



## MJE13003D

## NPN SILICON TRANSISTOR

### HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

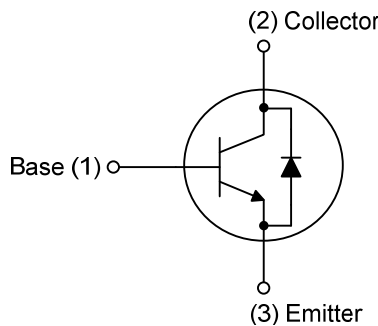
#### DESCRIPTION

The UTC **MJE13003D** is a NPN Power Transistor. It is intended to be used in applications requiring medium voltage capability and high switching speeds.

#### FEATURES

- \* Fast-Switching And High Voltage Capability
- \* Dynamic Parameters With Low Spread
- \* High Reliability
- \* Integrated Antiparallel Collector-Emitter Diode

#### INTERNAL SCHEMATIC DIAGRAM

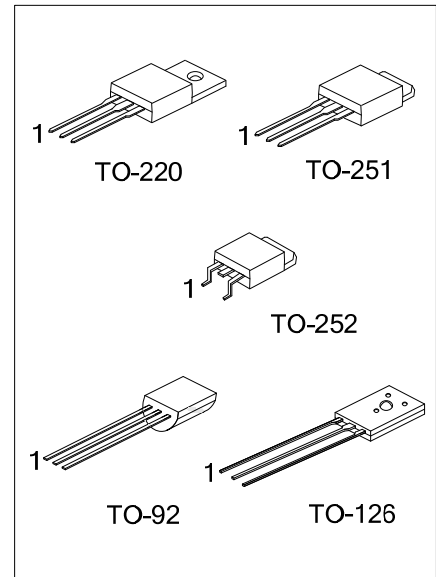


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
MJE13003DL-x-T60-K	MJE13003DG-x-T60-K	TO-126	B	C	E	Bulk
MJE13003DL-x-TA3-T	MJE13003DG-x-TA3-T	TO-220	B	C	E	Tube
MJE13003DL-x-TM3-T	MJE13003DG-x-TM3-T	TO-251	B	C	E	Tube
MJE13003DL-x-TN3-R	MJE13003DG-x-TN3-R	TO-252	B	C	E	Tape Reel
MJE13003DL-x-T92-B	MJE13003DG-x-T92-B	TO-92	B	C	E	Tape Box
MJE13003DL-x-T92-K	MJE13003DG-x-T92-K	TO-92	B	C	E	Bulk
MJE13003DL-x-T92-A-B	MJE13003DG-x-T92-A-B	TO-92	E	C	B	Tape Box
MJE13003DL-x-T92-A-K	MJE13003DG-x-T92-A-K	TO-92	E	C	B	Bulk

Note: Pin Assignment: E: Emitter B: Base C: Collector

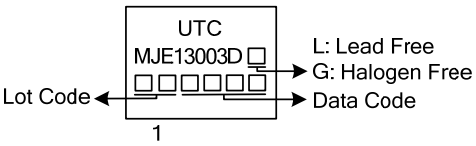
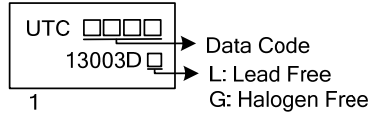
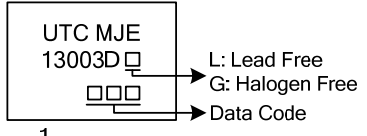
<p>MJE13003DG-x-T92-A-B</p>	<p>(1) T: Tube, B: Tape Box, K: Bulk, R: Tape Reel  (2) refer to Pin Assignment (for TO-92)  (3) TA3: TO-220, TM3: TO-251, TN3: TO-252,  T60: TO-126, T92: TO-92  (4) refer to Classification of <math>h_{FE1}</math>  (5) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING

PACKAGE	MARKING
TO-220 / TO-251 / TO-252	
TO-126	
TO-92	

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■ ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector- Emitter Voltage ( $V_{BE}=0$ )		$V_{CES}$	700	V
Collector-Emitter Voltage ( $I_B=0$ )		$V_{CEO}$	400	V
Emitter-Base Voltage ( $I_C=0, I_B=0.75\text{A}, t_P<10\mu\text{S}$ )		$V_{EBO}$	9	V
Collector Current		$I_C$	1.5	A
Collector Peak Current ( $t_P<5\text{ms}$ )		$I_{CM}$	3	A
Base Current		$I_B$	0.75	A
Base Peak Current ( $t_P<5\text{ms}$ )		$I_{BM}$	1.5	A
Power Dissipation	$T_A=25^\circ\text{C}$	TO-126	1.4	W
		TO-92	1.1	W
		TO-220	2	W
		TO-251/TO-252	1.56	W
	$T_C=25^\circ\text{C}$	TO-126	20	W
		TO-92	1.5	W
		TO-220	40	W
		TO-251/TO-252	25	W
Junction Temperature		$T_J$	150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220	$\theta_{JA}$	62.5	$^\circ\text{C/W}$
	TO-251		80.13	$^\circ\text{C/W}$
	TO-126		89.29	$^\circ\text{C/W}$
	TO-92		113.64	$^\circ\text{C/W}$
Junction to Case	TO-220	$\theta_{JC}$	0.63	$^\circ\text{C/W}$
	TO-251		1.0	$^\circ\text{C/W}$
	TO-126		1.25	$^\circ\text{C/W}$
	TO-92		16.67	$^\circ\text{C/W}$

■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Emitter-Base Breakdown Voltage		BV <sub>EBO</sub>	I <sub>E</sub> =10mA, I <sub>C</sub> =0	9		18	V
Collector-Emitter Sustaining Voltage (Note)		V <sub>CEO(SUS)</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =0	400			V
Collector Cut-Off Current		I <sub>CES</sub>	V <sub>CE</sub> =700V, V <sub>BE</sub> =0			1	mA
Collector-Emitter Saturation Voltage (Note)		V <sub>CE(SAT)</sub>	I <sub>C</sub> =0.5 A, I <sub>B</sub> =0.1 A			0.5	V
			I <sub>C</sub> =1 A, I <sub>B</sub> =0.25 A			1	V
			I <sub>C</sub> =1.5 A, I <sub>B</sub> =0.5 A			3	V
Base-Emitter Saturation Voltage (Note)		V <sub>BE(SAT)</sub>	I <sub>C</sub> =0.5 A, I <sub>B</sub> =0.1 A			1	V
			I <sub>C</sub> =1 A, I <sub>B</sub> =0.25 A			1.2	V
DC Current Gain		h <sub>FE1</sub>	I <sub>C</sub> =0.5A, V <sub>CE</sub> =5 V	14		57	
		h <sub>FE2</sub>	I <sub>C</sub> =1 A, V <sub>CE</sub> =5 V	5		30	
Resistive Load	Rise Time	t <sub>R</sub>	V <sub>CC</sub> =125 V, I <sub>C</sub> =1 A, I <sub>B1</sub> =0.2 A, I <sub>B2</sub> =-0.2 A, t <sub>p</sub> =25μs			1	μs
	Storage Time	t <sub>S</sub>				4	μs
	Fall Time	t <sub>F</sub>				0.7	μs
Inductive Load Storage Time		t <sub>S</sub>	I <sub>C</sub> =1 A, I <sub>B1</sub> =0.2 A, V <sub>BE</sub> =-5 V, L=50mH, V <sub>CLAMP</sub> =300V		0.8		μs
Diode Forward Voltage		V <sub>F</sub>	I <sub>F</sub> =0.5 A			1.5	V

Note: Pulse Test: Pulse duration ≤ 300μs, Duty cycle ≤ 2%.

