



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.

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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 °C 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 _{θJC}	0.83	°C/W
Total Power Dissipation	P _T	4 150	W
		@ T _A = +25 °C @ T _C = +25 °C ⁽¹⁾	
Drain-Source Voltage, dc	V _{DS}	100 200 400 500	V
		2N6764 2N6766 2N6768 2N6770	
Gate-Source Voltage, dc	V _{GS}	± 20	V
Drain Current, dc @ T _C = +25 °C ⁽²⁾	I _{D1}	38.0 30.0 14.0 12.0	A
		2N6764 2N6766 2N6768 2N6770	
Drain Current, dc @ T _C = +100 °C ⁽²⁾	I _{D2}	24.0 19.0 9.0 7.75	A
		2N6764 2N6766 2N6768 2N6770	
Off-State Current (Peak Total Value) ⁽³⁾	I _{DM}	152 120 56 48	A (pk)
		2N6764 2N6766 2N6768 2N6770	
Source Current	I _S	38.0 30.0 14.0 12.0	A
		2N6764 2N6766 2N6768 2N6770	

Notes featured on next page.



**TO-204AE (TO-3)
Package**

Also available in:

TO-254AA package
(leaded)

 [2N6764T1 & 2N6770T1](#)

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- NOTES:**
- Derate linearly by 1.2 W/°C for $T_c > +25$ °C.
 - 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:

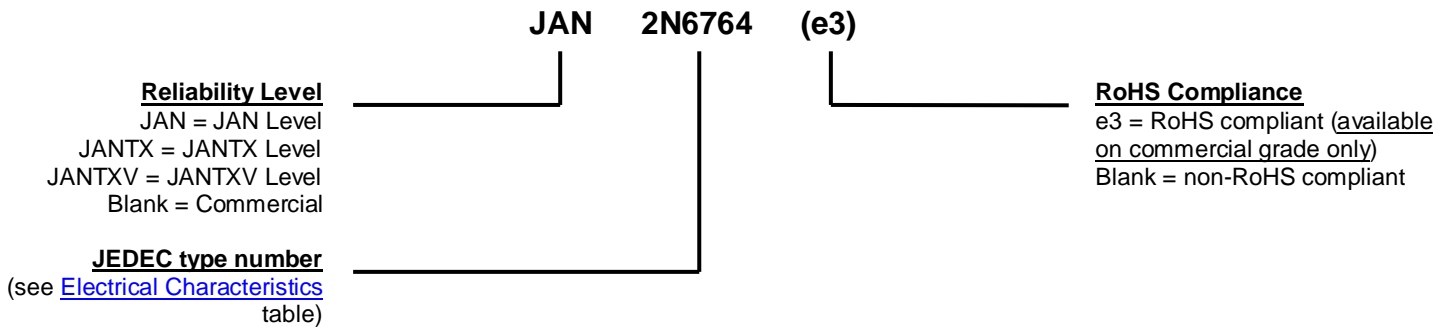
$$I_D = \sqrt{\frac{T_J(\text{max}) - T_c}{R_{\theta JC} \times R_{DS(\text{on})} @ T_J(\text{max})}}$$

- $I_{DM} = 4 \times I_{D1}$ 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



