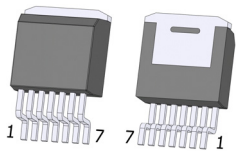
Silicon Carbide (SiC) JFET – EliteSiC, Power N-Channel, D2PAK-7L, 1700 V, 400 mohm

UF3N170400B7S



TO263-7
CASE 418BA

Description

onsemi 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.

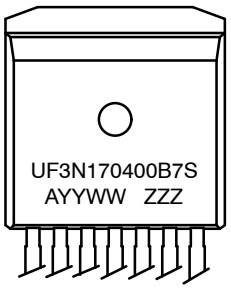
Features

- Typical On-Resistance $R_{DS(on),\ typ}$ of 400 mΩ
- Voltage Controlled
- Maximum Operating Temperature of 175 °C
- Extremely Fast Switching not Dependent on Temperature
- Low Gate Charge
- Low Intrinsic Capacitance
- This Device is Pb-Free, Halogen Free and is RoHS Compliant

Typical Applications

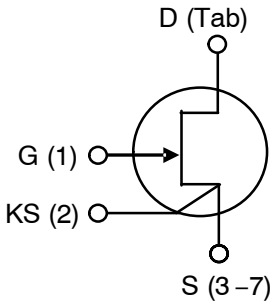
- Over Current Protection Circuits
- DC-AC Inverters
- Switch Mode Power Supplies
- Power Factor Correction Modules
- Motor Drives
- Induction Heating

MARKING DIAGRAM



UF3N170400B7S	= Specific Device Code
A	= Assembly Location
YY	= Year
WW	= Work Week
ZZZ	= Lot ID

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Value	Unit
Drain-source Voltage	V_{DS}		1700	V
Gate-Source Voltage	V_{GS}	DC	−20 to +3	V
		AC (Note 1)	−30 to +20	
Continuous Drain Current (Note 2)	I_D	T_C = 25 °C	6.8	A
		T_C = 100 °C	5.1	A
Pulsed Drain Current (Note 3)	I_{DM}	T_C = 25 °C	16	A
Power Dissipation	P_{TOT}	T_C = 25 °C	68	W
Maximum Junction Temperature	$T_{J,max}$		175	°C
Operating and Storage Temperature	T_J, T_{STG}		−55 to 175	°C
Reflow Soldering Temperature	T_{solder}	Reflow MSL 1	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. +20 V AC Rating Applies for Turn-on Pulses <200 ns applied with external R_G > 1 Ω
2. Limited by $T_{J,max}$
3. Pulse width t_p limited by $T_{J,max}$

THERMAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Value			
			Min	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$		–	1.7	2.2	°C/W

ELECTRICAL CHARACTERISTICS (T_J = +25 °C Unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
TYPICAL PERFORMANCE – STATIC						
Drain-Source Breakdown Voltage	BV_{DS}	V_{GS} = −20 V, I_D = 0.3 mA	1700	–	–	V
Total Drain Leakage Current	I_{DSS}	V_{DS} = 1700 V, V_{GS} = −20 V, T_J = 25 °C	–	2.2	60	μA
		V_{DS} = 1700 V, V_{GS} = −20 V, T_J = 175 °C	–	9	–	
Total Gate Leakage Current	I_{GSS}	V_{GS} = −20 V, T_J = 25 °C	–	0.15	6	μA
		V_{GS} = −20 V, T_J = 175 °C	–	0.8	–	μA
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 2 V, I_D = 5 A, T_J = 25 °C	–	350	–	mΩ
		V_{GS} = 0 V, I_D = 5 A, T_J = 25 °C	–	400	500	
		V_{GS} = 2 V, I_D = 5 A, T_J = 175 °C	–	928	–	
		V_{GS} = 0 V, I_D = 5 A, T_J = 175 °C	–	1040	–	
Gate Threshold Voltage	$V_{G(th)}$	V_{DS} = 5 V, I_D = 4.5 mA	−11.3	−9	−6.7	V
Gate Resistance	R_G	f = 1 MHz, Open Drain	–	5	–	Ω
TYPICAL PERFORMANCE – DYNAMIC						
Input Capacitance	C_{iss}	V_{DS} = 100 V, V_{GS} = −20 V, f = 100 kHz	–	225	–	pF
Output Capacitance	C_{oss}		–	22	–	
Reverse Transfer Capacitance	C_{rss}		–	18	–	
Effective Output Capacitance, Energy Related	$C_{oss(er)}$	V_{DS} = 0 V to 1200 V, V_{GS} = −20 V	–	11.4	–	pF
C_{OSS} stored energy	E_{oss}	V_{DS} = 1200 V, V_{GS} = −20 V	–	8.2	–	μJ
Total Gate Charge	Q_G	V_{DS} = 1200 V, I_D = 5 A, V_{GS} = −18 V to 0 V	–	30	–	nC
Gate-Drain Charge	Q_{GD}		–	17	–	
Gate-Source Charge	Q_{GS}		–	5	–	
Turn-On Delay Time	$t_{d(on)}$	V_{DS} = 1200 V, I_D = 5 A, Gate Driver = −18 V to + 0 V, R_G = 1 Ω, Inductive Load, FWD: 2x UJ3D1210TS in series T_J = 25 °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	–	μJ
Turn-Off Energy	E_{OFF}		–	38	–	
Total Switching Energy	E_{TOTAL}		–	163	–	
Turn-On Delay Time	$t_{d(on)}$	V_{DS} = 1200 V, I_D = 5 A, Gate Driver = −18 V to + 0 V, R_G = 1 Ω, Inductive Load, FWD: 2x UJ3D1210TS in series T_J = 150 °C	–	5	–	ns
Rise Time	t_r		–	16	–	
Turn-Off Delay Time	$t_{d(off)}$		–	8	–	
Fall Time	t_f		–	34	–	
Turn-On Energy	E_{ON}		–	114	–	μJ
Turn-Off Energy	E_{OFF}		–	31	–	
Total Switching Energy	E_{TOTAL}		–	145	–	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE DIAGRAMS

