

4A 650V N Channel MOSFET

Features

- $V_{DS} = 650V$
- $I_D = 4A @V_{GS} = 10V$
- $R_{DS(ON)} (Typ) = 2.4\Omega @V_{GS} = 10V$

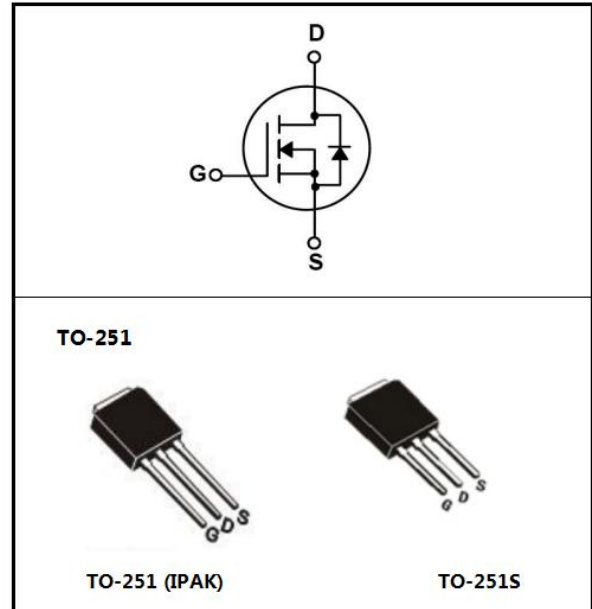
Applications

- Power Supply
- PFC
- High Current, High Speed Switching

Descriptions

These N-channel MOSFET are produced using advanced plane MOSFET Technology, which provides Low on-state resistance, high switching performance and excellent quality.

These devices are suitable device for SMPS, high Speed switching and general purpose applications.



Absolute Maximum Ratings(Ta=25°C)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	650	V
Drain Current	$I_D(T_C=25^\circ\text{C})$	4.0	A
Drain Current	$I_D(T_C=100^\circ\text{C})$	3.2	A
Drain Current - Pulsed	I_{DM}	16	A
Gate-Source Voltage	V_{GS}	± 30	V
Single Pulsed Avalanche Energy	E_{AS}	150	mJ
Repetitive Avalanche Energy	E_{AR}	30	mJ
Avalanche Current	I_{AR}	2.5	A
Power Dissipation	$P_D(T_C=25^\circ\text{C})$	50	W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C
Junction to Ambient	$R_{\theta JA}$	110	°C/W
Junction to Case	$R_{\theta JC}$	2.5	°C/W

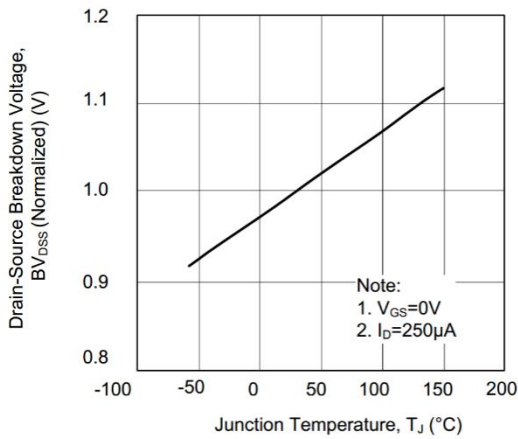
Electrical Characteristics(Ta=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V$ $I_D=250\mu A$	650			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=650V$ $V_{GS}=0V$			1	μA
		$V_{DS}=520V$ $T_C=125^\circ C$			100	μA
Gate-Body Leakage Current Forward	I_{GSS}	$V_{GS}=\pm 30V$ $V_{DS}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ $I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V$ $I_D=2.0A$		2.4	2.7	Ω
Input Capacitance	C_{iss}	$V_{DS}=25V$ $V_{GS}=0V$ $f=1.0MHz$		700		pF
Output Capacitance	C_{oss}			70		
Reverse Transfer Capacitance	C_{rss}			20		
Total Gate Charge	Q_G	$V_{DS}=520V, I_D=4.0A,$ $V_{GS}=10V$		102		nC
Gate-Source Charge	Q_{GS}			18		
Gate-Drain Charge	Q_{GD}			22		

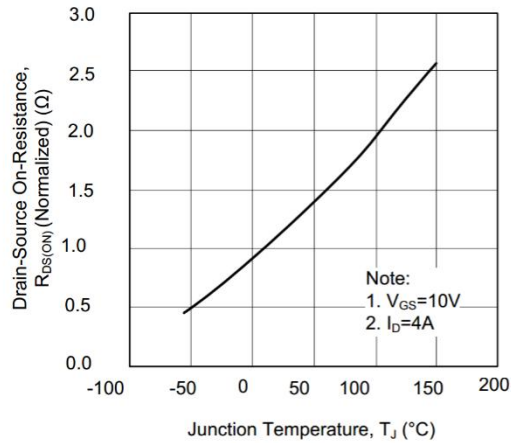
Electrical Characteristics(Ta=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=325V$ $I_D=4.0A$ $R_G=25\Omega$		48		ns
Turn-On Rise Time	t_r			102		
Turn-Off Delay Time	$t_{d(off)}$			205		
Turn-Off Fall Time	t_f			134		
Maximum Continuous Drain-Source Diode Forward Current	I_S				4.0	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				16	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0V$, $I_S = 4.0A$			1.4	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V$, $I_S = 4.4A$, $dI_F/dt = 100 A/\mu s$		250		nS
Reverse Recovery Charge	Q_{rr}			1500		nC

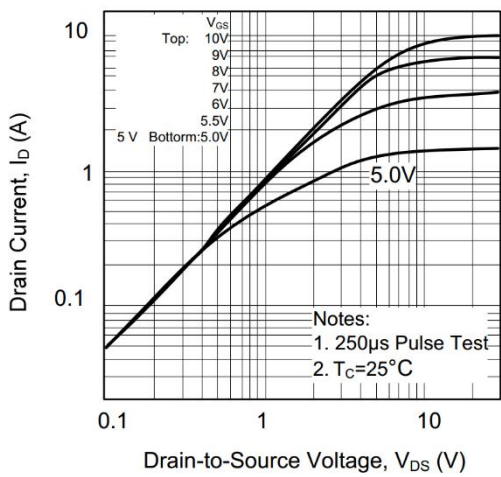
Electrical Characteristic Curve



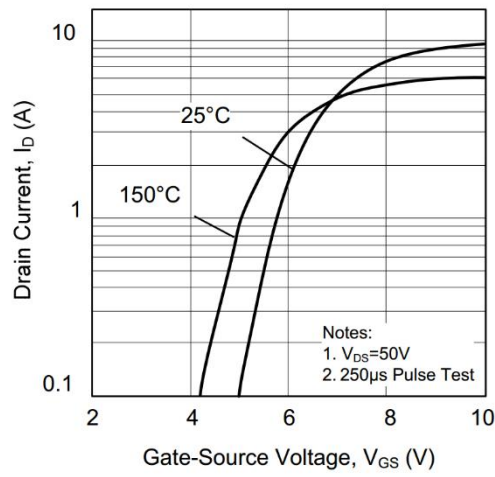
1. Breakdown Voltage Variation vs. Temperature



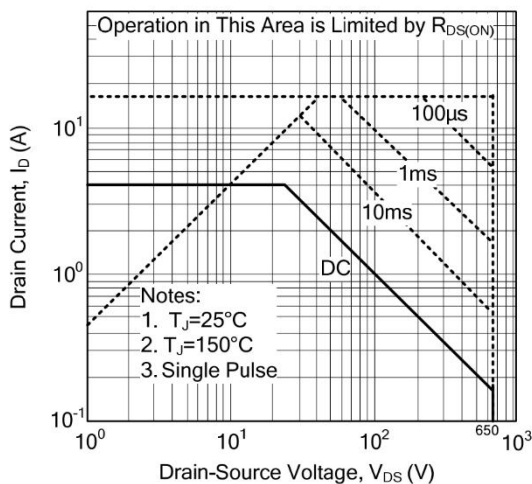
2. On-Resistance Junction Temperature



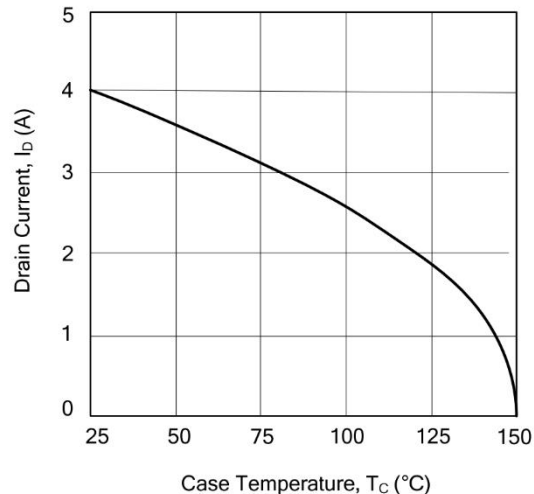
3. On-State Characteristics



4. Transfer Characteristics

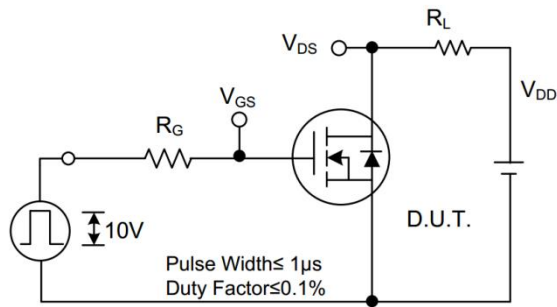


5. Safe Operating Area

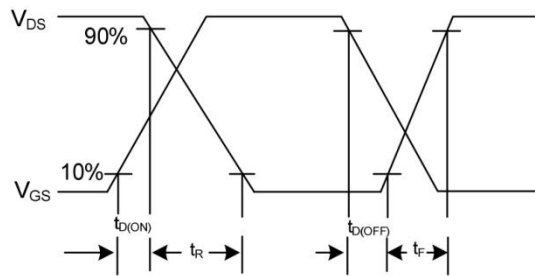


6. Maximum Drain Current vs. Case Temperature

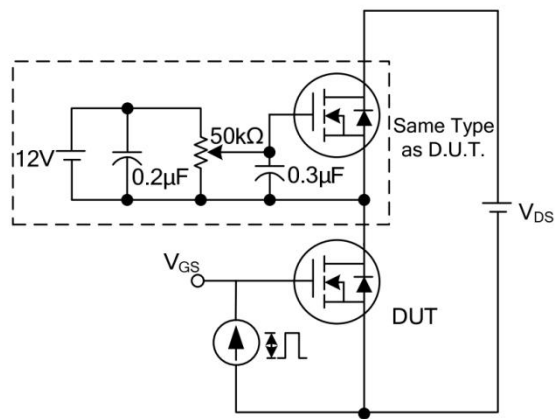
Test Circuits and Waveforms



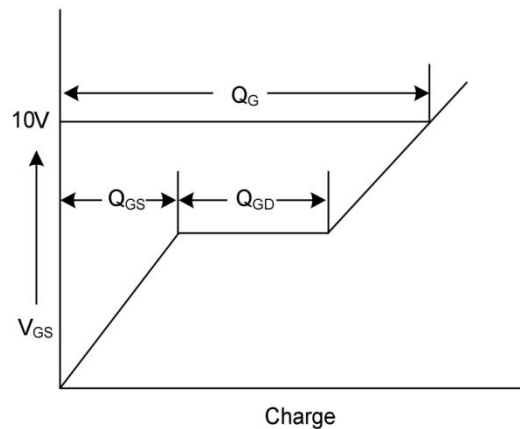
Switching Test Circuit



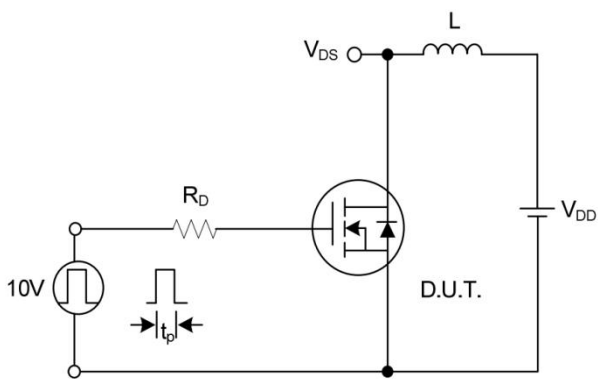
Switching Waveforms



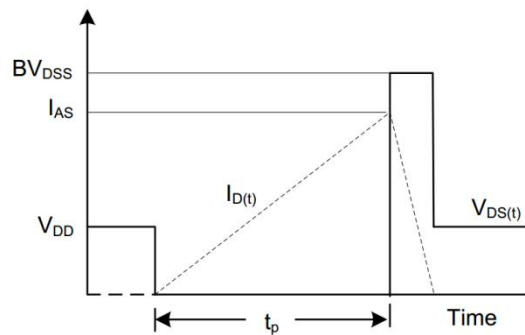
Gate Charge Test Circuit



Gate Charge Waveform

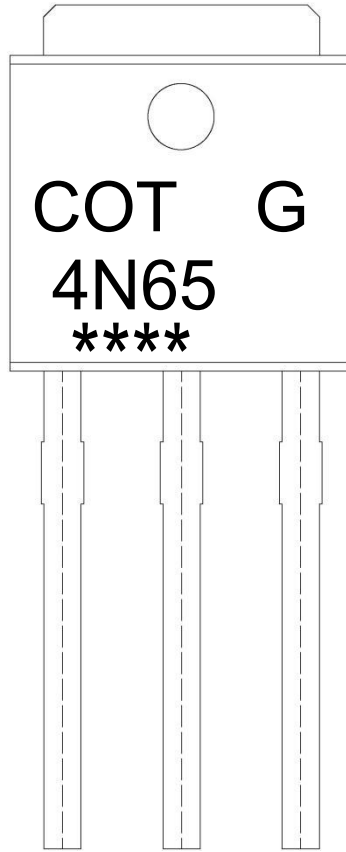


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

Marking Instructions



Note:

- COT: Company Logo
- G: Halogen Free
- 4N65: Product Type.
- ****: Lot No. Code, code change with Lot No.

Packaging SPEC.

BULK INFORMATION

Package Type	Units					Dimension (unit: mm ³)		
	Units/Bag	Bags/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Bag	Inner Box	Outer Box
TO-251/S	1,000	10	10,000	5	50,000	135×190	237×172×102	560×245×195

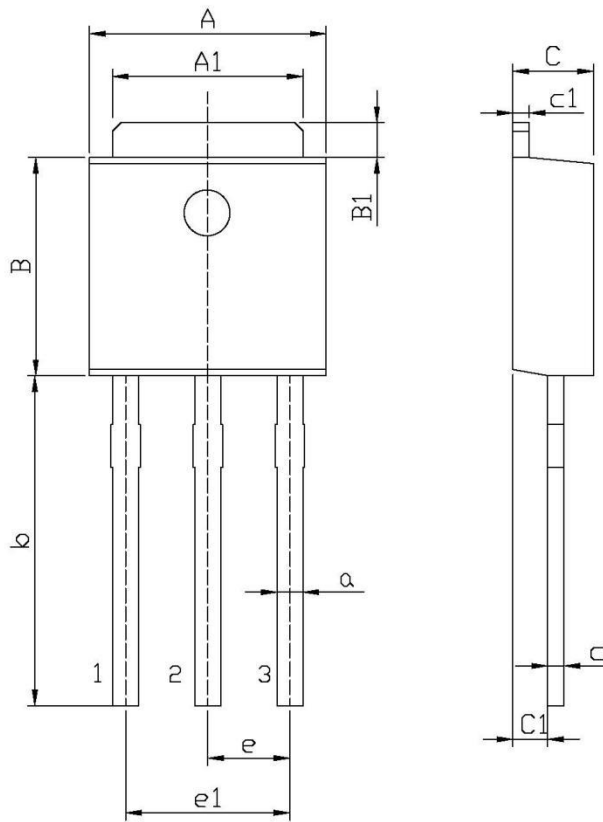
TUBE INFORMATION

Package Type	Units					Dimension (unit: mm ³)		
	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Tube	Inner Box	Outer Box
TO-251/S	75	48	3,600	5	18,000	526×20.5×5.25	555×164×50	575×290×180

Package Outline Dimensions

TO-251 (IPAK) MECHANICAL DATA

UNIT: mm



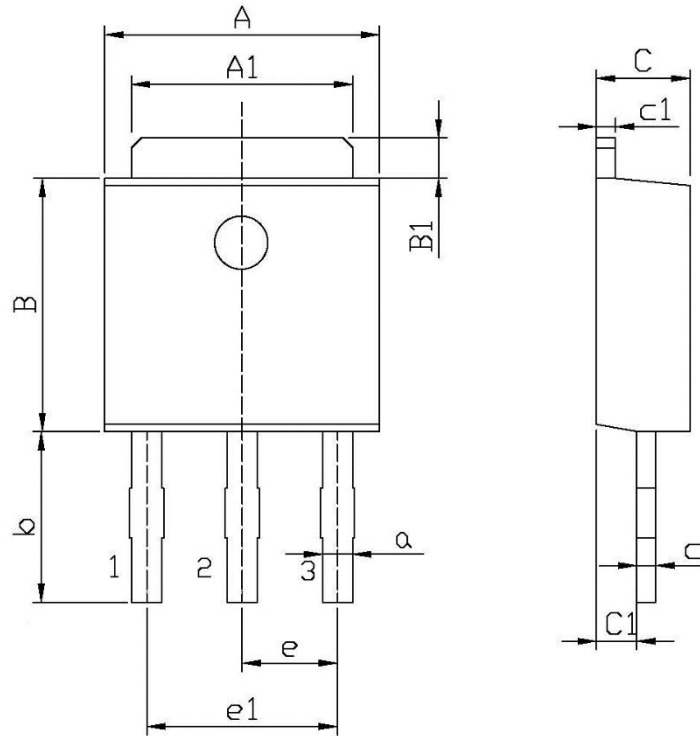
单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	6.45	6.75	a	0.50	0.70
A1	5.10	5.50	b	9.00	9.40
B	5.95	6.25	c	0.45	0.55
B1	0.95	1.25	c1	0.45	0.55
C	2.20	2.40	e	2.24	2.34
C1	0.95	1.15	e1	4.43	4.73

TO-251

TO-251S (IPAK) MECHANICAL DATA

UNIT: mm



单位: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	6.45	6.75	a	0.50	0.70
A1	5.10	5.50	b	3.00	4.40
B	5.95	6.25	c	0.45	0.55
B1	0.95	1.25	c1	0.45	0.55
C	2.20	2.40	e	2.24	2.34
C1	0.95	1.15	e1	4.43	4.73

TO-251S