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
OFF CHARACTERISTICS				
Drain-Source Breakdown Voltage $V_{GS} = 0\text{ V}, I_D = 1.0\text{ mA}$	2N6764 2N6766 2N6768 2N6770 $V_{(BR)DSS}$	100 200 400 500		V
Gate-Source Voltage (Threshold) $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA}$ $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA}, T_J = +125\text{ }^\circ\text{C}$ $V_{DS} \geq V_{GS}, I_D = 0.25\text{ mA}, T_J = -55\text{ }^\circ\text{C}$	$V_{GS(th)1}$ $V_{GS(th)2}$ $V_{GS(th)3}$	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}		± 100 ± 200	nA
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 320\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}$	2N6764 2N6766 2N6768 2N6770 I_{DSS1}		25	μA
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 200\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 500\text{ V}, T_J = +125\text{ }^\circ\text{C}$	2N6764 2N6766 2N6768 2N6770 I_{DSS2}		1.0	mA
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 320\text{ V}, T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}, T_J = +125\text{ }^\circ\text{C}$	2N6764 2N6766 2N6768 2N6770 I_{DSS3}		0.25	mA
Static Drain-Source On-State Resistance $V_{GS} = 10\text{ V}, I_D = 24.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 19.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 9.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 7.75\text{ A pulsed}$	2N6764 2N6766 2N6768 2N6770 $r_{DS(on)1}$		0.055 0.085 0.3 0.4	Ω
Static Drain-Source On-State Resistance $V_{GS} = 10\text{ V}, I_D = 38.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 30.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 14.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 12.0\text{ A pulsed}$	2N6764 2N6766 2N6768 2N6770 $r_{DS(on)2}$		0.065 0.09 0.4 0.5	Ω
Static Drain-Source On-State Resistance $T_J = +125\text{ }^\circ\text{C}$ $V_{GS} = 10\text{ V}, I_D = 24.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 19.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 9.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 7.75\text{ A pulsed}$	2N6764 2N6766 2N6768 2N6770 $r_{DS(on)3}$		0.094 0.153 0.66 0.88	Ω
Diode Forward Voltage $V_{GS} = 0\text{ V}, I_D = 38.0\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 30.0\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 14.0\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 12.0\text{ A pulsed}$	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	2N6764		125	nC
V _{GS} = 10 V, I _D = 30.0 A, V _{DS} = 100 V	2N6766		115	
V _{GS} = 10 V, I _D = 14.0 A, V _{DS} = 200 V	2N6768		110	
V _{GS} = 10 V, I _D = 12.0 A, V _{DS} = 250 V	2N6770		120	
Gate to Source Charge				
V _{GS} = 10 V, I _D = 38.0 A, V _{DS} = 50 V	2N6764		22	nC
V _{GS} = 10 V, I _D = 30.0 A, V _{DS} = 100 V	2N6766		22	
V _{GS} = 10 V, I _D = 14.0 A, V _{DS} = 200 V	2N6768		18	
V _{GS} = 10 V, I _D = 12.0 A, V _{DS} = 250 V	2N6770		19	
Gate to Drain Charge				
V _{GS} = 10 V, I _D = 38.0 A, V _{DS} = 50 V	2N6764		65	nC
V _{GS} = 10 V, I _D = 30.0 A, V _{DS} = 100 V	2N6766		60	
V _{GS} = 10 V, I _D = 14.0 A, V _{DS} = 200 V	2N6768		65	
V _{GS} = 10 V, I _D = 12.0 A, V _{DS} = 250 V	2N6770		70	

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	2N6764		35	ns
I _D = 30.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 100 V	2N6766			
I _D = 14.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 200 V	2N6768			
I _D = 12.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 250 V	2N6770			
Rise time				
I _D = 38.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 50 V	2N6764		190	ns
I _D = 30.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 100 V	2N6766			
I _D = 14.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 200 V	2N6768			
I _D = 12.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 250 V	2N6770			
Turn-off delay time				
I _D = 38.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 50 V	2N6764		170	ns
I _D = 30.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 100 V	2N6766			
I _D = 14.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 200 V	2N6768			
I _D = 12.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 250 V	2N6770			
Fall time				
I _D = 38.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 50 V	2N6764		130	ns
I _D = 30.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 100 V	2N6766			
I _D = 14.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 200 V	2N6768			
I _D = 12.0 A, V _{GS} = 10 V, R _G = 2.35 Ω, V _{DD} = 250 V	2N6770			
Diode Reverse Recovery Time				
di/dt = 100 A/μs, V _{DD} ≤ 30 V, I _D = 38.0 A	2N6764		500	ns
di/dt = 100 A/μs, V _{DD} ≤ 30 V, I _D = 30.0 A	2N6766		950	
di/dt = 100 A/μs, V _{DD} ≤ 30 V, I _D = 14.0 A	2N6768		1200	
di/dt = 100 A/μs, V _{DD} ≤ 30 V, I _D = 12.0 A	2N6770		1600	

