40-V, N-Channel NexFET™ Power MOSFETs

Check for Samples: CSD18503KCS

FEATURES

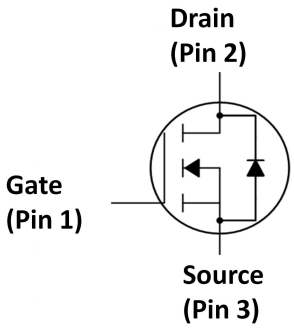
- **Ultra Low Qg and Qgd**
- **Low Thermal Resistance**
- **Avalanche Rated**
- **Logic Level**
- **Pb Free Terminal Plating**
- **RoHS Compliant**
- **Halogen Free**
- **TO-220 Plastic Package**

APPLICATIONS

- **DC-DC Conversion**
- **Secondary Side Synchronous Rectifier**
- **Motor Control**

DESCRIPTION

The NexFET™ power MOSFET has been designed to minimize losses in power conversion applications.



PRODUCT SUMMARY

T_A = 25°C		TYPICAL VALUE		UNIT
V_{DS}	Drain to Source Voltage	40		V
Q_g	Gate Charge Total (10V)	30		nC
Q_{gd}	Gate Charge Gate to Drain	4.6		nC
$R_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 4.5V	5.4	mΩ
		V_{GS} = 10V	3.6	mΩ
$V_{GS(th)}$	Threshold Voltage	1.9		V

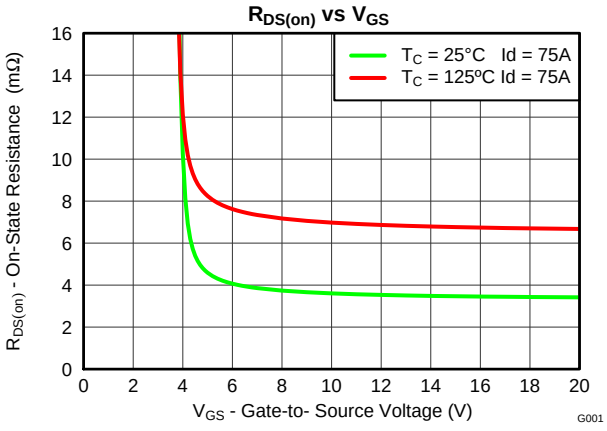
ORDERING INFORMATION

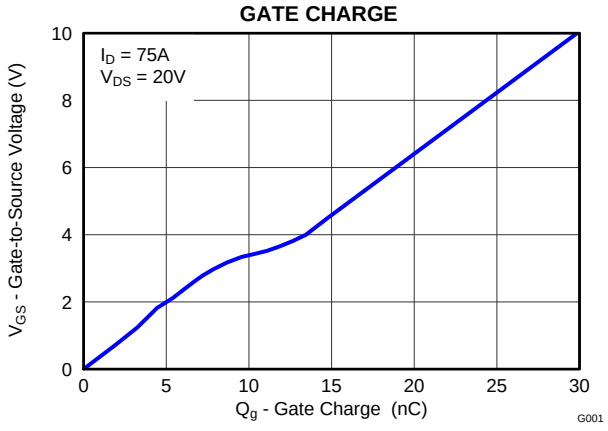
Device	Package	Media	Qty	Ship
CSD18503KCS	TO-220 Plastic Package	Tube	50	Tube

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C		VALUE	UNIT
V_{DS}	Drain to Source Voltage	40	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Continuous Drain Current (Package limited), T_C = 25°C	100	A
	Continuous Drain Current (Silicon limited), T_C = 25°C	130	
	Continuous Drain Current (Silicon limited), T_C = 100°C	83	
I_{DM}	Pulsed Drain Current (1)	155	A
P_D	Power Dissipation	143	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	–55 to 150	°C
E_{AS}	Avalanche Energy, single pulse I_D = 57A, L = 0.1mH, R_G = 25Ω	162	mJ

