

MMDT2227Q

40V COMPLEMENTARY NPN/PNP SMALL SIGNAL TRANSISTOR

Description

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of Automotive Applications.

Features

- BV_{CEO} >40V
- I_C = 600mA High Collector Current
- Epitaxial Planar Die Construction
- Ideal for Medium Power Amplification and Switching
- Ultra-Small Surface Mount Package
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP Capable (Note 4)

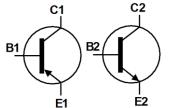
Mechanical Data

- Case: SOT363
- Case Material: Molded Plastic, "Green" Molding Compound;
 UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish Matte Tin Finish; Solderable per MIL-STD-202. Method 208@3
- Weight: 0.006 grams (Approximate)

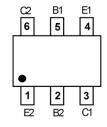
SOT363



Top View



Device Symbol



Top View Pin-Out

Ordering Information (Note 5)

Product	Compliance	Marking	Reel Size (inch)	Tape Width (mm)	Quantity per Reel
MMDT2227Q-7-F	Automotive	K27	7	8	3,000

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 4. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to https://www.diodes.com/quality/product-compliance-definitions/.
- 5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

SOT363

K27 = Product Type Marking Code YM = Date Code Marking Y or \overline{Y} = Year (ex: E = 2017) M or \overline{M} = Month (ex: 9 = September)

Date Code Key

Year	2017		2018	2019		2020	2021		2022	2023		2024
Code	Е		F	G		Н			J	K		L
Month	Jan	Feb	Mar	Anr	May	1	11	Aug	Son	Oct	Nov	Dec
111011111	Jan	רפט	IVIAI	Apr	way	Jun	Jul	Aug	Sep	OCI	NOV	Dec



Absolute Maximum Ratings, NPN (2222A Type) (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	75	V
Collector-Emitter Voltage	V _{CEO}	40	V
Emitter-Base Voltage	V _{EBO}	6	V
Collector Current	lc	600	mA

Absolute Maximum Ratings, PNP (2907A Type) (@TA = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	-60	V
Collector-Emitter Voltage	V _{CEO}	-60	V
Emitter-Base Voltage	V _{EBO}	-6	V
Collector Current	Ic	-600	mA

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P_{D}	200	mW
Thermal Resistance, Junction to Ambient (Note 6)	R _{0JA}	625	°C/W
Thermal Resistance, Junction to Case (Note 7)	$R_{ heta JC}$	150	°C/W
Operating and Storage and Temperature Range	T _J , T _{STG}	-55 to +150	°C

ESD Ratings (Note 8)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	С

Notes:

- 6. For the device mounted on minimum recommended pad layout FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
- 7. Thermal resistance from junction to the top of package.
- 8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristic and Derating Information

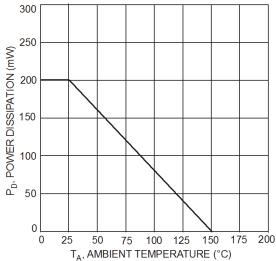


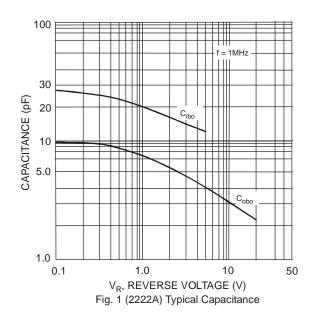
Fig. 1 Max Power Dissipation vs. Ambient Temperature

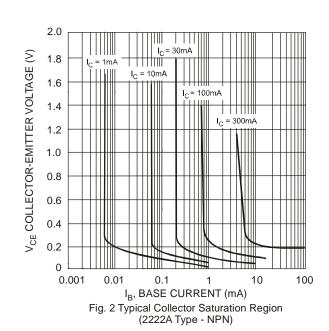


$\textbf{Electrical Characteristics, NPN (2222A Type)} \ (@T_A = +25^{\circ}C, \ unless \ otherwise \ specified.)$