GRAPHS

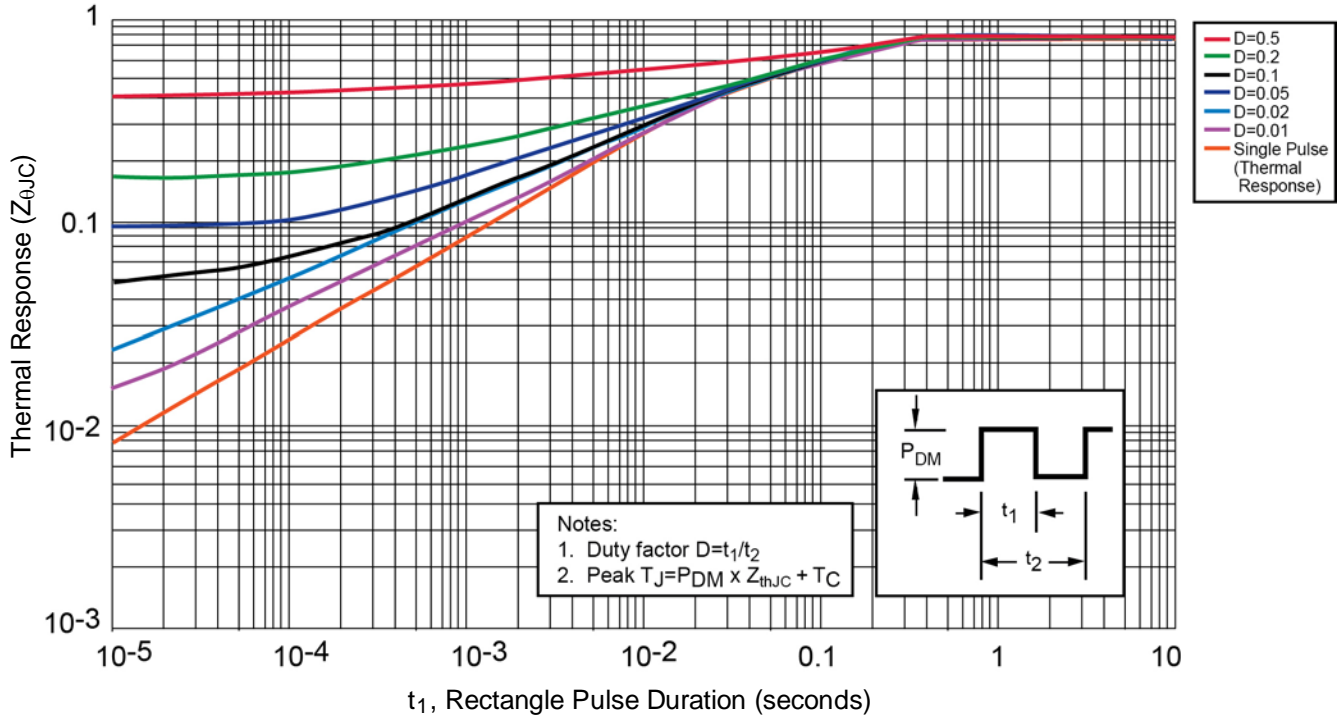
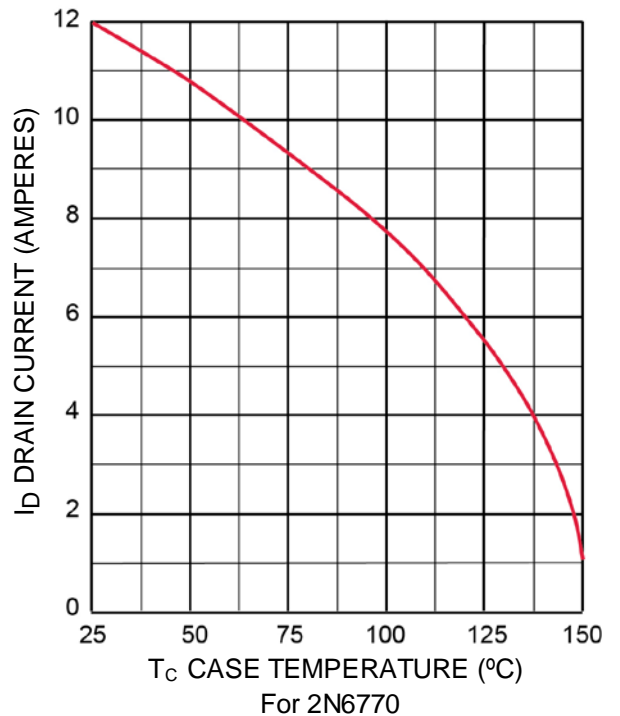
