

## 1. Product profile

### 1.1 General description

Based on Advanced Rugged Technology (ART), this 35 W LDMOS RF power transistor has been designed to cover a wide range of applications for ISM, broadcast and communications. The unmatched transistor has a frequency range of 1 MHz to 650 MHz.

**Table 1. Application information**

Test signal	f (MHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)
CW	13.56	65	35	36.5	74.5
CW [1]	10 to 54	65	35	28.7	75.3
CW [1]	60 to 130	65	35	24.6	65.8

[1] Center band performance numbers across the indicated frequency range.

### 1.2 Features and benefits

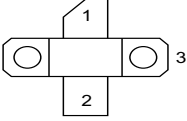
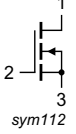
- High breakdown voltage enables class E operation up to V<sub>DS</sub> = 53 V
- Qualified up to a maximum of V<sub>DS</sub> = 65 V
- Characterized from 30 V to 65 V to support a wide range of applications
- Easy power control
- Integrated dual sided ESD protection enables class C operation and complete switch off of the transistor
- Excellent ruggedness with no device degradation
- High efficiency
- Excellent thermal stability
- Designed for broadband operation
- For RoHS compliance see the product details on the Ampleon website

### 1.3 Applications

- Industrial, scientific and medical applications
  - ◆ Plasma generators
  - ◆ MRI systems
  - ◆ CO<sub>2</sub> lasers
  - ◆ Particle accelerators
- Broadcast
  - ◆ FM radio
  - ◆ VHF TV
- Radar
  - ◆ Non cellular communications
  - ◆ UHF radar

## 2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
1	drain			 sym112
2	gate			
3	source	[1]		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Package name	Orderable part number	12NC	Packing description	Min. orderable quantity (pieces)
SOT467C	ART35FEU	9349 603 46112	Tray; 20-fold; non-dry pack	60

## 4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	[1]	-	200	V
$V_{GS}$	gate-source voltage		-9	+13	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature	[2]	-	225	°C

[1] Specified over lifetime at maximum operating temperature.

[2] Continuous use at maximum temperature will affect the reliability, for details refer to the online MTF calculator.

## 5. Thermal characteristics

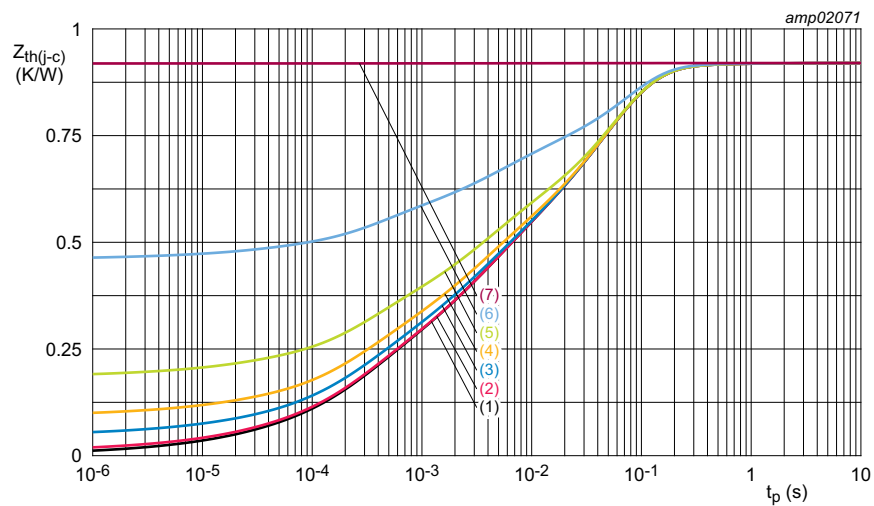
Table 5. Thermal characteristics

According to standard MIL-STD-883E.

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_j = 105\text{ °C}$ , measured under RF condition [1][2]	0.92	K/W

[1] Refer to application note AN221014 on the Ampleon website.

[2] See [Figure 1](#).



