



N-CHANNEL MOSFET

Qualified per MIL-PRF-19500/543

Qualified Levels:
JAN, JANTX, and
JANTXV

DESCRIPTION

This family of 2N6764T1, 2N6766T1, 2N6768T1 and 2N6770T1 switching transistors are military qualified up to the JANTXV level for high-reliability applications. These devices are also available in a thru hole TO-204AE metal can 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 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).

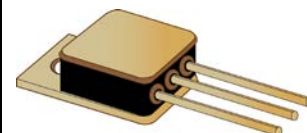
APPLICATIONS / BENEFITS

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

MAXIMUM RATINGS @ $T_A = +25^\circ\text{C}$ unless otherwise stated

Parameters / Test Conditions	Symbol	Value	Unit
Junction & Storage Temperature Range	T_J & T_{stg}	-55 to +150	$^\circ\text{C}$
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	0.83	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = +25^\circ\text{C}$ @ $T_C = +25^\circ\text{C}$ ⁽¹⁾	P_T	4 150	W
Drain-Source Voltage, dc 2N6764T1 2N6766T1 2N6768T1 2N6770T1	V_{DS}	100 200 400 500	V
Gate-Source Voltage, dc	V_{GS}	± 20	V
Drain Current, dc @ $T_C = +25^\circ\text{C}$ ⁽²⁾ 2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_{D1}	38.0 30.0 14.0 12.0	A
Drain Current, dc @ $T_C = +100^\circ\text{C}$ ⁽²⁾ 2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_{D2}	24.0 19.0 9.0 7.75	A
Off-State Current (Peak Total Value) ⁽³⁾ 2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_{DM}	152 120 56 48	A (pk)
Source Current 2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_S	38.0 30.0 14.0 12.0	A

Notes featured on next page.



TO-254AA Package

Also available in:

**TO-204AE (TO-3)
package**
(leadless)



[2N6764 & 2N6770](#)

MSC – Lawrence

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www.microsemi.com

- NOTES:**
1. Derate linearly by 1.2 W/°C for $T_C > +25\text{ }^{\circ}\text{C}$.
 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:

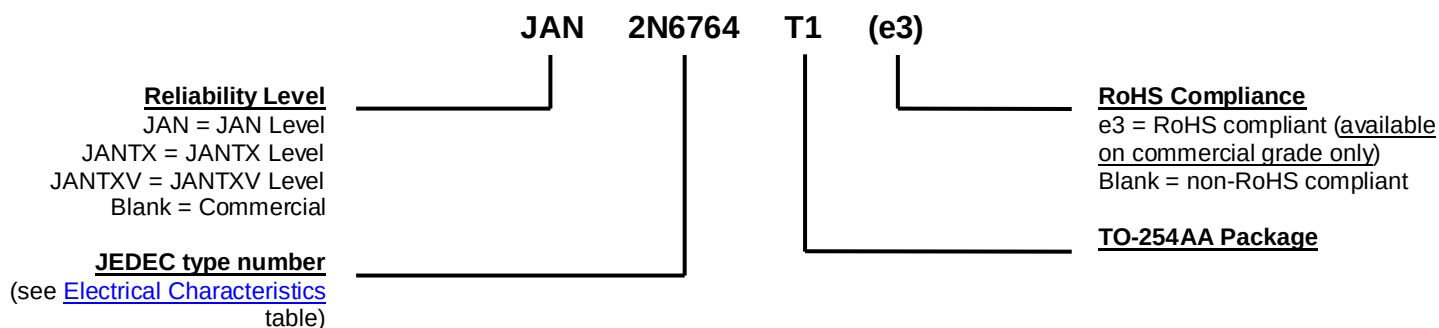
$$I_D = \sqrt{\frac{T_J(\text{max}) - T_C}{R_{\theta JC} \times R_{DS(on)} @ T_J(\text{max})}}$$

