

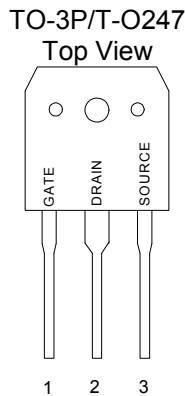
## GENERAL DESCRIPTION

This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and safety margin against unexpected voltage transients.

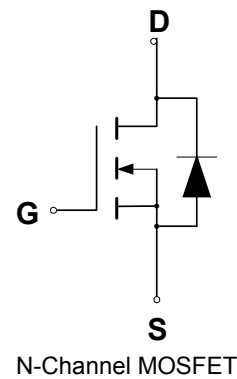
## FEATURES

- ◆ Robust High Voltage Termination
- ◆ Avalanche Energy Specified
- ◆ Source-to-Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode
- ◆ Diode is Characterized for Use in Bridge Circuits
- ◆  $I_{DSS}$  and  $V_{DS(on)}$  Specified at Elevated Temperature
- ◆ Isolated Mounting Hole Reduces Mounting Hardware

## PIN CONFIGURATION



## SYMBOL



## ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain to Current – Continuous	$I_D$	23.5	A
– Pulsed	$I_{DM}$	70.5	
Gate-to-Source Voltage – Continue	$V_{GS}$	±30	V
Total Power Dissipation – TO3P	$P_D$	255	W
– TO247		225	W/°C
Derate above 25°C – TO3P		2.1	
– TO247		2	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^\circ\text{C}$ ( $V_{DD} = 100\text{V}, V_{GS} = 10\text{V}, I_L = 22\text{A}, L = 10\text{mH}, R_G = 25\Omega$ )	$E_{AS}$	2420	mJ
Thermal Resistance – Junction to Case -TO3P	$\theta_{JC}$	0.48	°C/W
– Junction to Case -TO247		0.6	
– Junction to Ambient -TO3P, TO247		$\theta_{JA}$	40
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	$T_L$	260	°C
ESD SENSITIVITY – HBM, C=100pF, R=1.5kΩ	Vesd	2000	V

(1) Drain current limited by maximum junction temperature

## ORDERING INFORMATION

Part Number	Package
GPT24N50GN3P*	TO-3P
GPT24N50GN247*	TO-247

\*Note: G : Suffix for PB Free Product

## ELECTRICAL CHARACTERISTICS

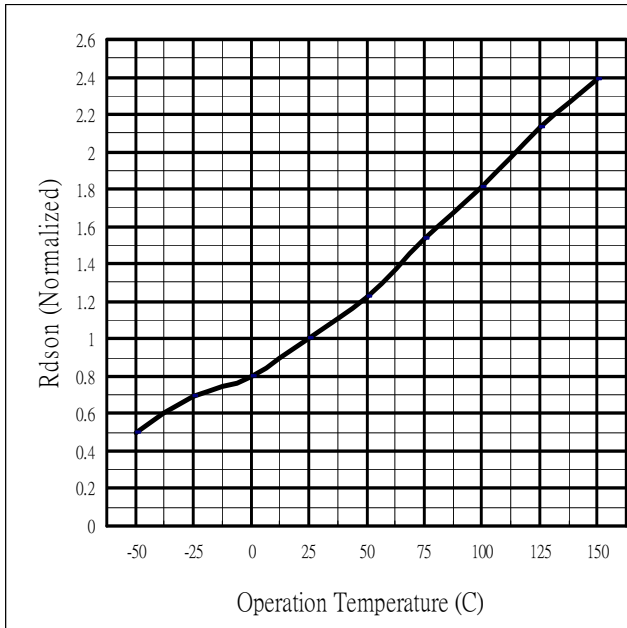
Unless otherwise specified,  $T_J = 25^\circ\text{C}$ .