(1) Pulse duration ≤300μs, duty cycle ≤2%





These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV_{DSS}	Drain to Source Voltage	V_{GS} = 0V, I_D = 250µA	40			V
I_{DSS}	Drain to Source Leakage Current	V_{GS} = 0V, V_{DS} = 32V			1	µA
I_{GSS}	Gate to Source Leakage Current	V_{DS} = 0V, V_{GS} = 20V			100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	1.5	1.9	2.3	V
$R_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 4.5V, I_D = 75A		5.4	6.8	mΩ
		V_{GS} = 10V, I_D = 75A		3.6	4.5	mΩ
g_{fs}	Transconductance	V_{DS} = 20V, I_D = 75A		98		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 20V, f = 1MHz		2500	3150	pF
C_{oss}	Output Capacitance			480	600	pF
C_{rss}	Reverse Transfer Capacitance			12	16	pF
R_G	Series Gate Resistance			1.4	2.8	Ω
Q_g	Gate Charge Total (4.5V)	V_{DS} = 20V, I_D = 75A		15	18	nC
Q_g	Gate Charge Total (10V)			30	36	nC
Q_{gd}	Gate Charge Gate to Drain			4.6		nC
Q_{gs}	Gate Charge Gate to Source			7.7		nC
$Q_{g(th)}$	Gate Charge at Vth			4.7		nC
Q_{oss}	Output Charge	V_{DS} = 20V, V_{GS} = 0V		30		nC
$t_{d(on)}$	Turn On Delay Time	V_{DS} = 20V, V_{GS} = 10V, I_{DS} = 75A, R_G = 0Ω		5.7		ns
t_r	Rise Time			5.3		ns
$t_{d(off)}$	Turn Off Delay Time			14		ns
t_f	Fall Time			6.8		ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	I_{SD} = 75A, V_{GS} = 0V		0.8	1	V
Q_{rr}	Reverse Recovery Charge	V_{DS}= 20V, I_F = 75A, di/dt = 300A/µs		60		nC
t_{rr}	Reverse Recovery Time			37		ns

THERMAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case			0.9	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient			62	°C/W