- (1)  $\delta = 0.1 \%$  (single push)
- (2)  $\delta = 1 \%$
- (3)  $\delta = 5 \%$
- (4)  $\delta = 10 \%$
- (5)  $\delta = 20 \%$
- (6)  $\delta = 50 \%$
- (7)  $\delta = 100 \%$  (steady state)

**Fig 1. Transient thermal impedance from junction to case as a function of pulse duration**

## 6. Characteristics

**Table 6. DC characteristics**

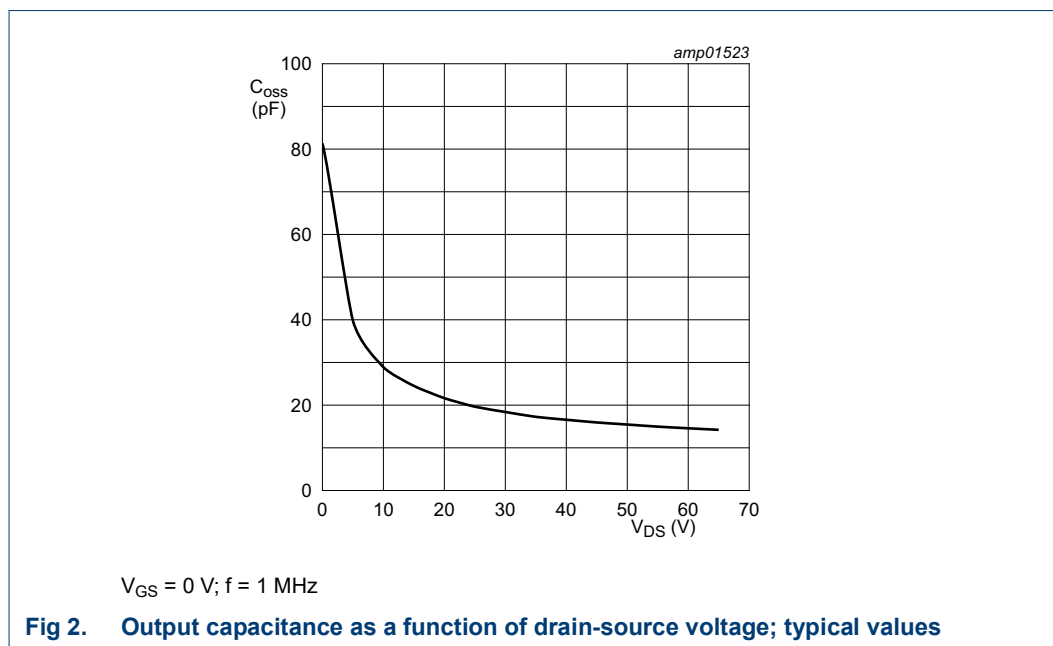
$T_j = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 0.3\text{ mA}$	203	209	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 20\text{ V}$ ; $I_D = 30\text{ mA}$	1.5	2.1	2.5	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 65\text{ V}$	-	-	1.2	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $V_{DS} = 20\text{ V}$	-	4.6	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 13\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	120	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 1.05\text{ A}$	-	1.6	-	$\Omega$

**Table 7. AC characteristics**

$T_j = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 65\text{ V}$ ; $f = 1\text{ MHz}$	-	0.087	-	pF
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 65\text{ V}$ ; $f = 1\text{ MHz}$	-	48.39	-	pF
$C_{oss}$	output capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 65\text{ V}$ ; $f = 1\text{ MHz}$	-	14.22	-	pF



**Table 8. RF characteristics**

Test signal: CW pulsed;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ ;  $f = 108\text{ MHz}$ ; RF performance at  $V_{DS} = 65\text{ V}$ ;  $I_{Dq} = 20\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_L = 35\text{ W}$	29	31	-	dB
$RL_{in}$	input return loss	$P_L = 35\text{ W}$	-	-24	-9	dB
$\eta_D$	drain efficiency	$P_L = 35\text{ W}$	67	70.5	-	%

7. Test information

7.1 Ruggedness in class-AB operation

The ART35FE is capable of withstanding a load mismatch corresponding to  $V_{SWR} \geq 65 : 1$  through all phases under the following conditions:  $V_{DS} = 65\text{ V}$ ;  $I_{DQ} = 20\text{ mA}$ ;  $P_L = 35\text{ W}$ ;  $f = 108\text{ MHz}$ ; CW and CW pulsed ( $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ ).