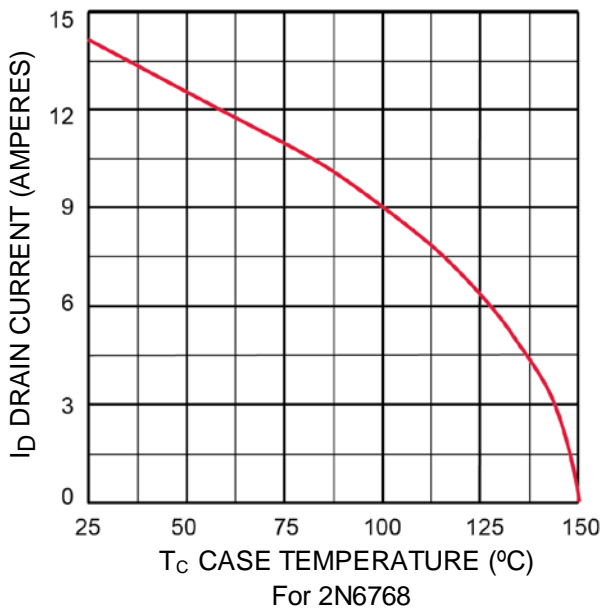
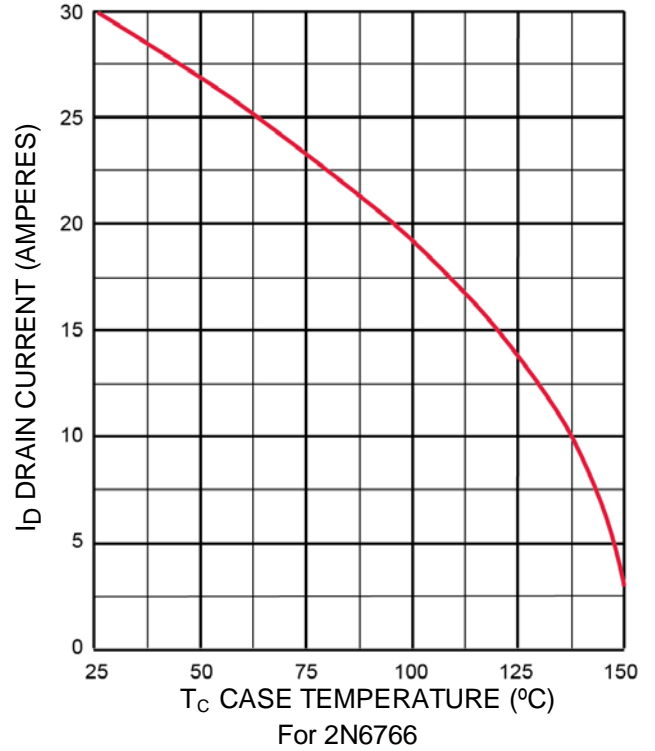
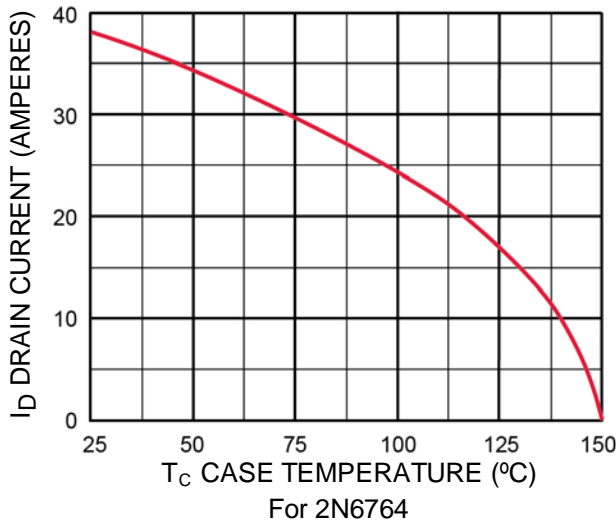
