



## N-CHANNEL MOSFET

Qualified per MIL-PRF-19500/556

Qualified Levels:  
JAN, JANTX, and  
JANTXV

### DESCRIPTION

This family of 2N6782, 2N6784 and 2N6786 switching transistors are military qualified up to the JANTXV level for high-reliability applications. These devices are also available in a low profile U-18 LCC surface mount package. Microsemi also offers numerous other transistor products to meet higher and lower power ratings with various switching speed requirements in both through-hole and surface-mount packages.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

- JEDEC registered 2N6782, 2N6784 and 2N6786 number series.
- JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/556. (See [part nomenclature](#) for all available options.)
- RoHS compliant versions available (commercial grade only).

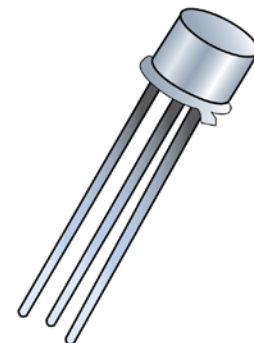
### APPLICATIONS / BENEFITS

- Lightweight top-hat design with flexible terminals offers a variety of mounting flexibility.
- Military and other high-reliability applications.

### MAXIMUM RATINGS @ T<sub>A</sub> = +25 °C unless otherwise stated

Parameters / Test Conditions	Symbol	Value	Unit
Operating & Storage Junction Temperature Range	T <sub>J</sub> & T <sub>stg</sub>	-55 to +150	°C
Thermal Resistance Junction-to-Case	R <sub>θJC</sub>	8.33	°C/W
Total Power Dissipation	P <sub>T</sub>	@ T <sub>A</sub> = +25 °C	0.8
		@ T <sub>C</sub> = +25 °C <sup>(1)</sup>	15
Drain-Source Voltage, dc	V <sub>DS</sub>	2N6782	100
		2N6784	200
		2N6786	400
Gate-Source Voltage, dc	V <sub>GS</sub>	± 20	V
Drain Current, dc @ T <sub>C</sub> = +25 °C <sup>(2)</sup>	I <sub>D1</sub>	2N6782	3.50
		2N6784	2.25
		2N6786	1.25
Drain Current, dc @ T <sub>C</sub> = +100 °C <sup>(2)</sup>	I <sub>D2</sub>	2N6782	2.25
		2N6784	1.50
		2N6786	0.80
Off-State Current (Peak Total Value) <sup>(3)</sup>	I <sub>DM</sub>	2N6782	14.0
		2N6784	9.0
		2N6786	5.5
Source Current	I <sub>S</sub>	2N6782	3.50
		2N6784	2.25
		2N6786	1.25

See notes on next page.



**TO-205AF (TO-39)  
Package**

Also available in:

**U-18 LCC package**  
(surface mount)  
 2N6782U & 2N6786U

#### MSC – Lawrence

6 Lake Street,  
Lawrence, MA 01841  
Tel: 1-800-446-1158 or  
(978) 620-2600  
Fax: (978) 689-0803

#### MSC – Ireland

Gort Road Business Park,  
Ennis, Co. Clare, Ireland  
Tel: +353 (0) 65 6840044  
Fax: +353 (0) 65 6822298

Website:

[www.microsemi.com](http://www.microsemi.com)

- Notes:**
- Derate linearly 0.12 W/°C for  $T_C > +25\text{ }^\circ\text{C}$ .
  - The following formula derives the maximum theoretical  $I_D$  limit.  $I_D$  is also limited by package and internal wires and may be limited due to pin diameter.

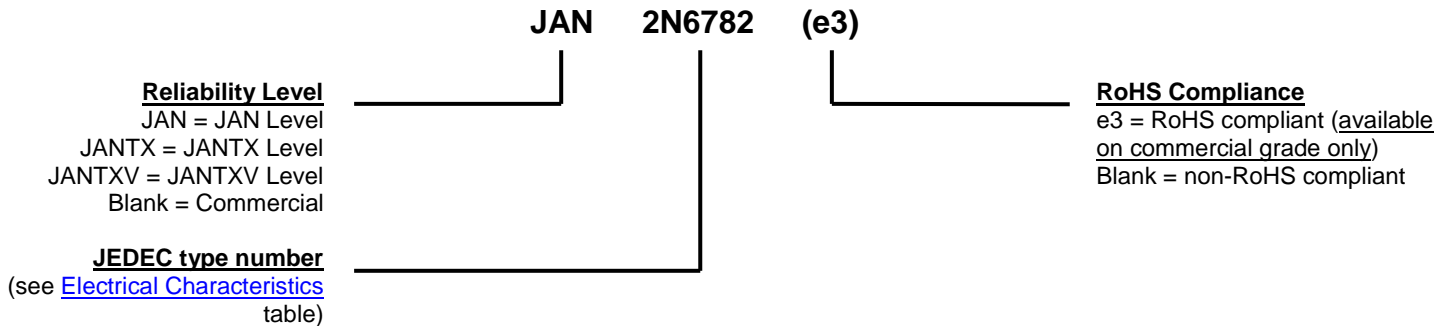
$$I_D = \sqrt{\frac{T_J(\text{max}) - T_C}{R_{\theta JC} \times R_{DS(on)} @ T_J(\text{max})}}$$

- $I_{DM} = 4 \times I_{D1}$  as calculated in note 1.

### MECHANICAL and PACKAGING

- CASE: Hermetically sealed, kovar base, nickel cap.
- TERMINALS: Tin/lead solder dip nickel plate or RoHS compliant pure tin plate (commercial grade only).
- MARKING: Part number, date code, manufacturer's ID.
- WEIGHT: Approximately 1.064 grams.
- See [Package Dimensions](#) on last page.

### PART NOMENCLATURE



### SYMBOLS & DEFINITIONS

Symbol	Definition
$di/dt$	Rate of change of diode current while in reverse-recovery mode, recorded as maximum value.
$I_F$	Forward current
$R_G$	Gate drive impedance
$V_{DD}$	Drain supply voltage
$V_{DS}$	Drain source voltage, dc
$V_{GS}$	Gate source voltage, dc

**ELECTRICAL CHARACTERISTICS @  $T_A = +25\text{ }^\circ\text{C}$ , unless otherwise noted**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Drain-Source Breakdown Voltage $V_{GS} = 0\text{ V}, I_D = 1.0\text{ mA}$	2N6782 2N6784 2N6786 $V_{(BR)DSS}$	100 200 400		V
Gate-Source Voltage (Threshold) $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA}$ $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA}, T_J = +125\text{ }^\circ\text{C}$ $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA}, T_J = -55\text{ }^\circ\text{C}$	$V_{GS(th)1}$ $V_{GS(th)2}$ $V_{GS(th)3}$	2.0 1.0	4.0 5.0	V
Gate Current $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$ $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}, T_J = +125\text{ }^\circ\text{C}$	$I_{GSS1}$ $I_{GSS2}$		$\pm 100$ $\pm 200$	nA
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 320\text{ V}$	2N6782 2N6784 2N6786 $I_{DSS1}$		25	$\mu\text{A}$
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 320\text{ V}, T_J = +125\text{ }^\circ\text{C}$	2N6782 2N6784 2N6786 $I_{DSS2}$		0.25	mA
Static Drain-Source On-State Resistance $V_{GS} = 10\text{ V}, I_D = 2.25\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 1.50\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 0.80\text{ A pulsed}$	2N6782 2N6784 2N6786 $r_{DS(on)1}$		0.60 1.50 3.60	$\Omega$
Static Drain-Source On-State Resistance $V_{GS} = 10\text{ V}, I_D = 3.50\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 2.25\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 1.25\text{ A pulsed}$	2N6782 2N6784 2N6786 $r_{DS(on)2}$		0.61 1.60 3.70	$\Omega$
Static Drain-Source On-State Resistance $T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 10\text{ V}, I_D = 2.25\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 1.50\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 0.80\text{ A pulsed}$	2N6782 2N6784 2N6786 $r_{DS(on)3}$		1.08 2.81 7.92	$\Omega$
Diode Forward Voltage $V_{GS} = 0\text{ V}, I_D = 3.50\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 2.25\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 1.25\text{ A pulsed}$	2N6782 2N6784 2N6786 $V_{SD}$		1.5 1.5 1.4	V

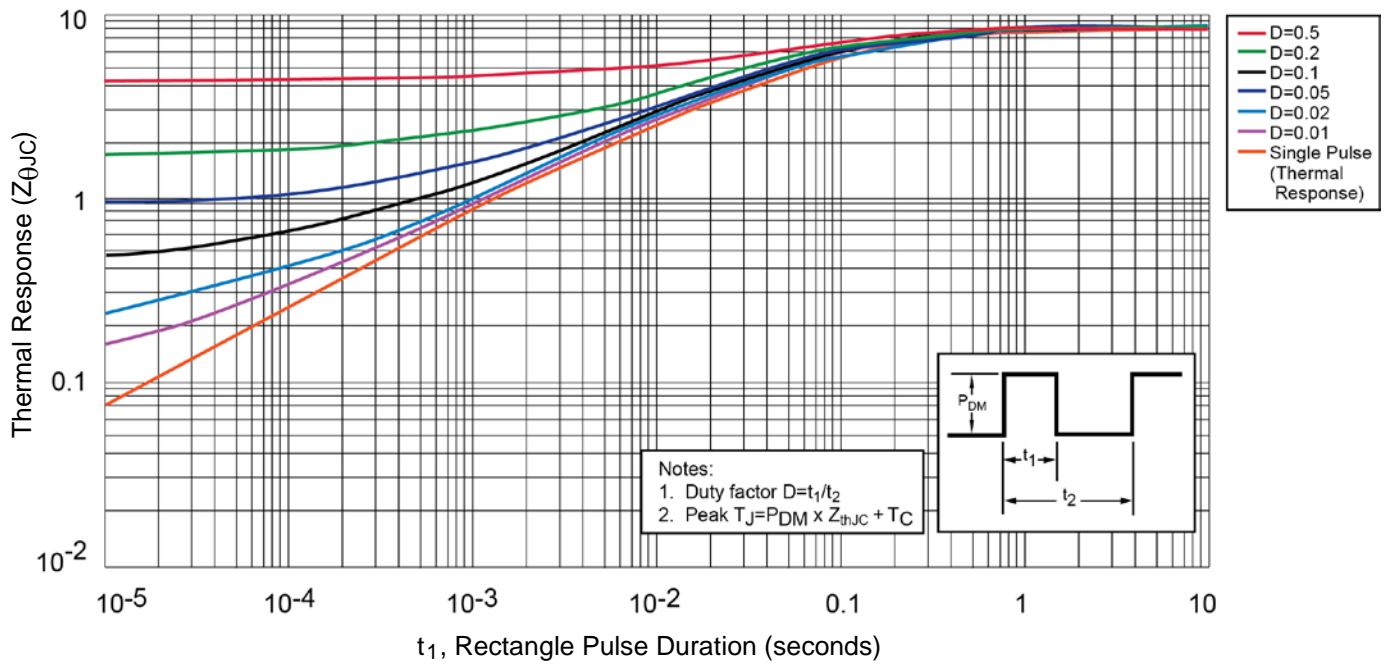
**ELECTRICAL CHARACTERISTICS @ T<sub>A</sub> = +25 °C, unless otherwise noted (continued)**
**DYNAMIC CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>Gate Charge:</b>				
<b>On-State Gate Charge</b>				
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.50 A, V <sub>DS</sub> = 50 V 2N6782	Q <sub>g(on)</sub>		8.1	nC
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.25 A, V <sub>DS</sub> = 100 V 2N6784			8.6	
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.25 A, V <sub>DS</sub> = 200 V 2N6786			12	
<b>Gate to Source Charge</b>				
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.50 A, V <sub>DS</sub> = 50 V 2N6782	Q <sub>gs</sub>		1.7	nC
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.25 A, V <sub>DS</sub> = 100 V 2N6784			1.5	
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.25 A, V <sub>DS</sub> = 200 V 2N6786			1.8	
<b>Gate to Drain Charge</b>				
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.50 A, V <sub>DS</sub> = 50 V 2N6782	Q <sub>gd</sub>		4.5	nC
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.25 A, V <sub>DS</sub> = 100 V 2N6784			5.5	
V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.25 A, V <sub>DS</sub> = 200 V 2N6786			7.6	

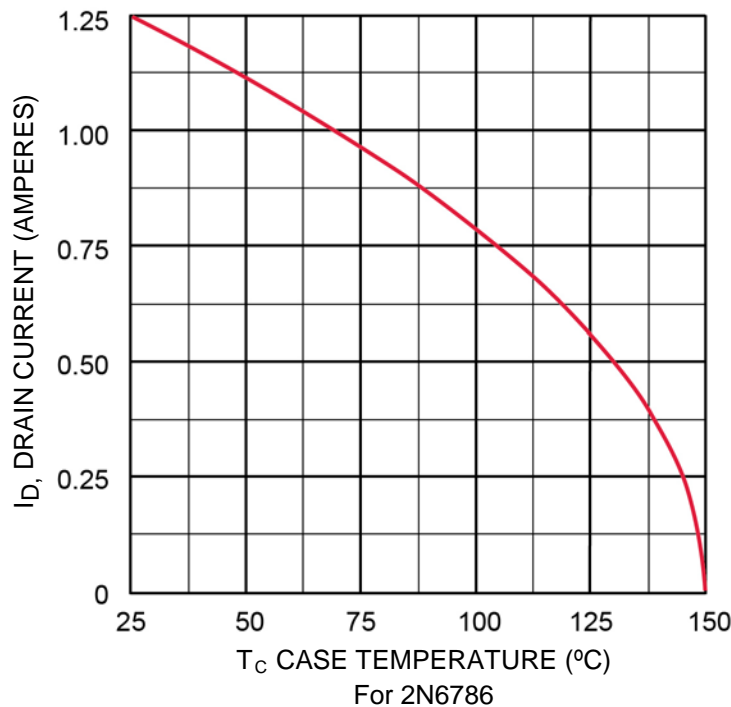
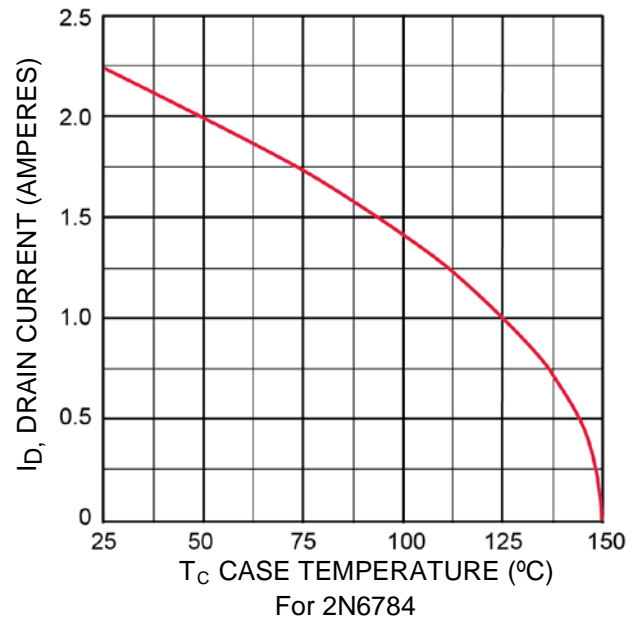
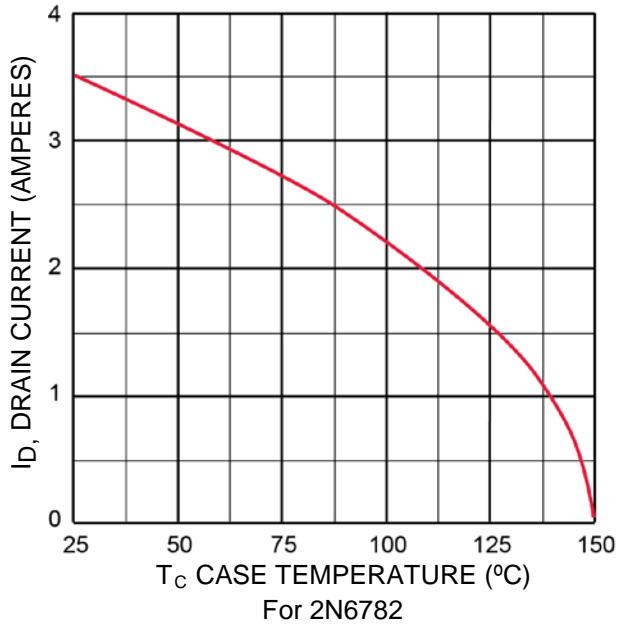
**SWITCHING CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>Turn-on delay time</b>				
I <sub>D</sub> = 3.50 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 50 V 2N6782	t <sub>d(on)</sub>		15	ns
I <sub>D</sub> = 2.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 100 V 2N6784				
I <sub>D</sub> = 1.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 200 V 2N6786				
<b>Rinse time</b>				
I <sub>D</sub> = 3.50 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 50 V 2N6782	t <sub>r</sub>		25	ns
I <sub>D</sub> = 2.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 100 V 2N6784			20	
I <sub>D</sub> = 1.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 200 V 2N6786			20	
<b>Turn-off delay time</b>				
I <sub>D</sub> = 3.50 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 50 V 2N6782	t <sub>d(off)</sub>		25	ns
I <sub>D</sub> = 2.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 100 V 2N6784			30	
I <sub>D</sub> = 1.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 200 V 2N6786			35	
<b>Fall time</b>				
I <sub>D</sub> = 3.50 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 50 V 2N6782	t <sub>f</sub>		20	ns
I <sub>D</sub> = 2.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 100 V 2N6784			20	
I <sub>D</sub> = 1.25 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 7.5 Ω, V <sub>DD</sub> = 200 V 2N6786			30	
<b>Diode Reverse Recovery Time</b>				
di/dt ≤ 100 A/μs, V <sub>DD</sub> ≤ 50 V, I <sub>F</sub> = 3.50 A 2N6782	t <sub>rr</sub>		180	ns
di/dt ≤ 100 A/μs, V <sub>DD</sub> ≤ 50 V, I <sub>F</sub> = 2.25 A 2N6784			350	
di/dt ≤ 100 A/μs, V <sub>DD</sub> ≤ 50 V, I <sub>F</sub> = 1.25 A 2N6786			540	

GRAPHS

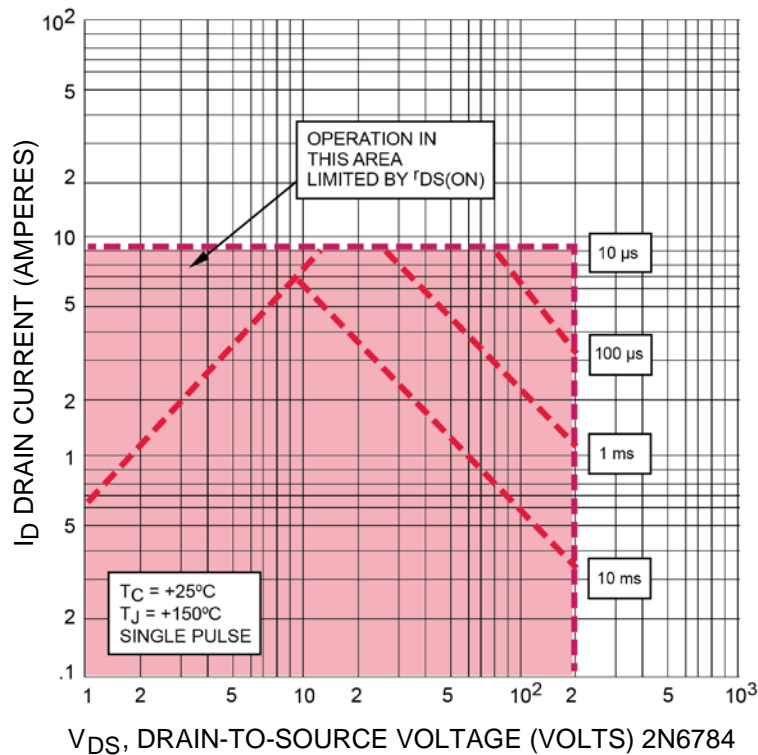
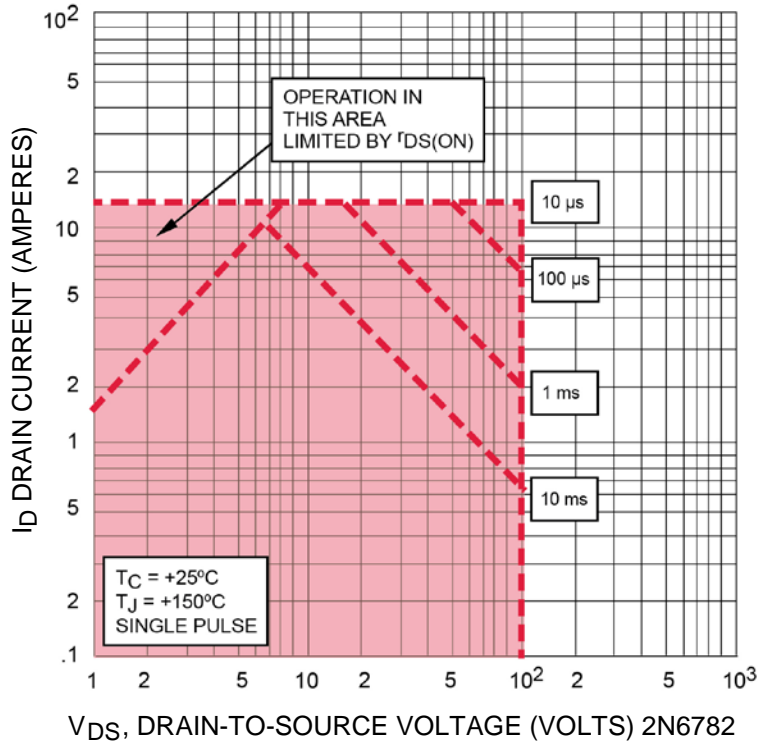


**FIGURE 1**  
Thermal Response Curves

**GRAPHS (continued)**
**FIGURE 2 – Maximum Drain Current vs Case Temperature Graphs**


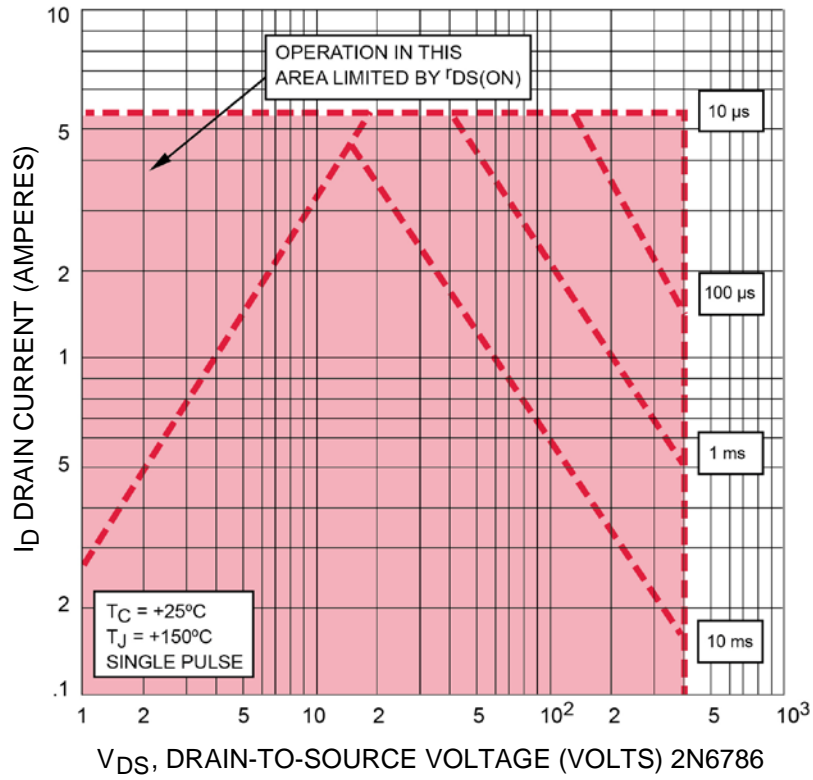
GRAPHS (continued)

FIGURE 3 – Maximum Safe Operating Area

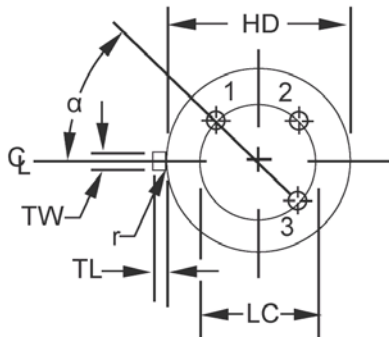
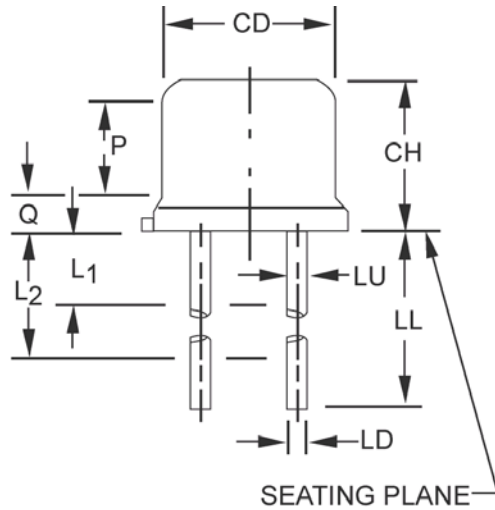


GRAPHS (continued)

FIGURE 3 – Maximum Safe Operating Area





**PACKAGE DIMENSIONS**


Symbol	Dimensions				Note
	Inch		Millimeters		
	Min	Max	Min	Max	
CD	0.305	0.335	7.75	8.51	
CH	0.160	0.180	4.06	4.57	
HD	0.335	0.370	8.51	9.40	
LC	0.200 TP		5.08 TP		6
LD	0.016	0.021	0.41	0.53	7, 8
LL	0.500	0.750	12.70	19.05	7, 8
LU	0.016	0.019	0.41	0.48	7, 8
L1		0.050		1.27	7, 8
L2	0.250		6.35		7, 8
P	.100		2.54		5
Q		0.050		1.27	4
TL	0.029	0.045	0.74	1.14	3
TW	0.028	0.034	0.72	0.86	2
r		0.010		0.25	9
$\alpha$	45° TP		45° TP		6

**NOTES:**

- Dimensions are in inches. Millimeters are given for general information only.
- Beyond radius (r) maximum, J shall be held for a minimum length of .011 (0.028 mm).
- Dimension TL measured from maximum HD.
- Outline in this zone is not controlled.
- Dimension CD shall not vary more than .010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
- Leads at gauge plane .054 +.001, -.000 (1.37 +0.03, -0.00 mm) below seating plane shall be within .007 (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
- LU applies between L1 and L2. LD applies between L2 and L minimum. Diameter is uncontrolled in L1 and beyond LL minimum.
- All three leads.
- Radius (r) applies to both inside corners of tab.
- Drain is electrically connected to the case.
- In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.