7.2 Impedance information

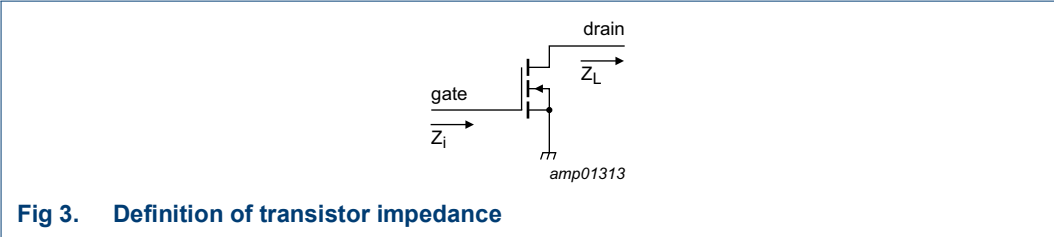
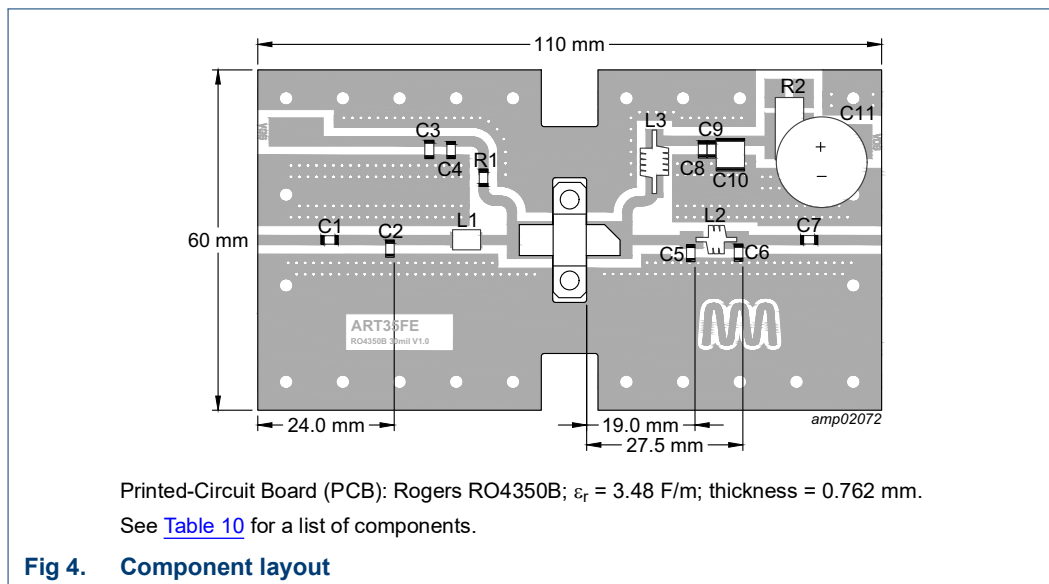


Table 9. Typical push-pull impedance  
Simulated  $Z_i$  and  $Z_L$  device impedance.

f	$Z_i$	$Z_L$	$P_L$
(MHz)	( $\Omega$ )	( $\Omega$ )	(W)
<b><math>V_{DS} = 65\text{ V}</math></b>			
108	$10.4 - j52.5$	$38.7 + j28.8$	35
<b><math>V_{DS} = 35\text{ V}</math></b>			
108	$10.4 - j52.5$	$36.4 + j23.0$	12

### 7.3 Test circuit



**Table 10. List of components**

For test circuit see [Figure 4](#).

