

QORVO

SiC JFET Division

Is Now Part of

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and onsemi and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that onsemi was negligent regarding the design or manufacture of the part. onsemi is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.

Silicon Carbide (SiC) JFET - EliteSiC, Power N-Channel, D2PAK-7L, 1700 V, 400 mohm

Rev. C, January 2025

DATASHEET

UF3N170400B7S

Description

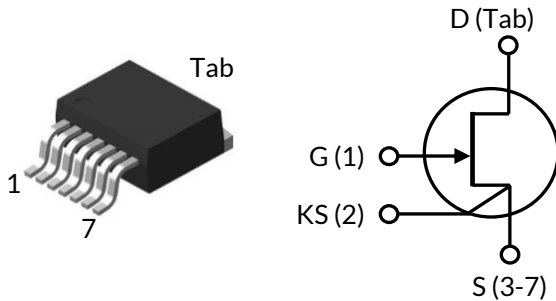
UnitedSiC offers the high-performance G3 SiC normally-on JFET transistors. This series exhibits ultra-low on resistance ($R_{DS(ON)}$) and gate charge (Q_G) allowing for low conduction and switching loss. The device normally-on characteristics with low $R_{DS(ON)}$ at $V_{GS} = 0$ V is also ideal for current protection circuits without the need for active control, as well as for cascode operation.

Features

- ◆ Typical on-resistance $R_{DS(on),typ}$ of 400mΩ
- ◆ Voltage controlled
- ◆ Maximum operating temperature of 175°C
- ◆ Extremely fast switching not dependent on temperature
- ◆ Low gate charge
- ◆ Low intrinsic capacitance
- ◆ RoHS compliant
- ◆ AECQ Qualified

Typical applications

- ◆ Over Current Protection Circuits
- ◆ DC-AC Inverters
- ◆ Switch mode power supplies
- ◆ Power factor correction modules
- ◆ Motor drives
- ◆ Induction heating



Part Number	Package	Marking
UF3N170400B7S	D ² PAK-7L	UF3N170400B7S



Maximum Ratings

Parameter	Symbol	Test Conditions	Value	Units
Drain-source voltage	V_{DS}		1700	V
Gate-source voltage	V_{GS}	DC	-20 to +3	V
		AC ¹	-30 to +20	V
Continuous drain current ²	I_D	$T_C = 25^\circ\text{C}$	6.8	A
		$T_C = 100^\circ\text{C}$	5.1	A
Pulsed drain current ³	I_{DM}	$T_C = 25^\circ\text{C}$	16	A
Power dissipation	P_{tot}	$T_C = 25^\circ\text{C}$	68	W
Maximum junction temperature	$T_{J,max}$		175	$^\circ\text{C}$
Operating and storage temperature	T_J, T_{STG}		-55 to 175	$^\circ\text{C}$
Reflow soldering temperature	T_{solder}	reflow MSL 1	245	$^\circ\text{C}$

1. +20V AC rating applies for turn-on pulses <200ns applied with external $R_G > 1\Omega$.

2. Limited by $T_{J,max}$

3. Pulse width t_p limited by $T_{J,max}$

Thermal Characteristics

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Thermal resistance, junction-to-case	$R_{\theta JC}$			1.7	2.2	$^\circ\text{C}/\text{W}$

Electrical Characteristics ($T_J = +25^\circ\text{C}$ unless otherwise specified)

Typical Performance - Static

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Drain-source breakdown voltage	BV_{DS}	$V_{GS} = -20\text{V}, I_D = 0.3\text{mA}$	1700			V
Total drain leakage current	I_{DSS}	$V_{DS} = 1700\text{V},$ $V_{GS} = -20\text{V}, T_J = 25^\circ\text{C}$		2.2	60	μA
		$V_{DS} = 1700\text{V},$ $V_{GS} = -20\text{V}, T_J = 175^\circ\text{C}$		9		
Total gate leakage current	I_{GSS}	$V_{GS} = -20\text{V}, T_J = 25^\circ\text{C}$		0.15	6	μA
		$V_{GS} = -20\text{V}, T_J = 175^\circ\text{C}$		0.8		μA
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS} = 2\text{V}, I_D = 5\text{A},$ $T_J = 25^\circ\text{C}$		350		m Ω
		$V_{GS} = 0\text{V}, I_D = 5\text{A},$ $T_J = 25^\circ\text{C}$		400	500	
		$V_{GS} = 2\text{V}, I_D = 5\text{A},$ $T_J = 175^\circ\text{C}$		928		
		$V_{GS} = 0\text{V}, I_D = 5\text{A},$ $T_J = 175^\circ\text{C}$		1040		
Gate threshold voltage	$V_{G(th)}$	$V_{DS} = 5\text{V}, I_D = 4.5\text{mA}$	-11.3	-9	-6.7	V
Gate resistance	R_G	f=1MHz, open drain		5		Ω

