/parametric-search.html/chartno_433

Solutions Search: https://www.microchip.com/en-us/solutions/aerospace-and-defense/products/high-reliability-discrete-and-power-management/radiation-hardened-mosfets

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