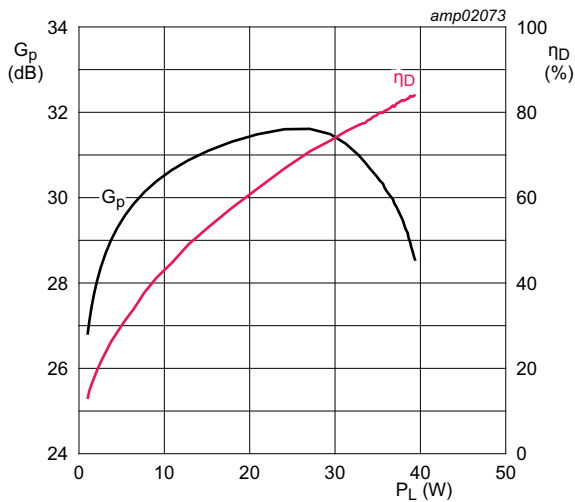
Component	Description	Value	Remarks
C1, C4, C7	multilayer ceramic chip capacitor	1 nF <a href="#">[1][2]</a>	
C2	multilayer ceramic chip capacitor	82 pF <a href="#">[1][2]</a>	
C3	multilayer ceramic chip capacitor	4.7 $\mu$ F, 100 V	Murata: GRM31CC72A475KE11L
C5	multilayer ceramic chip capacitor	15 pF <a href="#">[1][2]</a>	
C6	multilayer ceramic chip capacitor	24 pF <a href="#">[1][2]</a>	
C8, C9	multilayer ceramic chip capacitor	620 pF <a href="#">[1][2]</a>	
C10	multilayer ceramic chip capacitor	4.7 $\mu$ F, 100 V	TDK: CGA9N2X7R2A465K230
C11	electrolytic capacitor	470 $\mu$ F, 100 V	
L1	mini spring air core inductor	82 nH	Coilcraft: 1515SQ-82NGEC
L2	air core inductor	5.5 turns, D = 5 mm	1 mm copper wire
L3	air core inductor	5 turns, D = 5 mm	1 mm copper wire
R1	chip resistor	5.1 k $\Omega$	SMD 1206
R2	chip resistor	0.01 $\Omega$	FC4L110R010FER

[1] American Technical Ceramics type 800B or capacitor of same quality.

[2] Vertical mounted.

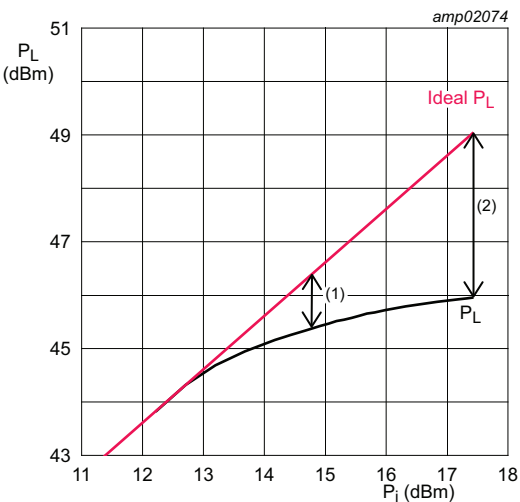
7.4 Graphical data

7.4.1 CW pulsed



$V_{DS} = 65\text{ V}$ ;  $I_{Dq} = 20\text{ mA}$ ;  $f = 108\text{ MHz}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  
 $\delta = 10\text{ }\%$ .

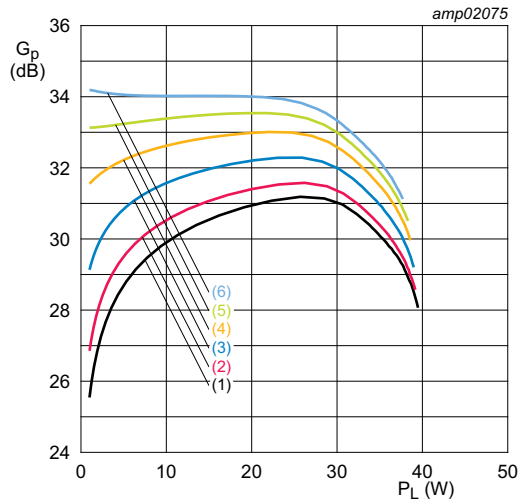
Fig 5. Power gain and drain efficiency as function of output power; typical values



$V_{DS} = 65\text{ V}$ ;  $I_{Dq} = 20\text{ mA}$ ;  $f = 108\text{ MHz}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  
 $\delta = 10\text{ }\%$ .

- (1)  $P_{L(1\text{dB})} = 45.31\text{ dBm}$  (34 W)
- (2)  $P_{L(3\text{dB})} = 45.91\text{ dBm}$  (39 W)

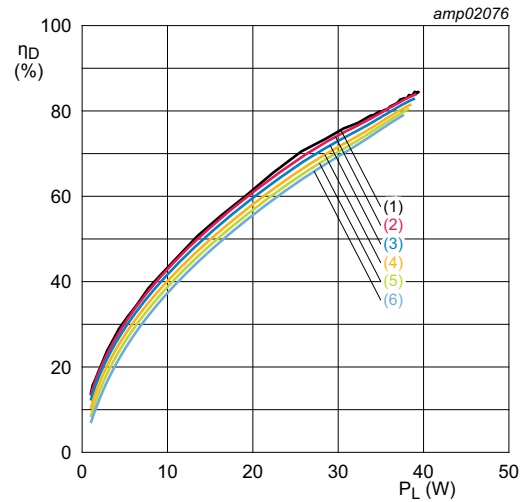
Fig 6. Output power as a function of input power; typical values



$V_{DS} = 65$  V;  $f = 108$  MHz;  $t_p = 100$   $\mu$ s;  $\delta = 10$  %.