Typical Performance - Dynamic

Parameter	Symbol	Test Conditions	Value			Units
			Min	Typ	Max	
Input capacitance	C_{iss}	$V_{DS}=100V, V_{GS}=-20V$ $f=100kHz$		225		pF
Output capacitance	C_{oss}			22		
Reverse transfer capacitance	C_{rss}			18		
Effective output capacitance, energy related	$C_{oss(er)}$	$V_{DS}=0V$ to 1200V, $V_{GS}=-20V$		11.4		pF
C_{oss} stored energy	E_{oss}	$V_{DS}=1200V, V_{GS}=-20V$		8.2		μJ
Total gate charge	Q_G	$V_{DS}=1200V, I_D=5A,$ $V_{GS} = -18V$ to 0V		30		nC
Gate-drain charge	Q_{GD}			17		
Gate-source charge	Q_{GS}			5		
Turn-on delay time	$t_{d(on)}$	$V_{DS}=1200V, I_D=5A,$ Gate Driver = -18V to 0V, $R_G=1\Omega,$ Inductive Load, FWD: 2x UJ3D1210TS in series $T_J=25^\circ C$		5		ns
Rise time	t_r			19		
Turn-off delay time	$t_{d(off)}$			9		
Fall time	t_f			37		
Turn-on energy	E_{ON}			125		
Turn-off energy	E_{OFF}	$V_{DS}=1200V, I_D=5A,$ Gate Driver = -18V to 0V, $R_G=1\Omega,$ Inductive Load, FWD: 2x UJ3D1210TS in series, $T_J=150^\circ C$		38		μJ
Total switching energy	E_{TOTAL}			163		
Turn-on delay time	$t_{d(on)}$			5		
Rise time	t_r			16		
Turn-off delay time	$t_{d(off)}$			8		
Fall time	t_f			34		
Turn-on energy	E_{ON}			114		
Turn-off energy	E_{OFF}		31			
Total switching energy	E_{TOTAL}		145			

Typical Performance Diagrams

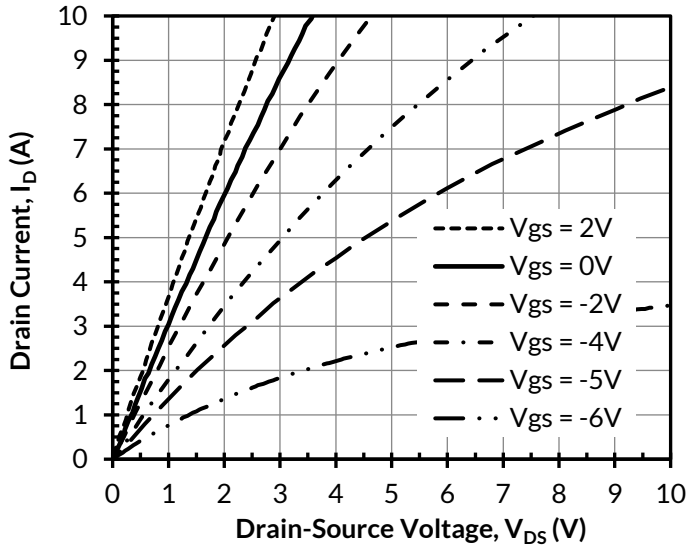


Figure 1. Typical output characteristics at $T_j = -55^\circ\text{C}$, $t_p < 250\mu\text{s}$

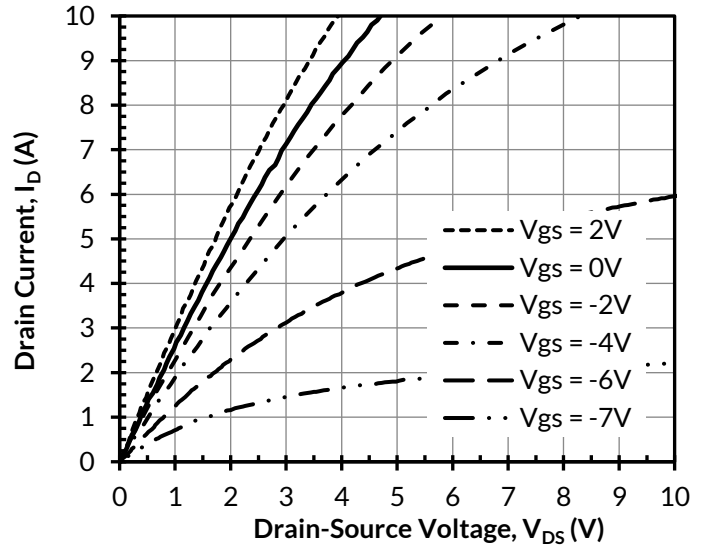


Figure 2. Typical output characteristics at $T_j = 25^\circ\text{C}$, $t_p < 250\mu\text{s}$

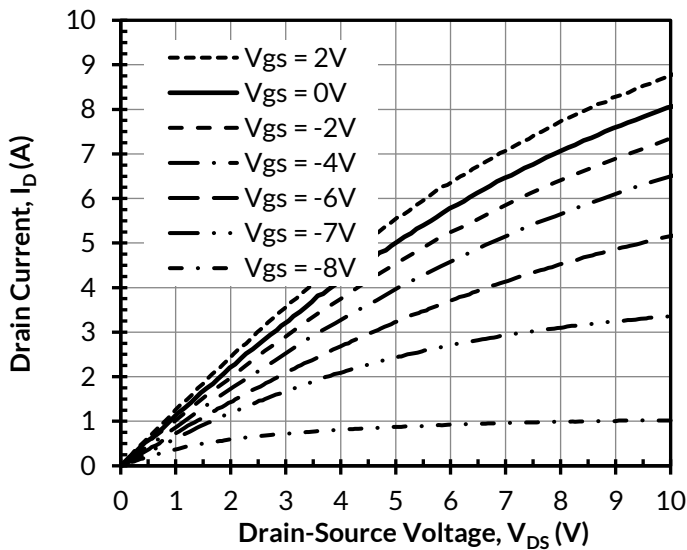


Figure 3. Typical output characteristics at $T_j = 175^\circ\text{C}$, $t_p < 250\mu\text{s}$