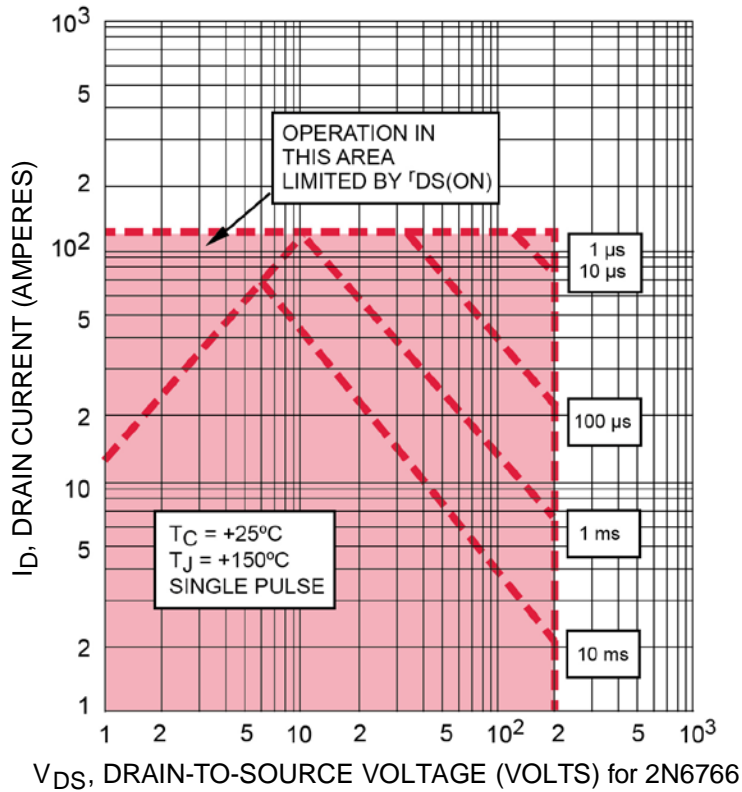
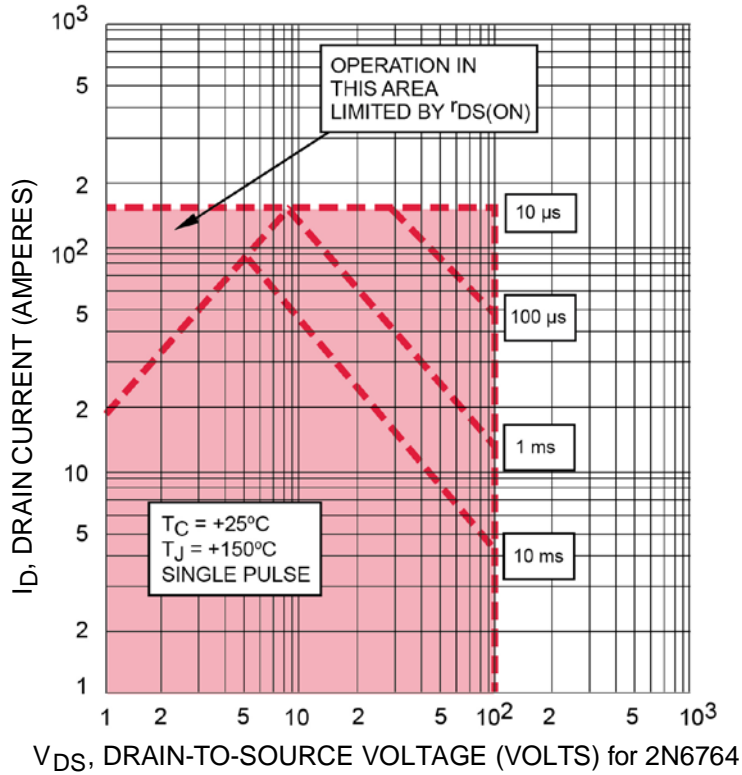


FIGURE 1
Thermal Response Curves

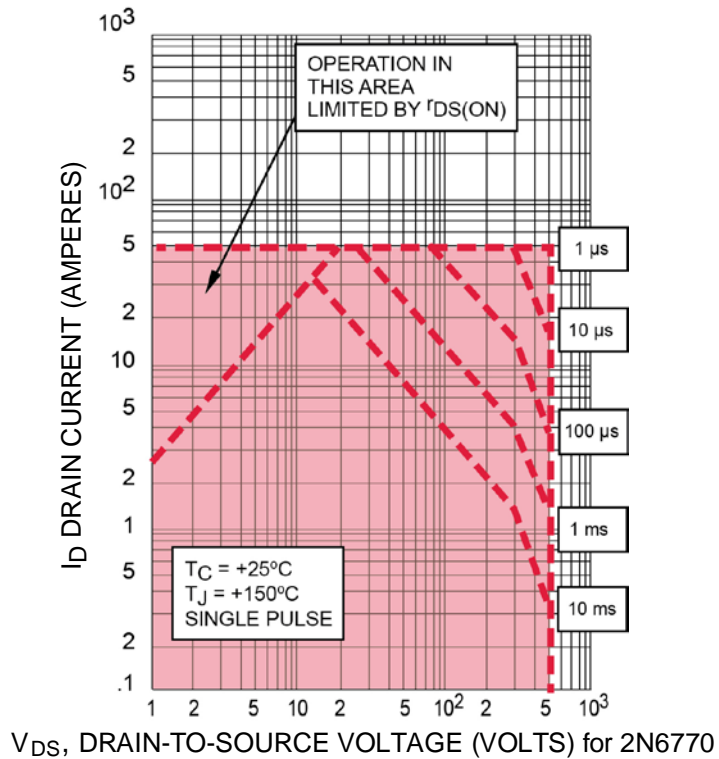
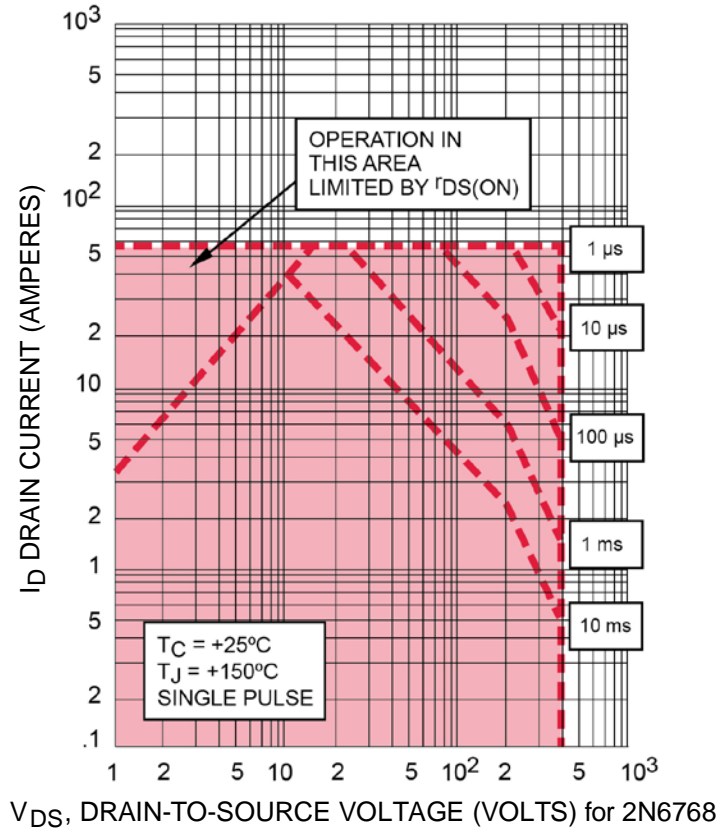
GRAPHS (continued)
FIGURE 2 – Maximum Drain Current vs Case Temperature Graphs