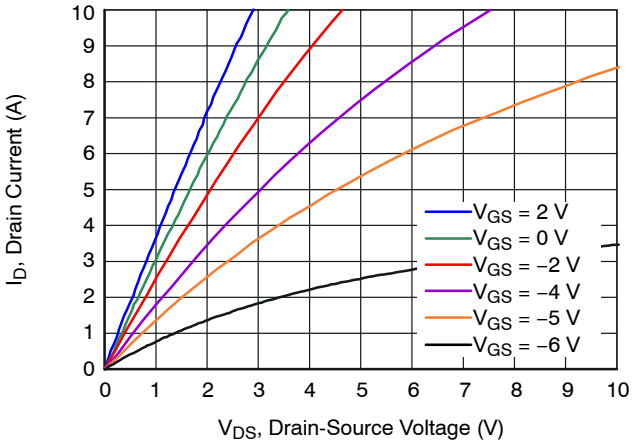


Figure 1. Typical Output Characteristics at T_J = −55 °C, t_p < 250 μs

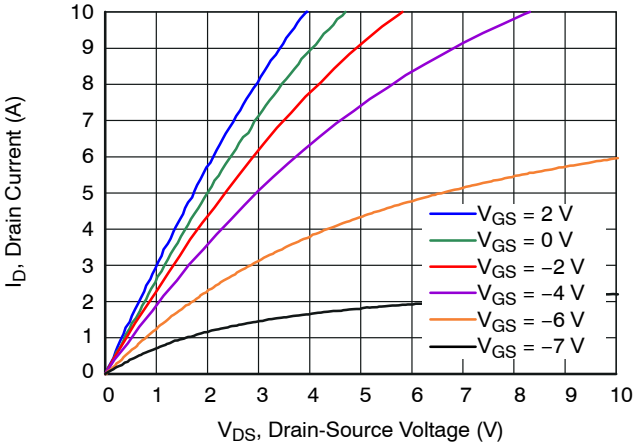


Figure 2. Typical Output Characteristics at T_J = 25 °C, t_p < 250 μs

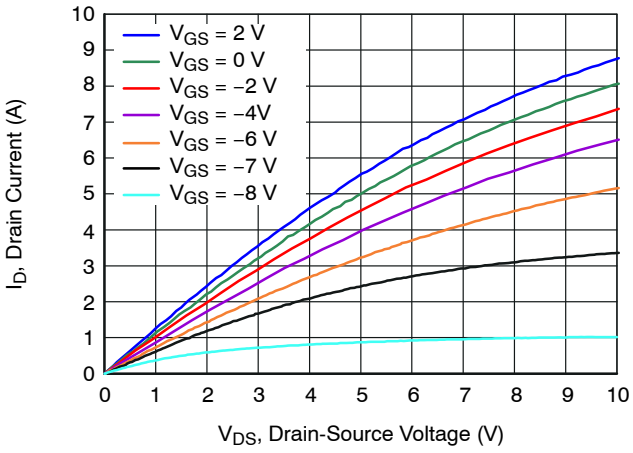


Figure 3. Typical Output Characteristics at T_J = 175 °C, t_p < 250 μs

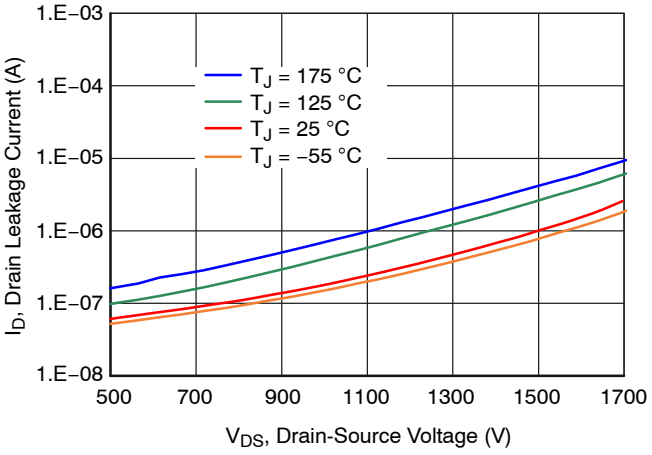


Figure 4. Typical Drain−Source Leakage at V_{DS} = −20 V

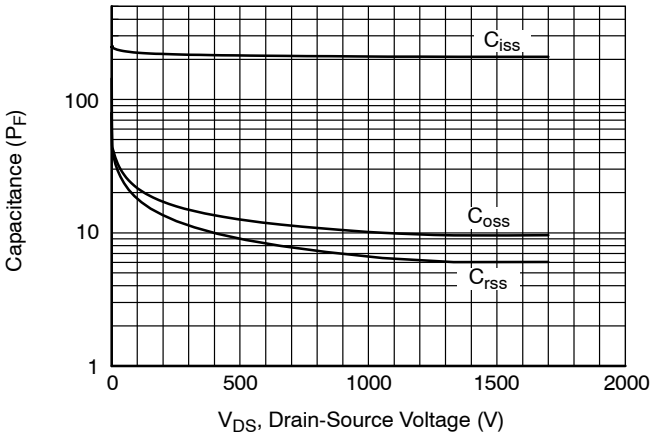


Figure 5. Typical Capacitances at 100 KHz and V_{GS} = −20 V

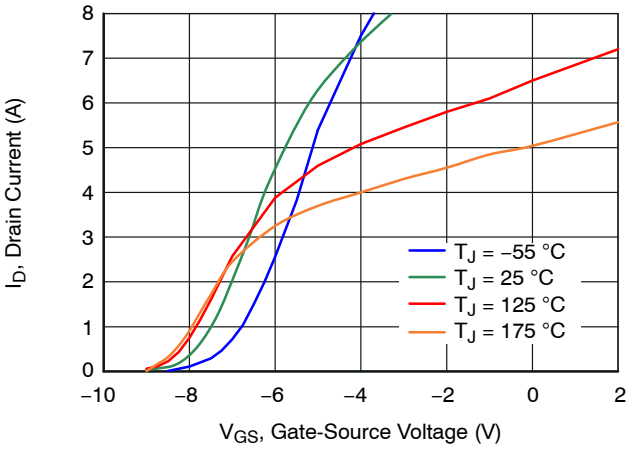


Figure 6. Typical Transfer Characteristics at V_{DS} = 5 V

TYPICAL PERFORMANCE DIAGRAMS (CONTINUED)