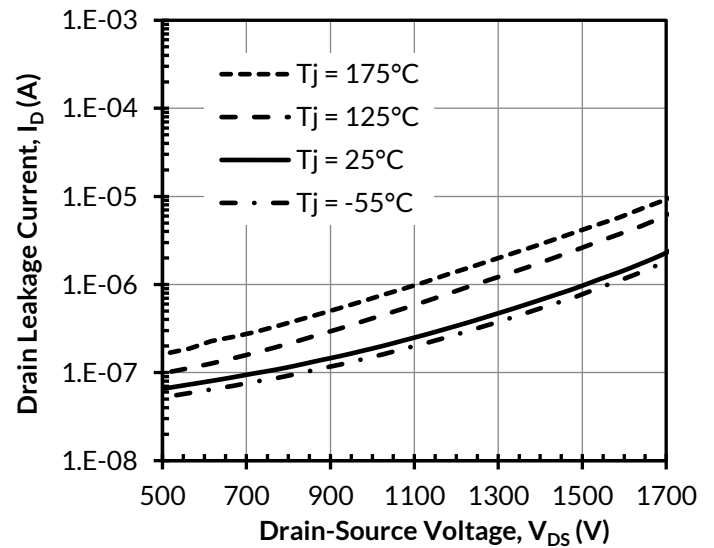


Figure 4. Typical drain-source leakage at $V_{GS} = -20\text{V}$

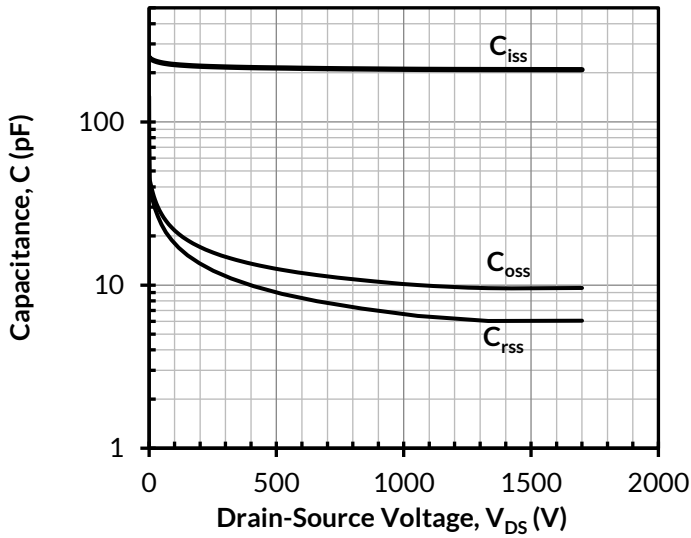


Figure 5. Typical capacitances at $f = 100\text{kHz}$ and $V_{GS} = -20\text{V}$

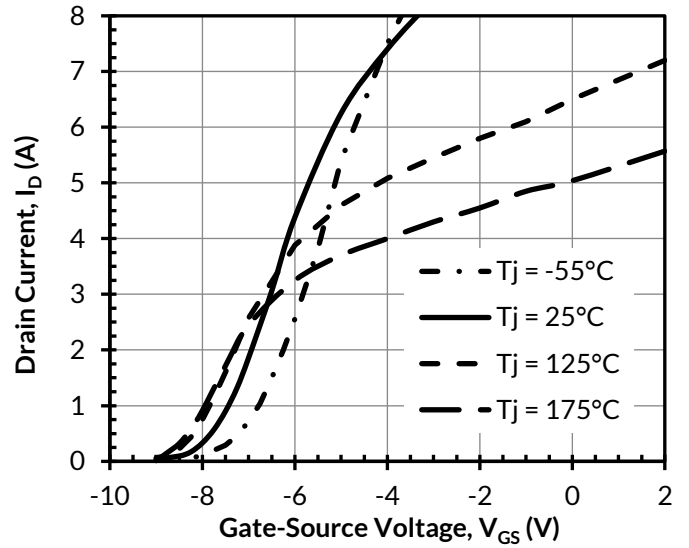


Figure 6. Typical transfer characteristics at $V_{DS} = 5\text{V}$

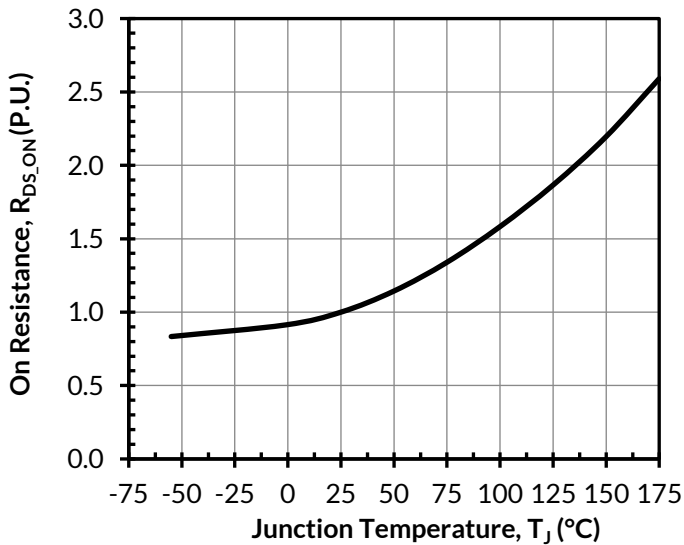


Figure 7. Normalized on-resistance vs. temperature at $V_{GS} = 0\text{V}$ and $I_D = 5\text{A}$