TYPICAL MOSFET CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

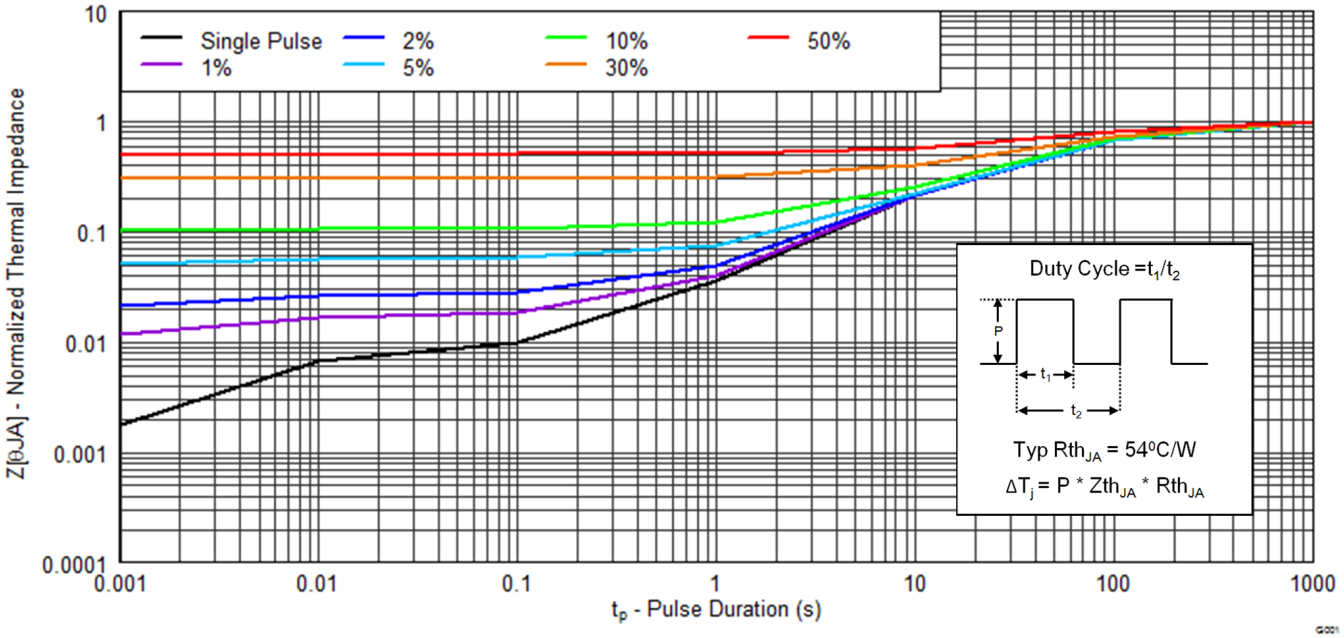


Figure 1. Transient Thermal Impedance

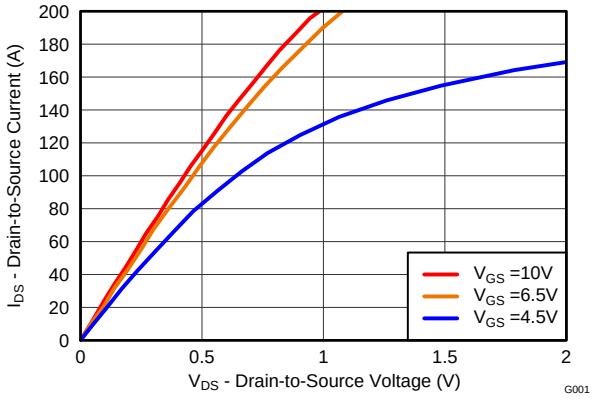


Figure 2. Saturation Characteristics

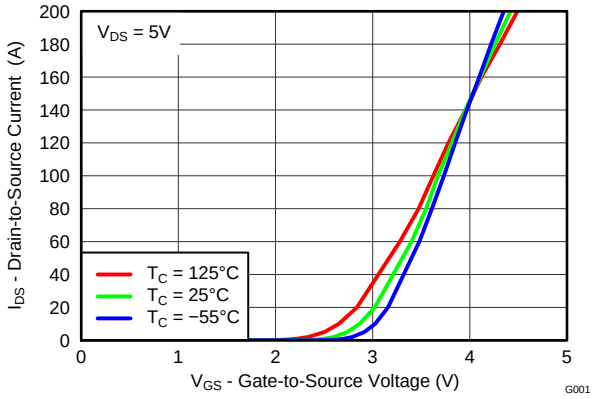


Figure 3. Transfer Characteristics

TYPICAL MOSFET CHARACTERISTICS (continued)

(T_A = 25°C unless otherwise stated)