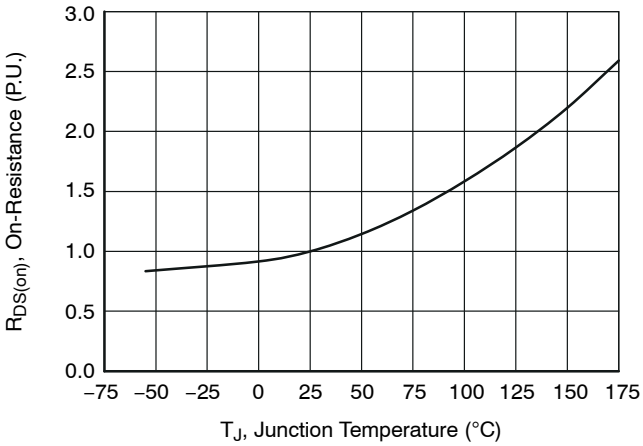


Figure 7. Normalized On−Resistance Vs. Temperature at V_{GS} = 0 V and I_D = 5 A

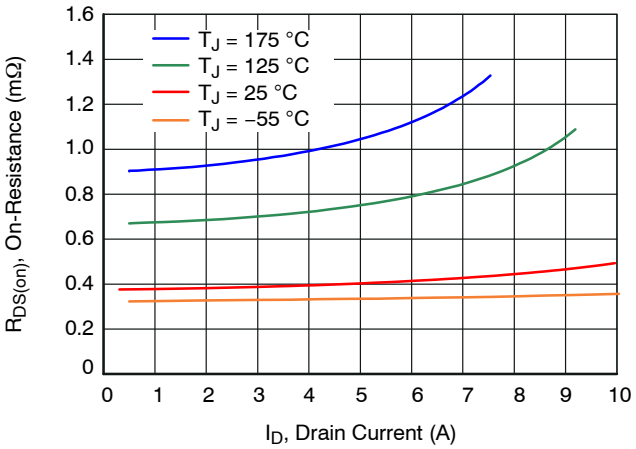


Figure 8. Typical Drain−Source On−Resistance V_{GS} = 0 V

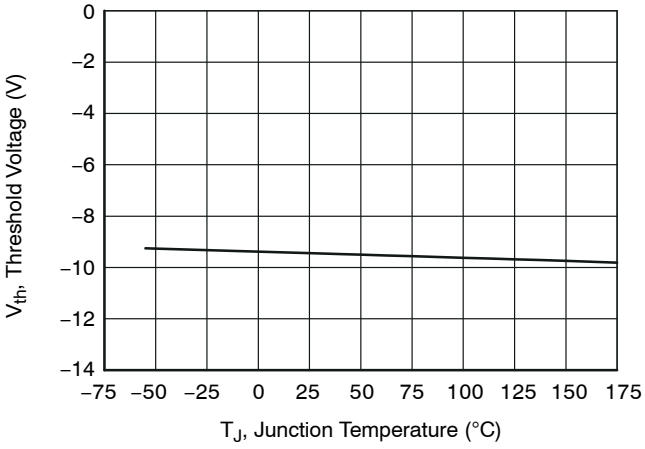


Figure 9. Threshold Voltage vs. Junction Temperature at V_{DS} = 5 V and I_D = 4.5 mA

