

**2N170-E4**

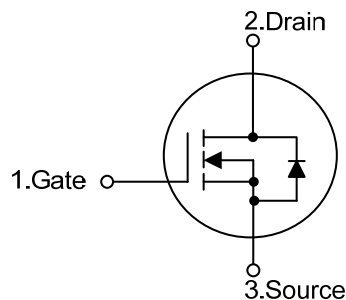
Preliminary

Power MOSFET**2.0A, 1700V N-CHANNEL
POWER MOSFET****DESCRIPTION**

The UTC **2N170-E4** provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch or in PWM applications.

FEATURES

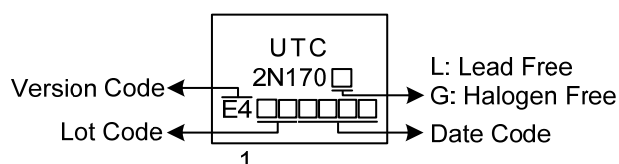
- * $R_{DS(ON)} \leq 11.5 \Omega$ @ $V_{GS}=10V$, $I_D=1.0A$
- * Low Reverse Transfer Capacitance
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N170L-E4-TF1-T	2N170G-E4-TF1-T	TO-220F1	G	D	S	Tube

Note: Pin Assignment: G: Gate D: Drain S: Source

2N170G-E4-TF1-T		(1) Packing Type	(1) T: Tube
		(2) Package Type	(2) TF1: TO-220F1
		(3) Version Code	(3) Version E4
		(4) Green Package	(4) G: Halogen Free and Lead Free, L: Lead Free

MARKING

■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	1700	V
Gate-Source Voltage		V _{GSS}	±30	V
Drain Current	Continuous	I _D	2	A
	Pulsed (Note 2)	I _{DM}	4	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	126	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2	V/ns
Power Dissipation		P _D	15	W
Junction Temperature		T _J	+150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress values only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. L = 30mH, I_{AS} = 2.9A, V_{DD} = 90V, R_G = 25Ω, Starting T_J = 25°C.

4. I_{SD} ≤ 2.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ _{JA}	62.5	°C/W
Junction to Case	θ _{JC}	8.3	°C/W

Note: Device mounted on FR-4 substrate P_c board, 2oz copper, with 1inch square copper plate.

■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	1700			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =1700V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	3.0		5.0	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =1.0A			11.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		892		pF
Output Capacitance	C _{OSS}			85		pF
Reverse Transfer Capacitance	C _{RSS}			13		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =1360V, V _{GS} =10V, I _D =2.0A (Note 1, 2)		33		nC
Gate-Source Charge	Q _{GS}			8		nC
Gate-Drain Charge	Q _{GD}			14		nC
Turn-On Delay Time (Note 1)	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =2.0A, R _G =25Ω (Note 1, 2)		19		ns
Turn-On Rise Time	t _R			26		ns
Turn-Off Delay Time	t _{D(OFF)}			99		ns
Turn-Off Fall Time	t _F			50		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				2	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =2.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =2.0A, V _{GS} =0V,		612		nS
Body Diode Reverse Recovery Charge	Q _{rr}	dl _F /dt=100A/μs		4.7		uC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

D.U.T.

V_{DS}

I_{SD}

L

V_{DD}

Driver

R_G

V_{GS}

Same Type as D.U.T.

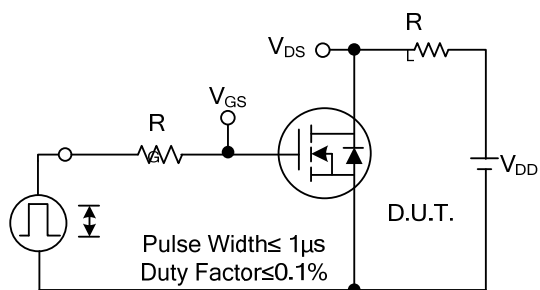
- * dv/dt controlled by R_G
- * I_{SD} controlled by pulse period
- * D.U.T.-Device Under Test

The diagram consists of three vertically aligned waveforms sharing a common time axis:

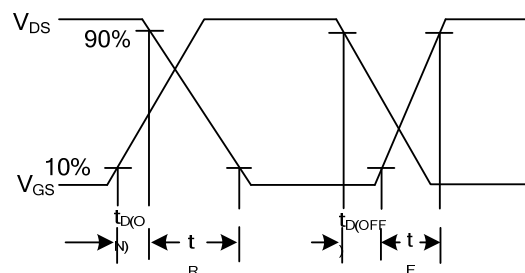
- Top Trace (V_{GS} (Driver)):** A square wave pulse. The pulse width is labeled $D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$. The pulse height is labeled $10V$.
- Middle Trace (I_{SD} (DUT)):** Shows the drain current. During the V_{GS} pulse, the current is a trapezoidal pulse labeled I_{FM} , Body Diode Forward Current. When V_{GS} falls, the current reverses, showing a reverse recovery transient labeled I_{RM} (Body Diode Reverse Current) and a di/dt slope.
- Bottom Trace (V_{DS} (DUT)):** Shows the drain-source voltage. When I_{SD} is positive, V_{DS} is at a low level labeled V_{SD} (Body Diode Forward Voltage Drop). When I_{SD} reverses, V_{DS} rises sharply, showing a recovery transient labeled V_{DD} and a dv/dt slope (Body Diode Recovery dv/dt).

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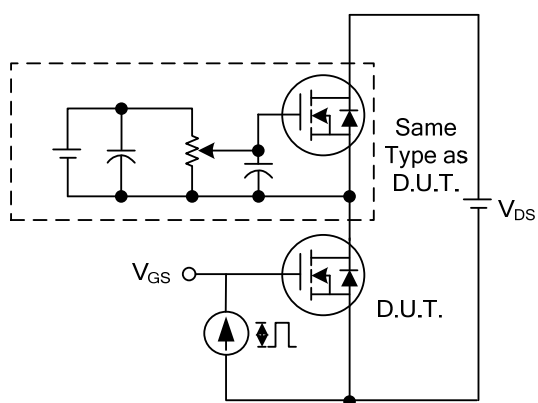
■ TEST CIRCUITS AND WAVEFORMS



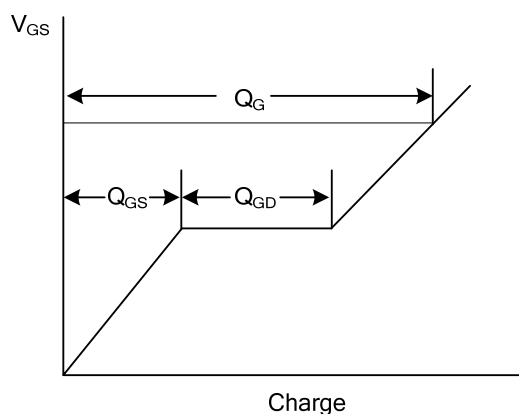
Switching Test Circuit



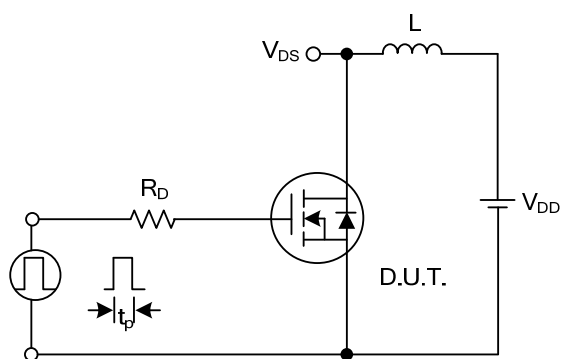
Switching Waveforms



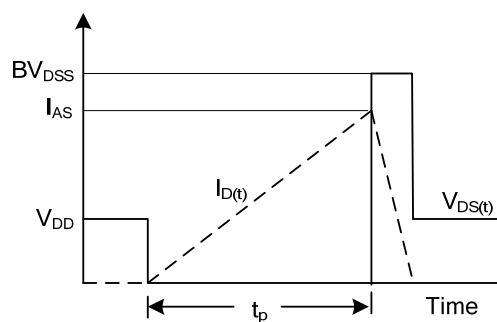
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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