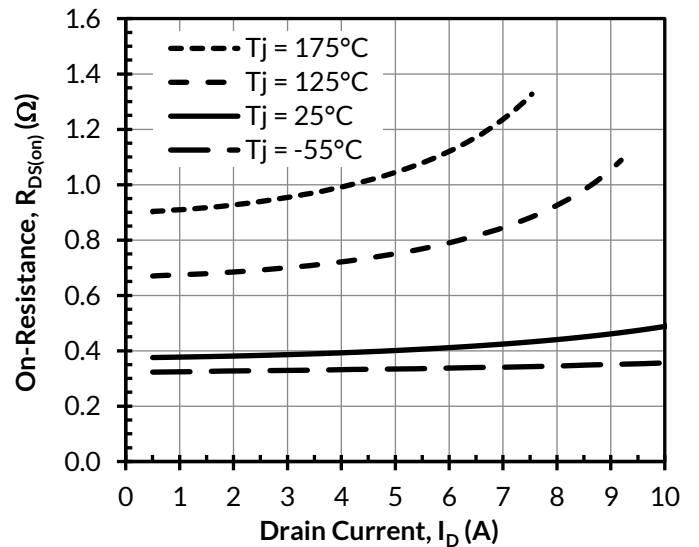


Figure 8. Typical drain-source on-resistances at $V_{GS} = 0\text{V}$

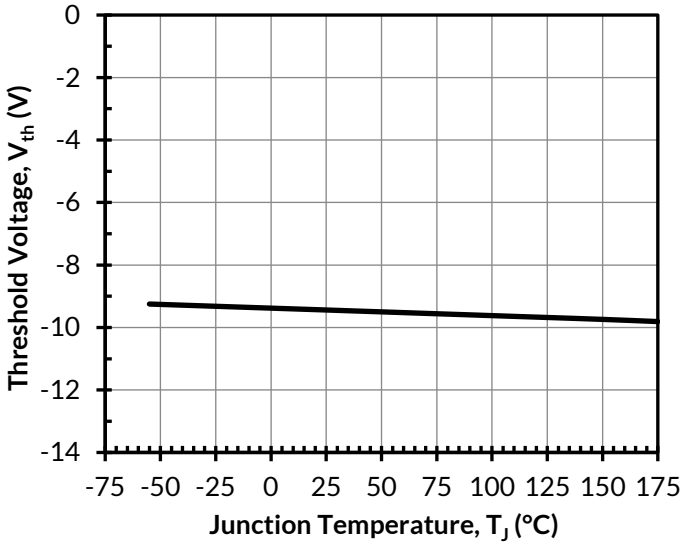


Figure 9. Threshold voltage vs. junction temperature at $V_{DS} = 5V$ and $I_D = 4.5mA$