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

MECHANICAL and PACKAGING

- CASE: Nickel plated, hermetically sealed, TO-254AA.
- TERMINALS: Ni plated, copper cored, kovar.
- MARKING: Manufacturers ID, part number, date code, Beo (Beryllium Oxide).
- WEIGHT: 6.5 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 $V_{GS} = 0\text{ V}, I_D = 1.0\text{ mA}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	$V_{(BR)DSS}$	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 $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 320\text{ V}$ $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_{DSS1}		25	μA
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 200\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 500\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_{DSS2}		1.0	mA
Drain Current $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 160\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 320\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}, T_J = +125\text{ }^{\circ}\text{C}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	I_{DSS3}		0.25	mA
Static Drain-Source On-State Resistance $V_{GS} = 10\text{ V}, I_D = 24.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 19.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 9.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 7.75\text{ A pulsed}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	$r_{DS(on)1}$		0.055 0.085 0.3 0.4	Ω
Static Drain-Source On-State Resistance $V_{GS} = 10\text{ V}, I_D = 38.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 30.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 14.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 12.0\text{ A pulsed}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	$r_{DS(on)2}$		0.065 0.09 0.4 0.5	Ω
Static Drain-Source On-State Resistance $T_J = +125\text{ }^{\circ}\text{C}$ $V_{GS} = 10\text{ V}, I_D = 24.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 19.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 9.0\text{ A pulsed}$ $V_{GS} = 10\text{ V}, I_D = 7.75\text{ A pulsed}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	$r_{DS(on)3}$		0.094 0.153 0.66 0.88	Ω
Diode Forward Voltage $V_{GS} = 0\text{ V}, I_D = 38.0\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 30.0\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 14.0\text{ A pulsed}$ $V_{GS} = 0\text{ V}, I_D = 12.0\text{ A pulsed}$	2N6764T1 2N6766T1 2N6768T1 2N6770T1	V_{SD}		1.9 1.9 1.7 1.7	V

ELECTRICAL CHARACTERISTICS @ $T_A = +25^\circ\text{C}$, unless otherwise noted (continued)
DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Gate Charge:				
On-State Gate Charge	$Q_{g(\text{on})}$			
$V_{GS} = 10\text{ V}$, $I_D = 38.0\text{ A}$, $V_{DS} = 50\text{ V}$ 2N6764T1			125	nC
$V_{GS} = 10\text{ V}$, $I_D = 30.0\text{ A}$, $V_{DS} = 100\text{ V}$ 2N6766T1			115	
$V_{GS} = 10\text{ V}$, $I_D = 14.0\text{ A}$, $V_{DS} = 200\text{ V}$ 2N6768T1			110	
$V_{GS} = 10\text{ V}$, $I_D = 12.0\text{ A}$, $V_{DS} = 250\text{ V}$ 2N6770T1			120	
Gate to Source Charge	Q_{gs}			
$V_{GS} = 10\text{ V}$, $I_D = 38.0\text{ A}$, $V_{DS} = 50\text{ V}$ 2N6764T1			22	nC
$V_{GS} = 10\text{ V}$, $I_D = 30.0\text{ A}$, $V_{DS} = 100\text{ V}$ 2N6766T1			22	
$V_{GS} = 10\text{ V}$, $I_D = 14.0\text{ A}$, $V_{DS} = 200\text{ V}$ 2N6768T1			18	
$V_{GS} = 10\text{ V}$, $I_D = 12.0\text{ A}$, $V_{DS} = 250\text{ V}$ 2N6770T1			19	
Gate to Drain Charge	Q_{gd}			
$V_{GS} = 10\text{ V}$, $I_D = 38.0\text{ A}$, $V_{DS} = 50\text{ V}$ 2N6764T1			65	nC
$V_{GS} = 10\text{ V}$, $I_D = 30.0\text{ A}$, $V_{DS} = 100\text{ V}$ 2N6766T1			60	
$V_{GS} = 10\text{ V}$, $I_D = 14.0\text{ A}$, $V_{DS} = 200\text{ V}$ 2N6768T1			65	
$V_{GS} = 10\text{ V}$, $I_D = 12.0\text{ A}$, $V_{DS} = 250\text{ V}$ 2N6770T1			70	

SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-on delay time	$t_{d(\text{on})}$			
$I_D = 38.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 50\text{ V}$ 2N6764T1				
$I_D = 30.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 100\text{ V}$ 2N6766T1			35	ns
$I_D = 14.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 200\text{ V}$ 2N6768T1				
$I_D = 12.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 250\text{ V}$ 2N6770T1				
Rise time	t_r			
$I_D = 38.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 50\text{ V}$ 2N6764T1				
$I_D = 30.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 100\text{ V}$ 2N6766T1			190	ns
$I_D = 14.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 200\text{ V}$ 2N6768T1				
$I_D = 12.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 250\text{ V}$ 2N6770T1				
Turn-off delay time	$t_{d(\text{off})}$			
$I_D = 38.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 50\text{ V}$ 2N6764T1				
$I_D = 30.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 100\text{ V}$ 2N6766T1			170	ns
$I_D = 14.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 200\text{ V}$ 2N6768T1				
$I_D = 12.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 250\text{ V}$ 2N6770T1				
Fall time	t_f			
$I_D = 38.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 50\text{ V}$ 2N6764T1				
$I_D = 30.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 100\text{ V}$ 2N6766T1			130	ns
$I_D = 14.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 200\text{ V}$ 2N6768T1				
$I_D = 12.0\text{ A}$, $V_{GS} = +10\text{ V}$, $R_G = 2.35\ \Omega$, $V_{DD} = 250\text{ V}$ 2N6770T1				
Diode Reverse Recovery Time	t_{rr}			
$di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} \leq 30\text{ V}$, $I_D = 38.0\text{ A}$ 2N6764T1			500	ns
$di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} \leq 30\text{ V}$, $I_D = 30.0\text{ A}$ 2N6766T1			950	
$di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} \leq 30\text{ V}$, $I_D = 14.0\text{ A}$ 2N6768T1			1200	
$di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} \leq 30\text{ V}$, $I_D = 12.0\text{ A}$ 2N6770T1			1600	