- (1)  $I_{Dq} = 10$  mA
- (2)  $I_{Dq} = 20$  mA
- (3)  $I_{Dq} = 50$  mA
- (4)  $I_{Dq} = 100$  mA
- (5)  $I_{Dq} = 150$  mA
- (6)  $I_{Dq} = 200$  mA

**Fig 7. Power gain as a function of output power; typical values**

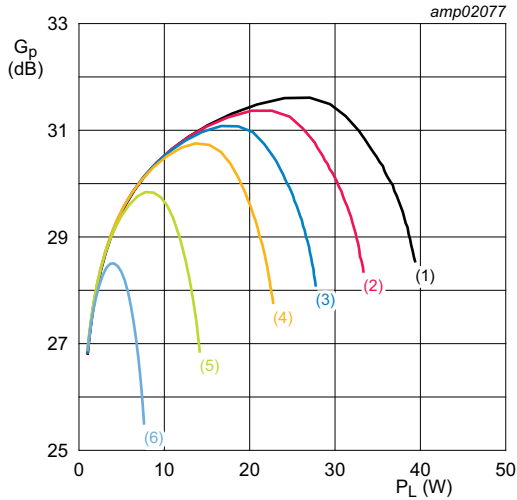


$V_{DS} = 65$  V;  $f = 108$  MHz;  $t_p = 100$   $\mu$ s;  $\delta = 10$  %.

- (1)  $I_{Dq} = 10$  mA
- (2)  $I_{Dq} = 20$  mA
- (3)  $I_{Dq} = 50$  mA
- (4)  $I_{Dq} = 100$  mA
- (5)  $I_{Dq} = 150$  mA
- (6)  $I_{Dq} = 200$  mA

**Fig 8. Drain efficiency as a function of output power; typical values**

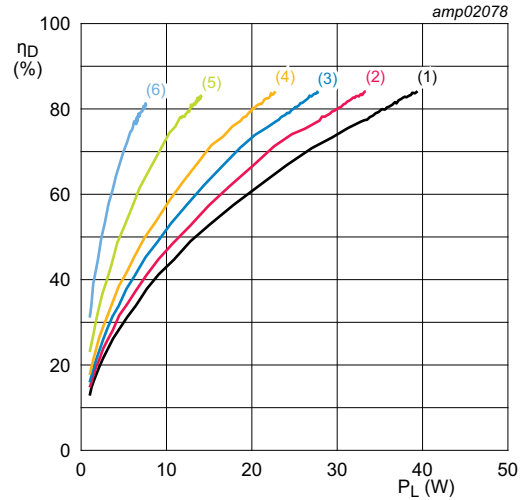




$I_{Dq} = 20 \text{ mA}$ ;  $f = 108 \text{ MHz}$ ;  $t_p = 100 \text{ }\mu\text{s}$ ;  $\delta = 10 \text{ }\%$ .

- (1)  $V_{DS} = 65 \text{ V}$
- (2)  $V_{DS} = 60 \text{ V}$
- (3)  $V_{DS} = 55 \text{ V}$
- (4)  $V_{DS} = 50 \text{ V}$
- (5)  $V_{DS} = 40 \text{ V}$
- (6)  $V_{DS} = 30 \text{ V}$

