RoHS
Available on commercial versions

N-CHANNEL MOSFET
Qualified per MIL-PRF-19500/543

Qualified Levels:
JAN, JANTX, and JANTXV

DESCRIPTION

This family of 2N6764, 2N6766, 2N6768 and 2N6770 switching transistors are military qualified up to the JANTXV level for high-reliability applications. These devices are also available in a thru hole TO-254AA leaded 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.

TO-204AE (TO-3) Package

Also available in:

TO-254AA package
(leaded)
2N6764T1 & 2N6770T1

FEATURES

- JEDEC registered 2N6764, 2N6766, 2N6768 and 2N6770 number series.
- JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/543.
  (See part nomenclature for all available options.)
- RoHS compliant versions available (commercial grade only).

APPLICATIONS / BENEFITS

- Low-profile metal can design.
- Military and other high-reliability applications.

MAXIMUM RATINGS @ T_A = +25 ºC unless otherwise stated

Parameters / Test Conditions		Symbol	Value	Unit
Junction & Storage Temperature Range		T_J & T_{stg}	-55 to +150	°C
Thermal Resistance Junction-to-Case		$R_{\Theta JC}$	0.83	ºC/W
Total Power Dissipation	@ T_A = +25 °C @ T_C = +25 °C (1)	P_T	4 150	W
Drain-Source Voltage, dc	2N6764 2N6766 2N6768 2N6770	V_{DS}	100 200 400 500	V
Gate-Source Voltage, dc		V_{GS}	± 20	V
Drain Current, dc @ T_C = +25 ºC (2)	2N6764 2N6766 2N6768 2N6770	I_{D1}	38.0 30.0 14.0 12.0	A
Drain Current, dc @ T_C = +100 ºC (2)	2N6764 2N6766 2N6768 2N6770	I_{D2}	24.0 19.0 9.0 7.75	A
Off-State Current (Peak Total Value) (3)	2N6764 2N6766 2N6768 2N6770	I_{DM}	152 120 56 48	A (pk)
Source Current	2N6764 2N6766 2N6768 2N6770	I_S	38.0 30.0 14.0 12.0	A

Notes featured on next page.

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NOTES:
1. Derate linearly by 1.2 W/ºC for T_C > +25 ºC.
2. The following formula derives the maximum theoretical I_D limit. I_D is limited by package and internal wires and may also be limited by pin diameter:

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

3. $I_{DM} = 4 \times I_{D1}$ as calculated in note 2.

MECHANICAL and PACKAGING

- CASE: TO-3 metal can.
- TERMINALS: Solder dipped (Sn63/Pb37) over nickel plated alloy 52. RoHS compliant matte-tin plating is also available on commercial grade only.
- MARKING: Manufacturer's ID, part number, date code.
- WEIGHT: Approximately 12.7 grams.
- See Package Dimensions on last page.

PART NOMENCLATURE

JAN 2N6764 (e3)

Reliability Level
JAN = JAN Level
JANTX = JANTX Level
JANTXV = JANTXV Level
Blank = Commercial

JEDEC type number
(see Electrical Characteristics table)

RoHS Compliance
e3 = RoHS compliant (available on commercial grade only)
Blank = non-RoHS compliant