GRAPHS

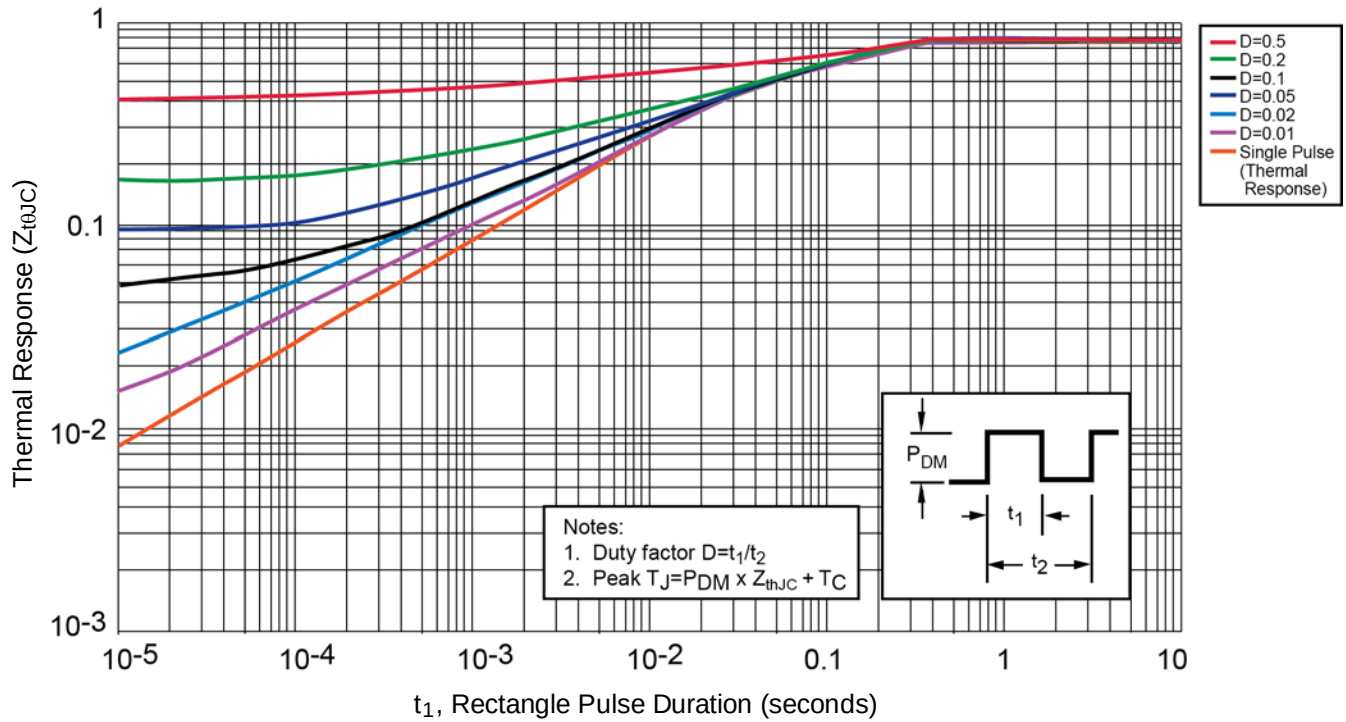
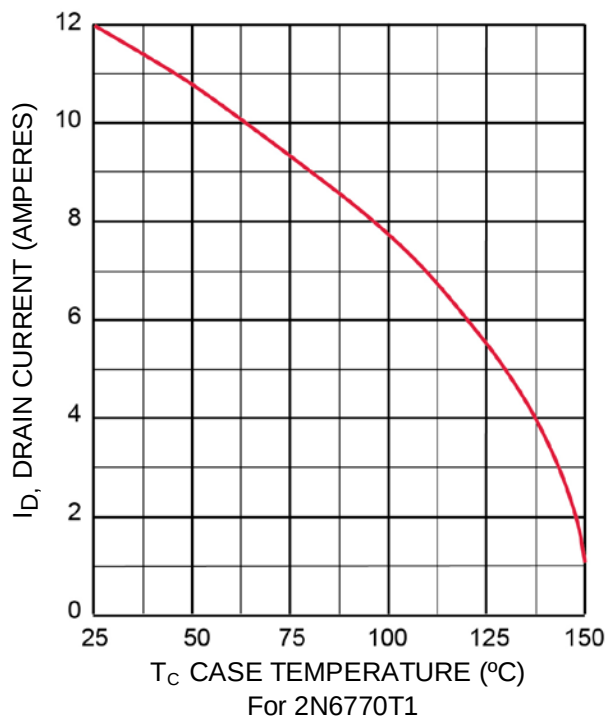
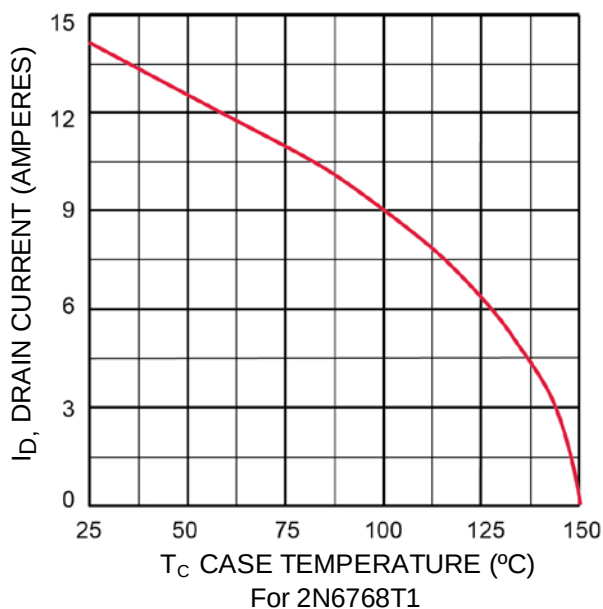
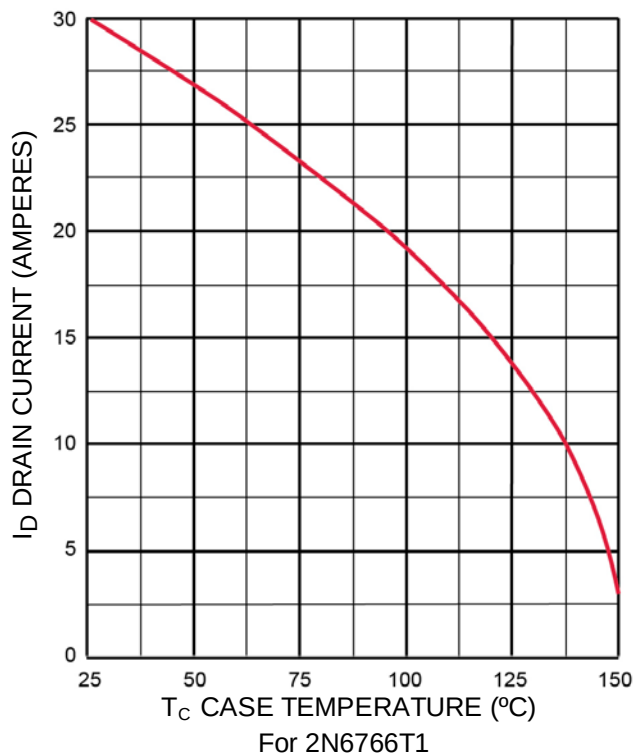
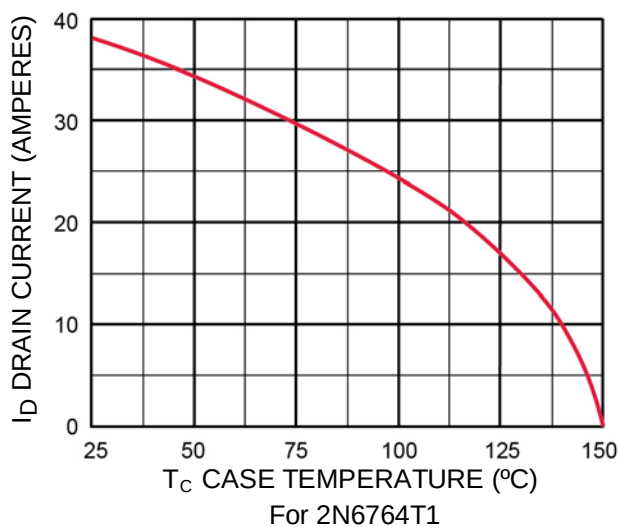
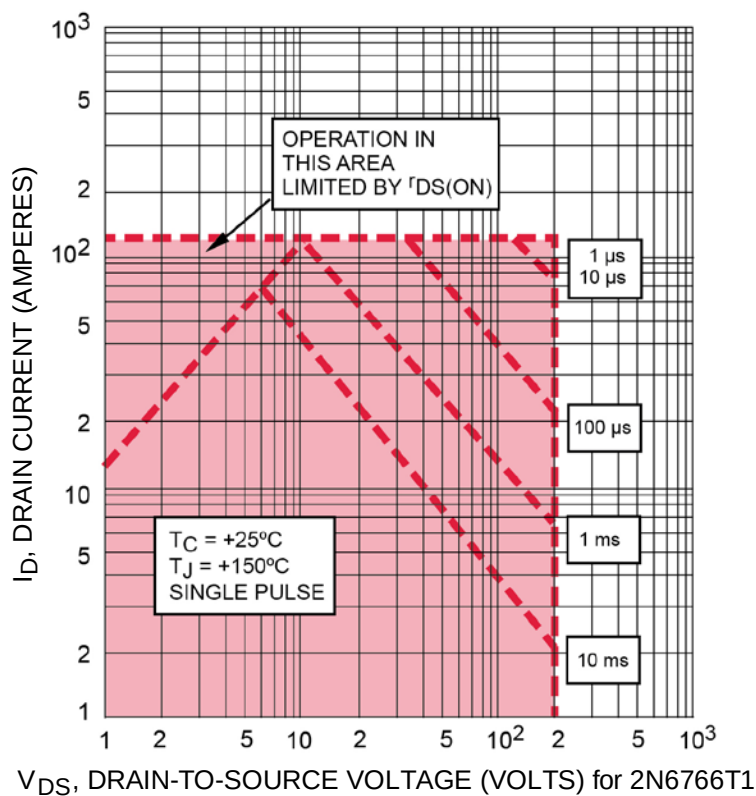
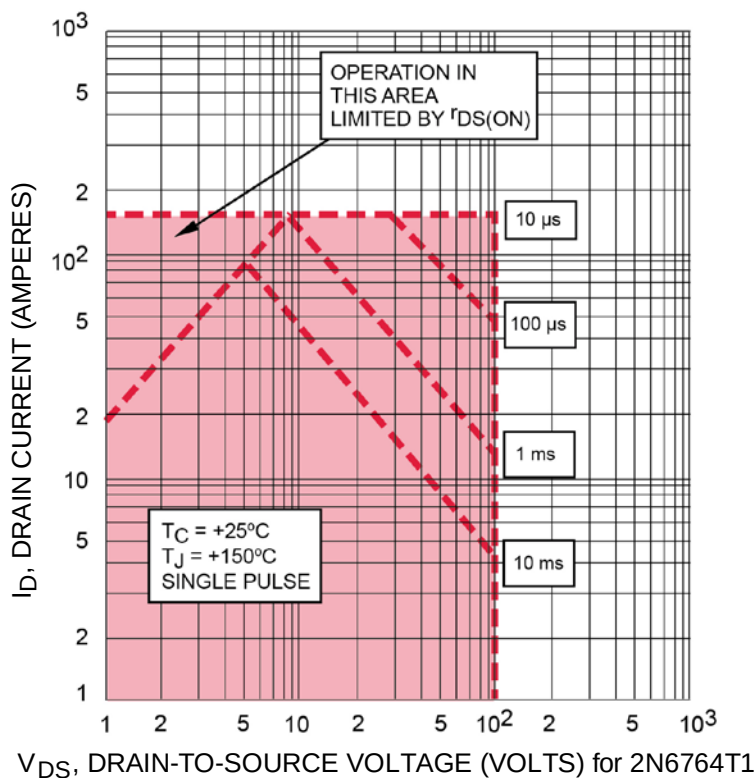