**Fig 9. Power gain as a function of output power; typical values**

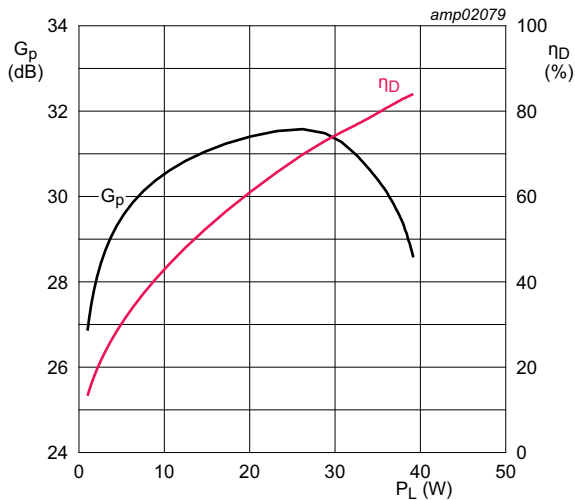


$I_{Dq} = 20 \text{ mA}$ ;  $f = 108 \text{ MHz}$ ;  $t_p = 100 \text{ }\mu\text{s}$ ;  $\delta = 10 \text{ }\%$ .

- (1)  $V_{DS} = 65 \text{ V}$
- (2)  $V_{DS} = 60 \text{ V}$
- (3)  $V_{DS} = 55 \text{ V}$
- (4)  $V_{DS} = 50 \text{ V}$
- (5)  $V_{DS} = 40 \text{ V}$
- (6)  $V_{DS} = 30 \text{ V}$

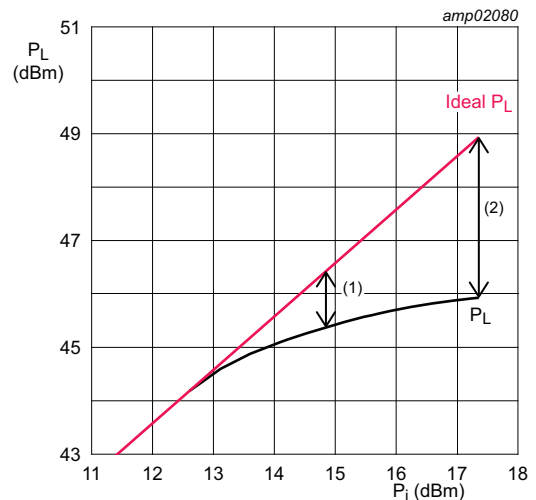
**Fig 10. Drain efficiency as a function of output power; typical values**

## 7.4.2 CW



$V_{DS} = 65 \text{ V}$ ;  $I_{Dq} = 20 \text{ mA}$ ;  $f = 108 \text{ MHz}$ .

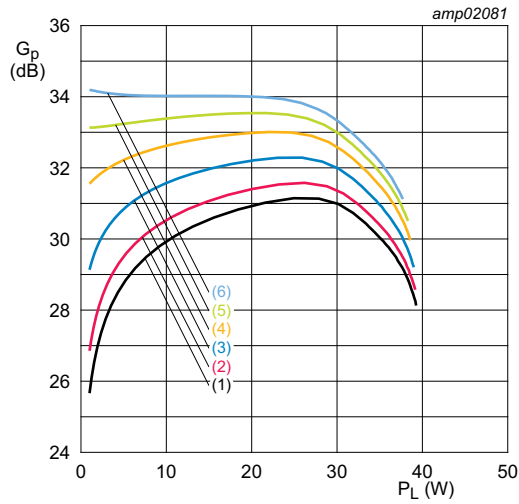
**Fig 11. Power gain and drain efficiency as function of output power; typical values**



$V_{DS} = 65 \text{ V}$ ;  $I_{Dq} = 20 \text{ mA}$ ;  $f = 108 \text{ MHz}$ .

- (1)  $P_{L(1\text{dB})} = 45.31 \text{ dBm}$  (34 W)
- (2)  $P_{L(3\text{dB})} = 45.91 \text{ dBm}$  (39 W)

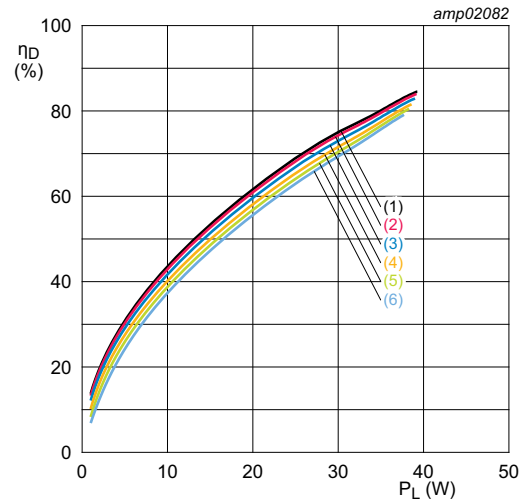
**Fig 12. Output power as a function of input power; typical values**



$V_{DS} = 65$  V;  $f = 108$  MHz.

- (1)  $I_{Dq} = 10$  mA
- (2)  $I_{Dq} = 20$  mA
- (3)  $I_{Dq} = 50$  mA
- (4)  $I_{Dq} = 100$  mA
- (5)  $I_{Dq} = 150$  mA
- (6)  $I_{Dq} = 200$  mA

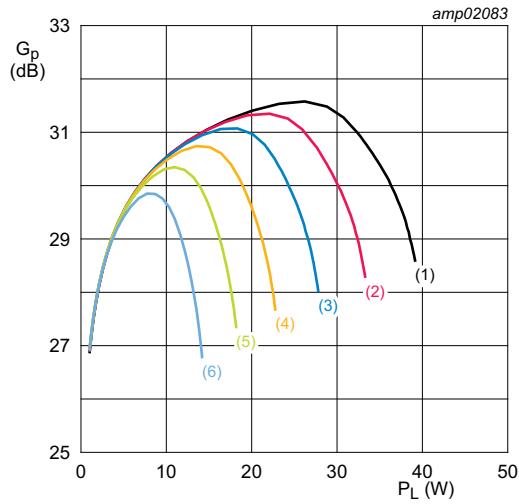
**Fig 13. Power gain as a function of output power; typical values**



$V_{DS} = 65$  V;  $f = 108$  MHz.

- (1)  $I_{Dq} = 10$  mA
- (2)  $I_{Dq} = 20$  mA
- (3)  $I_{Dq} = 50$  mA
- (4)  $I_{Dq} = 100$  mA
- (5)  $I_{Dq} = 150$  mA
- (6)  $I_{Dq} = 200$  mA

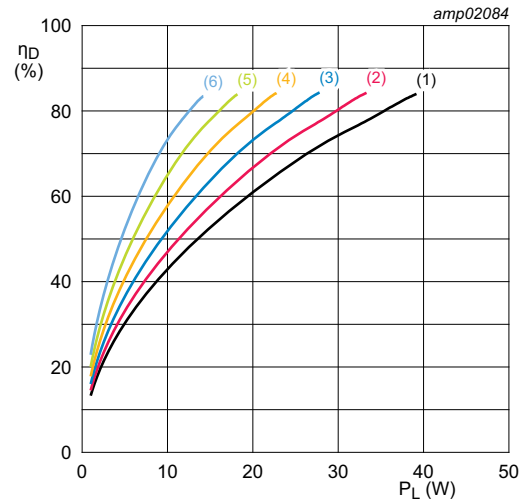
**Fig 14. Drain efficiency as a function of output power; typical values**



$I_{Dq} = 20$  mA;  $f = 108$  MHz.

- (1)  $V_{DS} = 65$  V
- (2)  $V_{DS} = 60$  V
- (3)  $V_{DS} = 55$  V
- (4)  $V_{DS} = 50$  V
- (5)  $V_{DS} = 40$  V
- (6)  $V_{DS} = 30$  V

**Fig 15. Power gain as a function of output power; typical values**



$I_{Dq} = 20$  mA;  $f = 108$  MHz.

- (1)  $V_{DS} = 65$  V
- (2)  $V_{DS} = 60$  V
- (3)  $V_{DS} = 55$  V
- (4)  $V_{DS} = 50$  V
- (5)  $V_{DS} = 40$  V
- (6)  $V_{DS} = 30$  V

**Fig 16. Drain efficiency as a function of output power; typical values**

8. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT467C

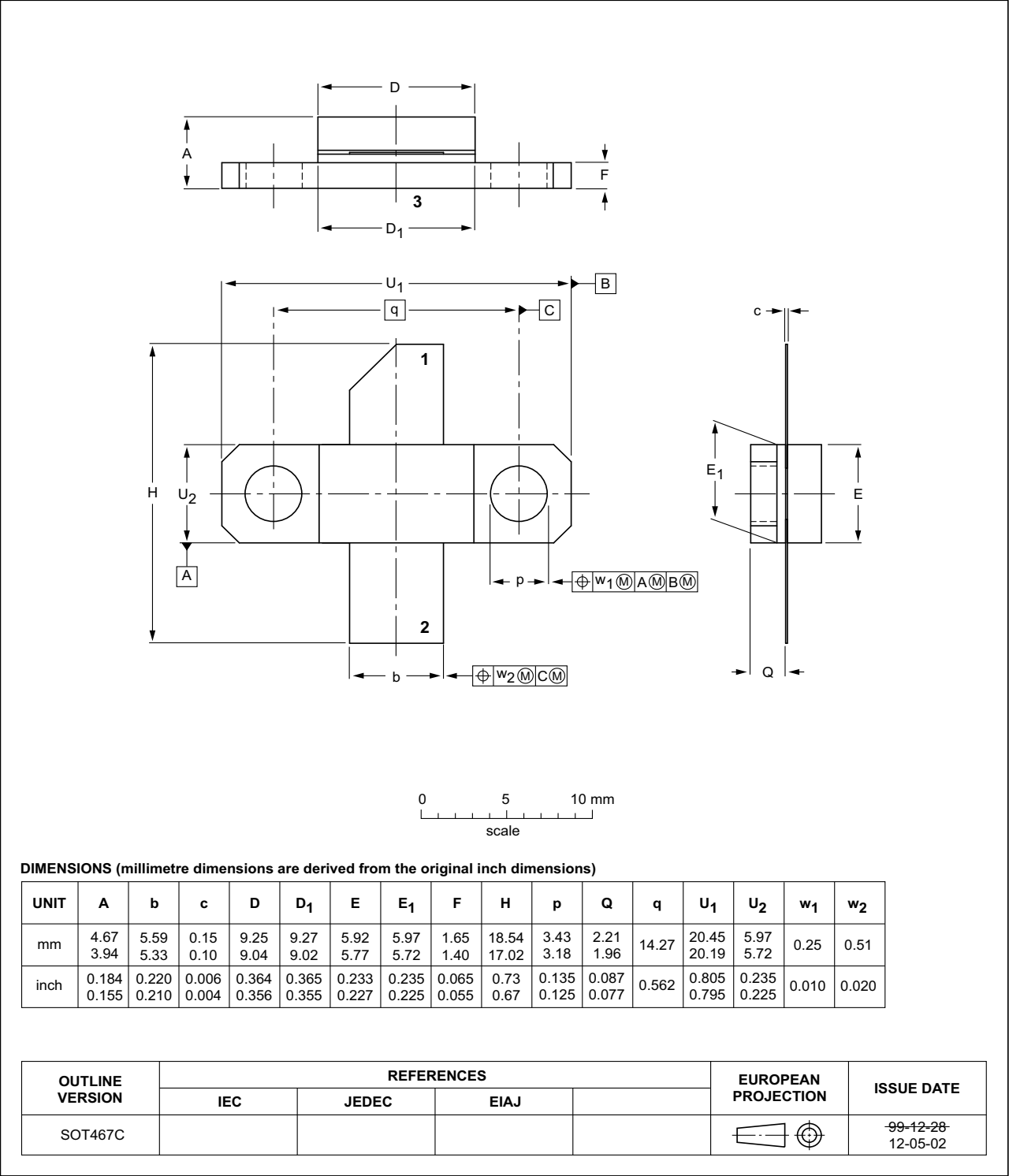


Fig 17. Package outline SOT467C

## 9. Handling information

### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

**Table 11. ESD sensitivity**

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C2A
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2

## 10. Abbreviations

**Table 12. Abbreviations**

Acronym	Description
CW	Continuous Wave
ESD	ElectroStatic Discharge
FM	Frequency Modulation
ISM	Industrial, Scientific and Medical
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MRI	Magnetic Resonance Imaging
MTF	Median Time to Failure
RoHS	Restriction of Hazardous Substances
UHF	Ultra High Frequency
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

## 11. Revision history

**Table 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
ART35FE v.4	20260402	Product data sheet	-	ART35FE v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 3 on page 2</a>: updated section</li> </ul>			
ART35FE v.3	20240903	Product data sheet	-	ART35FE v.2
ART35FE v.2	20220708	Product data sheet	-	ART35FE v.1
ART35FE v.1	20201207	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.ampleon.com>.

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## 12.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 13. Contact information

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