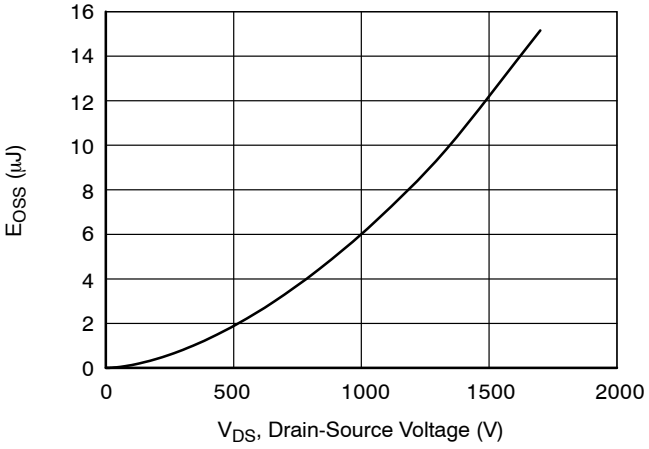


Figure 10. Typical Stored Energy in C_{OSS} at V_{GS} = −20 V

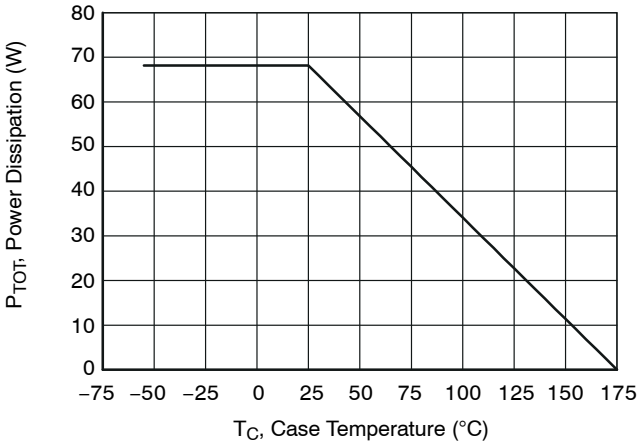


Figure 11. Total Power Dissipation

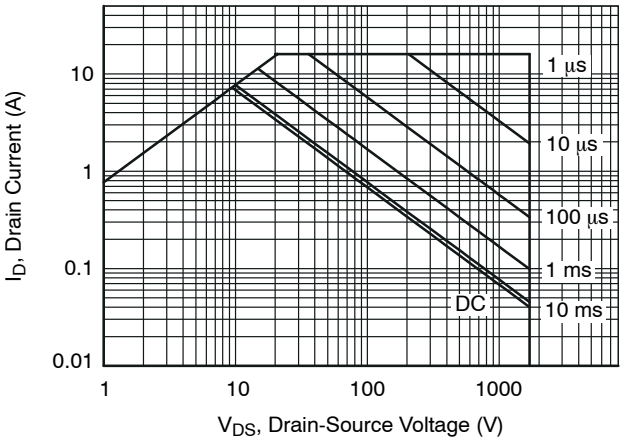


Figure 12. Safe Operation Area at T_C = 25 °C, Parameter t_p

TYPICAL PERFORMANCE DIAGRAMS (CONTINUED)