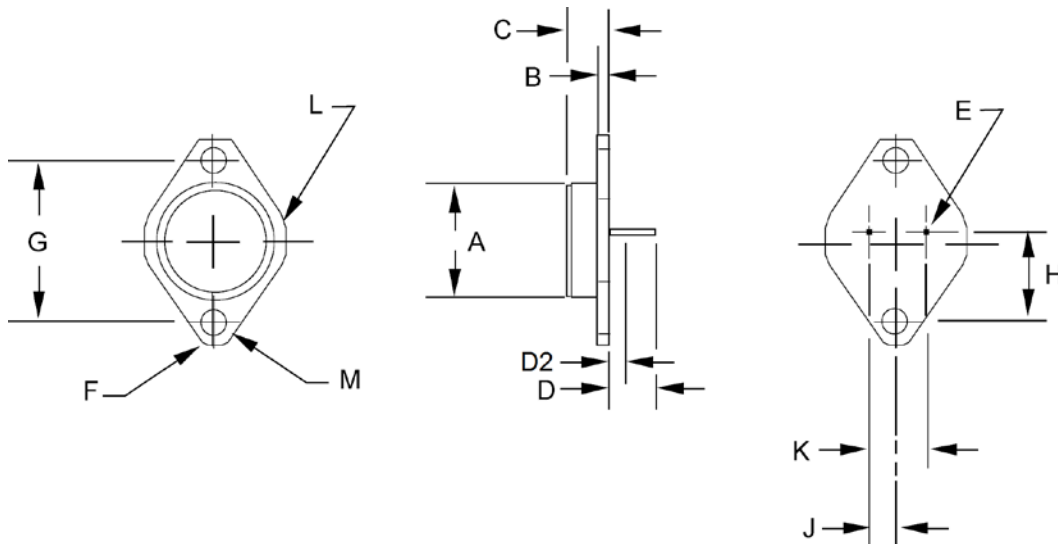
GRAPHS (continued)

FIGURE 3 – Maximum Safe Operating Area



GRAPHS (continued)



PACKAGE DIMENSIONS

NOTE:

- Dimensions are in inches.
- Millimeters are given for general information only.
- 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.
- 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.
- These dimensions pertain to the 2N6764 and 2N6766 types.
- These dimensions pertain to the 2N6768 and 2N6770 types.
- Mounting holes shall be deburred on the seating plane side.
- Drain is electrically connected to the case.
- In accordance with ASME Y14.5M, diameters are equivalent to Φ x 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	0.063	1.45	1.60	DIA. (5)
	0.038	0.043	0.97	1.10	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