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 °C, unless otherwise noted

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage V_{GS} = 0 V, I_D = 1.0 mA	2N6764 2N6766 2N6768 2N6770	$V_{(BR)DSS}$	100 200 400 500		V
Gate-Source Voltage (Threshold) $V_{DS} \geq V_{GS}$, I_D = 0.25 mA $V_{DS} \geq V_{GS}$, I_D = 0.25 mA, T_J = +125 °C $V_{DS} \geq V_{GS}$, I_D = 0.25 mA, T_J = -55 °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} = ± 20 V, V_{DS} = 0 V V_{GS} = ± 20 V, V_{DS} = 0 V, T_J = +125 °C		I_{GSS1} I_{GSS2}		±100 ±200	nA
Drain Current V_{GS} = 0 V, V_{DS} = 80 V V_{GS} = 0 V, V_{DS} = 160 V V_{GS} = 0 V, V_{DS} = 320 V V_{GS} = 0 V, V_{DS} = 400 V	2N6764 2N6766 2N6768 2N6770	I_{DSS1}		25	µA
Drain Current V_{GS} = 0 V, V_{DS} = 100 V, T_J = +125 °C V_{GS} = 0 V, V_{DS} = 200 V, T_J = +125 °C V_{GS} = 0 V, V_{DS} = 400 V, T_J = +125 °C V_{GS} = 0 V, V_{DS} = 500 V, T_J = +125 °C	2N6764 2N6766 2N6768 2N6770	I_{DSS2}		1.0	mA
Drain Current V_{GS} = 0 V, V_{DS} = 80 V, T_J = +125 °C V_{GS} = 0 V, V_{DS} = 160 V, T_J = +125 °C V_{GS} = 0 V, V_{DS} = 320 V, T_J = +125 °C V_{GS} = 0 V, V_{DS} = 400 V, T_J = +125 °C	2N6764 2N6766 2N6768 2N6770	I_{DSS3}		0.25	mA
Static Drain-Source On-State Resistance V_{GS} = 10 V, I_D = 24.0 A pulsed V_{GS} = 10 V, I_D = 19.0 A pulsed V_{GS} = 10 V, I_D = 9.0 A pulsed V_{GS} = 10 V, I_D = 7.75 A pulsed	2N6764 2N6766 2N6768 2N6770	$r_{DS(on)1}$		0.055 0.085 0.3 0.4	Ω
Static Drain-Source On-State Resistance V_{GS} = 10 V, I_D = 38.0 A pulsed V_{GS} = 10 V, I_D = 30.0 A pulsed V_{GS} = 10 V, I_D = 14.0 A pulsed V_{GS} = 10 V, I_D = 12.0 A pulsed	2N6764 2N6766 2N6768 2N6770	$r_{DS(on)2}$		0.065 0.09 0.4 0.5	Ω
Static Drain-Source On-State Resistance T_J = +125 °C V_{GS} = 10 V, I_D = 24.0 A pulsed V_{GS} = 10 V, I_D = 19.0 A pulsed V_{GS} = 10 V, I_D = 9.0 A pulsed V_{GS} = 10 V, I_D = 7.75 A pulsed	 2N6764 2N6766 2N6768 2N6770	$r_{DS(on)3}$		0.094 0.153 0.66 0.88	Ω
Diode Forward Voltage V_{GS} = 0 V, I_D = 38.0 A pulsed V_{GS} = 0 V, I_D = 30.0 A pulsed V_{GS} = 0 V, I_D = 14.0 A pulsed V_{GS} = 0 V, I_D = 12.0 A pulsed	2N6764 2N6766 2N6768 2N6770	V_{SD}		1.9 1.9 1.7 1.7	V

ELECTRICAL CHARACTERISTICS @ T_A = +25 °C, unless otherwise noted (continued)

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Gate Charge:					
On-State Gate Charge V_{GS} = 10 V, I_D = 38.0 A, V_{DS} = 50 V V_{GS} = 10 V, I_D = 30.0 A, V_{DS} = 100 V V_{GS} = 10 V, I_D = 14.0 A, V_{DS} = 200 V V_{GS} = 10 V, I_D = 12.0 A, V_{DS} = 250 V	 2N6764 2N6766 2N6768 2N6770	$Q_{g(on)}$		 125 115 110 120	nC
Gate to Source Charge V_{GS} = 10 V, I_D = 38.0 A, V_{DS} = 50 V V_{GS} = 10 V, I_D = 30.0 A, V_{DS} = 100 V V_{GS} = 10 V, I_D = 14.0 A, V_{DS} = 200 V V_{GS} = 10 V, I_D = 12.0 A, V_{DS} = 250 V	 2N6764 2N6766 2N6768 2N6770	Q_{gs}		 22 22 18 19	nC
Gate to Drain Charge V_{GS} = 10 V, I_D = 38.0 A, V_{DS} = 50 V V_{GS} = 10 V, I_D = 30.0 A, V_{DS} = 100 V V_{GS} = 10 V, I_D = 14.0 A, V_{DS} = 200 V V_{GS} = 10 V, I_D = 12.0 A, V_{DS} = 250 V	 2N6764 2N6766 2N6768 2N6770	Q_{gd}		 65 60 65 70	nC