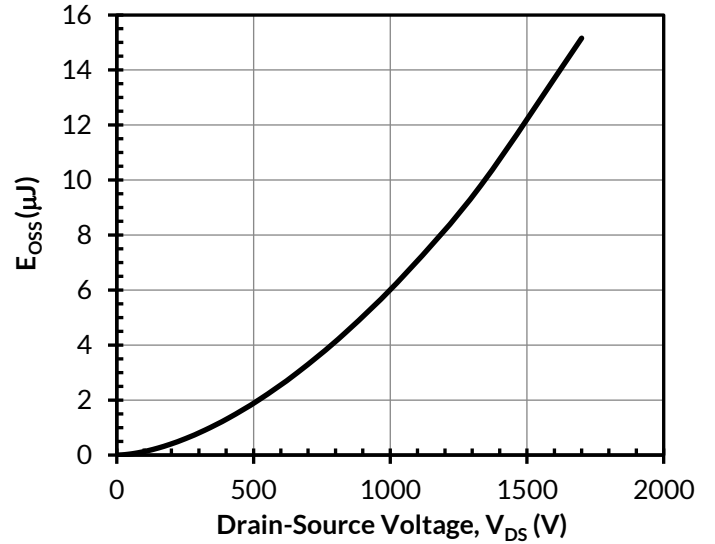


Figure 10. Typical stored energy in C_{OSS} at $V_{GS} = -20V$

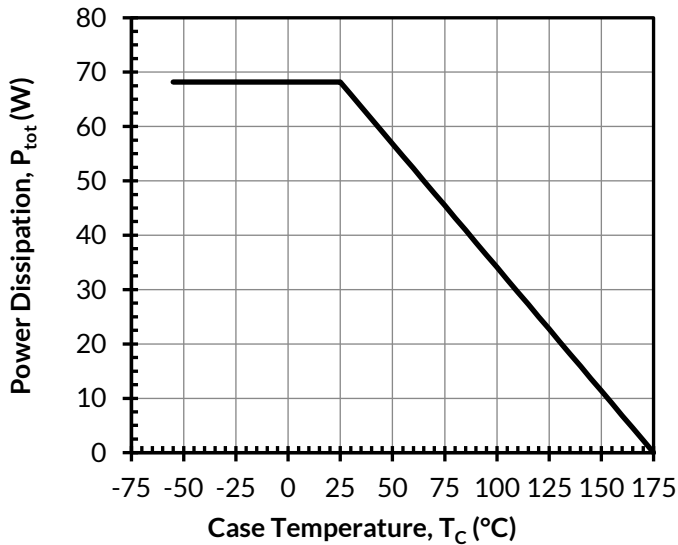


Figure 11. Total power Dissipation

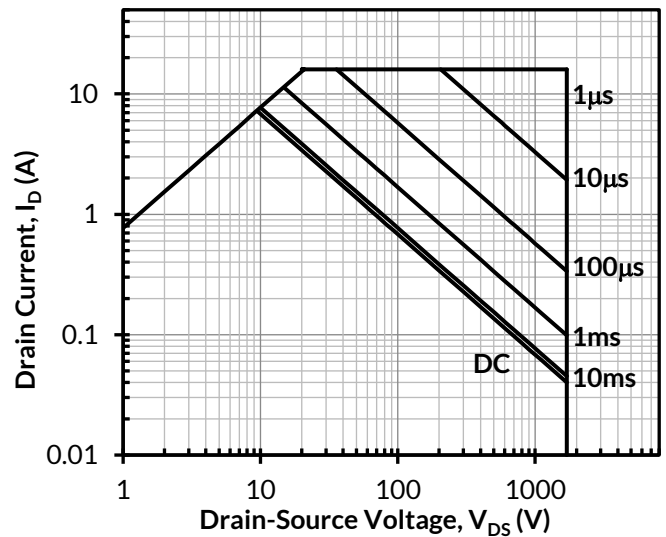


Figure 12. Safe operation area at $T_c = 25^\circ C$, Parameter t_p

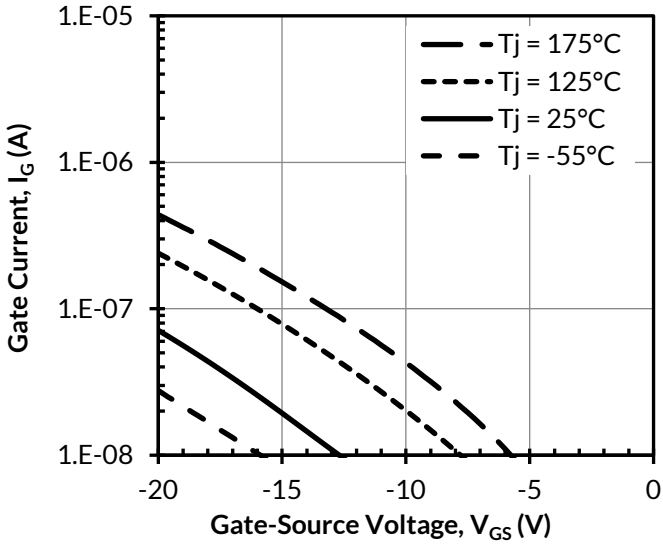


Figure 13. Typical gate leakage at $V_{DS} = 0V$

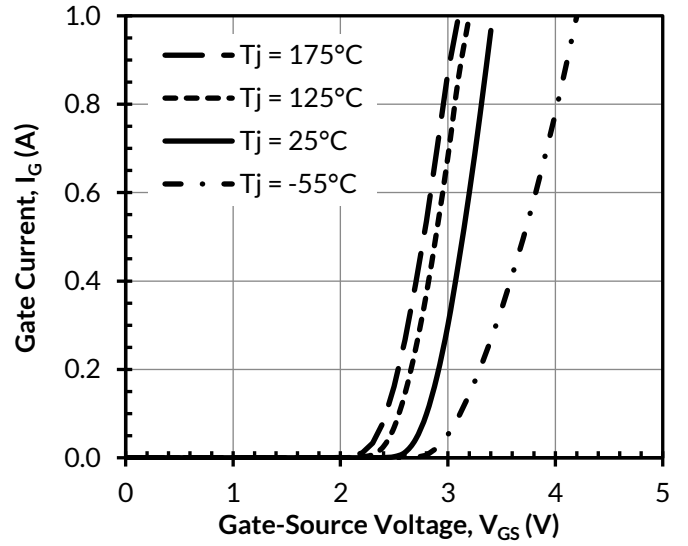


Figure 14. Typical gate forward current at $V_{DS} = 0V$

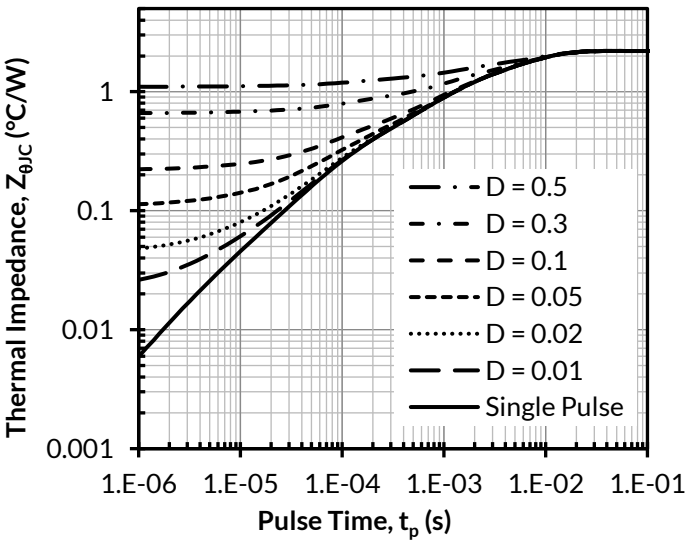