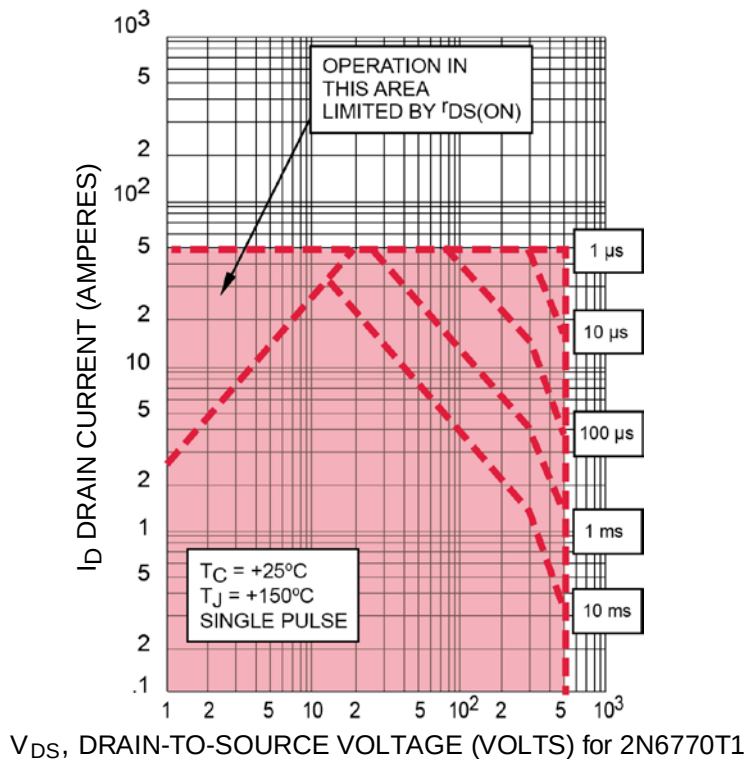
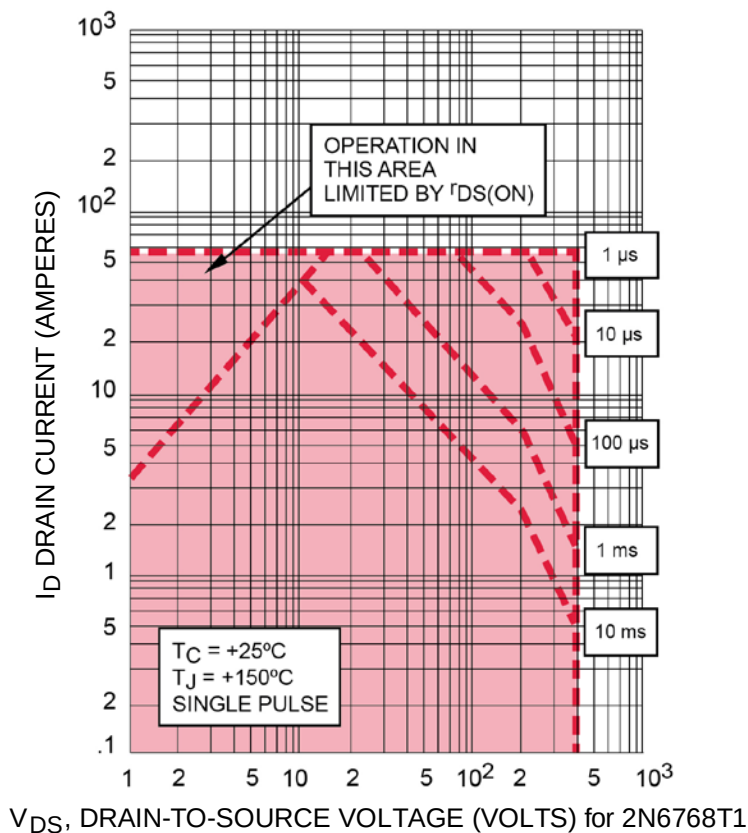
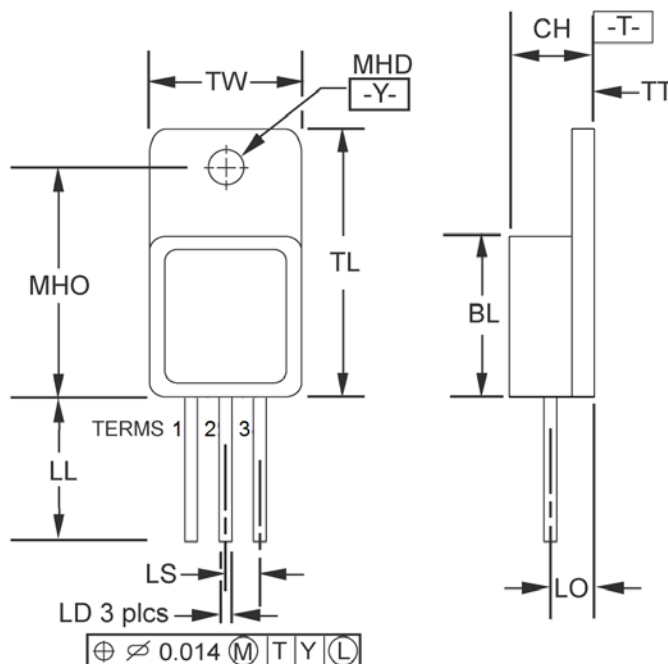


FIGURE 1
Thermal Response Curves

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


GRAPHS (continued)
FIGURE 3 – Maximum Safe Operating Area


GRAPHS (continued)


PACKAGE DIMENSIONS

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Protrusion thickness of ceramic eyelets included in dimension LL.
4. All terminals are isolated from case.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

Ltr	Dimensions				Notes
	Inch		Millimeters		
	Min	Max	Min	Max	
BL	0.535	0.545	13.59	13.84	
CH	0.249	0.260	6.32	6.60	
LD	0.035	0.045	0.89	1.14	
LL	0.510	0.570	12.95	14.48	3,4
LO	0.150 BSC		3.81 BSC		
LS	0.150 BSC		3.81 BSC		
MHD	0.139	0.149	3.53	3.78	
MHO	0.665	0.685	16.89	17.40	
TL	0.790	0.800	20.07	20.32	
TT	0.040	0.050	1.02	1.27	
TW	0.535	0.545	13.59	13.84	
Term 1	Drain				
Term 2	Source				
Term 3	Gate				