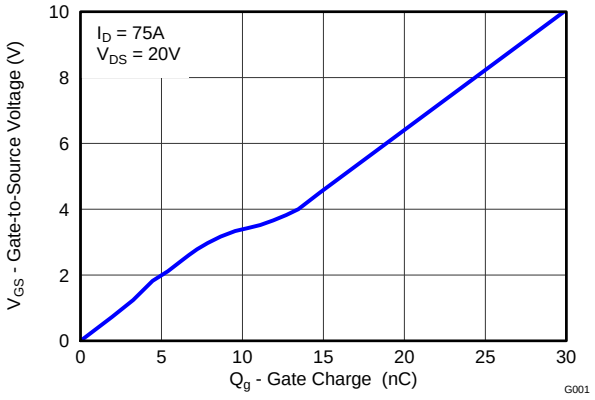


Figure 4. Gate Charge

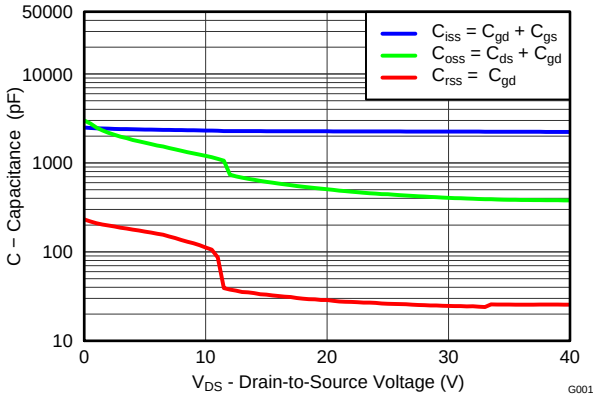


Figure 5. Capacitance

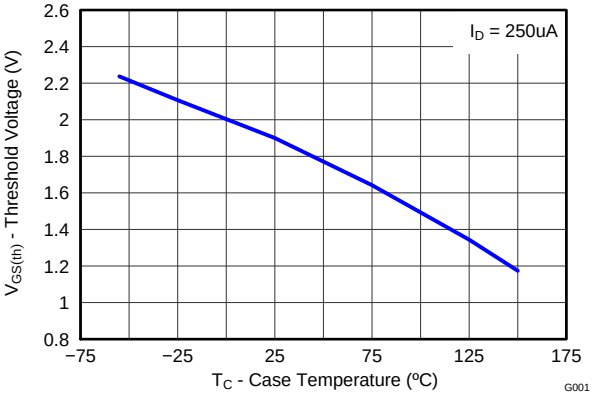


Figure 6. Threshold Voltage vs. Temperature

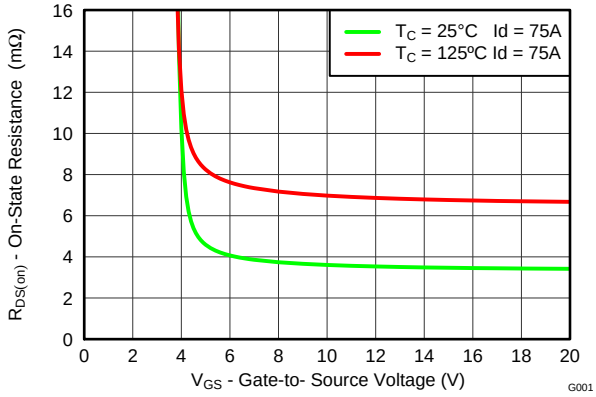


Figure 7. On-State Resistance vs. Gate-to-Source Voltage

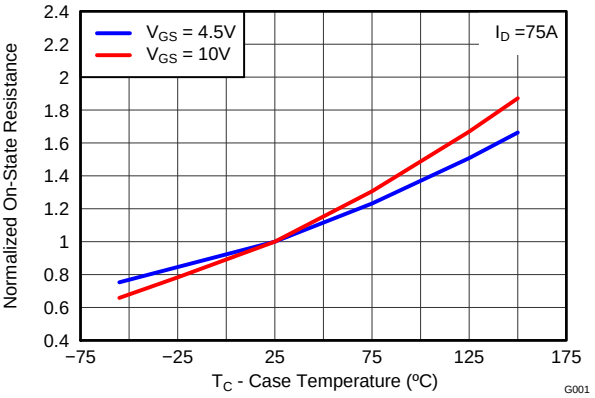


Figure 8. Normalized On-State Resistance vs. Temperature

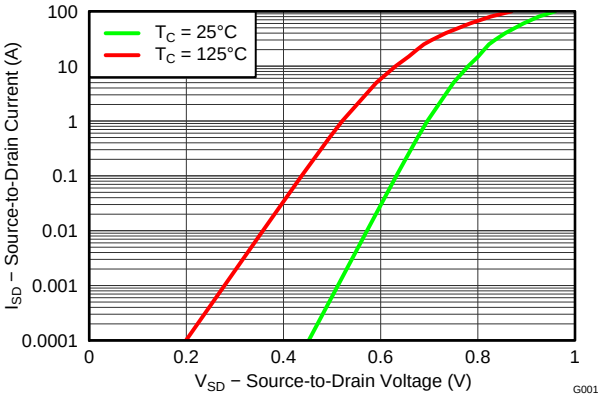


Figure 9. Typical Diode Forward Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

(T_A = 25°C unless otherwise stated)