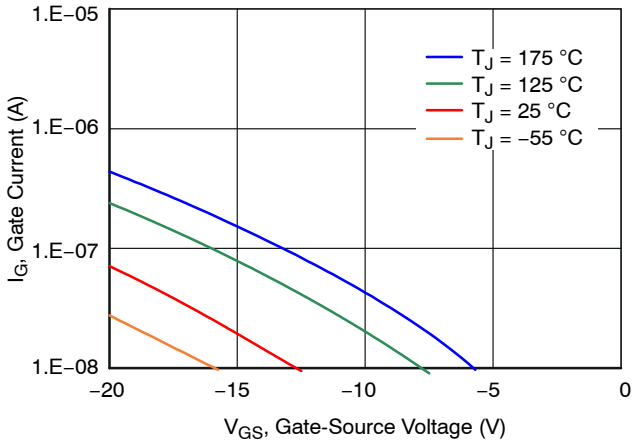


Figure 13. Typical Gate Leakage Current at V_{DS} = 0 V

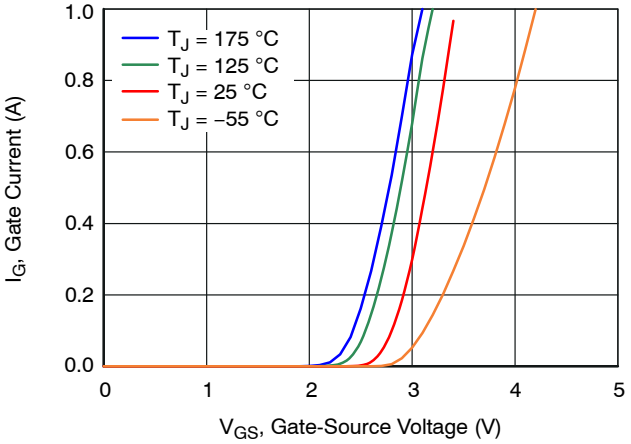


Figure 14. Typical Gate Forward Current at V_{DS} = 0 V

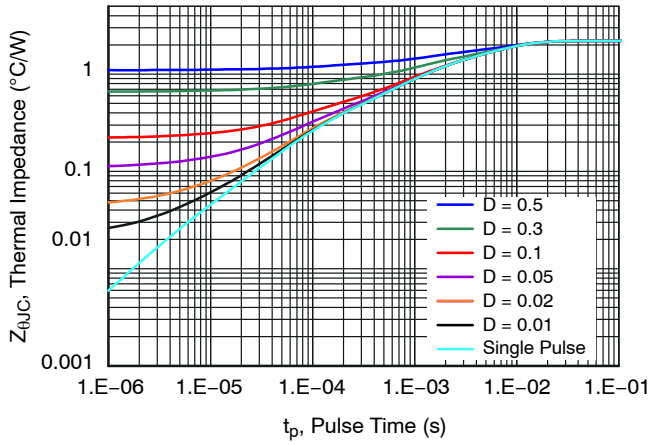


Figure 15. Maximum Transient Thermal Impedance

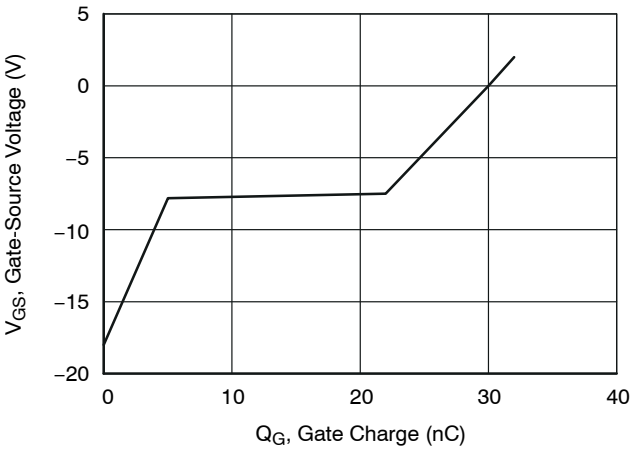


Figure 16. Typical Gate Charge at V_{DS} = 1200 V and I_D = 5 A

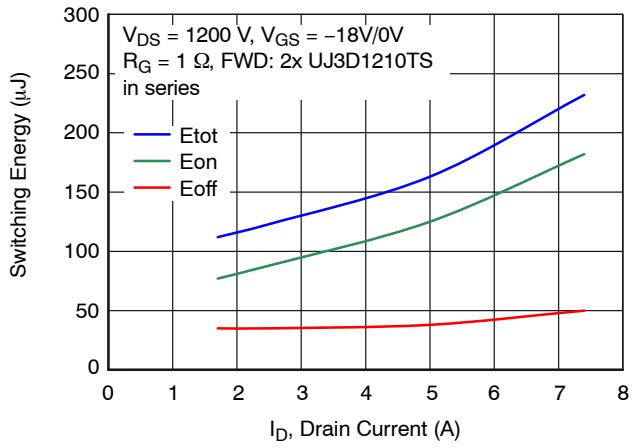


