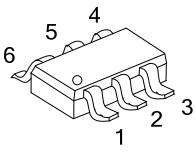
MMDT2227

DUAL TRANSISTOR

NPN & PNP GENERAL PURPOSE AMPLIFIER



SOT-363

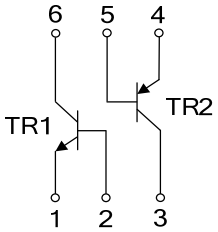
■ DESCRIPTION

The UTC **MMDT2227** is an NPN & PNP general purpose amplifier. it's suitable for a medium power amplifier and switch requiring collector currents up to 600mA.

■ FEATURES

* Low $V_{CE(SAT)}$, $V_{CE(SAT)}$ = 0.3V (typ.)@I_C / I_B = 150mA / 15mA
  $V_{CE(SAT)}$ < -0.4V (typ.) @I_C/I_B = -150mA / -15mA
* NPN MMBT2222A
  PNP MMBT2907A
* High collector current gain under high collector current condition

■ EQUIVALENT CIRCUIT



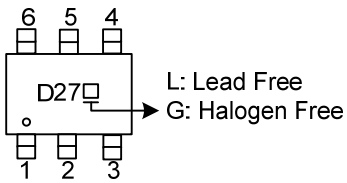
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment						Packing
Lead Free	Halogen Free		1	2	3	4	5	6	
MMDT2227L-AL6-R	MMDT2227G-AL6-R	SOT-363	E1	B1	C2	E2	B2	C1	Tape Reel

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

MMDT2227G-AL6-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) AL6: SOT-363 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C , unless otherwise specified)(Note 2)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage	TR1	V_{CEO}	40	V
	TR2		-60	
Collector-Base Voltage	TR1	V_{CBO}	75	V
	TR2		-60	
Emitter-Base Voltage	TR1	V_{EBO}	6	V
	TR2		-5.0	
Collector Current - Continuous	TR1	I_C	600	mA
	TR2		-600	
Derate above 25°C		P_D	200	mW
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 ratings only and functional device operation is not implied.
2. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Case	θ_{JC}	415	°C/W

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

TR1

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=10mA, I_B=0 (Note)	40			V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=10 μA, I_E=0	75			V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=10μA, I_C=0	6			V
Collector Cutoff Current	I_{CBO}	V_{CB}= 60V, I_E=0			10	nA
Emitter Cutoff Current	I_{EBO}	V_{EB}=3.0V, I_C=0			10	nA
ON CHARACTERISTICS						
DC Current Gain	h_{FE}	I_C=0.1mA, V_{CE}=10V	35			
		I_C=1mA, V_{CE}=10V	50			
		I_C=10mA, V_{CE}=10V	75			
		I_C=150mA, V_{CE}=10V	100		300	
		I_C=150mA, V_{CE}= 1V (Note)	50			
		I_C=500mA, V_{CE}=10V	40			
Collector-Emitter Saturation Voltage (Note)	$V_{CE(SAT)}$	I_C=150mA, I_B=15mA			0.3	V
		I_C=500mA, I_B=50mA			1.0	V
Base-Emitter Saturation Voltage (Note)	$V_{BE(SAT)}$	I_C=150mA, I_B=15mA	0.6		1.2	V
		I_C=500mA, I_B=50mA			2.0	V
SMALL SIGNAL CHARACTERISTICS						
Current Gain - Bandwidth Product	f_T	I_C= 20mA, V_{CE}=20V, f =100MHz	300			MHz
Output Capacitance	C_{OB}	V_{CB}=10 V, I_E=0, f=100 kHz			8	pF
Input Capacitance	C_{IB}	V_{EB}=0.5V, I_C=0, f=100 kHz			25	pF
Noise Figure	NF	I_C=100μA, V_{CE}=10V, R_S=1.0kΩ, f =1.0kHz			4	dB

■ ELECTRICAL CHARACTERISTICS (Cont.)

TR1

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SWITCHING CHARACTERISTICS						
Delay Time	t_D	V_{CC}=30V,I_C=150mA,$V_{BE(OFF)}$=-0.5V,			10	ns
Rise Time	t_R	I_{B1}=15mA			25	ns
Storage Time	t_S	V_{CC}=30V, I_C=150mA, I_{B1}=I_{B2}=15mA			225	ns
Fall Time	t_F				60	ns

Note: Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%

TR2

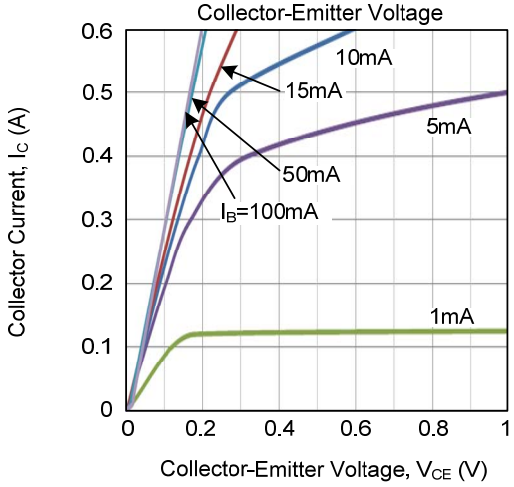
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=-10mA, I_B=0 (Note)	-60			V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=-10 μA, I_E=0	-60			V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=-10μA, I_C=0	-5.0			V
Collector Cutoff Current	I_{CBO}	V_{CB}= -50V, I_E=0			-20	nA
Emitter Cutoff Current	I_{EBO}	V_{EB}=-3.0V, I_C=0			-30	nA
ON CHARACTERISTICS						
DC Current Gain	h_{FE}	I_C=-0.1mA, V_{CE}=-10V	75			
		I_C=-1.0mA, V_{CE}=-10V	100			
		I_C=-10mA, V_{CE}=-10V	100			
		I_C=-150mA, V_{CE}= -10V (Note)	100		300	
		I_C=-500mA, V_{CE}=-10V (Note)	50			
Collector-Emitter Saturation Voltage (Note)	$V_{CE(SAT)}$	I_C=-150mA, I_B=-15mA			-0.4	V
		I_C=-500mA, I_B=-50mA			-1.6	V
Base-Emitter Saturation Voltage (Note)	$V_{BE(SAT)}$	I_C=-150mA, I_B=-15mA			-1.3	V
		I_C=-500mA, I_B=-50mA			-2.6	V
SMALL SIGNAL CHARACTERISTICS						
Current Gain - Bandwidth Product	f_T	I_C= -50mA,V_{CE}=-20V,f =100MHz	200			MHz
Output Capacitance	C_{OB}	V_{CB}=-10V, I_E=0, f=100 kHz			8	pF
Input Capacitance	C_{IB}	V_{EB}=-2.0V, I_C=0, f=100 kHz			30	pF
Noise Figure	NF	I_C=-100μA, V_{CE}=-10V, R_S=-1.0kΩ, f =1.0kHz		2.0		dB
SWITCHING CHARACTERISTICS						
Turn-on Time	t_{ON}	V_{CC}=30V, I_C=-150mA,			45	ns
Rise Time	t_R	I_{B1}=-15mA			40	ns
Storage Time	t_S	V_{CC}=6V, I_C=-150mA,			80	ns
Fall Time	t_F	I_{B1}= I_{B2}=-15mA			30	ns