Characteristic	Symbol	GPT24N50			Units
		Min	Typ	Max	
Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ )	$V_{(BR)DSS}$	500			V
Drain-Source Leakage Current ( $V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$ )	$I_{DSS}$			1	$\mu\text{A}$
Gate-Source Leakage Current-Forward ( $V_{gsf} = 30\text{ V}, V_{DS} = 0\text{ V}$ )	$I_{GSSF}$			100	nA
Gate-Source Leakage Current-Reverse ( $V_{gsr} = 30\text{ V}, V_{DS} = 0\text{ V}$ )	$I_{GSSR}$			100	nA
Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ )	$V_{GS(th)}$	3		5	V
Static Drain-Source On-Resistance ( $V_{GS} = 10\text{ V}, I_D = 12\text{A}$ ) *	$R_{DS(on)}$			0.19	$\Omega$
Forward Transconductance ( $V_{DS} = 50\text{ V}, I_D = 12\text{A}$ ) *	$g_{FS}$		25		S
Input Capacitance	$(V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz})$	$C_{iss}$	3992.1		pF
Output Capacitance		$C_{oss}$	418.9		pF
Reverse Transfer Capacitance		$C_{rss}$	20.89		pF
Turn-On Delay Time	$(V_{DD} = 250\text{ V}, I_D = 24\text{ A}, R_G = 25\Omega) *$	$t_{d(on)}$	40.4		ns
Rise Time		$t_r$	82		ns
Turn-Off Delay Time		$t_{d(off)}$	130		ns
Fall Time		$t_f$	76.8		ns
Total Gate Charge	$(V_{DS} = 400\text{ V}, I_D = 24\text{ A}, V_{GS} = 10\text{ V}) *$	$Q_g$	85.6		nC
Gate-Source Charge		$Q_{gs}$	18.8		nC
Gate-Drain Charge		$Q_{gd}$	32.2		nC
SOURCE-DRAIN DIODE CHARACTERISTICS					
Forward On-Voltage(1)	$(I_S = 24\text{ A}, d_{IS}/d_t = 100\text{A}/\mu\text{s})$	$V_{SD}$		1.5	V
Forward Turn-On Time		$t_{on}$		**	ns
Reverse Recovery Time		$t_{rr}$		510	ns

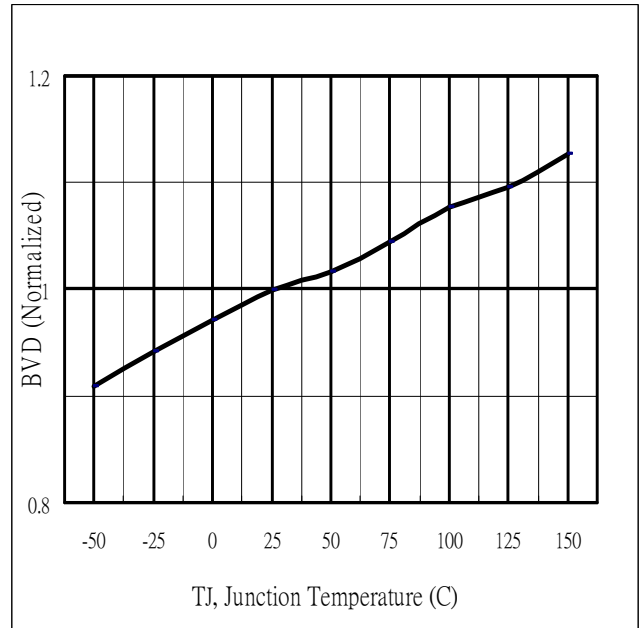
\* Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$

\*\* Negligible, Dominated by circuit inductance

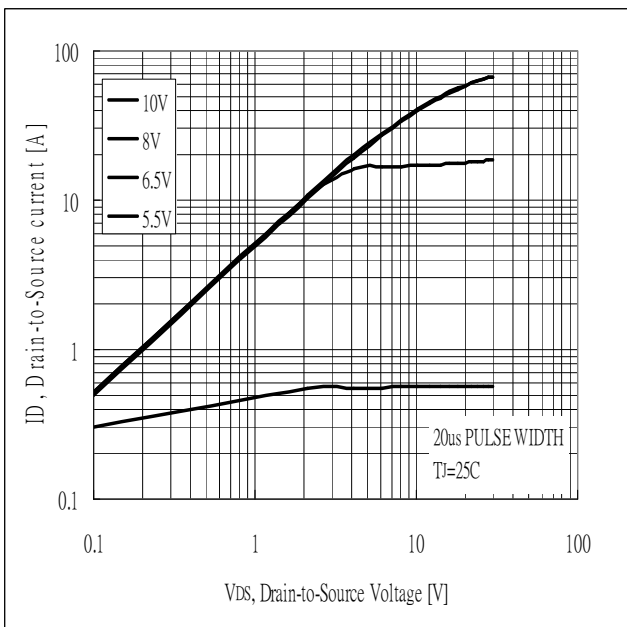
**TYPICAL ELECTRICAL CHARACTERISTICS**



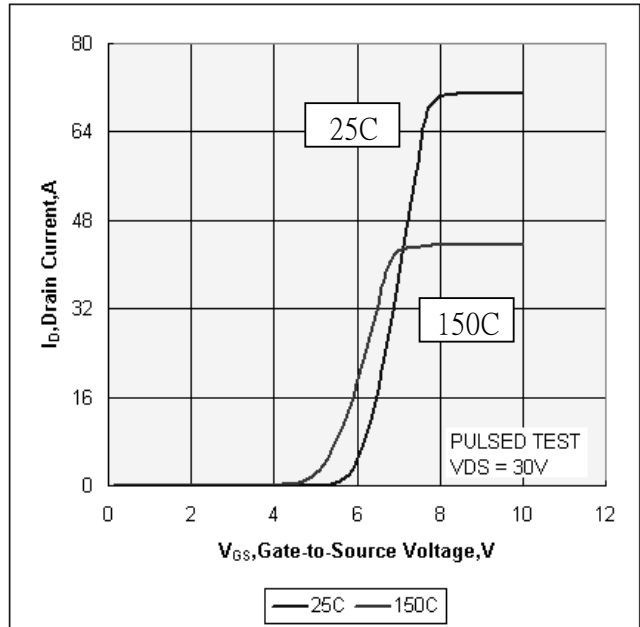
**Fig 1. On-Resistance Variation with vs. Temperature**