Figure 15. Maximum transient thermal impedance

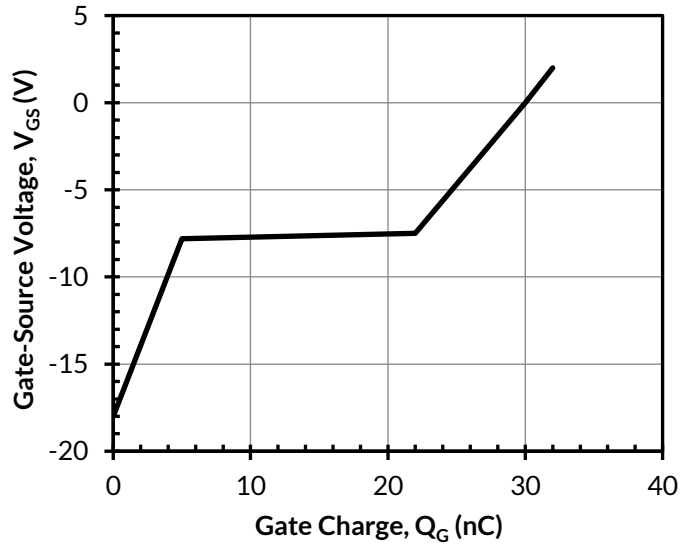


Figure 16. Typical gate charge at $V_{DS} = 1200V$ and $I_D = 5A$

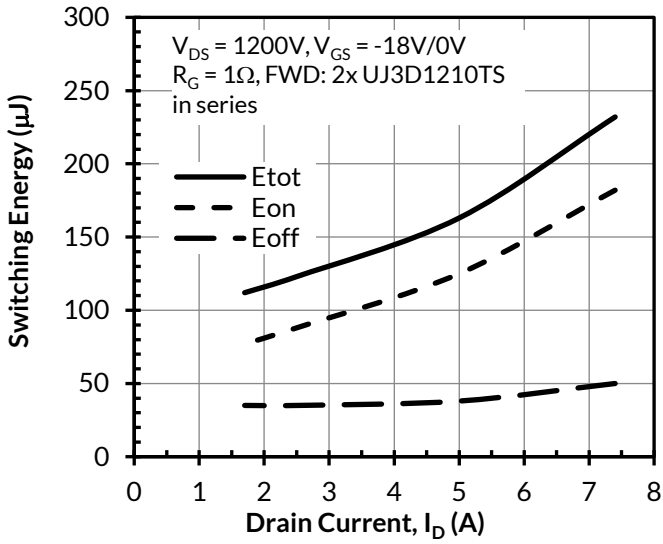


Figure 17. Clamped inductive switching energy vs. drain current at $T_J = 25^\circ C$

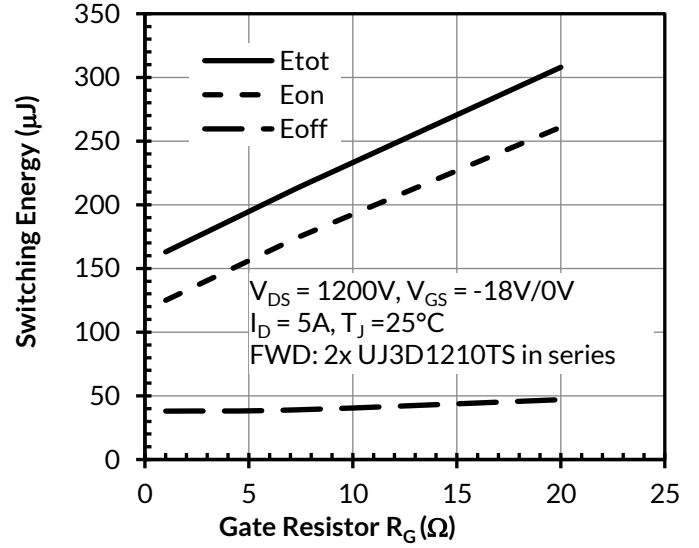


Figure 18. Clamped inductive switching energy vs. gate resistor R_G

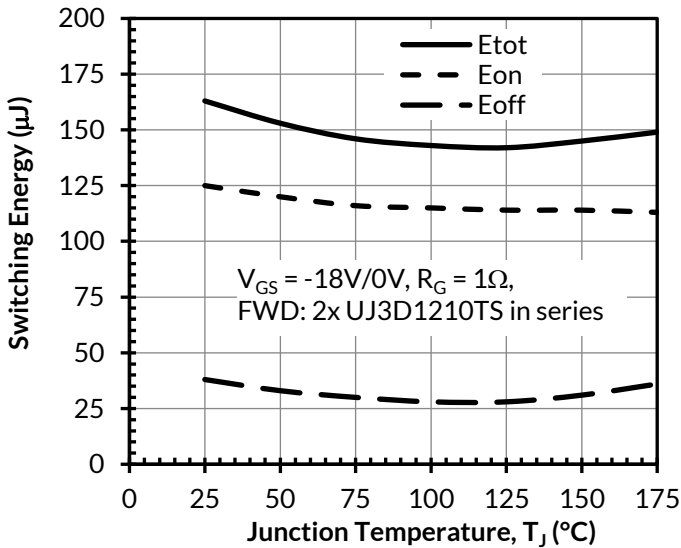


Figure 19. Clamped inductive switching energy vs. junction temperature at $V_{DS} = 1200V$ and $I_D = 5A$