Figure 17. Clamped Inductive Switching Energy vs. Drain Current at T_J = 25 °C

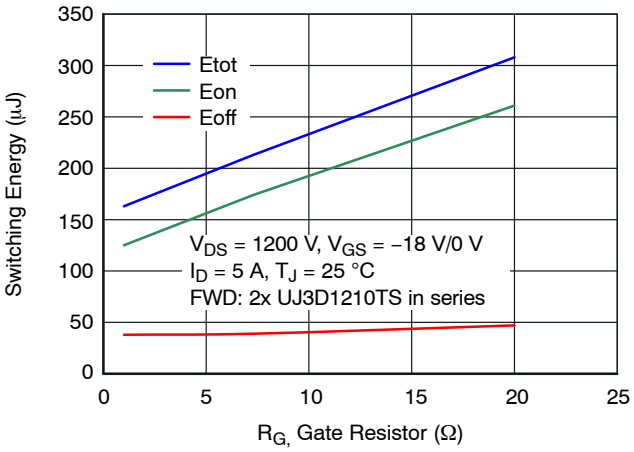


Figure 18. Clamped Inductive Switching Energy vs. Gate Resistor R_G

TYPICAL PERFORMANCE DIAGRAMS (CONTINUED)

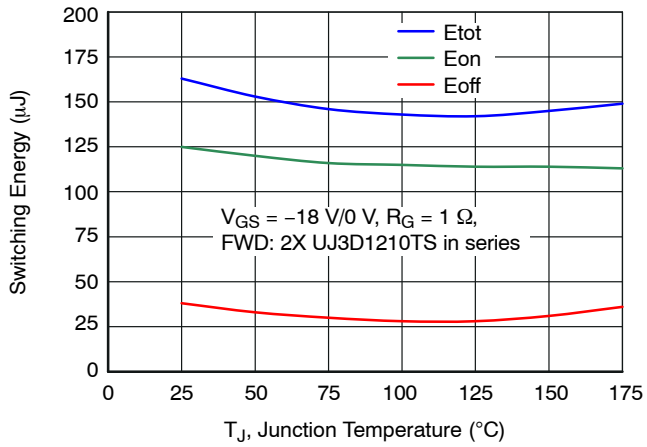
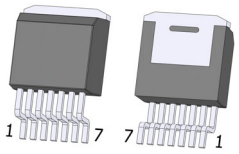


Figure 19. Clamped Inductive Switching Energy vs. Junction Temperature at V_{DS} = 1200 V and I_D = 5 A