**Fig.2 Breakdown Voltage Variation vs. Temperature**



**Fig 3. Typical Output Characteristics**



**Fig 4. Typical Transfer Characteristics**

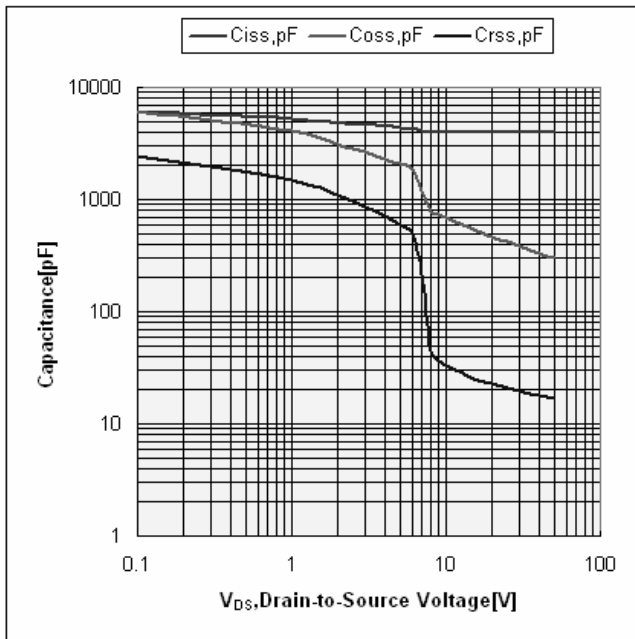


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

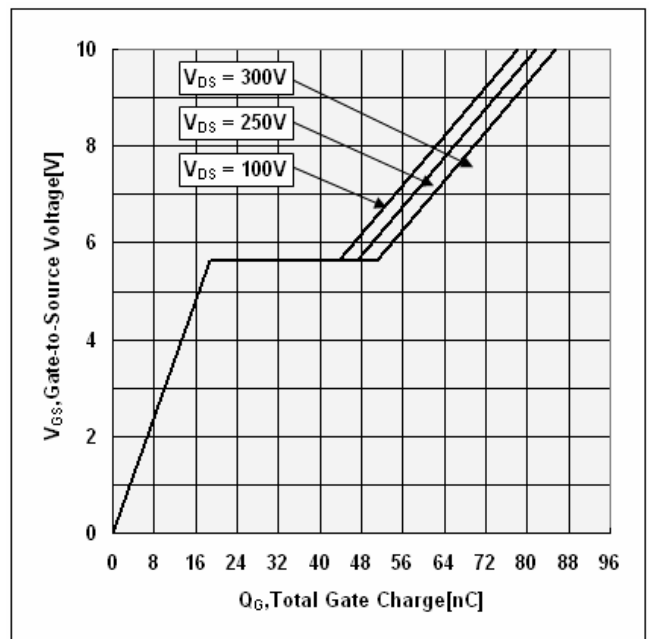
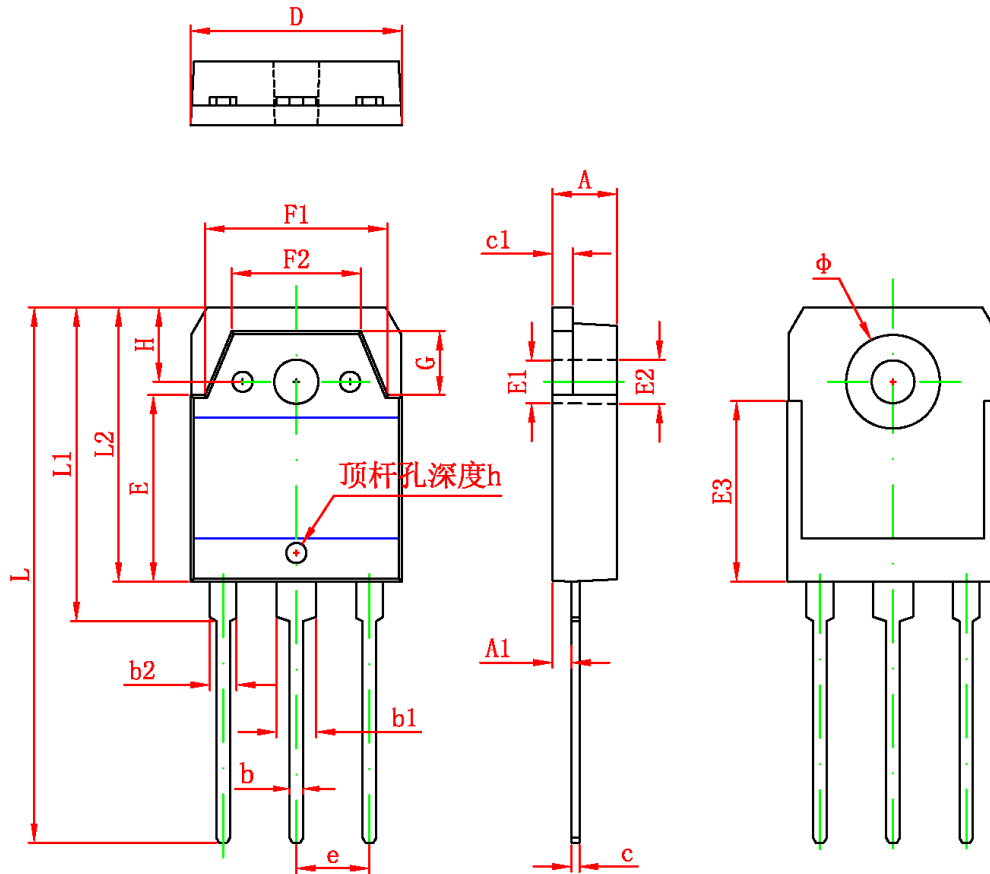


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

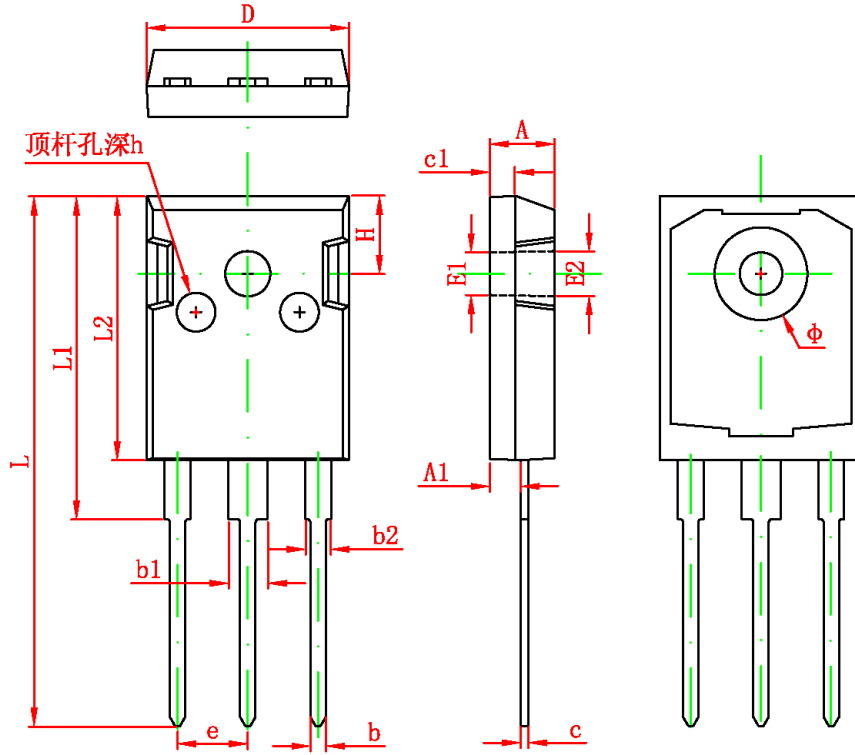
PACKAGE DIMENSION

TO-3P



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.600	5.000	0.181	0.197
A1	1.200	1.600	0.047	0.063
b	0.800	1.200	0.031	0.047
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.450	1.650	0.057	0.065
D	15.450	15.850	0.606	0.622
E	13.700	14.100	0.539	0.555
E1	3.200 REF		0.126 REF	
E2	3.300 REF		0.130 REF	
E3	13.450 REF		0.530 REF	
F1	13.400	13.800	0.528	0.543
F2	9.400	9.800	0.370	0.386
L	39.900	40.300	1.571	1.587
L1	23.200	23.600	0.913	0.929
L2	20.300	20.600	0.799	0.811
φ	6.900	7.100	0.272	0.280
G	5.150	5.550	0.203	0.219
e	5.450 TYP		0.215 TYP	
H	5.000 REF		0.197 REF	
h	0.000	0.300	0.000	0.012

TO-247



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
$\phi$	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	
h	0.000	0.300	0.000	0.012

## IMPORTANT NOTICE

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