Note: Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

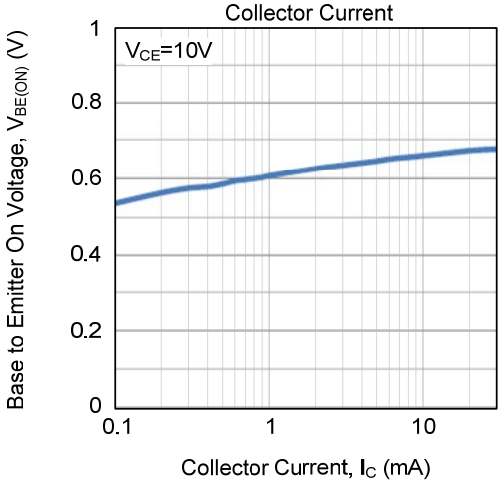
■ TYPICAL CHARACTERISTICS

MMDT2227 TR1

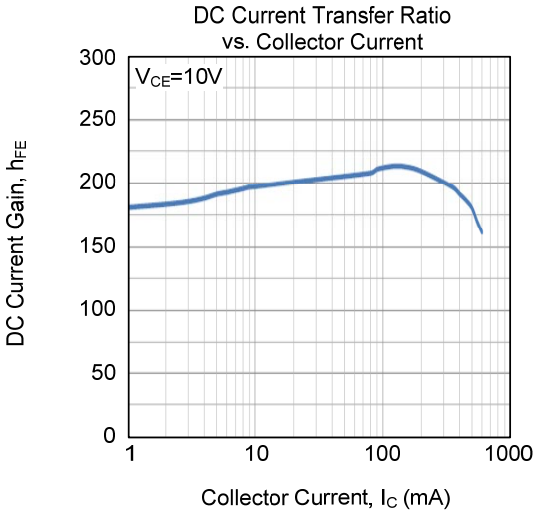
Collector Current vs. Collector-Emitter Voltage



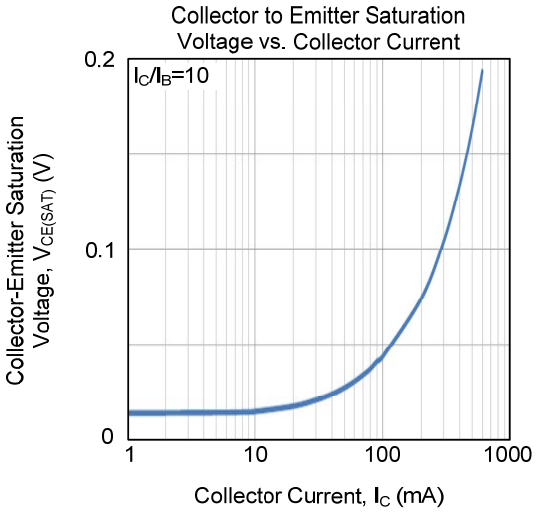
Base to Emitter On Voltage vs. Collector Current



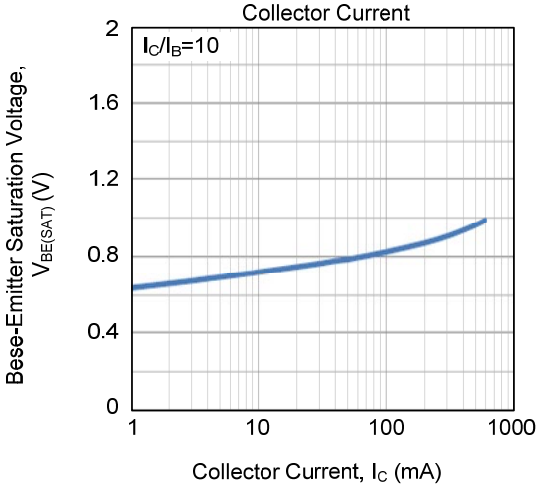
DC Current Transfer Ratio vs. Collector Current



Collector to Emitter Saturation Voltage vs. Collector Current



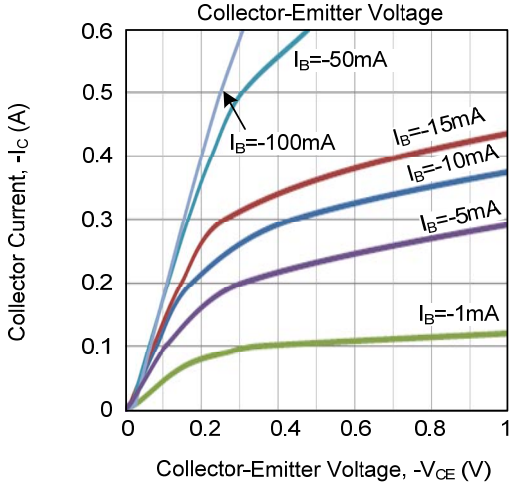
Bese-Emitter Saturation Voltage vs. Collector Current



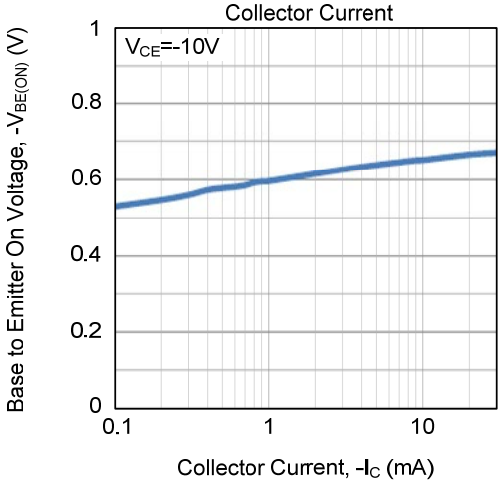
■ TYPICAL CHARACTERISTICS (Cont.)

MMDT2227 TR2

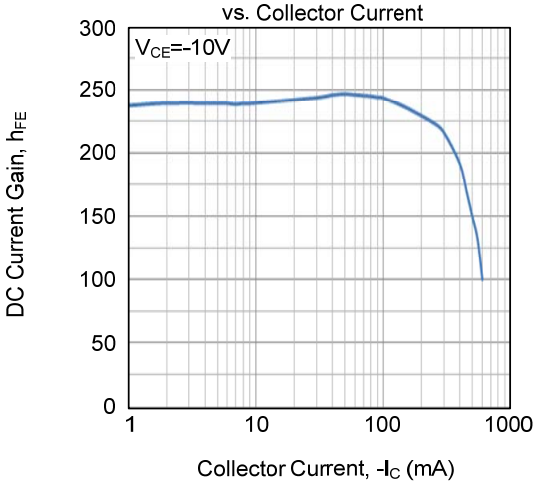
Collector Current vs. Collector-Emitter Voltage



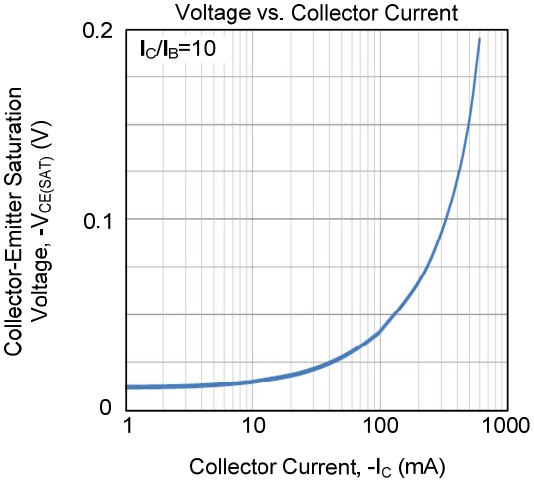
Base to Emitter On Voltage vs. Collector Current



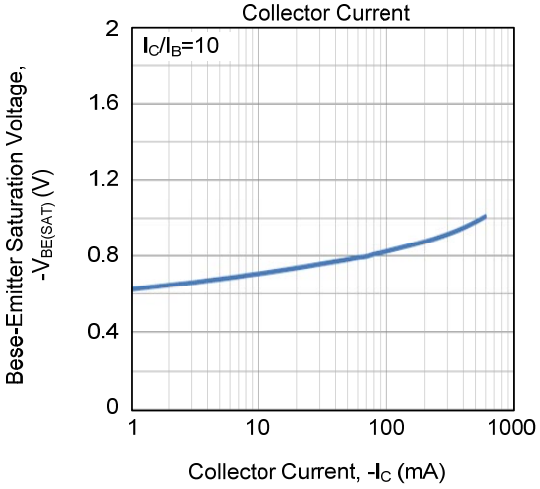
DC Current Transfer Ratio vs. Collector Current



Collector to Emitter Saturation Voltage vs. Collector Current



Bese-Emitter Saturation Voltage vs. Collector Current



■ TYPICAL CHARACTERISTICS (Cont.)