ORDERING INFORMATION

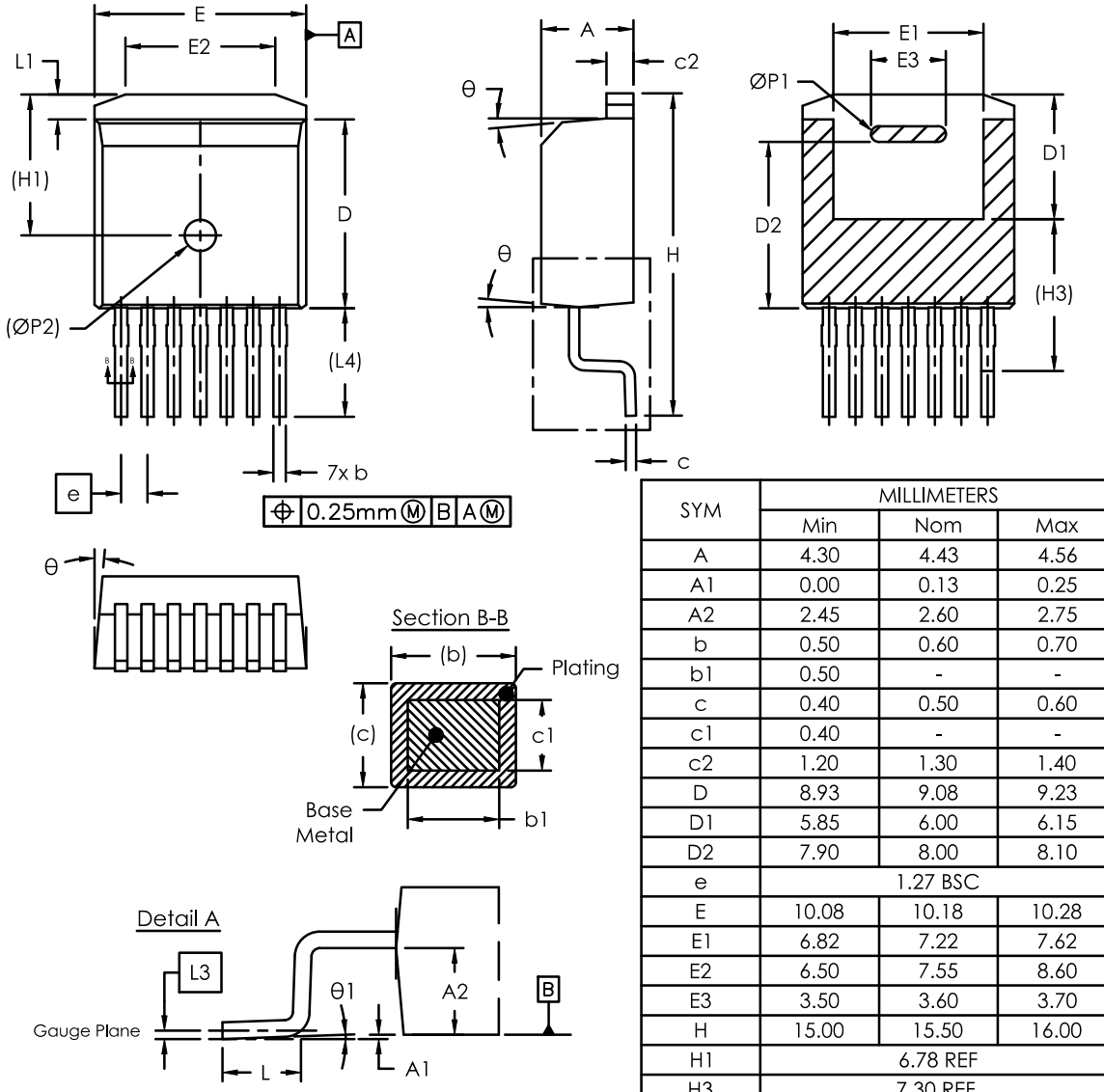
Part Number	Marking	Package	Shipping†
UF3N170400B7S	UF3N170400B7S	D^2 PAK-7L (Pb−Free, Hlogen Free)	800 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