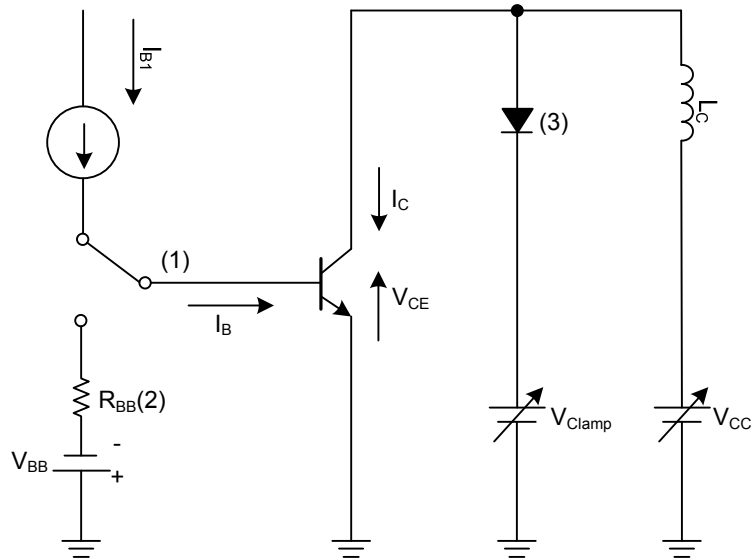
■ CLASSIFICATION OF h<sub>FE1</sub>

RANK	A	B	C	D	E	F	G	H
RANGE	14 ~ 22	21 ~ 27	26 ~ 32	31 ~ 37	36 ~ 42	41 ~ 47	46 ~ 52	51 ~ 57

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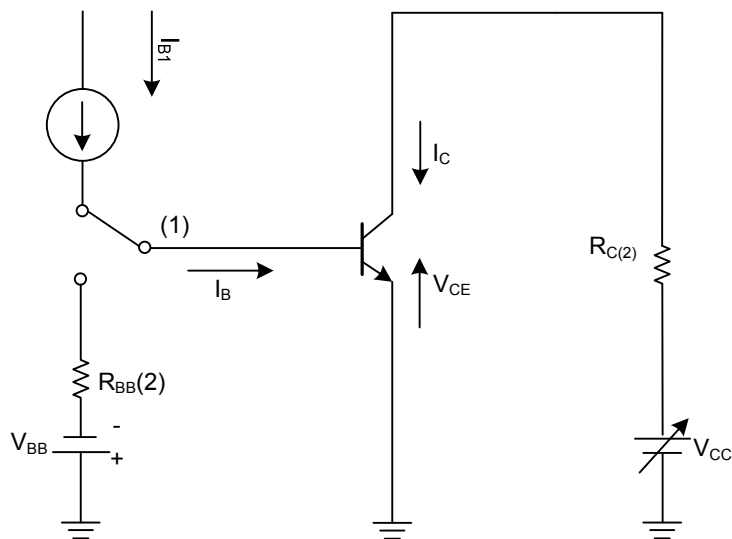
## ■ TEST CIRCUITS

### Inductive Load Switching Test Circuit



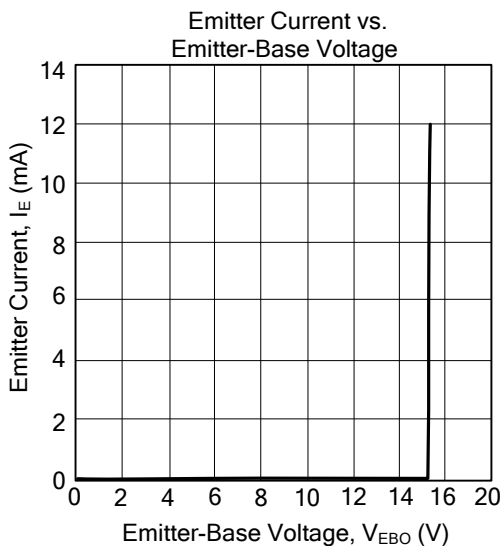
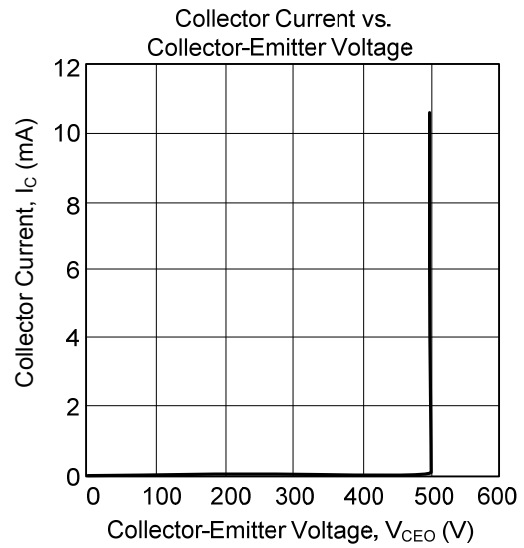
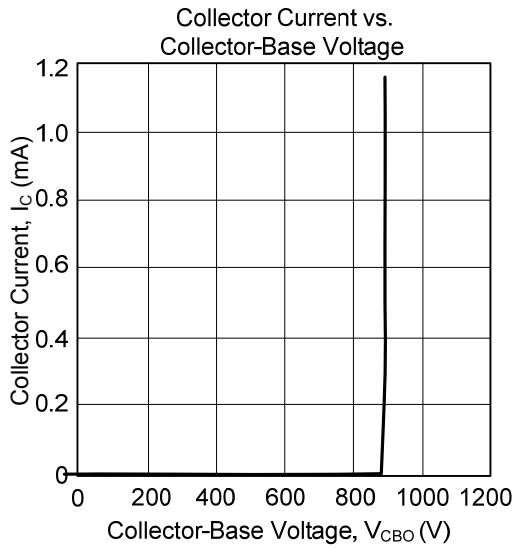
- Notes: 1. Fast Electronic Switch  
 2. Non-Inductive Resistor  
 3. Fast Recovery Rectifier

### Resistive Load Switching Test Circuit



- Notes: 1. Fast Electronic Switch  
 2. Non-Inductive Resistor

### TYPICAL CHARACTERISTICS



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