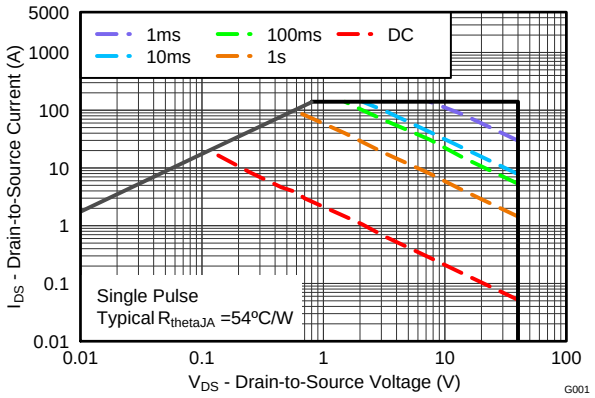


Figure 10. Maximum Safe Operating Area

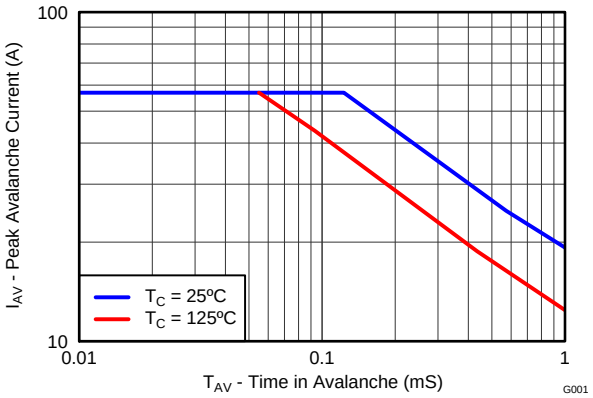


Figure 11. Single Pulse Unclamped Inductive Switching

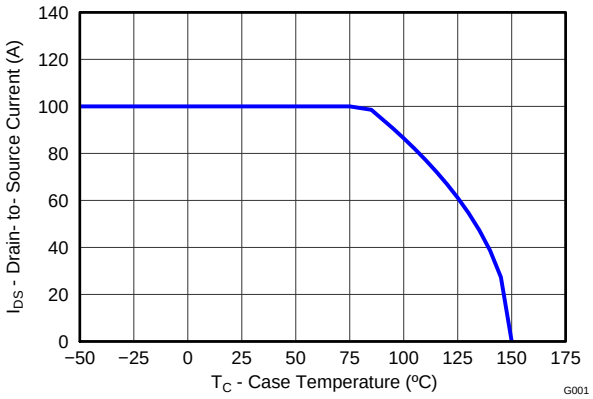
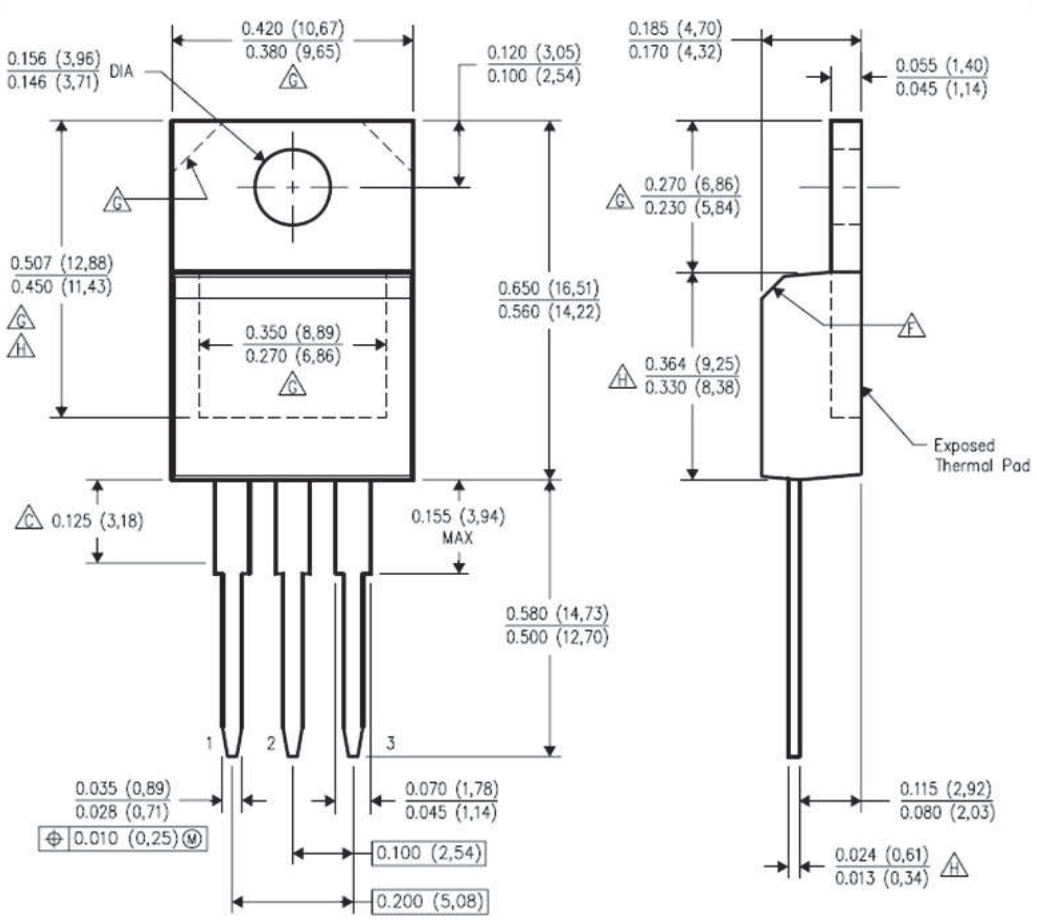


Figure 12. Maximum Drain Current vs. Temperature

MECHANICAL DATA

KCS Package Dimensions



Notes:

1. All linear dimensions are in inches
2. This drawing is subject to change without notice
3. Lead Dimensions are not controlled within "C" area
4. All lead dimensions apply before solder dip
5. The center lead is in electrical contact with the mounting tab
6. The chamfer at "F" is optional
7. Thermal pad contour at "G" optional with these dimensions
8. "H" Falls within JEDEC TO-220 variation AB, except minimum lead thickness, minimum exposed pad length, and maximum body length.

Table 1. Pin Configuration

Position	Designation
Pin 1	Gate
Pin 2 / Tab	Drain
Pin 3	Source

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
CSD18503KCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS Exempt)	CU SN	N / A for Pkg Type	

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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