TO−263−7 10.18x9.08x4.43, 1.27P
CASE 418BA
ISSUE B

DATE 17 APR 2025



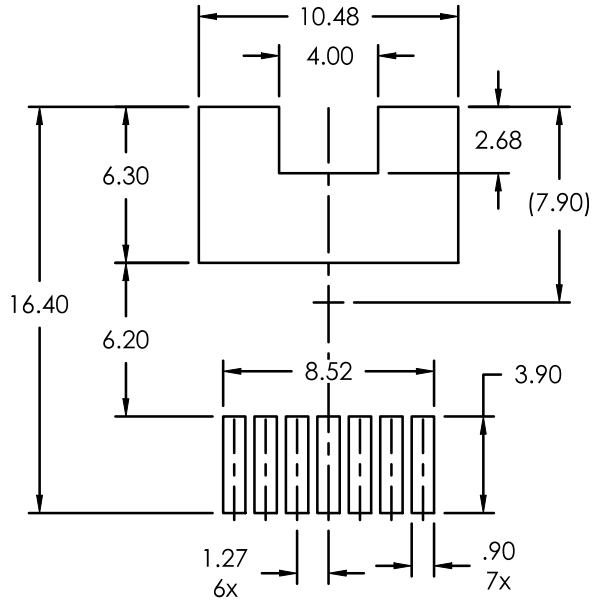
SYM	MILLIMETERS		
	Min	Nom	Max
A	4.30	4.43	4.56
A1	0.00	0.13	0.25
A2	2.45	2.60	2.75
b	0.50	0.60	0.70
b1	0.50	-	-
c	0.40	0.50	0.60
c1	0.40	-	-
c2	1.20	1.30	1.40
D	8.93	9.08	9.23
D1	5.85	6.00	6.15
D2	7.90	8.00	8.10
e		1.27 BSC	
E	10.08	10.18	10.28
E1	6.82	7.22	7.62
E2	6.50	7.55	8.60
E3	3.50	3.60	3.70
H	15.00	15.50	16.00
H1		6.78 REF	
H3		7.30 REF.	
L	1.90	2.20	2.50
L1	0.98	1.20	1.42
L3		0.25 BSC	
L4		5.22 REF	
ØP1	0.65	0.75	0.85
ØP2		1.50 REF	
θ		5°	
θ1		3°	

Notes:
1. Dimensioning and Tolerancing as per ASME Y14.5M, 2018.
2. Controlling Dimension : Millimeters
3. Package body sides exclude mold flash and gate burrs.
4. Dimension L is measured on gauge plane.
5. Dimension c1 and b1 applies to base metal only.

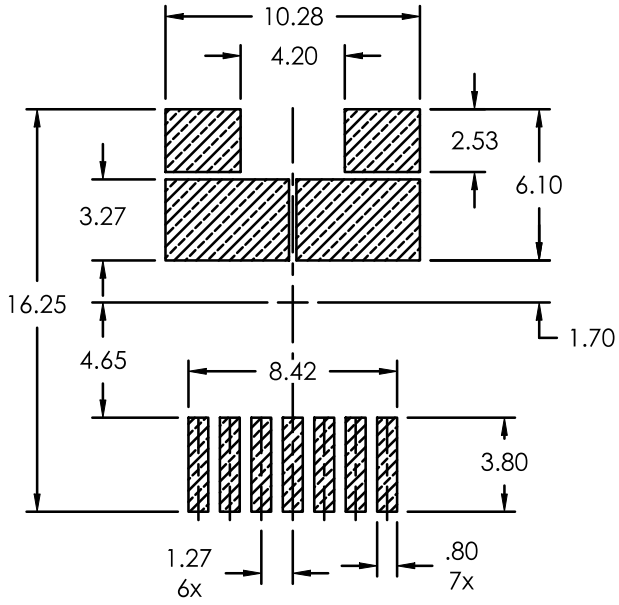
TO−263−7 10.18x9.08x4.43, 1.27P
CASE 418BA
ISSUE B

DATE 17 APR 2025

RECOMMENDED PCB FOOTPRINT

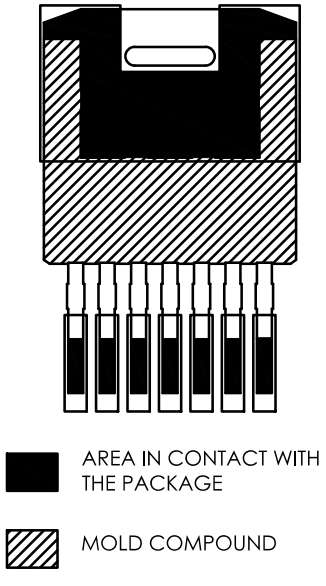


RECOMMENDED STENCIL APERTURE



NOTE: LAND PATTERN AND STENCIL APERTURE DIMENSIONS SERVE ONLY AS AN INITIAL GUIDE. END-USER PCB DESIGN RULES AND TOLERANCES SHOULD ALWAYS PREVAIL.

PCB FOOTPRINT with PACKAGE OVERLAY



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DESCRIPTION:	**TO−263−7 10.18x9.08x4.43, 1.27P**		**PAGE 2 OF 2**

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