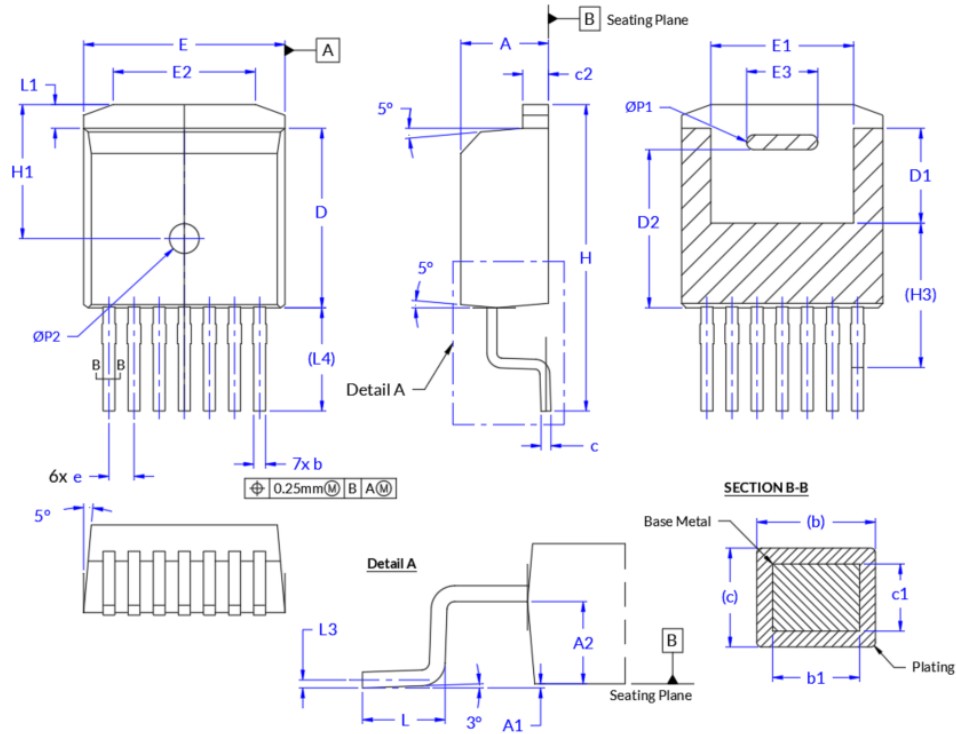
Disclaimer

UnitedSiC reserves the right to change or modify any of the products and their inherent physical and technical specifications without prior notice. UnitedSiC assumes no responsibility or liability for any errors or inaccuracies within.

Information on all products and contained herein is intended for description only. No license, express or implied, to any intellectual property rights is granted within this document.

UnitedSiC assumes no liability whatsoever relating to the choice, selection or use of the UnitedSiC products and services described herein.

PACKAGE OUTLINE



SYM	7L-D2PAK			
	MM		MIN	MAX
A	4.30	4.56	.169	.180
A1	0.00	0.25	.000	.010
A2	2.45	2.75	.096	.108
b	0.50	0.70	.020	.028
b1	0.50	-	.020	-
c	0.40	0.60	.016	.024
c1	0.40	-	.016	-
c2	1.20	1.40	.047	.055
D	8.93	9.23	.352	.363
D1	4.65	4.95	.183	.195
D2	7.90	8.10	.311	.319
e	1.27 BSC		.050 BSC	
E	10.08	10.28	.397	.405
E1	6.82	7.62	.269	.300
E2	6.50	8.60	.256	.339
E3	3.50	3.70	.138	.146
H	15.00	16.00	.591	.630
H1	6.68	6.88	.263	.271
H3	7.3 REF.		.287 REF	
L	1.90	2.50	.075	.098
L1	0.98	1.42	.039	.056
L3	0.25 BSC		.0098 BSC	
L4	5.22 REF		.205 REF	
ØP1	0.65	0.85	.026	.033
ØP2	1.40	1.60	.055	.063

Notes:

1. GENERAL TOLERANCE: ±0.1 unless otherwise specified
2. CONTROLLING DIMENSION: **MILLIMETERS**
3. PACKAGE BODY SIDES EXCLUDE MOLD FLASH AND GATE BURRS.
4. DIMENSION L IS MEASURED IN GAUGE LINE.
5. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
6. DIMENSION c1 AND b1 APPLIES TO BASE METAL ONLY