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV _{CBO}	75		V	$I_C = 100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 9)	BV _{CEO}	40	_	V	$I_C = 10.0 \text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV _{EBO}	6.0	_	V	$I_E = 100 \mu A, I_C = 0$
Collector-Base Cut-Off Current	I _{CBO}		10	nΑ μΑ	$V_{CB} = 60V, I_{E} = 0$ $V_{CB} = 60V, I_{E} = 0, T_{A} = +150$ °C
Collector-Emitter Cut-Off Current	I _{CEX}	_	10	nA	$V_{CE} = 60V, V_{EB(OFF)} = 3.0V$
Emitter-Base Cut-Off Current	I _{EBO}		10	nA	$V_{EB} = 5.0V, I_C = 0$
Base Cut-Off Current	I _{BL}	_	20	nA	$V_{CE} = 60V, V_{EB(OFF)} = 3.0V$
ON CHARACTERISTICS (Note 9)	•		•		\\\-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
DC Current Gain	h _{FE}	35 50 75 100 40 50 35	 300 	_	$\begin{split} I_C &= 100 \mu A, \ V_{CE} = 10 V \\ I_C &= 1.0 mA, \ V_{CE} = 10 V \\ I_C &= 10 mA, \ V_{CE} = 10 V \\ I_C &= 150 mA, \ V_{CE} = 10 V \\ I_C &= 500 mA, \ V_{CE} = 10 V \\ I_C &= 10 mA, \ V_{CE} = 10 V, \ T_A = -55 ^{\circ}C \\ I_C &= 150 mA, \ V_{CE} = 1.0 V \end{split}$
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	_	0.3 1.0	V	$I_C = 150 \text{mA}, I_B = 15 \text{mA}$ $I_C = 500 \text{mA}, I_B = 50 \text{mA}$
Base-Emitter Saturation Voltage	V _{BE(SAT)}	0.60	1.2 2.0	V	$I_C = 150$ mA, $I_B = 15$ mA $I_C = 500$ mA, $I_B = 50$ mA
SMALL SIGNAL CHARACTERISTICS				1	
Output Capacitance	C _{obo}	_	8	pF	$V_{CB} = 10V$, $f = 1.0MHz$, $I_E = 0$
Input Capacitance	C _{ibo}	_	25	pF	$V_{EB} = 0.5V$, $f = 1.0MHz$, $I_{C} = 0$
Current Gain-Bandwidth Product	f⊤	300	_	MHz	$V_{CE} = 20V, I_{C} = 20mA,$ f = 100MHz
Noise Figure	NF		4.0	dB	$V_{CE} = 10V, I_{C} = 100\mu A,$ $R_{S} = 1.0k\Omega, f = 1.0kHz$
SWITCHING CHARACTERISTICS				•	
Delay Time	t _D		10	ns	$V_{CC} = 30V, I_C = 150mA,$
Rise Time	t _R		25	ns	$V_{BE(OFF)} = 0.5V, I_{B1} = 15mA$
Storage Time	ts		225	ns	$V_{CC} = 30V, I_C = 150mA,$
Fall Time	t_F	_	60	ns	$I_{B1} = -I_{B2} = 15mA$

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.



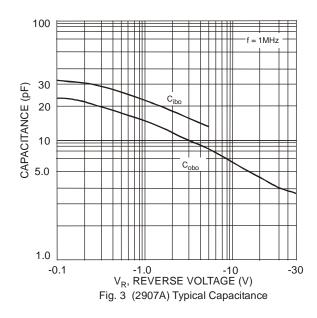


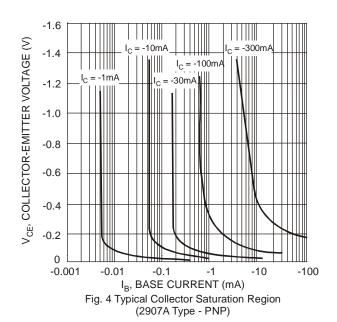


Electrical Characteristics, PNP (2907A Type) ($@T_A = +25^{\circ}C$, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 10)	-				
Collector-Base Breakdown Voltage	BV_{CBO}	-60		V	$I_C = -100 \mu A, I_E = 0$
Collector-Emitter Breakdown Voltage	BV_{CEO}	-60		V	$I_C = -10 \text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-6.0		V	$I_E = -100 \mu A, I_C = 0$
Collector Cutoff Current	1		-10	nA	$V_{CB} = -50V, I_{E} = 0$
Conector Cuton Current	I _{CBO}			μΑ	$V_{CB} = -50V$, $I_E = 0$, $T_A = +125$ °C
Collector Cutoff Current	I _{CEX}		-50	nA	$V_{CE} = -30V, V_{EB(OFF)} = -0.5V$
Base Cutoff Current	I_{BL}	_	-50	nA	$V_{CE} = -30V, V_{EB(OFF)} = -0.5V$
ON CHARACTERISTICS (Note 10)			1		
		75	_		$I_C = -100 \mu A, V_{CE} = -10 V$
		100	_		$I_C = -1.0 \text{mA}, V_{CE} = -10 \text{V}$
DC Current Gain	h_{FE}	100	_	_	$I_C = -10 \text{mA}, V_{CE} = -10 \text{V}$
		100	300		$I_C = -150 \text{mA}, V_{CE} = -10 \text{V}$
		50	_		$I_C = -500 \text{mA}, V_{CE} = -10 \text{V}$
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	_	-0.4	V	$I_C = -150 \text{mA}, I_B = -15 \text{mA}$
Oblicator Emiliar Saturation Voltage			-1.6	٧	$I_C = -500 \text{mA}, I_B = -50 \text{mA}$
Base-Emitter Saturation Voltage	V25(247)		-1.3	V	$I_C = 150 \text{mA}, I_B = 15 \text{mA}$
ŭ	$V_{BE(SAT)}$		-2.6	V	$I_C = 500 \text{mA}, I_B = 50 \text{mA}$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	_	8.0	pF	$V_{CB} = -10V$, $f = 1.0MHz$, $I_E = 0$
Input Capacitance	C _{ibo}		30	pF	$V_{EB} = -2.0V$, $f = 1.0MHz$, $I_{C} = 0$
Current Gain-Bandwidth Product	f _T	200	_	MHz	$V_{CE} = -20V, I_{C} = -50mA,$ f = 100MHz
SWITCHING CHARACTERISTICS				I	1 - 100WH2
Turn-On Time	ton	_	45	ns	
Delay Time	t _D	_	10	ns	V _{CC} = -30V, I _C = -150mA,
Rise Time	t _R	_	40	ns	I _{B1} = -15mA
Turn-Off Time	toff	_	100	ns	_
Storage Time	t _S		80	ns	$V_{CC} = -6.0V, I_{C} = -150mA,$
Fall Time	t _F	_	30	ns	$I_{B1} = -I_{B2} = -15mA$

Notes: 10. Short duration pulse test used to minimize self-heating effect.



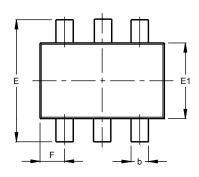


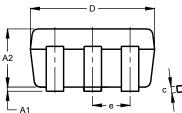


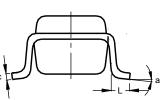
Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT363





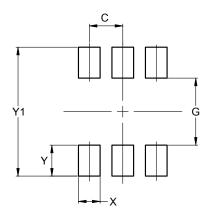


SOT363						
Dim	Min	Max	Тур			
A1	0.00	0.10	0.05			
A2	0.90	1.00	1.00			
b	0.10	0.30	0.25			
С	0.10	0.22	0.11			
D	1.80	2.20	2.15			
Е	2.00	2.20	2.10			
E1	1.15	1.35	1.30			
е	C).650 B	SC			
F	0.40	0.45	0.425			
L	0.25	0.40	0.30			
а	0°	8°				
All	Dimen	sions i	in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT363



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500



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