SWITCHING CHARACTERISTICS

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Turn-on delay time I_D = 38.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 50 V I_D = 30.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 100 V I_D = 14.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 200 V I_D = 12.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 250 V	 2N6764 2N6766 2N6768 2N6770	$t_{d(on)}$		35	ns
Rise time I_D = 38.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 50 V I_D = 30.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 100 V I_D = 14.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 200 V I_D = 12.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 250 V	 2N6764 2N6766 2N6768 2N6770	t_r		190	ns
Turn-off delay time I_D = 38.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 50 V I_D = 30.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 100 V I_D = 14.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 200 V I_D = 12.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 250 V	 2N6764 2N6766 2N6768 2N6770	$t_{d(off)}$		170	ns
Fall time I_D = 38.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 50 V I_D = 30.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 100 V I_D = 14.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 200 V I_D = 12.0 A, V_{GS} = 10 V, R_G = 2.35 Ω, V_{DD} = 250 V	 2N6764 2N6766 2N6768 2N6770	t_f		130	ns
Diode Reverse Recovery Time di/dt = 100 A/µs, V_{DD} ≤ 30 V, I_D = 38.0 A di/dt = 100 A/µs, V_{DD} ≤ 30 V, I_D = 30.0 A di/dt = 100 A/µs, V_{DD} ≤ 30 V, I_D = 14.0 A di/dt = 100 A/µs, V_{DD} ≤ 30 V, I_D = 12.0 A	 2N6764 2N6766 2N6768 2N6770	t_{rr}		500 950 1200 1600	ns

GRAPHS

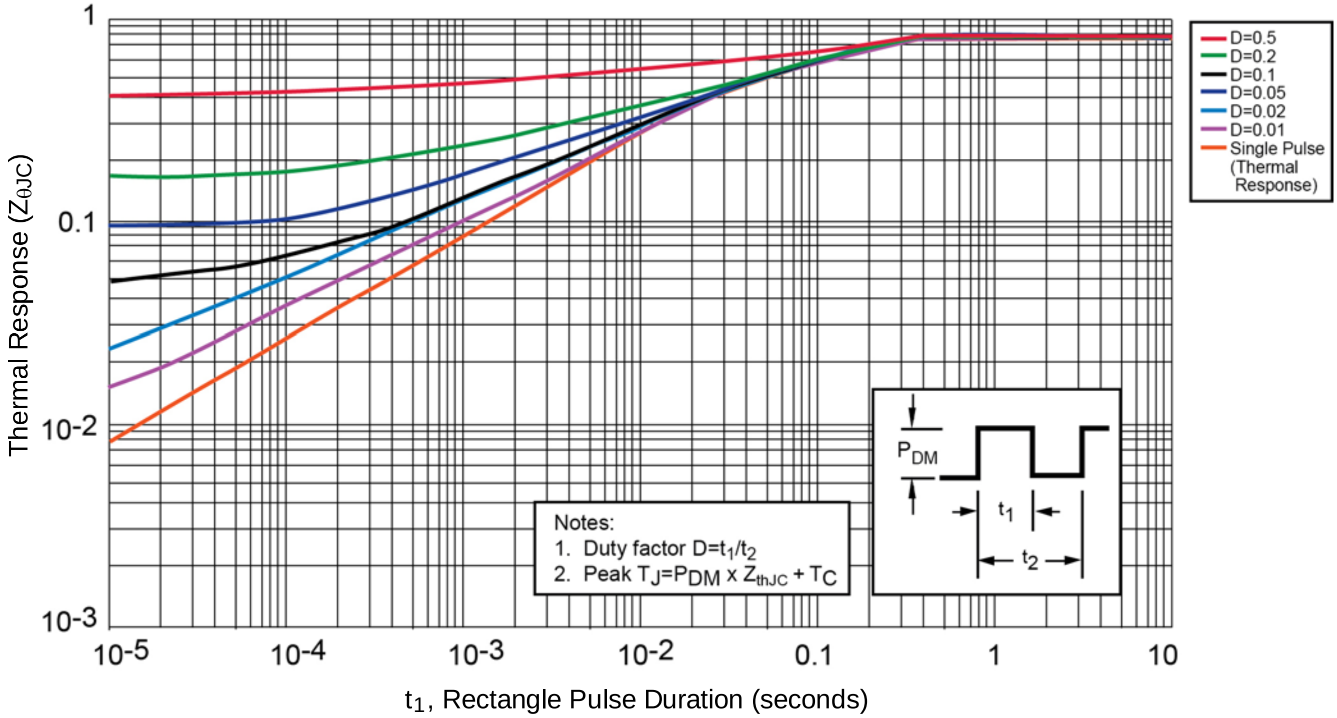
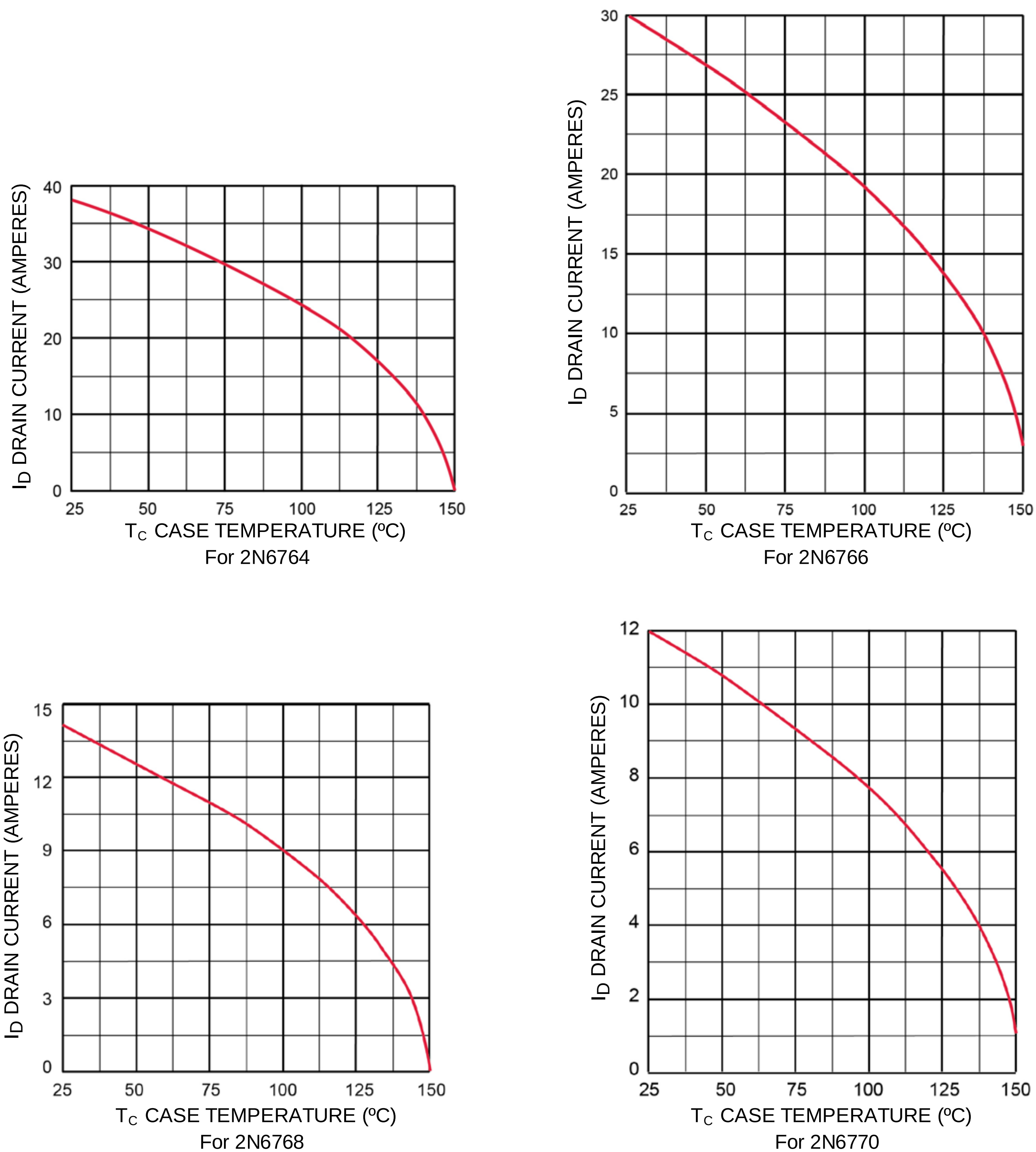


FIGURE 1
Thermal Response Curves

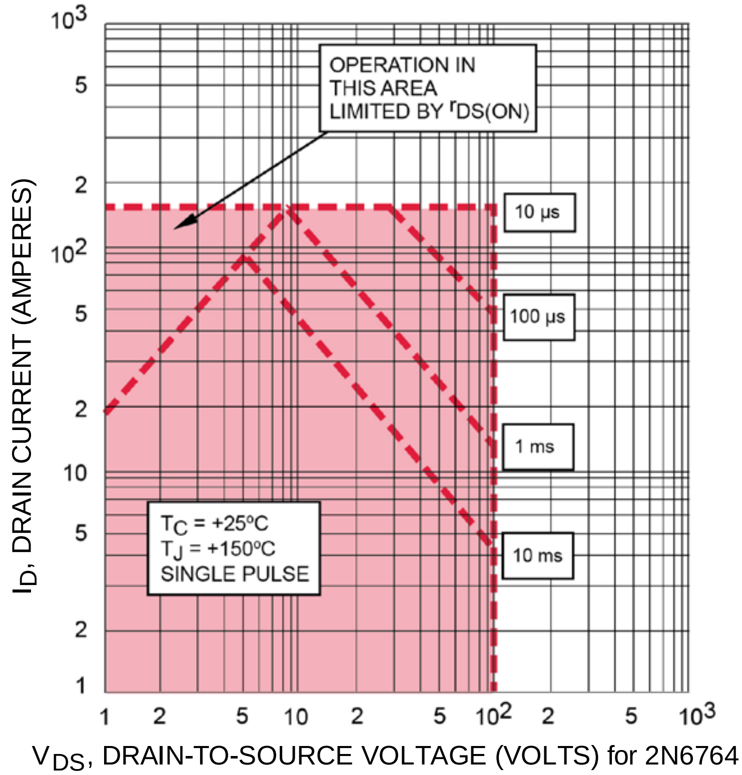
GRAPHS (continued)

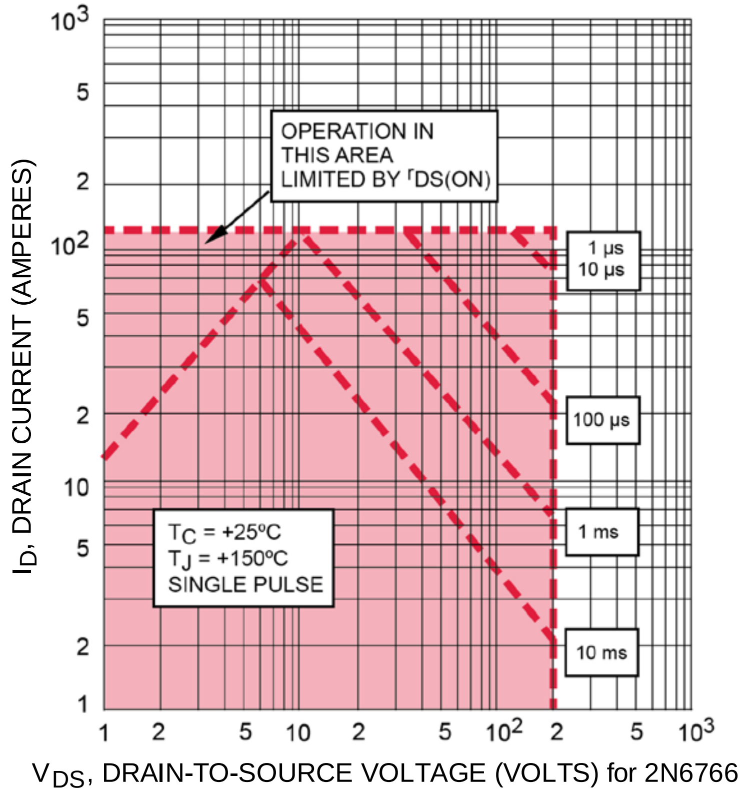
FIGURE 2 – Maximum Drain Current vs Case Temperature Graphs



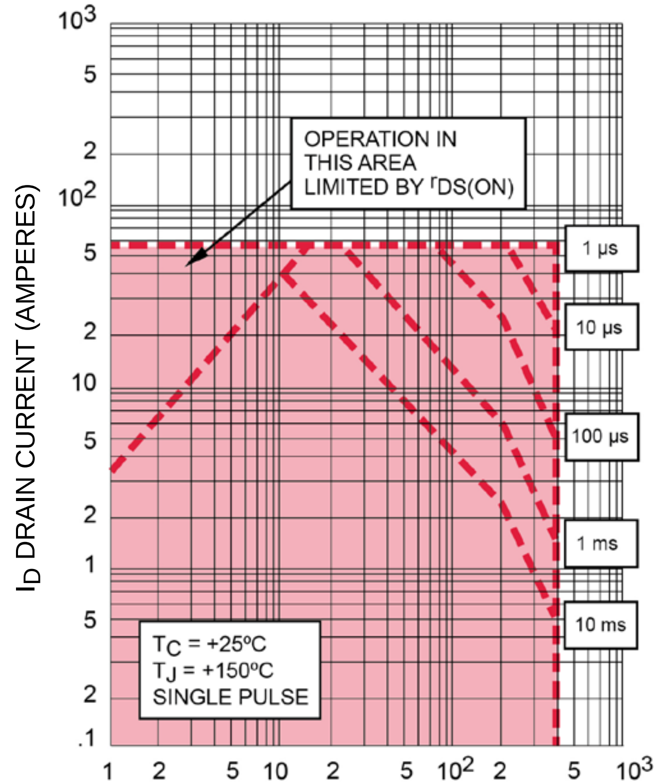
GRAPHS (continued)

FIGURE 3 – Maximum Safe Operating Area

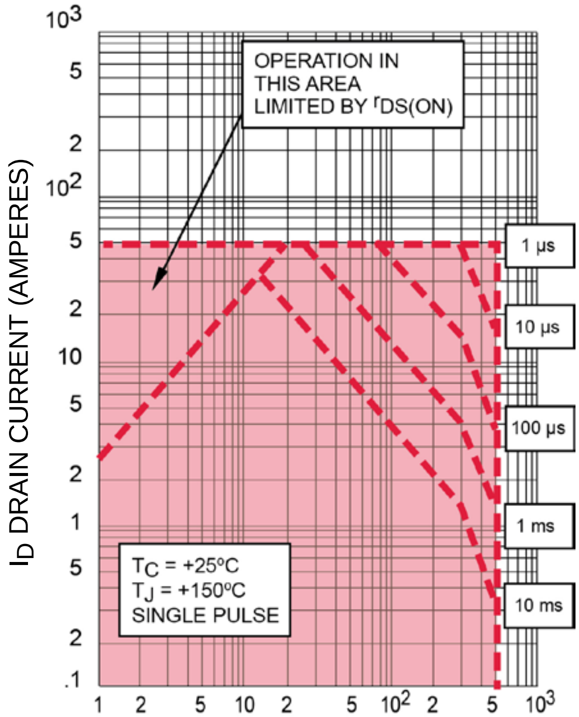




GRAPHS (continued)

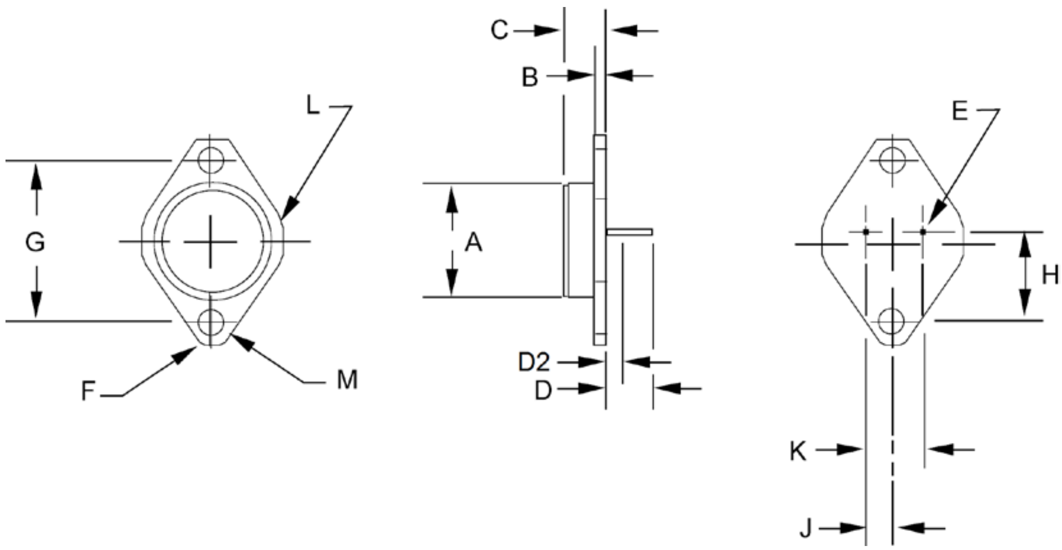


V_{DS}, DRAIN-TO-SOURCE VOLTAGE (VOLTS) for 2N6768



V_{DS}, DRAIN-TO-SOURCE VOLTAGE (VOLTS) for 2N6770

PACKAGE DIMENSIONS



NOTE:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. These dimensions should be measured at points .050 inch (1.27 mm) and .055 inch (1.40 mm) below the seating plane. When gauge is not used measurement will be made at the seating plane.
4. The seating plane of the header shall be flat within .001 inch (0.03 mm) concave to .004 inch (0.10 mm) convex inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
5. These dimensions pertain to the 2N6764 and 2N6766 types.
6. These dimensions pertain to the 2N6768 and 2N6770 types.
7. Mounting holes shall be deburred on the seating plane side.
8. Drain is electrically connected to the case.
9. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

DIM	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	-	0.875	-	22.23	
B	0.060	0.135	1.52	3.43	
C	0.250	0.360	6.35	9.15	
D	0.312	0.500	7.92	12.70	
D2	-	0.050	-	1.27	(3)
E	0.057 0.038	0.063 0.043	1.45 0.97	1.60 1.10	DIA. (5) DIA. (6)
F	0.131	0.188	3.33	4.78	Radius
G	1.177	1.197	29.90	30.40	
H	0.655	0.675	16.64	17.15	
J	0.205	0.225	5.21	5.72	
K	0.420	0.440	10.67	11.18	
L	0.495	0.525	12.57	13.3	Radius
M	0.151	0.161	3.84	4.09	DIA. (7)

SCHEMATIC