PART MARKING

G3, 650V / 1200V variant

UF3C: > 40 mOhm

UF3SC: ≤ 40 mOhm

G3, 1700V variant

UF3N: 400 mOhm

G4, 750V variant

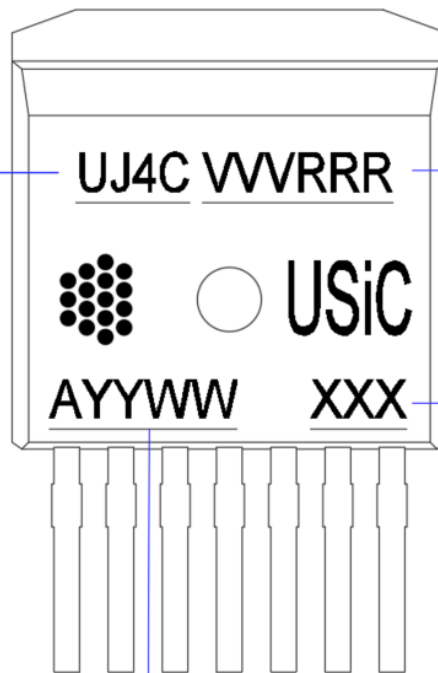
UJ4C: ≥ 23 mOhm

UJ4SC: < 23 mOhm

G4, 1200V variant

UF4C: > 30 mOhm

UF4SC: ≤ 30 mOhm



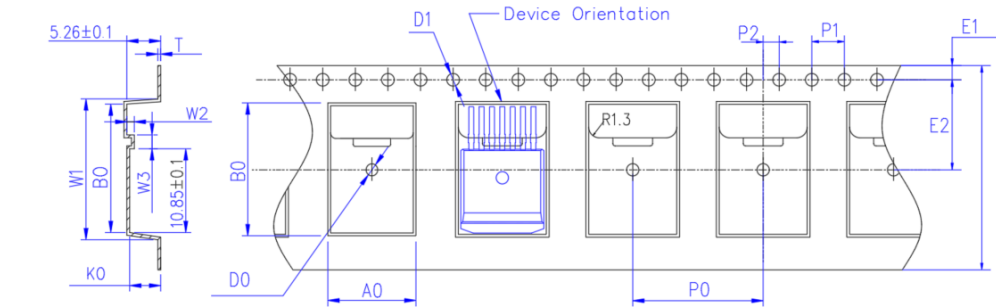
VVV : Voltage Rating
 RRR : Resistance Rating

Lot Code

A: Assembly Site
 YY: Year Code
 WW: Week code

PACKING TYPE

Carrier Tape

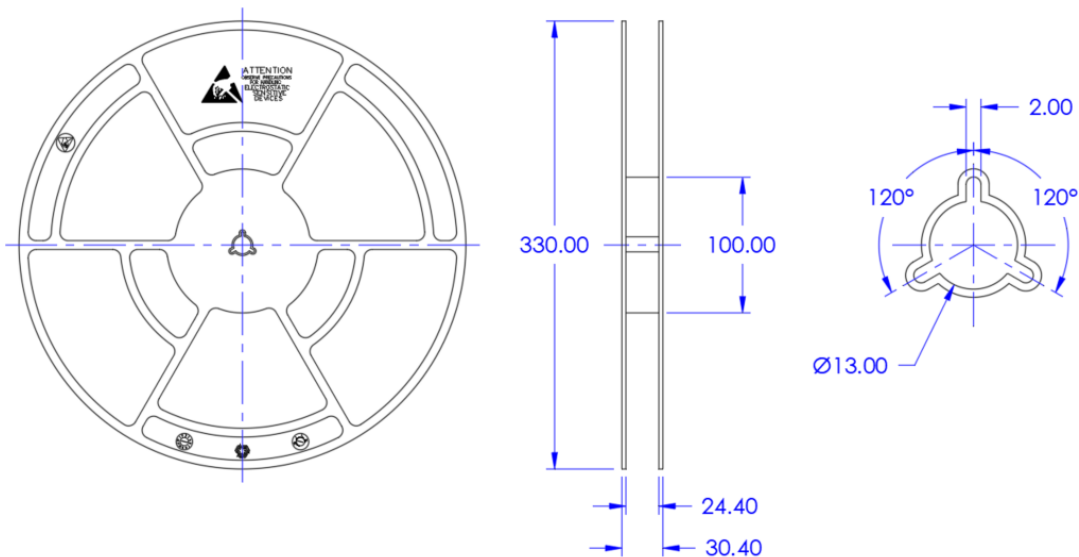


UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
D2PAK (24 mm)	10.80 ±0.10	16.30 ±0.10	4.70 ±0.10	1.50 ±0.10	1.50 +0.1 -0	24.00 ±0.30	1.75 ±0.10	11.50 ±0.10	16.00 ±0.10	4.00 ±0.10	2.00 ±0.10	0.35 ±0.10

Exterior		size
Spec 1	W1	16.9±0.1
	W2	1.3±0.1
	W3	1.0±0.1
Spec 2	W1	17.2±0.1 (a)
	W2	1.8±0.1 (b)
	W3	0.85±0.1 (c)

Reel



All dimensions in millimeters
Anti-Static Tape and Reel (T&R)
Quantity per Reel: 800 units



DISCLAIMER

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo products. The information contained herein, or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regards to such information itself or anything described by such information. THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Without limiting the generality of the foregoing, Qorvo products are not warranted or authorized for use as critical components in medical, lifesaving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

REVISION HISTORY

Revision	Create Date (mm/dd/yyyy)	Description of Change	Initiator of Change
C	11/06/2023	Updated to Qorvo template Updated Package outline drawing based latest drawing revision	Glenn Galang
D	05/21/2024	Added illustration of device orientation on carrier tape (page 3)	Glenn Galang

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales