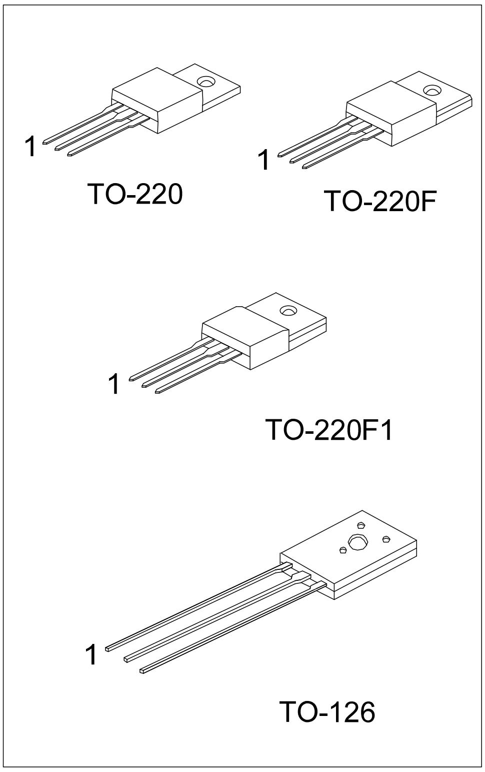
MJE13005-XS

NPN SILICON TRANSISTOR

NPN SILICON POWER TRANSISTORS



■ DESCRIPTION

These devices are designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. They are particularly suited for 115 and 220 V SWITCHMODE.

■ FEATURES

* $V_{CEO(SUS)}$= 400V
* Reverse bias SOA with inductive loads @ T_C = 100°C
* Inductive switching matrix 2 to 4 Amp, 25 and 100°C
t_C @ 3A, 100°C is 180 ns (Typ)
* 700V blocking capability
* SOA and switching applications information

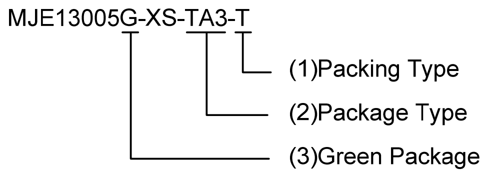
■ APPLICATIONS

* Switching regulator's, inverters
* Motor controls
* Solenoid/Relay drivers
* Deflection circuits

■ ORDERING INFORMATION

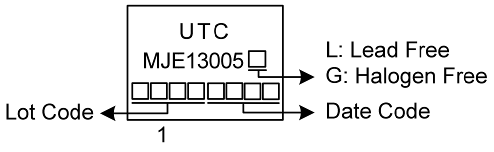
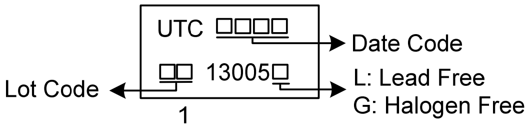
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
MJE13005L-XS-TA3-T	MJE13005G-XS-TA3-T	TO-220	B	C	E	Tube
MJE13005L-XS-TF1-T	MJE13005G-XS-TF1-T	TO-220F1	B	C	E	Tube
MJE13005L-XS-TF3-T	MJE13005G-XS-TF3-T	TO-220F	B	C	E	Tube
MJE13005L-XS-T60-K	MJE13005G-XS-T60-K	TO-126	B	C	E	Bulk

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



(1) T: Tube, K: Bulk
(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F
T6S: TO-126
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

TO-220 / TO-220F / TO-220F1	TO-126
	

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage		$V_{CEO(SUS)}$	400	V
Collector-Emitter Voltage (V_{BE}=0)		V_{CES}	700	V
Collector-Base Voltage		V_{CBO}	700	V
Emitter Base Voltage		V_{EBO}	9	V
Collector Current	Continuous	I_C	4	A
	Peak (1)	I_{CM}	8	A
Base Current	Continuous	I_B	2	A
	Peak (1)	I_{BM}	4	A
Emitter Current	Continuous	I_E	6	A
	Peak (1)	I_{EM}	12	A
Power Dissipation at T_C=25°C	TO-220F/TO-220F1 TO-126	P_D	40	W
	TO-220		75	
Derate above 25°C	TO-220F/TO-220F1 TO-126		320	mW/°C
	TO-220		600	
Operating and Storage Junction Temperature		T_J , T_{STG}	-65 ~ +150	°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

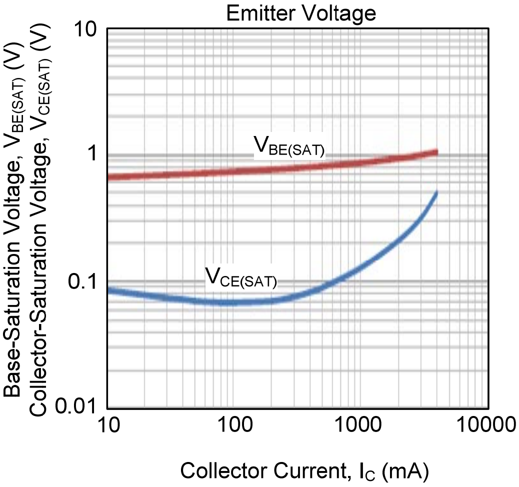
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1	θ_{JA}	62.5	°C/W
	TO-126		89	
Junction to Case	TO-220F/TO-220F1 TO-126	θ_{JC}	3.125	°C/W
	TO-220		1.67	

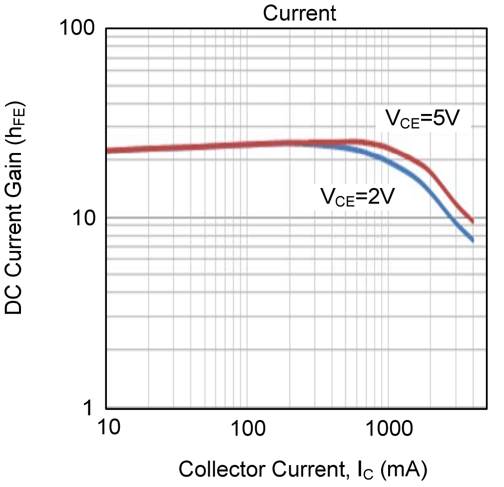
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

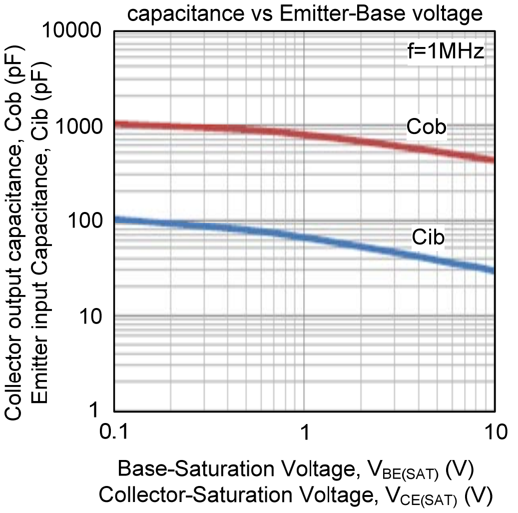
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS (Note 1)						
Collector-Emitter Sustaining Voltage	$V_{CEO(SUS)}$	I_C=10mA , I_B=0	400			V
Collector Cutoff Current	I_{CBO}	V_{CBO}=Rated Value, $V_{BE(OFF)}$=1.5V			1	mA
		V_{CBO}=Rated Value, $V_{BE(OFF)}$=1.5V, T_C=100°C			5	
Emitter Cutoff Current	I_{EBO}	V_{EB}=9V, I_C=0			1	mA
SECOND BREAKDOWN						
Second Breakdown Collector Current with bass forward biased	$I_{S/B}$			See Fig. 11		
Clamped Inductive SOA with Base Reverse Biased	RBSOA			See Fig. 12		
ON CHARACTERISTICS (Note 1)						
DC Current Gain	h_{FE1}	I_C=0.5A, V_{CE}=5V	15		35	
	h_{FE2}	I_C=1A, V_{CE}=5V	10		35	
	h_{FE3}	I_C=2A, V_{CE}=5V	8		30	
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	I_C=1A, I_B=0.2A			0.5	V
		I_C=2A, I_B=0.5A			0.6	V
		I_C=4A, I_B=1A			1	V
		I_C=2A, I_B=0.5A, Ta=100°C			1	V
Base-Emitter Saturation Voltage	$V_{BE\ (SAT)}$	I_C=1A, I_B=0.2A			1.2	V
		I_C=2A, I_B=0.5A			1.6	V
		I_C=2A, I_B=0.5A, T_C=100°C			1.5	V
DYNAMIC CHARACTERISTICS						
Current-Gain-Bandwidth Product	f_T	I_C=500mA, V_{CE}=10V, f=1MHz	4			MHz
Output Capacitance	C_{OB}	V_{CB}=10V, I_E=0, f=0.1MHz		30		pF
SWITCHING CHARACTERISTICS						
Resistive Load (Table 1)						
Delay Time	t_D	V_{CC}=125V, I_C=2A, I_{B1}=I_{B2}=0.4A, t_P=25μs, Duty Cycle≤1%		0.025	0.1	μs
Rise Time	t_R			0.3	0.7	μs
Storage Time	t_S			1.7	4	μs
Fall Time	t_F			0.4	0.9	μs

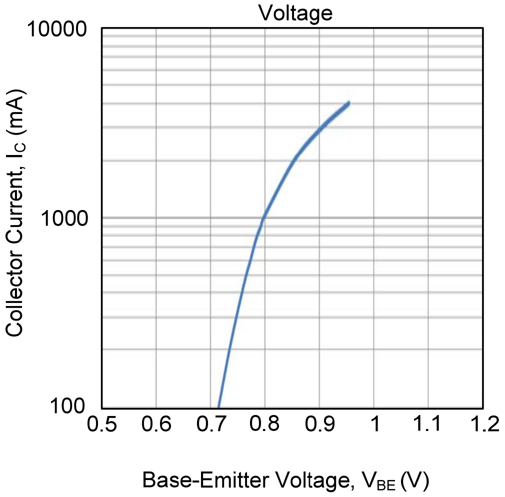
Notes: 1. Pulse Test: Pulse Width=5ms, Duty Cycle≤10%
2. Pulse Test: P_W=300μs, Duty Cycle≤2%

■ TYPICAL CHARACTERISTICS


Collector Current vs. Collector-Emitter Voltage


DC Current Gain vs. Collector Current


Collector output capacitance vs Collector-Base voltage Emitter input capacitance vs Emitter-Base voltage


Collector Current vs. Base-Emitter Voltage